DOE/EA-1885

FINAL
ENVIRONMENTAL ASSESSMENT

FOR THE

BOSTON ARCHITECTURAL COLLEGE'S (BAC) URBAN SUSTAINABILITY INITIATIVE FOR THE RENOVATION OF PUBLIC ALLEY #444, BOSTON, MASSACHUSETTS

U.S. Department of Energy
National Energy Technology Laboratory

March 2012

DOE/EA-1885

FINAL
ENVIRONMENTAL ASSESSMENT

FOR THE

BOSTON ARCHITECTURAL COLLEGE'S (BAC) URBAN SUSTAINABILITY INITIATIVE FOR THE RENOVATION OF PUBLIC ALLEY #444, BOSTON, MASSACHUSETTS

U.S. Department of Energy
National Energy Technology Laboratory

MARCH 2012

COVER SHEET

Responsible Agency: U.S. Department of Energy (DOE)

Title: *Environmental Assessment for the Boston Architectural College's (BAC) Urban Sustainability Initiative for the Renovation of Public Alley #444, Boston, Massachusetts* (DOE/EA-1885)

Contact: For additional copies, more information, or to provide comments concerning this environmental assessment (EA), please contact:

Mr. Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
Bldg. 1, MS B07
Morgantown, WV 26507-0880
Email: Fred.Pozzuto@netl.doe.gov

Abstract: DOE prepared this EA to evaluate the potential environmental consequences of providing $1.6 million in financial assistance pursuant to a Congressional earmark to Boston Architectural College (BAC) for its Urban Sustainability Initiative for the Renovation of Public Alley #444. The financial assistance would be in the form of cost-shared funding. This EA analyzes the potential environmental impacts of DOE's proposed action of providing the grant funding and the No-Action Alternative.

In this EA, DOE evaluated potential environmental impacts resulting from the proposed project on air quality, geology and soils, biological resources – sensitive species, water resources, cultural/historic resources, traffic, noise, aesthetics and visual resources, and socioeconomic resources. The proposed project would be designed in compliance with all federal and state regulations, would reduce storm water runoff into the Charles River Basin and would become an ongoing tool for the BAC curriculum and community public education. The project would include the installation of 13 to 15 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the facilities. Operation of the geothermal wells would not result in any increase in noise in the vicinity. The aesthetics of Boston's Historic Back Bay District community would be enhanced with the addition of the green screen trellis system, planting soils, concrete pavement, and pavers. After consulting with Massachusetts State Historic Preservation Office (SHPO) DOE has determinated that this project would not have an adverse effect on the historical Back Bay District. As part of the Green Alley Phase II, the green screen trellis system is a vine covered vegetated screen intended to provide an attractive visual amenity that benefits both the public and the institution by softening the appearance of two faces of an existing masonry block stair tower.

Developing the geothermal wells on the BAC site would not significantly impact any population of plant or animal species. The project site is relatively small (less than 1.0 acre) and isolated from larger tracts of undisturbed land; nor does the area provide any unique habitats for special species. The Indiana bat (*Myotis sodalist*), an endangered species, is known to reside in Suffolk and Middlesex counties and in various locations throughout Massachusetts. However, given the localized construction area in the alley and the species' tendency to not stray from its wooded habitat, it is highly unlikely that the proposed action would have any negative impacts on the endangered Indiana bat species.

CONTENTS

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

APPENDICES

ACRONYMS AND ABBREVIATIONS

BAC	Boston Architectural College
BTP	Building Technology Program
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy (also referred to as the Department)
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
HVAC	heating, ventilation, and air conditioning
IPCC	Intergovernmental Panel on Climate Change
LEED	Leadership in Energy and Environmental Design
Mass DEP	Massachusetts Department of Environmental Protection
NEPA	National Environmental Policy Act, as amended
NETL	National Energy Technology Laboratory
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
R&D	Research and Development
SHPO	State Historic Preservation Office(r)
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGBC	U.S. Green Building Council
USGS	United States Geological Survey
VOC	volatile organic compound

SUMMARY

The U.S. Department of Energy (DOE) proposes to provide $1.6 million in financial assistance, pursuant a Congressional earmark to the Boston Architectural College (BAC) for the construction and implementation of the Urban Sustainability Initiative for the Renovation of Public Alley #444 between 951 Boylston Street and 320 Newbury Street at Hereford Street in Boston's Historic Back Bay District. The financial assistance proposed would be in the form of cost-shared funding. Under an assistance agreement, BAC would install 13 to 15 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the benefiting facilities. The completed Green Alley project would reduce storm water runoff into the Charles River Basin and become an ongoing tool for the BAC curriculum and community public education. BAC would contribute $2.1 million of the estimated total cost of the project of about $3.7 million.

In compliance with the *National Environmental Policy Act* (42 United States Code [U.S.C. Section 4321 et seq.) and DOE's *National Environmental Policy Act* implementing regulations (10 Code of Federal Regulations [CFR] Part 1021) and procedures, this environmental assessment (EA) examines the potential environmental impacts of DOE's proposed action, renovation of Public Alley #444, and the No-Action Alternative. Its purpose is to inform DOE and the public of the potential environmental consequences of the proposed project and the alternatives.

In this EA, DOE analyzed impacts to air quality, geology and soils, biological resources, water resources, cultural/historical resources, traffic, noise, aesthetics and visual resources, and socioeconomic resources from construction and renovation of Public Alley #444 in Boston's Historic Back Bay District into a Green Alley. Installation and operation of the Proposed Action would not have any meaningful or detectable impacts on land use; vegetation and wildlife resources, occupational health and safety; environmental justice; utilities, energy, and materials; and waste generation.

The proposed project is in Suffolk County, Massachusetts, which is a nonattainment area for ozone, and according to the Environmental Protection Agency, the area is considered to be in "moderate nonattainment." For an area of moderate nonattainment of ozone standards, a conformity determination is not required if project emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are ozone precursors, are each less than 100 tons per year [40 CFR 93.153(b)(1)]. The proposed project would involve temporary air emissions during construction. Once completed, the proposed project would provide heating and cooling to the facilities via geothermal energy, thereby reducing the amount of pollutants produced from burning fossil fuels for conventional heating and cooling. The proposed project would contribute to a minor reduction in regional greenhouse gas emissions and aid in the attainment goals for air quality of the area.

The subsurface soils of the Back Bay area are comprised primarily of sand and gravel, so the area is susceptible to amplification (the physical reaction of seismic waves becoming more robust as they travel through soft soil) and soil liquefaction (which occurs when saturated sand

and gravel is shaken with enough energy to cause a sudden but temporary pore fluid pressure increase between the grains) in a severe earthquake. According to the United States Geological Survey, the historic record of seismicity in Massachusetts reveals a low threat from earthquakes, so a severe earthquake probability is highly unlikely. Also, since the project area is not located near a fault line or area of high seismicity, drilling, boring, and other construction activities would not induce seismic activity. Soil studies performed in and around the project area indicate that the soils are capable of infiltrating return water at an acceptable rate for this project.

The Indiana bat (*Myotis sodalist*), an endangered species, is known to reside in Suffolk and Middlesex counties and in various locations throughout Massachusetts. Given the localized construction area in the alley and the species' tendency to not stray from its wooded habitat, it is highly unlikely that the proposed action would have any negative impacts on this endangered species, or its habitat.

All excess water (approximately seven to ten million gallons of water annually) from the geothermal system would be directed approximately 200 feet into the fractured bedrock via two to three proposed injection wells. The 4,000 square feet of porous pavers and porous concrete that would be installed in the alley would also aid in recharging the groundwater. Although construction of the proposed project may slightly lower groundwater levels, this condition would only be temporary. The proposed project site is not located close enough to the floodplain or any wetland to have a negative impact on either resource.

The geothermal wells would be installed in Public Alley #444 and under the sidewalks on Newbury Street and Hereford Street. The drilling for the geothermal wells is not anticipated to negatively affect any parts of the historical buildings in the surrounding area because drilling and installation of the underground wells would not cause enough vibration to disturb the buildings. Connection of the geothermal system to historic building 951 Boylston Street could potentially cause adverse impacts due to alteration of the exterior of the buildings and potential renovations. Feasibility studies are being prepared to determine how the system will be connected but typically geothermal systems do not require extensive renovations and can use existing plumbing and HVAC systems. Engineering plans currently indicate that the connection to the building would occur underground to the existing mechanical room therefore it is not anticipated that adverse impacts would occur.

During construction, impacts to traffic are expected to be minimal as the project is not located within any main roadway artery or circulation route. Several construction vehicles would be on the project site during installation of the geothermal system and Green Alley. Public Alley #444 would be closed for approximately four weeks, twenty-four hours a day, for the installation of the Green Alley Phase II and part of the geothermal system. The installation of the geothermal system beyond Public Alley #444 would likely create temporary lane blockages for Newbury and Hereford Streets, leaving one lane open and partially blocking sidewalks for approximately four to eight weeks.

As is common with any construction site, noise levels would temporarily increase in the project area. Upon completion, the geothermal system would not generate any noise.

The impacts to the area's aesthetics are anticipated to be positive upon completion of the proposed project by the transformation of Public Alley #444 into a Green Alley in two phases by adding a public way, a green trellis system, porous pavers and concrete, street lights, bollards, and granite curbing. The geothermal wells underneath Public Alley #444 and both Newbury and Hereford Streets, once capped, would not be visible to the pedestrian or motoring public.

The proposed project would create temporary construction jobs and provide work for local firms. The project would also provide long-term energy related cost savings of approximately $60,000 per year, reduce storm water runoff, and generate power through alternative energy sources, while greatly reducing BAC's carbon footprint. The project could also provide public outreach and education of alternative energy systems upon its completion.

Under the No-Action Alternative, DOE would not provide funding to the BAC and the Green Alley would not be installed, nor would the geothermal heating and cooling system be installed. Without this Federal funding, it is likely that the proposed project would not be built, or would at least be delayed until additional funding sources could be identified. For comparison purposes, it is assumed no impacts to the existing environment would occur, and the beneficial impacts discussed above would not be realized.

1. INTRODUCTION

The U.S. Department of Energy's (DOE or the Department) National Energy Technology Laboratory (NETL) proposed action is to provide a $1.6 million in financial assistance pursuant to a Congressional earmark to Boston Architectural College (BAC) for its Urban Sustainability Initiative for the Renovation of Public Alley #444 (Green Alley Phase II and Geothermal Solution). The area of Boston that the project is located is called the Historic Back Bay District, the Back Bay Historic District, and the Back Bay Architectural District. This financial assistance would allow BAC to design, construct and implement the renovation of Public Alley #444. The project would include the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping. The main component of the project would be the installation of 13 to 15 open loop geothermal wells to provide heating and cooling energy to the facilities of BAC and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the benefiting facilities. The Green Alley would reduce storm water runoff into the Charles River Basin and become an ongoing tool for the BAC curriculum and community public education. The geothermal solution would serve the hot and chilled water needs for three of BAC's campus facilities, 320 Newbury Street, 322 Newbury Street and 951 Boylston Street. The funding of these projects requires compliance with the *National Environmental Policy Act of 1969*, as amended (NEPA; 42 U.S.C. 4321 et seq.), Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] Parts 1500 to 1508), and DOE NEPA implementing procedures (10 CFR Part 1021).

The BAC would use DOE financial assistance in the form of cost-shared funding to facilitate two of three capital projects at the BAC as part of its Urban Sustainability Initiative. The Green Alley Phase I was funded by the Massachusetts Department of Environmental Protection (Mass DEP) and the city of Boston and commenced in 2010. The DOE funding would support the Green Alley Phase II and the Geothermal Solution projects. All local approvals and permits have been obtained for both phases of the Green Alley and the Geothermal Solution (McNeil 2011b). The purpose of BAC's Urban Sustainability Initiative is to develop a green alley and energy saving renovations to the BAC physical plant which could serve as a working model for energy efficient design in enclosed 19th century and 20th century urban sites and as an education living laboratory for teaching ecological and sustainable technologies to students and the public while creating jobs.

Phase II Green Alley includes the completion of the green renovation of Public Alley #444 between 320 Newbury Street and 951 Boylston Street in Boston, MA. The Urban Sustainability Initiative proposes 4,000 square feet of pervious paving to maximize storm water absorption infiltration and to provide enhanced groundwater recharge. The pervious paving includes two difference material applications; 1,700 square feet of pervious bituminous concrete to resist loads and vehicular turning movements in the highly traveled main alley areas; and 2,250 square feet of concrete unit pavers placed on both sides of the main alley which is predominantly pedestrian with lighter travel loading. The Green Alley Phase II renovations also include the green screen trellis system located on the back of 951 Boylston Street. The green screen trellis system would

cover approximately 950 square feet (23 feet wide by 44 feet high) and provide a vegetated screen to soften the appearance of the two faces of an existing four story concrete masonry block construction stair tower (see Figure 2-3).

The proposed Geothermal Solution includes the installation of approximately 13 to 15 geothermal wells to provide air conditioning and heating for three existing BAC campus facilities. The standing column wells would extend down to approximately 1,500 feet with two or three bleed injection wells to approximately 200 feet. The thermodynamics of an open loop geothermal well heat pump system makes use of the constant mid 50 degree temperatures of the earth by circulating fluid through closed pipes exchanging the heat of the earth in the winter, and returning the heat of the building to the earth in the summer. The system would run on a standard heating, ventilation, and air conditioning (HVAC) system, use no fossil fuels, produce no emissions, run silently, and once capped, would be invisible to the public.

DOE prepared this environmental assessment (EA) to evaluate the potential environmental consequences of its proposed action and BAC's proposed project. In compliance with NEPA and its implementing procedures, this EA examines the potential environmental consequences of DOE's proposed action (that is, providing funding), the BAC's proposed project, and the No-Action Alternative (under which it is assumed that the BAC would either not proceed with the project or would delay the project until additional funding sources could be identified). The EA's purpose is to inform DOE, resource agencies, and the public of the potential environmental consequences of the proposed project and alternatives.

This chapter explains NEPA and related procedures (Section 1.1), the background of this project (Section 1.2), the purpose and need for DOE action (Section 1.3), and the environmental resource areas DOE did not carry forward to detailed analysis (Section 1.4). Chapter 2 discusses DOE's proposed action, BAC's proposed project, action alternatives, and the No-Action Alternative. Chapter 3 details the affected environment and potential environmental consequences of the proposed action, proposed project, and No-Action Alternative. Chapter 4 addresses cumulative impacts, and Chapter 5 provides DOE's conclusions from the analysis. Chapter 6 lists the references for this document. Appendix A contains the distribution list for this document. Appendix B contains copies of DOE's consultation letters with other agencies.

1.1 National Environmental Policy Act and Related Procedures

In accordance with DOE NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to states and private entities. In compliance with these regulations and DOE's procedures, this EA:

- Examines the potential environmental impacts of the proposed action and the No-Action Alternative;

- Identifies unavoidable adverse environmental impacts of the proposed action;

- Describes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and

- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its proposed action.

DOE must meet these requirements before it can make a final decision to proceed with any proposed Federal action that could cause adverse impacts to human health or the environment. This EA provides DOE with the information needed to make an informed decision regarding its proposed action. This EA evaluates the potential individual and cumulative impacts of the proposed project. No other action alternatives are analyzed. For purposes of comparison, this EA also evaluates the impacts that could occur if DOE did not provide funding (the No-Action Alternative), under which DOE assumes that BAC would not proceed with the project, allowing DOE to compare the impacts of an alternative in which the project occurs with one in which it does not.

1.2 Background

The NETL, part of DOE's national laboratory system, is owned and operated by the DOE and supports DOE's mission to advance the national, economic, and energy security of the United States. The NETL implements a broad spectrum of energy and environmental research and development (R&D) programs that will return benefits for generations to come, while protecting our environment and enhancing our energy independence. DOE invests in R&D to make more efficient use of energy in buildings, transportation, and industry, and to accelerate development of renewable energy options. The NETL supports DOE's Office of Energy Efficiency and Renewable Energy in managing research partnerships. The NETL's project portfolio includes R&D conducted through partnerships, cooperative research and development agreements, financial assistance, and contractual arrangements with universities and the private sector. Together, these efforts focus a wealth of scientific and engineering talent on creating commercially viable solutions to national energy and environmental problems (NETL 2011).

The proposed action is for the DOE to provide BAC with financial support for the design, construction and implementation of the Urban Sustainability Initiative, including the Geothermal Solution and Green Alley II. The financial assistance proposed would be $1.6 million in the form of cost-shared funding provided to BAC, based on a FY2010 congressional earmark. Total direct cost for the Geothermal Solution and Green Alley Phase II is estimated at about $3.7 million.

This project promotes the goals of the DOE's Building Technology Program (BTP) by demonstrating and promoting the benefits of energy efficiency and renewable energy technologies. The mission of the BTP is to develop technologies, techniques, and tools for making buildings more energy efficient, productive, and affordable. BTP focuses on improving commercial and residential building components, energy modeling tools, building energy codes,

and appliance standards. Research, development, demonstration, and technology transfer is conducted in partnership with industry, government agencies, universities, and national laboratories that are often designed as cost-shared projects. In fact, most of the research conducted by the program is funded through competitive solicitations with partners. The program selects its research partners and projects based on factors such as energy savings potential, likelihood of success, and alignment with the recommendations of industry-developed technology roadmaps (DOE 2011).

In accordance with Section 5(a)(8) of DOE Order 451.B, NEPA Compliance Program, the DOE is required to determine whether the proposed action would comply with a Categorical Exclusion level of review, the preparation of an EA, or the preparation of an Environmental Impact Statement. BAC completed an Environmental Questionnaire for the Urban Sustainability Initiative for the Renovation of Public Alley #444, located in Boston, Massachusetts to provide DOE with the necessary information to determine the appropriate level of NEPA review and documentation.

The questionnaire includes: (1) a brief description of objectives of the proposed work, (2) proposed project alternatives, if applicable, (3) a summary of the anticipated environmental impacts, if any, (4) required regulatory compliance, if any, and (5) a description of any issues that would generate public concern regarding the proposed action, if any. Based on the information provided in the questionnaire, and supporting analyses and recommendations by DOE staff, DOE determined that that an EA was the appropriate level of review. On April 27, 2011, DOE announced in a Memorandum for Distribution its decision to prepare an EA for the proposed project. This decision was based on the scope of the proposed project, the potential for the project to result in no significant impacts, and the absence of extraordinary circumstances that might affect the significance of the proposed project's environmental consequences.

1.3 Purpose and Need

The purpose and need for DOE action is to comply with the direction in the requirements of the Congressional earmark in the Fiscal Year 2010 Appropriations Act. Furthermore, DOE has determined that BAC's circumstances and situation provide adequate justification why this project was selected at this location, at this time.

The BAC's Urban Sustainability Initiative is a multi-part project with several important goals and objectives. The scope of the proposed action includes:

- Green Alley Phase II – The green renovation of Public Alley #444 in Boston's Historic Back Bay District. The renovation would include installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping

- Geothermal Solution – Upon completion of Green Alley Phase II, approximately 13 to 15 wells would be installed to provide heating and cooling to three BAC facilities.

- Sustainability Design Curriculum – This effort includes the ongoing development of new interactive sustainability teaching tools for the BAC and the community.

As a result of the completion and ongoing performance of the Green Alley and Geothermal Solution, BAC expects to serve the Back Bay and Fenway neighborhoods, the city of Boston and the citizens of Massachusetts with a Sustainability Design Curriculum that would demonstrate and share sustainability design practices and inspire energy efficient practices by teaching ecological and sustainable technologies to students and the public while also creating jobs. The Sustainability Design program focuses in particular on energy efficiency, energy performance, energy modeling, energy and air quality principles, green building, and renewable energy alternatives.

The project would have positive impacts on the surrounding neighborhood and achieve several important goals including (1) energy conservation, (2) improved quality and reduction of storm water runoff into the Charles River Basin, (3) monitoring of the quality of storm water runoff, (4) recharging of the area groundwater, (5) generation of power through alternative energy sources, and (6) help eliminate the BAC's carbon footprint. It is expected that the completed project would continue to create jobs, evaluate the effectiveness of urban sustainability design principles in existing structures and densely built urban neighborhoods throughout the Charles River Basin, and serve as a model for other college campuses and communities across the country. BAC's goal is to ultimately provide a Sustainability Design Curriculum with an active working laboratory for green education, becoming an ongoing tool for the BAC curriculum and community public education.

1.4 Environmental Resources Not Carried Forward

Chapter 3 of this EA examines the potential environmental consequences of the proposed project and the No-Action Alternative for the following resource areas:

- Air quality
- Geology and soils
- Biological resources – sensitive species
- Water resources
- Cultural/Historical resources
- Traffic
- Noise
- Aesthetics and visual resources
- Socioeconomic resources

In an effort to streamline the NEPA process and enable a timely award to the selected project, this assessment did not examine all resource areas at the same level of detail as those listed above. The focus for the more detailed analysis was on those activities or actions that would require new or revised permits, have the potential for adverse environmental impacts, or have the potential for public controversy. For the reasons discussed below, DOE concludes that BAC's

proposed project would result in no impacts or very minor impacts to the following resource areas, therefore a detailed description and analyses of these resource areas are not carried forward into Chapter 3.

- Land use. The Green Alley Phase II and Geothermal Solution would be located in an area already designated for urban development. DOE assumes the BAC has obtained all necessary permits and approvals for the development, and the proposed action would require no additional approvals related to land use. The total size of the proposed project for Phase II is approximately 3,568 square feet. No land areas would be affected due to the proposed project. Green Alley Phase II anticipated the removal of three feet of asphalt and soils from the renovation area, installation of a drainage system, and permeable paving system on the demonstration area of the Green Alley Phase II and the installation of approximately 13 to 15 geothermal wells.

- Vegetation and wildlife resources. The project site is approximately 1,650 feet away from wooded areas and rivers and also been an urban area for many years. Given the localized construction area in the alley and distance of the proposed project site from wooded habitat, it is unlikely that the proposed action would have any negative impacts on plant and animal resources.

- Occupational health and safety. Consistent with the nature, size and scope of this project there would be no unique risks to occupational health and safety during installation and operation of the Green Alley Phase II and Geothermal Solution. Occupational health and safety requirements would be similar to those for other small construction and renewable energy projects.

- Environmental justice. Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,* directs Federal agencies to address environmental and human health conditions in minority and low-income communities. The evaluation of impacts to environmental justice is dependent on demonstrating that significant, adverse impacts from the proposed project are not disproportionately borne by any low-income or minority groups in the affected community. As illustrated in this EA, no significant adverse impacts would occur to any members of the nearby community; therefore, DOE feels there would be no adverse and disproportional impacts to minority or low-income populations.

- Utilities, energy, and materials. The Geothermal Solution, ultimately in combination with other projects, would assist in making the BAC "carbon-neutral" by helping reduce their carbon footprint to near zero. The open loop geothermal well heat pump system should yield around 3.4 for a coefficient of performance in heating, and approximately 16 for the energy efficiency rating in cooling. There are no unique materials required to manufacture, install, or operate the geothermal wells or Green Alley Phase II.

- Waste generation. Existing conditions indicate no hazardous waste in the construction area (GZA Geoenvironmental Inc. 2005). The Green Alley Phase II and the Geothermal Solution projects are not anticipated to generate any hazardous or nonhazardous waste beyond small temporary amounts of construction debris. Asphalt and materials would be trucked for recycle or disposal at a reclaim facility, which would be addressed by the construction plans from the general contractor.

1.5 Consultations

1.5.1 CONSULTATIONS

DOE consulted with the Back Bay Architectural Commission, the Boston Landmarks Commission and the Massachusetts Historical Commission to comply with the review requirements of Section 106 of the *National Historic Preservation Act*, as amended (16 United States Code [U.S.C]. 470 et seq.). Copies of DOE's consultation correspondence are in Appendix B.

Back Bay Architectural Commission

DOE sent a letter to the Back Bay Architectural Commission on April 14, 2011, requesting information on concerns or issues (on behalf of both the Boston Landmarks Commission and the Back Bay Architectural Commission) prior to initiating the test bore and test well at the proposed project site. This information was requested to aid in the preparation of this EA and to meet the Department's obligation to contact consulting parties to determine their interest in the review (36 CFR 800.2(a)(4)). The Back Bay Architectural Commission responded in a letter dated April 14, 2011, that the Boston Landmarks Commission has no jurisdiction over the BAC campus, which lies within the boundaries of the Back Bay Architectural District, established by Chapter 625 of the Acts of 1966, as amended. Moreover, the Back Bay Architectural Commission's review authority is limited to exterior architectural features, not below-grade conditions. The only aspect of the test bore and test well area that would be subject to Back Bay Architectural Commission mandate would be the surface treatment. DOE sent a letter to the Boston Landmarks Commission and Back Bay Architectural Commission on September 23, 2011, requesting any additional information on properties of historic or archaeological significance within the vicinity of the BAC project and any comments or concerns on the potential for this project to affect these properties. Appendix B contains further response from the BBAC dated August 16, 2011 and October 7, 2011.

Massachusetts Historical Commission

DOE sent a letter to the Massachusetts Historical Commission on April 14, 2011, requesting information on historic properties within and near the proposed site. DOE also requested any comments or concerns the State Historic Preservation Officer (SHPO) might have on the potential for the proposed project to affect the properties. This information was requested to aid in the preparation of this EA and to meet the Department's obligations under Section 106 of the

National Historic Preservation Act to take into account the effects of undertakings by Federal agencies on historic properties and cultural resources. The SHPO responded in a letter dated April 1, 2010, the project is located within the Back Bay Historic District (MHC #BOS.BT), which is listed in the National Register of Historic Places, and may be sensitive for containing significant archaeological features preserved below the late 19th-century fill. They also expressed concern that the test bore could cause vibration effects to adjacent historic masonry buildings or encounter intact soils beneath the urban fill that may contain archaeological features. The SHPO recommended that DOE make a finding that the six-inch diameter test bore between 941 and 951 Boylston Street will have "no adverse effect" on significant historic and archaeological characteristics of the Back Bay Historic District and Back Bay Architectural District and if any vibration effects to nearby historic buildings occur, the drilling should cease and consultation should occur with the MHC and other consulting parties. DOE replied in a letter dated April 27, 2011, with its intention to prepare an EA to fulfill the requirements of DOE's NEPA Implementing Procedures. DOE sent a letter to the Massachusetts Historical Commission and State Historic Preservation Office on September 23, 2011, requesting any additional information on properties of historic or archaeological significance within the vicinity of the BAC project and any comments or concerns on the potential for this project to affect these properties. DOE intends to support its "no adverse effect" with further geotechnical information and mitigation measures provided in this EA.

2. DOE PROPOSED ACTION AND ALTERNATIVES

This chapter describes DOE's proposed action (Section 2.1), the BAC's proposed projects (Section 2.2), the bases for not considering other alternatives (Section 2.3), and the No-Action Alternative (Section 2.4).

2.1 DOE's Proposed Action

DOE's proposed action is to provide $1.6 million in financial assistance in the form of cost-shared funding, to the BAC pursuant to a FY2010 Congressional earmark to facilitate the BAC's proposed project in the Historic Back Bay District of Boston, Massachusetts. The total cost of the project is estimated to be approximately $3.7 million.

2.2 BAC's Proposed Project

The BAC is an independent, accredited college of spatial design, founded in 1889. The BAC is located in the center of Boston's Historic Back Bay District (see Figure 2-1). The BAC offers undergraduate and graduate programs in Architecture, Interior Design, Landscape Architecture and Design Studies and has over 1200 students (BAC 2011). The BAC proposed project would include the installation of 13 to 15 open loop geothermal wells to provide heating and cooling energy to the BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the benefiting facilities. The proposed project would contribute slightly to the reduction of storm water runoff into the Charles River Basin and would become an ongoing tool for the BAC curriculum and community public education (McNeil 2011a).

The BAC Urban Sustainability Initiative is a multi-part project with several important objectives. The key project objectives are to develop green alley projects, implement energy saving renovations to the BAC physical plant, and to teach ecological and sustainable technologies to students and the general public while creating jobs. The scope of the project includes the Phase II Green Alley, Geothermal Solution, and Sustainability Design Curriculum.

2.2.1 PHASE II GREEN ALLEY

Phase II Green Alley includes completing the green renovation of Public Alley #444 between 320 Newbury Street and 951 Boylston Street in Boston, MA (see Figures 2-2 and 2-3). Phase I Green Alley was a separate project funded by the Mass DEP and the City of Boston. The Green Alley would help to reduce the storm water runoff into the Charles River Basin in one of the most significantly polluted reaches known as, the Cheese Cake Brook to Boston Harbor sub-watershed (McNeil 2011a).

The Urban Sustainability Initiative proposes 4,000 square feet of pervious paving to maximize storm water infiltration and groundwater recharge. The design for the pervious paving will

include two different material applications. The first application is 1,700 square feet and is composed of pervious bituminous concrete designed to resist loads and vehicular turning movements in the highly traveled main alley areas while remaining free draining. The second application includes a 2,250 square foot area to both sides of the main alley which is predominantly pedestrian with lighter travel loading which would be composed of a "colorful blend of high quality, low maintenance concrete unit pavers with sand swept, hand tight joints." The area beneath the pavers would be composed of a compacted, free draining aggregate base to support the paving systems and accept the associated loads. The drainage layer would also accept, filter, and convey the storm water from the permeable paving surfaces as well was roof runoff from the two adjacent buildings to maximize the amount of storm water that could enter the subsurface for groundwater recharge (McNeil 2011a).

The system is designed to absorb 90 percent of all storm water flows which will exceed the recharge capability of the existing paver system. The free draining aggregate base layer would act as a filter media to reduce the amount of pollutants currently entering the local storm drainage system. The pervious pavement would also help to reduce sediment, total nitrogen, total phosphorus, metals, and some studies indicate it could also reduce chemical oxygen demand and motor oil concentrations (McNeil 2011a). The estimated annual total volume of rainfall on the site is approximately 432,000 gallons. The estimated total volume of rainwater to be infiltrated by the Green Alley pervious paving and storm water infiltration system is 362,400 gallons which is an estimated reduction of 84 percent over existing conditions.

The Phase II Green Alley renovations also include the green screen trellis system. The trellis system would be located on the back of 951 Boylston Street. The intent of the trellis system is to "provide an attractive visual amenity that benefits both the public and the institution in the form of a vine covered vegetated screen to soften the appearance of the two faces of an existing four story concrete masonry block construction stair tower." The green screen trellis system would cover approximately 950 square feet (23 feet wide by 44 feet high). The trellis would consist of eight inch square stainless steel cable grid with standoffs that support the trellis five inches off the wall of the building. There would be a planter located beneath the trellis on one side of the stair tower, which would hold 30 Boston Ivy vines. The planter would be approximately three feet wide and 24 feet long and would be protected by a perimeter granite planter curb (McNeil 2011a).

2.2.2 GEOTHERMAL SOLUTION

The BAC proposes to install a geothermal system designed to serve the hot and chilled water needs for three of the campus facilities. The three facilities are located at 320 Newbury Street, 322 Newbury Street, and 951 Boylston Street. The geothermal solution includes the installation of approximately thirteen geothermal wells to provide air conditioning and heating for the BAC facilities. The geothermal system does not use fossil fuel, does not produce emissions and is not a noise pollutant. One goal of the geothermal solution is to provide a sustainable model for

commercial and residential buildings throughout Boston. Another goal is to make the BAC, with the implementation of other projects, "carbon-neutral" (McNeil 2011a).

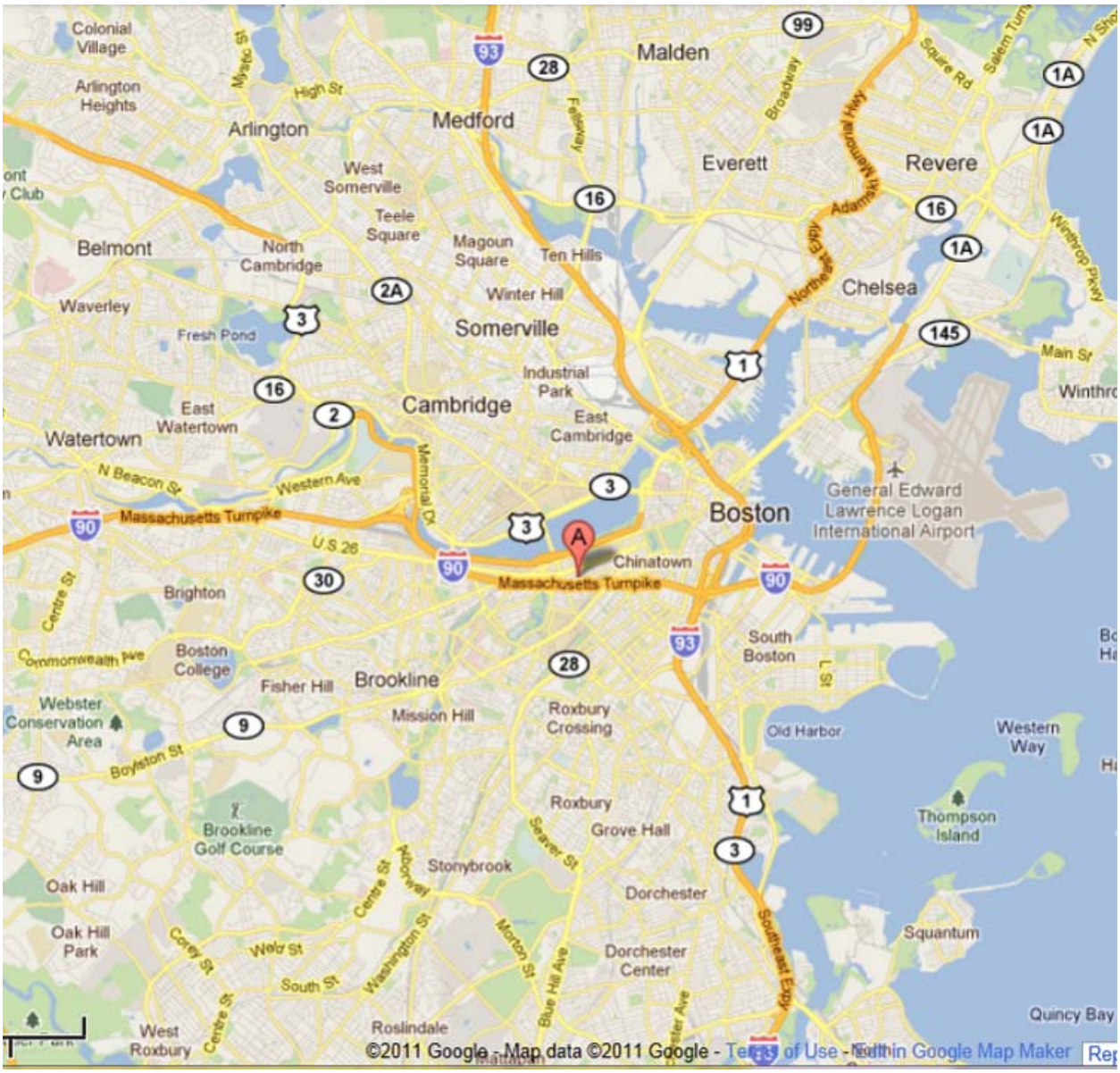


Figure 2-1. Regional map showing approximate location of the Boston Architectural College in relation to Boston.

The proposed plan for the geothermal wells includes thirteen standing column wells to approximately 1,500 feet and two or three bleed injection wells to approximately 200 feet. Ongoing feasibility studies are being conducted for the total number of wells, HVAC design and the retrofit/equipment options. Currently plans indicate that there would be an approximate 3.4 coefficient of performance in heating and an approximate 16 coefficient of performance in cooling (McNeil 2011a). The coefficient of performance is the ratio of heat provided in Btu per Btu of energy input. The coefficient of performance is a measure of efficiency in the

heating/cooling mode that represents the ratio of total heating/cooling capacity to electrical energy input.

The three facilities proposed to be connected to the geothermal wells would need to undergo plumbing and electrical upgrades. Currently a feasibility study is being conducted to identify three options for both heating and cooling configurations to service the geothermal systems. The feasibility study takes into consideration the building usage and occupancy schedules, an estimate of heating and cooling loads, a high level energy usage calculation for payback analysis, existing conditions emissions, and evaluation of existing equipment for adaptation into a proposed hybrid geothermal system.

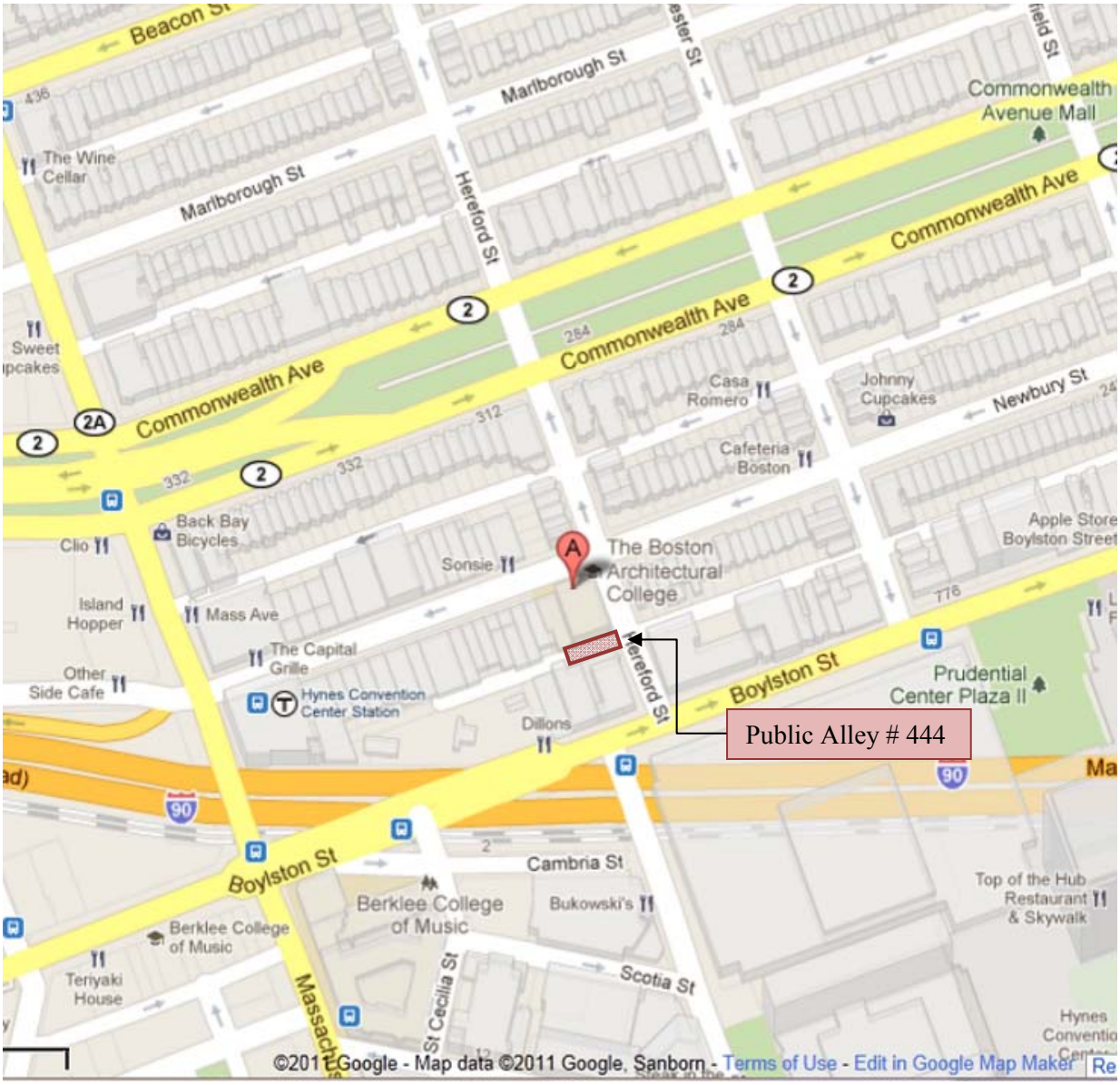


Figure 2-2. Vicinity map showing general location of the portion of Public Alley #444 proposed for renovation in relation to the BAC.

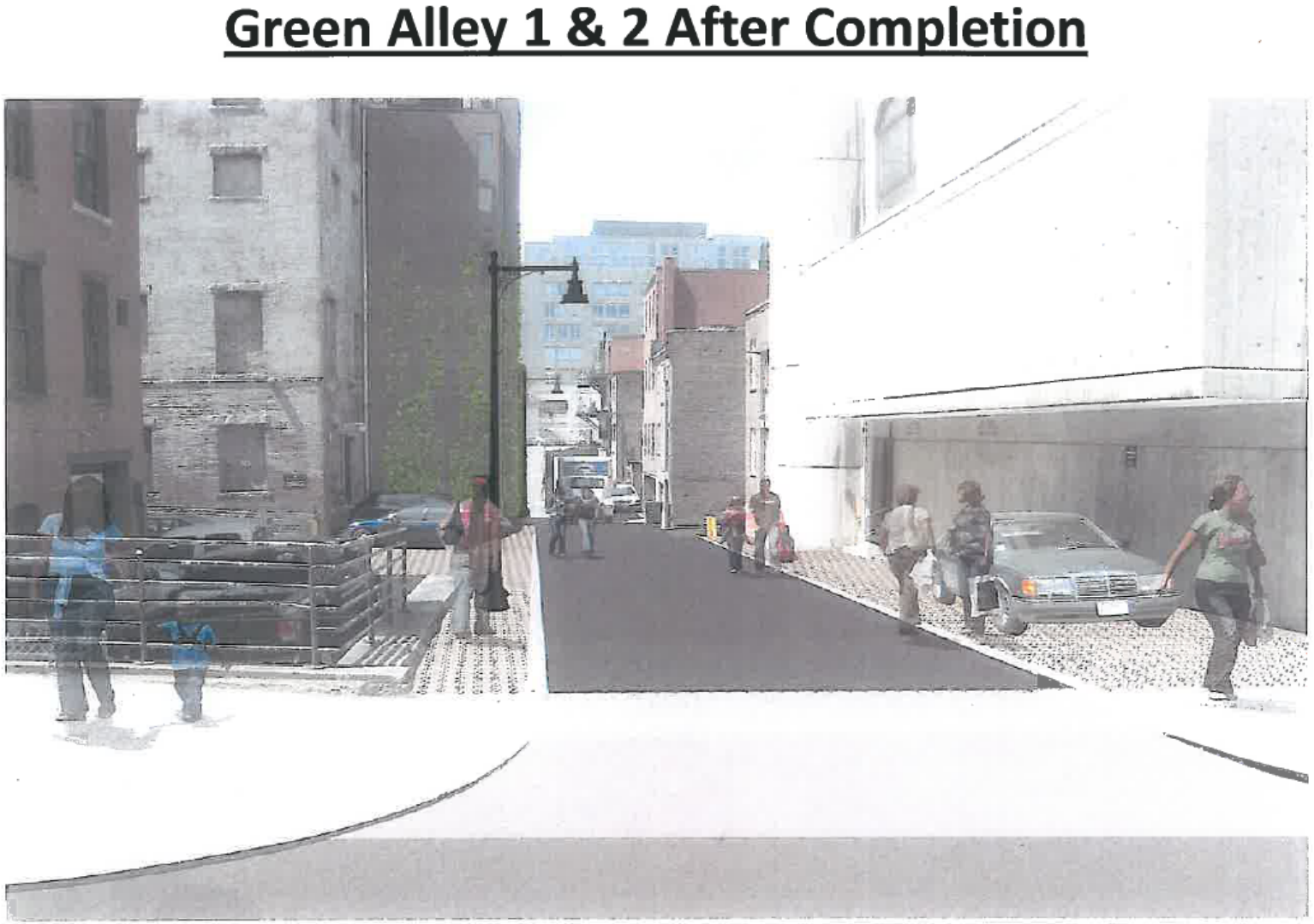


Figure 2-3. Detailed view (artist's rendering) of the Green Alley facing west. (From the center of the figure, north is toward the upper left side.)

Preliminary estimates of the 13 to 15 wells indicate there would be an annual bleed of seven to ten million gallons of water per year due to periods of peak usage. Discharging the bleed water into the Boston Water and Sewer System could cost up to $80,000 per year which would eliminate the savings provide by the reduction of natural gas usage through the geothermal system. The two-three proposed injection wells would take in all the bleed water and return it into the fractured bedrock approximately 200 feet below the surface. The basic design aspects would utilize high density polyethylene piping without any mechanical joints. This piping would be pressure tested to ensure no leaks prior to backfilling. The piping is typically warranted for 50 years with anticipated lifespan being over 100 years. This would allow the geothermal system to run at 100 percent efficiency and eliminate the cost of discharging the excess water into the municipal sewer system. If the proposed geothermal solution project is implemented and reaches 100 percent efficiency, the approximate savings are estimated to be $60,000 per year in natural gas expenditures for the three facilities.

2.2.3 SUSTAINABILITY DESIGN CURRICULUM

The BAC plans to serve the Back Bay and Fenway neighborhoods, the city of Boston, and the citizens of Massachusetts by demonstrating and sharing sustainability design practices and inspire energy efficient practices throughout a broad area. As part of the Urban Sustainability Initiative, the BAC's plans include an intensive Sustainability Design Curriculum and ongoing development of new interactive sustainability teaching tools for the BAC and the community. The Sustainability Design program focuses on energy efficiency, energy performance, energy modeling, energy and air quality principles, green building, and renewable energy alternatives. The Urban Sustainability Initiative has an objective of providing courses relative to the BAC's project, the project's period of performance, subsequent performance data, and anticipated sustainability teaching tools (McNeil 2011a).

2.3 Alternatives

DOE's proposed action is to provide cost-shared funding to BAC for its Urban Sustainability Initiative Renovation of Public Alley #444 pursuant to a Congressional earmark therefore DOE does not have any reasonable action alternatives. DOE made preliminary determinations regarding the level of review required by NEPA for the proposed action. A portion of DOE's technical reviews was based on potentially significant impacts that could be identified. The projects' significant impacts were considered within the context and intensity of possible impacts. DOE conducted these preliminary environmental reviews and completed an Environmental Determination for the project after reviewing the Environmental Questionnaire completed by the BAC. The Environmental Questionnaire must be completed for each proposed action to provide DOE with the information necessary to determine the appropriate level of NEPA review and documentation.

Because DOE's proposed action is limited to providing financial assistance, pursuant to a Congressional earmark, DOE's decision is limited to either accepting or rejecting the project as

proposed by the proponent, including its proposed technology and selected site. DOE's consideration of reasonable alternatives is therefore limited to the proposed action and a No-Action Alternative.

2.4 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project, and assumes the project would not proceed. Furthermore, installation of the 13 to 15 open loop geothermal wells to provide heating and cooling energy to the BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the benefiting facilities; and the reduction of storm water runoff would not occur. It is possible that the BAC could continue the project, if other funding were secured; however, this scenario is unlikely.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

In this section, DOE assesses the following resources: air quality, geology and soils, biological resources, water resources, cultural/historical resources, traffic, noise, aesthetics and visual resources, and socioeconomics resources. The "environmental baseline" for each of these resource areas is described first, followed by an assessment of the potential consequences of the proposed project and of the No-Action Alternative.

3.1 Air Quality

3.1.1 AFFECTED ENVIRONMENT

This section describes the existing air quality conditions at and surrounding the project site. Climate and ambient air quality conditions are discussed followed by a discussion of air quality conformity and greenhouse gas emissions.

3.1.1.1 Climate and Ambient Air Quality Conditions

The proposed project is located in Boston, Massachusetts on the Atlantic Coast. The average annual high temperature is approximately 59 degrees Fahrenheit with the average annual low temperature at 44 degrees. Average annual rainfall is around 42 inches and average annual snowfall is around 41 inches. Average annual humidity is about 67 percent. Boston is prone to Northeaster weather systems, which may bring heavy rain, ice, or snow to the area (National Oceanic and Atmospheric Administration 2004).

The ambient air quality in an area can be characterized in terms of whether it complies with the primary and secondary National Ambient Air Quality Standards. The Clean Air Act (42 U.S.C. 7401 et seq.) requires the U.S. Environmental Protection Agency (EPA) to set national standards for pollutants considered harmful to public health and the environment. National Ambient Air Quality Standards have been established for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter (including particulate matter with both an aerodynamic size less than or equal to 10 microns and less than or equal to 2.5 microns), and sulfur dioxide. Primary standards define levels of air quality the EPA has determined as necessary to provide an adequate margin of safety to protect public health, including the health of sensitive populations such as children and the elderly. Secondary standards define levels of air quality deemed necessary to protect the public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Table 3-1 lists the primary National Ambient Air Quality Standards for each of the criteria pollutants and provides air quality data for Suffolk County for the last 4 years of record available from the EPA. Since 2007, average air quality data in Suffolk County have not exceeded national standards.

Table 3-1. National ambient air quality primary standards and air quality data for Suffolk County, Massachusetts, from 2007 through 2010.

Pollutant	Averaging Period	Primary Standard	Units	Suffolk County by Year			
				2007	2008	2009	2010
Carbon Monoxide	8 hours	9	ppm	1.25	1.125	1.2	1.575
	1 hour	35	ppm	1.8	1.575	1.95	2.275
Lead	Quarterly	1.5	$\mu g/m^3$	0.01	0.011	0.007	0.008
Nitrogen Dioxide	Annual	0.053	ppm	0.012	0.016	0.015	0.014
Ozone	8 hours	0.075	ppm	0.077	0.069	0.071	0.069
	1 hour	0.12	ppm	0.09	0.084	0.084	0.082
PM_{10}	24 hours	150	$\mu g/m^3$	17.62	17.13	16.27	13.82
$PM_{2.5}$	Annual	15	$\mu g/m^3$	14	12.4	10.02	10.02
	24 hours	35	$\mu g/m^3$	11.46	10.77	9.69	9.18
Sulfur Dioxide	Annual	0.03	ppm	0.004	0.003	0.002	0.002
	24 hours	0.14	ppm	0.017	0.014	0.011	0.008

Source: Mass DEP 2010
ppm = parts per million
$\mu g/m^3$ = micrograms per cubic meter

3.1.1.2 Greenhouse Gas Emissions

The burning of fossil fuels, such as diesel and gasoline, emits carbon dioxide, contributing to greenhouse gases. Greenhouse gases can trap heat in the atmosphere and have been associated with global climate change. The Intergovernmental Panel on Climate Change (IPCC), in its Fourth Assessment Report issued in 2007, stated that warming of the earth's climate system is unequivocal, and that most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in concentrations of greenhouse gases from human activities (IPCC 2007). Greenhouse gases are well mixed throughout the lower atmosphere, such that any emissions would add to cumulative regional and global concentrations of carbon dioxide. However, the effects from any individual source of greenhouse gases cannot be accurately determined with presently available technologies.

3.1.2 ENVIRONMENTAL CONSEQUENCES

3.1.2.1 Proposed Project

Impacts to air quality during construction of the proposed project would be temporary and considered negligible. In general, the primary source of air pollutants during any construction project is attributed to the movement and operation of construction equipment. Construction activities would be temporary, would occur in a localized area, and emissions would be very small compared with existing emissions in Suffolk County. Given the nature of the drilling and excavation process, it is not anticipated that fugitive dust would be an issue. Geothermal systems, when operational, produce no air pollutants, so there would be positive impacts to air quality during operation of the proposed project.

3.1.2.2 Greenhouse Gas Emissions

Carbon dioxide is one of the predominant greenhouse gases that would be generated during the proposed project (from construction and maintenance vehicles) since it is produced by combustion that occurs during the burning of fossil fuels. The carbon dioxide generated would be short term and negligible, as construction vehicles and equipment would be outfitted with scrubbers to control emissions. Over time, it is expected that the success of this project would lead to a significant reduction in the amount of fossil fuel needed for heating and cooling at the BAC with a corresponding reduction in greenhouse gases. The proposed project would contribute to a reduction of the area's greenhouse gas emissions during operation.

3.1.2.3 Air Quality Conformity

Section 176(c) (1) of the *Clean Air Act* requires Federal agencies to ensure that their actions conform to applicable implementation plans for the achievement and maintenance of the National Ambient Air Quality Standards for criteria pollutants (DOE 2000). To achieve conformity, a Federal action must not contribute to new violations of standards for ambient air quality, increase the frequency or severity of existing violations, or delay timely attainment of standards in the area of concern. The EPA general conformity regulations (40 CFR 93, Subpart B) contain guidance for determining whether a proposed Federal action would cause emissions to be above specified levels in nonattainment or maintenance areas.

The BAC's proposed project would be located in an area that is in nonattainment for ozone, and according to the EPA, the area is considered to be in "moderate nonattainment." For an area of moderate nonattainment of ozone standards, a conformity determination is not required if project emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are ozone precursors, are each less than 100 tons per year [40 CFR 93.153(b)(1)].

Air emissions associated with the proposed project would be limited to fugitive dust and common equipment exhaust from construction and transportation of materials into the site. Internal combustion engines using either gasoline or diesel fuel emit NO_x and VOCs, but the limited duration and size of the project would result in relatively minor quantities of these air pollutants. For example, according to EPA emission factors (AP-42 – *Compilation of Air Pollutant Emission Factors*) for internal combustion engines, a piece of equipment with a moderately large 300 horsepower gasoline engine could run for 8 hours per day for a full year and would emit about 4.8 tons of NO_x and no more than 9.5 tons of VOCs. In the case of a 300 horsepower diesel-fueled engine under the same condition (running 8 hours per day for a full year), emissions of NO_x would be about 13.6 tons and VOCs emissions would be no more than 1.1 tons. The proposed project would be expected to involve several pieces of equipment, however the construction period is anticipated to be a matter of several weeks, and it is unlikely the equipment would continually run for 8 hours a day during the short construction period. Using the calculations above it is clear that the proposed project would not involve either NO_x or VOC emissions that approach the 100-ton threshold and, as a result, a conformity determination is not necessary (40 CFR 93, Subpart B).

3.1.2.4 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, no changes or impacts from DOE's proposed action would occur to existing air quality and there would be no beneficial decrease in the BAC's emissions from the use of a geothermal energy system.

3.2 Noise

3.2.1 AFFECTED ENVIRONMENT

The proposed project site is located in a populated residential and retail area. The primary source of noise in the area is residential/urban traffic from Newbury Street, Hereford Street, Boylston Street, and Commonwealth Avenue. There is some construction activity, with associated noise, in the area from other unassociated projects.

3.2.2 ENVIRONMENTAL CONSEQUENCES

3.2.2.1 Proposed Project

During construction, noise levels would temporarily increase in the project area. The primary temporal increase in noise from the project would be during the drilling operation for the geothermal system. It is envisioned a rotary rig mounted air drill will be utilized to drill the (13-15) 1500 foot deep holes that will be used in the Geothermal Solution. These drilling operations will occur between the hours of 7:00 am and 6:00 pm as per local code (see below) and it is not expected that extended periods of time will be required for the drilling operation. This temporary increase in noise levels would cease upon completion of the project. Construction noise generated from this project would be subject to the local ordinances explained below.

According to 16-26.4 Regulation of Construction Hours in the Boston Municipal Code (City of Boston 1991), "No erection, demolition, alteration, or repair of any building and excavation in regard thereto, except between the hours of 7:00 a.m. and 6:00 p.m., on weekdays or except in the interest of public safety or welfare, upon the issuance of and pursuant to a permit from the Commissioner, Inspectional Services Department, which permit may be renewed for one or more periods of not exceeding one week each" (Ord. 1984 c. 10 §1 (354c); Ord. 1991 c. 5 § 38).

After the geothermal system is installed it is not anticipated to generate noise during operation.

3.2.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, no new sources of noise from DOE's proposed action would occur at the proposed project site.

3.3 Aesthetics and Visual Resources

3.3.1 AFFECTED ENVIRONMENT

This section describes the existing aesthetic conditions in the area of the proposed project site. The proposed project site is located in Public Alley #444 at the rear of 951 Boylston Street. The proposed geothermal system would include 13 to 15 underground standing column wells and injection wells and the green alley would include a green trellis system, porous pavers and concrete, street lights, bollards, and granite curbing.

The area surrounding the project is primarily a residential and retail neighborhood with large 19th century Victorian buildings made from red brick and brownstone. The Back Bay area is known for being one of the best preserved late 19th century architectural districts in the world. The surrounding area is being developed primarily as residential, but with some light commercial activities (for example, non-manufacturing, offices, retail, etc.).

The geothermal system and green alley would be installed in the southwestern portion of the Back Bay Architectural District, adjacent to the BAC, accessible from Hereford Street. This area is more heavily urban, with a higher density of apartment buildings, restaurants, and retail stores. Figures 3-1 through 3-5 show views of the project area.

Figure 3-1. View of Public Alley #444 facing west from Hereford Street.

Figure 3-2. View of Public Alley #444 facings east towards Hereford Street.

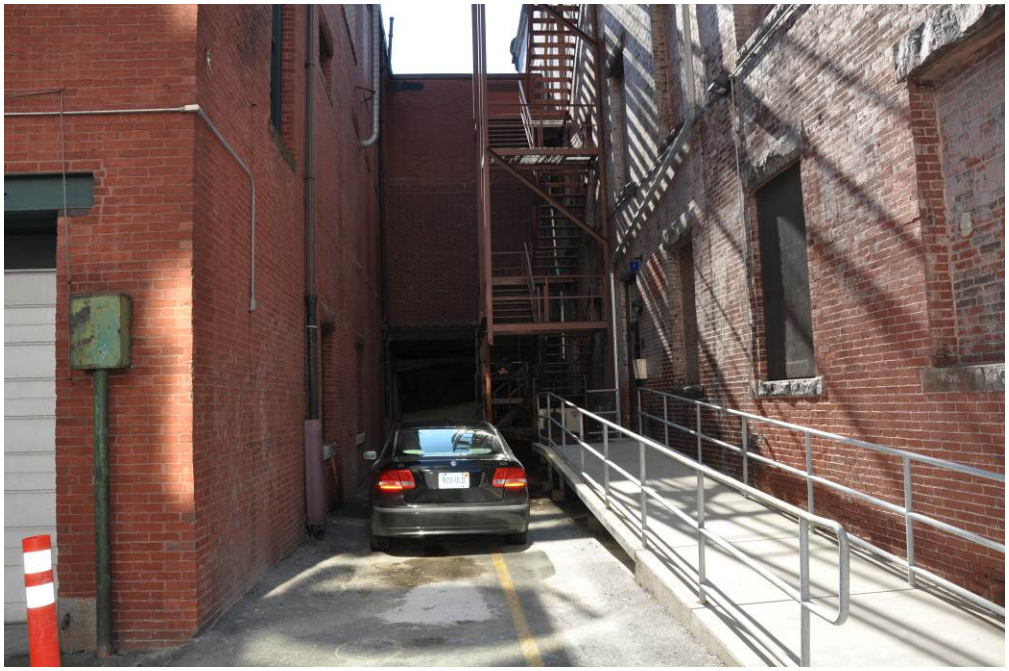


Figure 3-3. View south into Green Alley Phase I from Public Alley #444.

Figure 3-4. View north along Hereford Street and the east side of the BAC.

Figure 3-5. View east along Newbury Street and the north side of the BAC.

3.3.2 ENVIRONMENTAL CONSEQUENCES

3.3.2.1 Proposed Project

The impacts to the area's aesthetics are anticipated to be positive upon completion of the proposed project. Public Alley #444 would be transformed into a Green Alley in two phases,

adding a public way, a green trellis system, porous pavers, porous asphalt, street lights, bollards, granite curbing, concrete sidewalks, and a concrete driveway entrance. The green trellis system would be installed on the back wall of the 951 Boylston Street building and is intended to provide an attractive visual amenity that benefits the public and the BAC in the form of a vine covered vegetative screen that measures 23 feet wide by 44 feet high. Furthermore, the geothermal wells underneath Public Alley #444 and both Newbury and Hereford Streets, once capped, would not be visible to the public. BAC is an architectural and design educational institution and is keenly aware of any aesthetic impacts to the surrounding area after the project is complete. Negative visual impacts would occur only during construction, when the ground would be temporarily disturbed.

3.3.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no impacts from DOE's proposed action to aesthetics.

3.4 Water Resources

3.4.1 AFFECTED ENVIRONMENT

This section describes the existing water resources on and in the area of the proposed project site, including groundwater, storm water and water quality, wetlands, and floodplains.

3.4.1.1 Groundwater

According to the Boston Groundwater Trust, which monitors groundwater on a monthly basis via more than 800 observation wells located throughout the city, groundwater levels near the project site have been consistently between five and six feet deep since 2010. The groundwater level rarely drops below six feet deep and rarely rises above five feet deep. The four observation wells closest to the project site are in the within the project boundaries in Public Alley #444 at the rear of 951 Boylston Street, at the corner of Boylston and Hereford Streets, at the corner of Hereford and Newbury Streets adjacent to 307 Newbury Street, and in front of 314 Newbury Street. Over the last century, groundwater levels in Boston have been slowly decreasing due to construction, sump pumping, and other causes. The solution that has had the most success is the installation of 79 recharge wells from 2006 to 2010 throughout the city to reroute water to the groundwater table. Of these, 24 recharge wells were installed in the Back Bay area (Boston Groundwater Trust 2011). The Groundwater Trust monitoring wells would not be used to monitor for the geothermal system. However, the wells would provide the Groundwater Trust and the BAC an opportunity to be made aware of any abnormality in groundwater levels through the Groundwater Trust's monthly measurements. The BAC owns a monitoring well on its property which can also be used to monitor any subsurface abnormalities related to either the green alley project or the geothermal project in real time (Byers 2011).

3.4.1.2 Storm Water and Water Quality

The annual total volume of rainfall at the project site is approximately 432,000 gallons. The storm water runoff in the Back Bay area negatively impacts the Charles River Basin by transporting sediment and increased total nitrogen, total phosphorus, metals, chemical oxygen demand, and motor oil concentrations into the watershed. Water testing at the project site was performed via test well by Phoenix Environmental Laboratories in May 2011. The BAC would install monitoring devices for the purpose of:

- Monitoring storm water quantities from the roofs of our campus buildings adjacent to the site;
- Monitor storm water overflow quantities from the porous paving system and flows into the combined sanitary and storm water sewer in the alley;
- Monitor the influent and effluent water quality of the porous pavement system;
- Measure precipitation at the site;
- Configure automated monitoring system to convey data to a central dashboard and website where the information can be processed and made available to the Groundwater Trust and general public;
- Water quality would also be tested for:
    - Total suspended solids
    - Total Kjeldahl nitrogen
    - Total phosphorus
    - Ortho phosphorus
    - phosphorus
    - Total coliform
    - Oil and grease
    - Total petroleum Hydrocarbons.

Some parts of this system of monitors may help in detecting abnormal water quantities related to the geothermal wells and provide the opportunity to address any potential subsidence issue before it becomes a problem (Byers 2011).

3.4.1.3 Wetlands

DOE regulations at 10 CFR Part 1022, "Compliance with Floodplain and Wetland Environmental Review Requirements," implement the requirements of Executive Order 11990, Protection of Wetlands. These regulations require, among other things, that the Department notify appropriate government agencies (the U.S. Army Corps of Engineers in the case of wetlands associated with waters of the United States) and interested parties of a proposed wetland action; conduct a wetlands assessment to evaluate the impacts of that action to wetlands in an EA or environmental impact statement; consider alternatives that would avoid or minimize impacts to wetlands; design or modify the action to minimize potential harm to wetlands; and allow for public review and comment of the analysis.

According to the U.S. Fish and Wildlife Service's (USFWS) National Wetlands Inventory, six wetlands are present within a one mile radius of the BAC. The two closest wetlands to the project site are located approximately 1,650 feet away. However, these wetlands are isolated and do not extend to the location of the project site, and since they are isolated do not fall under jurisdiction of Sec 404 of the Clean Water Act (USFWS 2011).

3.4.1.4 Floodplain

Executive Order 11988, Flood Plain Management, requires that development in floodplains be avoided if practicable. According to the Federal Emergency Management Agency (FEMA 2009), there are two floodplain zones within a one mile radius of the BAC. A 100-year flood zone is located approximately 1,650 feet west of the project site and a 500-year flood zone is located approximately 1,650 feet north of the project site. Therefore, the project is located outside of the 100 year and 500 year flood zones.

3.4.2 ENVIRONMENTAL CONSEQUENCES

3.4.2.1 Proposed Project

The potential exists whereby more ground water will be discharging from the borehole than is needed for the geothermal system. All excess water would be re-directed approximately 200 feet into the fractured bedrock via two to three proposed injection wells. The 4,000 square feet of porous pavers and porous concrete that would be installed in the alley would also serve to recharge the groundwater. Construction of the proposed project may slightly lower the groundwater level temporarily and would be negligible. Upon completion, the proposed project is anticipated to reduce runoff by 84 percent, allowing approximately 362,400 gallons of storm water to infiltrate the Green Alley. The proposed project site is not located close enough to the wetlands and floodplain to have a negative impact on either resource.

3.4.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no impacts from DOE's proposed action to water resources.

3.5 Geology and Soils

3.5.1 AFFECTED ENVIRONMENT

This section describes the geology and soil conditions that exists within and surrounding the project site.

3.5.1.1 Seismicity

According to the United States Geological Survey (USGS 2010), the historic record of seismicity in Massachusetts reveals a low threat from earthquakes. Since 1976, a total of 26 earthquakes have occurred within 100 miles of Boston. The largest earthquake within 100 miles of Boston

was a 4.7 magnitude on the Richter scale in 1982, with an epicenter 83 miles from Boston. The most recent earthquake within 100 miles of Boston was a 3.2 magnitude on September 26, 2010, with an epicenter 72 miles away. The USGS states that there is a 2.189% chance of a major earthquake (5.0 or higher magnitude) within 50 km (31 miles) of Boston, MA within the next 50 years. There is a 0% chance of a 7.7 or higher magnitude earthquake within 50 km of Boston within the next 50 years. A 5.9 magnitude earthquake with an epicenter over 500 miles away near Mineral, Virginia shook buildings in the Boston area on August 23, 2011, but caused no damage or injuries.

3.5.1.2 Soil

According to Pine and Swallow Environmental (P&S 2009), historically the Boston Back Bay area was filled in a series of land reclamation projects from 1820 to 1870. The area is remnant of the salt marshes and tidal flats that surrounded the Shawmut Peninsula of Old Boston. It is estimated that approximately 580 acres of the Back Bay was filled with sand and gravel (see Section 3.7.1 for details).

Recently, P&S studied a January 2008 Report by CDM, "Summary of Geotechnical Exploration Program", for a project in Allston, Massachusetts, which is approximately 4 miles east of the project site. In all boring logs reviewed, 5 to 15 feet of silty sand to fine to coarse sand and gravel fill was noted above fibrous peat or organic silt deposits. Below the organic material, marine silty clay deposits were noted, typical of salt marshes and tidal flats.

P&S also reviewed an October 2005, Environmental Report for the Institute of Contemporary Art at 955 Boylston Street by GZA. The report included boring logs from an area of Public Alley #444 immediately east, adjacent to the BAC project site, behind Dillon's Restaurant. The boring logs indicate that the shallow soils beneath the existing pavement consist of urban fill, described as dense fine silty sand to fine to medium sand with little gravel. Concrete, glass, and brick fragments were also noted in the fill (GZA 2005).

Additionally, Pine and Swallow Environmental (P&S 2010) performed an in-situ percolation test in two locations in Public Alley #444. The infiltration rate of the soil was found to be rapid at both locations. Four gallons of water were poured into each test hole and measured in time per inch. The first location infiltrated four gallons in five minutes, for an estimated percolation rate of 30 inches per hour. The second location infiltrated four gallons in ten minutes. The results of these tests indicated that the use of permeable paving could be feasible and beneficial to the alley.

3.5.2 ENVIRONMENTAL CONSEQUENCES

3.5.2.1 Proposed Project

The subsurface soils of the Back Bay area is comprised primarily of sand and gravel, so the area is susceptible to amplification (the physical reaction of seismic waves becoming more robust as

they travel through soft soil) and soil liquefaction (which occurs when saturated sand and gravel is shaken with enough energy to cause a sudden but temporary pore fluid pressure increase between the grains) in a severe earthquake. The potential impact of a major earthquake on the elegant brick-and-mortar architecture of the city is acknowledged. As noted above, however, the probability of a severe earthquake is highly unlikely. Also, since the project area is not located near a fault line or area of high seismicity, drilling, boring, and other construction activities would not induce seismic activity.

Soil studies performed in and around the project area indicate that the soils are capable of infiltrating water and are acceptable for the project (P&S 2010). A layer of compacted, free draining aggregate would serve as the base for the permeable paving. The proposed permeable paving design would include a 1,700 square foot application of pervious bituminous concrete in the center of the alley to resist loads and vehicular turning movements and a 2,250 square foot application of porous concrete pavers on both sides of the alley.

3.5.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no impacts from DOE's proposed action to the existing geology and soils.

3.6 Biological Resources

3.6.1 AFFECTED ENVIRONMENT

This section describes existing biological resources at the proposed project site. It focuses on animal species that are typical or are an important element of the ecosystem, are of special category importance (of special interest due to societal concerns), or are protected under state or Federal law or statute regulatory requirements.

3.6.1.1 Sensitive Species

There is one species listed as endangered by the USFWS occurring in the general surrounding area of the BAC. The Indiana bat (*Myotis sodalist*) is known to reside in Suffolk and Middlesex counties and in various locations throughout Massachusetts. The bald eagle (*Haliaeetus leucocephalus*) also occurs in the area. Although no longer listed under the Endangered Species Act, bald eagles are still protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act (USFWS 2011).

3.6.2 ENVIRONMENTAL CONSEQUENCES

3.6.2.1 Proposed Project

The Indiana bat's hibernacula requirements are wooded areas in the summer and caves in the winter. They forage along the edges of wooded areas and along rivers. The project site is

approximately 1,650 feet away from wooded areas and rivers, but given the localized urbanization area in the alley and the species' tendency to not stray from its wooded habitat, it is unlikely that the proposed action would have any negative impacts on the endangered Indiana bat species.

3.6.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no impacts from DOE's proposed action to the existing biological resources.

3.7 Cultural/Historical Resources

3.7.1 AFFECTED ENVIRONMENT

This section describes the existing listed historical places as well as the historical places eligible for listing in the National Register of Historic Places (NRHP) and Massachusetts Historic Sites. The National Historic Preservation Act, Section 106, requires that Federally funded, licensed, or permitted projects be reviewed for their potential impact on historic properties. A cultural resources survey for this project was conducted to locate and record historic or cultural resources visible in the study area as identified by the NRHP and through research. A Historic Sites map was also provided (NPS 2011).

The closest historical sites to the proposed project is 941-957 Boylston Street, which includes an active fire station that currently houses the Boston Fire Department Engine Company 33 and Ladder Company 15, and an inactive police station that housed the Boston Police Department's Division 16 until 1976 and the Institute of Contemporary Art from 1976 to 2007. The Boston Architectural College purchased the Institute in 2007 and plans on connecting the building to the geothermal system. Boston Police Department's Division 16 also built an addition in 1887 immediately to the west (currently Dillon's Restaurant & Bar). The proposed project is approximately 170 feet north from this building.

In the mid-1600s, Boston was defined by three large hills (Pemberton Hill, Beacon Hill, and Mt. Vernon), known as the Trimountain. The Back Bay area was actually a salt water bay at this time. Filling the city of Boston began in 1820. The majority of the fill came from the Trimountain, which was slowly cut down and spread out over Boston. The West Cove and Mill Pond were the first to be filled, followed by the South Cove, East Cove, South Boston, and South Bay. The Back Bay was the final and largest area to be filled. Most of the fill from the Trimountain was gone, so gravel was hauled from Needham via railroad. Needham is a small town 10 miles Southwest of Boston. To comprehend the magnitude of this filling operation at the peak of activity, 3,500 train carloads per day were sent from the Needham gravel pits to be dumped in the Back Bay. The majority of the Back Bay as it presently exists was filled by 1870, with the Fens as one of the only areas left to be completed. There are no known historical or cultural artifacts buried in the Back Bay fill since it was largely a salt water bay before this large

public works project began. Once the Back Bay was completely filled, the challenge of supporting new buildings on this fill arose. The solution in the late 1800s was to use wooden timber pilings as supports that were driven through the fill and onto the bedrock bearing surface (Howe 1996).

3.7.2 ENVIRONMENTAL CONSEQUENCES

3.7.2.1 Proposed Project

The geothermal wells would be installed in Public Alley #444 and under the sidewalks on Newbury Street and Hereford Street. Installation of the geothermal wells is not anticipated to negatively affect any parts of the historical buildings in the surrounding area. The installation of geothermal wells is not expected to disturb any below ground cultural artifacts since the Back Bay was filled primarily with sand and gravel as discussed in the paragraph above. During soil drilling, the BAC would have a qualified archeologist on-site so that if some artifact is uncovered during the drilling process, operations can be temporarily stopped until further archeological examination is conducted. The geothermal wells would be connected to 320, 322 Newbury Street and 951 Boylston Street. The building at 951 Boylston Street is an historic building. Adverse impacts to historic resources could possible occur if connection of 951 Boylston to the geothermal system changes the appearance, structure, historical integrity of the building.

The BAC has engaged RDK Engineering to provide mechanical, electrical, and plumbing (MEP) engineering services, a feasibility study, and to design a geothermal integration into the existing infrastructure serving 320, 322 Newbury Street and 951 Boylston Street. Several options are being explored in the design and retrofit of the MEP and HVAC systems, including existing equipment and/or new equipment depending on the presented option. The Draft Feasibility Study scope of work included:

- Review of existing MEP systems.
- Determination of usage and building occupancy schedules.
- A high level survey of existing building envelope and MEP systems.
- An estimate of heating and cooling loads.
- Identification of potential options to integrate the existing heating and cooling systems with a new geothermal earth coupling system being developed by Wellspring Geothermal.
- A high level energy usage calculation for payback analysis and to determine emissions for existing conditions and proposed options.
- Development of heating and cooling load models for HVAC design and integration.
- Evaluation of existing equipment for adaptation into a proposed hybrid geothermal system and other options.

The engineers and designers will be using the above information to determine the appropriate type of connection for the geothermal wells to the buildings. Careful measures would be taken when connecting the geothermal system to the BAC's historic building at 951 Boylston Street.

Typically geothermal systems do not require extensive renovations and can be connect to existing HVAC systems with little or no modifications. Engineering plans show the connection of the geothermal wells to the buildings would be below ground to the existing mechanical rooms, therefore adverse impacts should not occur.

3.7.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no impacts from DOE's proposed action to cultural and historical resources.

3.8 Traffic

3.8.1 AFFECTED ENVIRONMENT

Traffic in the Back Bay area, especially on Newbury and Hereford Streets, is light to moderate. Traffic is more prevalent on busier streets further from the project site, such as Boylston Street and Commonwealth Avenue. According to the Massachusetts Department of Transportation, traffic counts since 2000 for Boylston Street and Commonwealth Avenue are much higher than Newbury Street, but normal compared to other streets of Boston similar in size (Massachusetts Department of Transportation 2009). Pedestrian traffic is more common near the project site because of the large retail and shopping areas throughout the Back Bay area.

3.8.2 ENVIRONMENTAL CONSEQUENCES

3.8.2.1 Proposed Project

During construction, impacts to traffic are expected to be minimal. Installation of the geothermal system would involve two drill rigs and two support trucks at the project site with other personnel located offsite. Installation of the Green Alley Phase II would likely involve two support trucks, a dump truck, and a back hoe. Public Alley #444 would be closed for approximately four weeks, twenty-four hours a day, for the installation of the Green Alley Phase II and part of the geothermal system. The installation of the geothermal system beyond Public Alley #444 would likely create lane blockages for Newbury and Hereford Streets, leaving one lane open and partially blocking sidewalks for temporarily for four to eight weeks.

3.8.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no traffic impacts from DOE's proposed action.

3.9 Socioeconomics

3.9.1 AFFECTED ENVIRONMENT

Temporary disruptions to local businesses, primarily on Newbury and Hereford Streets, but also on Boylston Street and Commonwealth Avenue, are anticipated to occur during construction. These disruptions include the occasional rerouting of deliveries, trash pickup, parking, and pedestrian traffic. Such disruptions would be minimized by implementing traffic control plans, providing alternate parking for residents and local businesses, coordinating the construction schedule with area activities, and notifying the area's businesses and residents, specifically through the Neighborhood Association of the Back Bay, in advance of construction activities.

3.9.2 ENVIRONMENTAL CONSEQUENCES

3.9.2.1 Proposed Project

The proposed project would create construction jobs and provide work for local firms including a geothermal design firm, a law firm, a civil engineering firm, mechanical, electrical and plumbing contractors, an HVAC contractor, metal workers, a general contractor, and many related support personnel. Once completed it is estimated that the project would also provide long-term energy related cost savings of approximately $60,000 per year, reduce storm water runoff, generate power through alternative energy sources, help greatly reduce the BAC's carbon footprint, and provide public outreach and education.

3.9.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to the BAC for the proposed project. As such, there would be no impacts from DOE's proposed action to socioeconomics.

3.10 The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Council on Environmental Quality regulations that implement the procedural requirements of NEPA requires consideration of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). Installation and operation of the proposed geothermal system would require short-term use of land and other resources. Short-term use of the environment, as used here, is that used during the life of the geothermal system, whereas long-term productivity refers to the period of time after the equipment has been decommissioned and removed. The short-term use of the project site and other resources for the BAC's proposed project would not impact the long-term productivity of the area. When it is time to decommission and remove the geothermal system, the land and facilities occupied by those systems could be used for other industrial or residential purposes.

3.11 Irreversible and Irretrievable Commitments of Resources

There would be an irretrievable commitment of materials for equipment at the proposed project site. The alley is already committed to renovation as part of the Urban Sustainability Initiative, and the materials that would be committed under the proposed project would support the "green" technology of the BAC. DOE asserts that the irreversible and irretrievable commitment of resources does not exceed any extraordinary amount as could be associated with any other type of major HVAC improvement project.

3.12 Unavoidable Adverse Impacts

Implementation of the proposed Urban Sustainability Initiative would cause unavoidable minor impacts to air quality during the construction phase of the project. Construction vehicles and equipment would be outfitted with standard acceptable pollution control equipment to control air emissions which would mitigate the minor impacts to air quality. These minor unavoidable impacts to air quality during the construction phase would be offset in the operational phase. The geothermal wells would provide heating and cooling capability that would result in the reduction of natural gas consumption which would lower greenhouse gas emissions.

4. CUMULATIVE IMPACTS

Council on Environmental Quality regulations stipulate that the cumulative impacts analysis in an EA consider the potential environmental impacts resulting from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions (40 CFR 1508.7). Because the impacts of the proposed project generally would be minor and localized (see Section 3), DOE focused this evaluation of cumulative impacts on activities immediately surrounding the proposed project site and other past, present, and reasonably foreseeable future actions on and around the BAC and Back Bay Architectural District.

The vicinity in and around the project site is part of the Boston Back Bay historic area. Recent past activities include development of a high-end retail area on Newbury Street known as the "Rodeo Drive of the East" and the preservation of the 19th century Victorian buildings throughout the Back Bay. The following sections describe reasonably foreseeable future actions (Section 4.1) and the incremental cumulative impacts of installation and operation of the proposed geothermal wells and green alley (Section 4.2).

4.1 Reasonably Foreseeable Actions

To identify reasonably foreseeable actions in and around the project site, DOE primarily considered information and further input from the Back Bay Architectural Commission, Boston Redevelopment Authority, and the Massachusetts Historical Commission on future planned projects in the vicinity. Reasonably foreseeable diverse actions are described below, however are not funded or associated with DOE's project.

- The surrounding area is being developed as a high-end retail and residential area. The Back Bay area was originally designed as an upper-class neighborhood in the late 1800s and early 1900s before transitioning into more retail oriented area. Some of the red brick and brownstone buildings were converted into restaurants and retail stores, especially on Newbury Street, while the others were converted into apartments. Office and home ownership markets in the Back Bay are sluggish, opening up a demand for rental units. The Back Bay neighborhood continues to develop while preserving its architectural history (BOSarchitecture 2010).

- Avalon Exeter is a 28-story luxury apartment building that broke ground on September 23, 2011 at 88 Exeter Street in the Back Bay, approximately one-third of a mile east of the project site. It will feature 187 apartment units in a 242,000 square-foot glass-and-stone tower and it will be Leadership in Energy and Environmental Design (LEED) certifiable (Boston Redevelopment Authority [BRA] 2011).

- The Fenway Triangle Mixed Use Project is a proposed project on Boylston Street that will include two towers approximately 170 feet high, one for commercial use and the other for a 150-unit apartment complex. The Fenway Triangle project is located less than

a mile west of the BAC project site. Construction is slated to begin in the spring of 2012 and be completed in late 2014 (BRA 2011).

- According to the U.S. Green Building Council (USGBC), Boston is ranked 14th on the total number of LEED projects list for U.S. cities. As of September 2, 2011, Boston has 98 LEED certified buildings and 175 buildings registered to be LEED certified in the near future. Furthermore, Boston is the first city in the nation to require a green building standard through municipal zoning requirements, indicating that Boston is committed to increasing energy efficiency and reducing environmental impacts throughout the city, with new or existing structures. (USGBC 2011).

4.2 Summary of Cumulative Impacts

In this analysis of cumulative impacts, DOE determined that only impacts to air quality, noise, and water resources from past, present, and reasonably foreseeable actions in the vicinity of the project site would be cumulative with the installation and operation of the geothermal system and green alley. Impacts of the proposed project to other resources would be negligible or would not occur. DOE considers cumulative impacts to be minimal for this project since installation and operation of the geothermal system and green alley would be limited to the BAC. Therefore, based upon the context and intensity of the impacts, the BAC project does not establish any future actions with significant effects.

4.2.1 AIR QUALITY

Ongoing and planned development activities in the surrounding area would cause emissions of particulate matter and other pollutants in the project area. However, emissions from each construction project individually would be temporary, with the BAC's proposed project being the shortest in duration. Installation of the geothermal system would have a very small incremental adverse impact for the few weeks that heavy equipment would be required. The proposed project may be completed before the Fenway Triangle project is started, but the Avalon Exeter development is expected to be ongoing before and after the BAC project. Furthermore, the Fenway Triangle and the Avalon Exeter projects are much larger in size, scope and impacts. Therefore, air emissions from these various sources might not be additive in terms of occurring at the same time, but the same people could be present throughout and be exposed to annoyance air emissions for a longer duration.

Operation of the geothermal system, as well as the proposed improvements to energy efficiency in new buildings, would contribute to the region's independence from fossil fuel for energy, which would contribute to the beneficial cumulative impact on air quality by reducing air emissions from traditional power generating sources.

4.2.2 NOISE

Construction of the geothermal system and green alley at the BAC would add to the cumulative noise generated with the construction of the reasonably foreseeable projects listed in Section 4.1.

The contribution of the proposed project to noise in the area would be very minor duration and scope in comparison with the much larger construction of the Fenway Triangle project and the Avalon Exeter development. Noise from these various sources may not occur at the same time, but they could all contribute to the amount of time that people in the area would be exposed to the sounds of construction.

4.2.3 WATER RESOURCES

The BAC's proposed project and the reasonably foreseeable projects listed in Section 4.1 are actions that will result in a temporary decrease in groundwater levels throughout the Back Bay. It is unclear how storm water runoff will be affected as a result of the Fenway Triangle project and the Avalon Exeter development, but it is expected to be minimal. Upon completion, the proposed project is anticipated to reduce runoff by 84 percent, allowing approximately 362,400 gallons of storm water to infiltrate the Green Alley. This reduced runoff and increased infiltration, combined with the ongoing installation of recharge wells throughout the Back Bay, would contribute to the beneficial cumulative impact on water resources.

4.2.4 CULTURAL RESOURCES

The Avalon Exeter apartment building and the Fenway Triangle Mixed Use Project are essential to the economic growth of the Back Bay, but they do not enhance and preserve the architectural integrity of the historic Back Bay area as successfully as the BAC project. Both projects include the development of new high-rises with modern architecture, using reinforced concrete and steel as the primary building materials and featuring large glass windows. These modern designs are much different than the 19th century Victorian buildings made from red brick and brownstone that are prevalent throughout the Back Bay area.

Unlike the projects mentioned above, the BAC project does not involve the development of a new building. Typically, geothermal systems do not require extensive renovations and can be connected to existing HVAC systems with little or no modifications. Engineering plans show the connection of the geothermal wells to the buildings would be below ground to the existing mechanical rooms, therefore preserving the architectural integrity of the building. Furthermore, the proposed green alley would significantly enhance the area's aesthetics while preserving the 19th century Victorian architecture of the historic Back Bay area.

5. CONCLUSIONS

DOE's proposed action is to provide $1.6 million in financial assistance pursuant to a Congressional earmark to BAC for the design, construction, and installation of 13 to 15 open loop geothermal wells to provide heating and cooling energy to the BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the benefiting facilities. The BAC Urban Sustainability Initiative is a multi-part project with several important objectives to implement energy saving renovations and sustainable technologies while creating jobs. The scope of the project includes the Phase II Green Alley, Geothermal Solution, and Sustainability Design Curriculum. DOE concludes the following about the potential environmental impacts of its proposed action and the BAC's proposed project:

- Implementation of the Urban Sustainability Initiative would involve no potential for significant environmental impacts. Similarly, installation of plumbing and electrical upgrades in the BAC facilities would involve no adverse environmental consequences as long as the connection to historic building located at 951 Boylston Street is done below ground to the existing HVAC and plumbing system.

- Installation and operation of the proposed green alley and geothermal wells would not have any meaningful or detectable impacts on land use; geology and soils; groundwater; cultural resources; environmental justice; socioeconomics; occupational health and safety; transportation and traffic; utilities, energy, and materials; and waste.

- Operation of the new geothermal wells would not generate criteria pollutants or carbon dioxide, but construction activities would result in air emissions. The proposed project is located in Suffolk County, Massachusetts, which is a nonattainment area for the 8-hour ozone standard. A conformity review was performed in accordance with Subpart B of 40 CFR Part 93, and it was determined that emissions of ozone precursors during construction would be sufficiently small that a conformity determination would not be required. Therefore, the proposed project would meet the conformity requirements of the *Clean Air Act*.

- The proposed project would produce geothermal energy to heat and cool the three BAC facilities which would reduce the amount of natural gas consumed via conventional heating and cooling. Therefore, the proposed project would slightly reduce regional greenhouse gas emissions.

- Construction of the green alley and geothermal wells would cause a negligible increase in noise volumes. The test bore drilling created little or no vibration and the noise level was low enough that it did not require hearing protection based on safety standards. Operation of the geothermal wells would not cause an increase in sound levels.

- The aesthetics of the area would change with the implementation of the Urban Sustainability Initiative. The purpose of the Green Alley project is to provide environmental benefits to the surrounding area and improve the aesthetics of Public Alley #444. Aesthetics would be improved with the proposed permeable pavers, green trellis system, new sidewalks and curbing, and improved lighting.

- Construction actions would be performed with necessary controls on runoff to ensure there would be no erosion or sedimentation issues. The project location does not involve wetlands or floodplains. Positive impacts to Charles River watershed are expected due to decreased storm water and higher quality storm water due to filtration of the proposed green alley.

- Implementing the Urban Sustainability Initiative on a currently urban site would not significantly impact any population of plant or animal species because the project site is not suitable for many species of plants and animals. The proposed project would have no effect on species protected under the Federal *Endangered Species Act*, and there is no reason to suspect the project site has unique habitat for any State-protected or rare species. No impacts to wetlands are expected to occur since the closest wetlands are 1,650 feet away and do not extend to the project site.

- DOE does not expect the BAC's proposed project to directly impact cultural resources or historic properties. As stated in Section 3.7.2.1, a qualified archeologist would be on-site during soil drilling. DOE has completed consultation with the Massachusetts Historical Commission, the Boston Landmarks Commission, and the Back Bay Architectural Commission prior to issuing this Final EA.

- Relative to the cumulative changes in the environment that would be caused by the proposed project in combination with other planned activities nearby, the implementation of the Urban Sustainability Initiative would cause minor, adverse incremental changes to air quality and noise during construction. The proposed project would result in small, beneficial, incremental impacts to aesthetics, the region's surface water quality by reducing storm water runoff and air quality during operation by reducing greenhouse gas emissions.

- Under the No-Action Alternative, DOE would not provide funding to the BAC and the Urban Sustainability Initiative would not be implemented. For comparison purposes, it is assumed no impacts to the existing environment would occur, and any beneficial impacts of the proposed project would not be realized. However, Phase I of the Green Alley was a separately funded project.

6. REFERENCES

BAC. 2011. "About BAC" http://www.the-bac.edu/about-the-bac/bac-in-brief (accessed on September 13, 2011).

BOSarchitecture. 2010. "Boston Architecture: Back Bay Neighborhoods." http://www.bosarchitecture.com/backbay/index.html (accessed August 22, 2011).

Boston Groundwater Trust. 2011. "Boston Groundwater Trust." http://www.bostongroundwater.org/ (accessed September 8, 2011).

BRA. 2011. "Avalon Exeter Groundbreaking." http://www.bostonredevelopmentauthoritynews.org/2011/09/22/avalon-exeter-groundbreaking/ (accessed September 23, 2011).

BRA. 2011. "Fenway Triangle Project Approval Will Continue Boylston Street Transformation." http://www.bostonredevelopmentauthoritynews.org/2011/09/15/fenway-triangle-project-approval-will-continue-boylston-street-transformation/ (accessed September 23, 2011).

Byers, Arthur. 2011. Project information provided by Arthur Byers (BAC) to John Beaver (BSA Environmental Services) via email on November 11, 2011.

City of Boston. 1991. "Regulations for the control of noise in the city of Boston." Air Pollution Control Commission. http://www.cityofboston.gov/Images_Documents/noise_reg_tcm3-13127.pdf (accessed August 17, 2011).

City of Boston. 2011. "Back Bay." http://www.cityofboston.gov/landmarks/historic/backbay.asp (accessed August 16, 2011).

DOE. 2000. Clean Air Act General Conformity Requirements and the National Environmental Policy Act Process, Office of Environment, Safety and Health, Washington, D.C.

FEMA. 2009. "Flood Maps." http://www.fema.gov/hazard/map/flood.shtm (accessed August 18, 2011).

GZA GeoEnvironmental, Inc. 2005. "Environmental Report for the Institute of Contemporary Art at 955 Boylston Street." Accessed August 15, 2011.

Howe, Jeffery. 1996. "Boston: History of the Landfills." Boston College. http://www.bc.edu/bc_org/avp/cas/fnart/fa267/bos_fill3.html (accessed October 7, 2011).

IPCC. 2007. Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment. Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. Geneva, Switzerland.

http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm (accessed August 29, 2010).

Mass DEP. 2010. "2010 Air Quality Report." http://www.mass.gov/dep/air/priorities/10aqrpt.pdf (accessed August 29, 2011).

Massachusetts Department of Transportation. 2009. "Traffic Counts for Boston." http://www.mhd.state.ma.us/traffic.asp?f=1&C=BOSTON (accessed September 7, 2011).

McNeil, Steve. 2011a.Project information provided by Steve McNeil (BAC) to Rachel Davidson (BSA Environmental Services) via letter on September 15, 2011.

McNeil, Steve. 2011b. Project information provided by Steve McNeil (BAC) and John Beaver (BSA Environmental Services) via personal communication on October 6, 2011.

Miller, Jeremy. 2006. "Boston's Earthquake Problem." Boston Globe. http://www.boston.com/news/globe/magazine/articles/2006/05/28/bostons_earthquake_problem/ (accessed August 25, 2011).

National Energy Technology Laboratory. 2011. Information about NETL obtained from http://www.netl.doe.gov on 29 September 2011.

National Oceanic and Atmospheric Administration. 2004. NCDC: U.S. Climate Normals, Boston Logan International Airport. http://cdo.ncdc.noaa.gov/climatenormals/clim20/ma/190770.pdf (accessed August 29, 2011).

National Park Service. 2011. National Register of Historic Places, Massachusetts and Boston. http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome (accessed August 19, 2011).

P&S (Pine and Swallow Environmental). 2009. "Existing Soil Conditions-Boston Architectural College (BAC), Boston, MA." Project: BAC Permeable Pavement. P&S Project Number: 08158.

P&S (Pine and Swallow Environmental). 2010. "Geotechnical Report – BAC, 320 Newbury St., Boston, MA." Project: Boston Architectural College Pavements. P&S Project Number: 08158.

USGBC (U.S. Green Building Council) 2011. "50 U.S. States Ranked By Total Number of LEED Projects." http://www.usgbc.org/ShowFile.aspx?DocumentID=7744 (accessed September 26, 2011).

U.S. Census Bureau. 2000. "Boston (city), Massachusetts QuickFacts." http://quickfacts.census.gov/qfd/states/25/2507000.html (accessed August 24, 2011).

US Department of Energy. 2010. Building Technologies Program. Information obtained from http://www1.eere.energy.gov/buildings/financial_opportunities.html on 29 September 2011.

USGBC. 2011. "50 U.S. States Ranked By Total Number of LEED Projects." http://www.usgbc.org/ShowFile.aspx?DocumentID=7744 (accessed September 26, 2011).

USFWS. 2011. "Bald eagle (Haliaeetus leucocephalus)." http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008 (accessed August 18, 2011).

USFWS. 2011. "Indiana bat (Myotis sodalist)." http://www.fws.gov/midwest/Endangered/mammals/inba/index.html (accessed August 18, 2011).

USFWS. 2011. "National Wetlands Inventory." http://www.fws.gov/wetlands/ (accessed August 18, 2011).

USGS. 2010. "Massachusetts Earthquake Information." http://earthquake.usgs.gov/earthquakes/states/index.php?regionID=21 (accessed August 19, 2011).

APPENDIX A

DISTRIBUTION LIST

STATE GOVERNOR
The Honorable Deval Patrick
State House
Office of the Governor
Room 360
Boston, MA 02133

MUNICIPAL ELECTED OFFICIALS
The Honorable Thomas M. Menino, Mayor
Boston City Hall
One City Hall Square
Boston, MA 02201

FEDERAL AGENCIES
Mr. Timothy L. Timmermann
Office of Environmental Review
U.S. Environmental Protection Agency
Region I
5 Post Office Square, Suite 100
Boston, MA 02109-3912

STATE AGENCIES
Mr. Richard Bourré
Assistant Director, Massachusetts
Environmental Policy Act Office
Executive Office of Energy and
Environmental Affairs
100 Cambridge Street, 9th Floor
Boston, MA 02114

William F. Galvin, Secretary of the
Commonwealth
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, MA 02125-3314

Brona Simon, State Historic Preservation
Officer
220 Morrissey Boulevard
Boston, MA 02125-3314

MUNICIPAL & COUNTY OFFICIALS
Amy Cording/Doug Coughin
City of Boston Public Improvement
Commission
Boston City Hall
One City Hall Plaza, Room 715
Boston, MA 02201

Gary Moccia
Inspectional Services Department
1010 Massachusetts Avenue
Boston, MA 02118

Ed Hesford
City of Boston Transportation Department
Boston City Hall
One City Hall Plaza, Rom 721
Boston, MA 02201

Stephen Shea
Boston Water and Sewer Commission
980 Harrison Avenue
Boston, Ma 02119

Glenn E. Cooper
Principal Electrical Engineer
Boston Public Works
Street Lighting Division
400 Frontage Road, Room 220
Boston, MA 02118

Kenneth Crasco
Chief Landscape Architect
Boston Parks & Recreation Department
1010 Massachusetts Avenue
Boston, MA 02118

Kristen McCosh
Commission for Persons with Disabilities
Boston City Hall
One City Hall Plaza, Room 966
Boston, MA 02201

James W. Hunt, Chief
City of Boston Environmental & Energy Services
1 City Hall Square, Room 603
Boston, MA 02201

Bryan Glascock
City of Boston Environment
1 City Hall Square, Room 805
Boston, MA 02201

Ellen Lipsey, Executive Director
Boston Landmarks Commission
1 City Hall Square
Room 805
Boston, MA 02201

William Young
Back Bay Architectural Commission
Boston Landmarks Commission
1 City Hall Square
Room 805
Boston, MA 02201

UTILITIES

Richard Schifone
Rights & Permits
NSTAR
1165 Massachusetts Avenue
Dorchester, MA 02125

John Leskow
National Grid
40 Sylvan Road
Waltham, MA 02451-1120

Ellen Joy
Right of Way Agent
Verizon New England, Inc.
125 High Street
Oliver Tower, Floor 5
Boston, MA 02110

Robert Glynn
Comcast
426 East 1st Street
South Boston, MA 02127

Kenneth Bates
ISP/OPS Engineer
RCN
173 Bedford Street
Lexington, MA 02420

John Moloney
Project Engineer
Veolia Energy
15 Elkins Street
Boston, MA 02127

SPECIAL INTEREST GROUPS

Mr. Ed Hopkins
Sierra Club, Washington, DC Office
408 C Street, NE
Washington, DC 20002

Massachusetts Chapter Sierra Club
10 Milk Street, Suite 632
Boston, MA 02108-4621

Mr. David Goldstein
Energy Program Director
Natural Resources Defense Council
111 Sutter Street, 20th Floor
San Francisco, CA 94104

Mr. David Hawkins
Director, Climate Programs
Washington Office
Natural Resources Defense Council
1200 New York Avenue, NW, Suite 400
Washington, DC 20005

MEDIA

The Boston Globe
P.O. Box 55819
Boston, MA 02205-5819

Boston Herald
One Herald Square
Boston, MA 02118

LIBRARIES AND REPOSITORIES

The Boston Public Library
Central Library
700 Boylston St.
Boston, MA 02116

Mr. Kevin Haggerty
Department of Energy
Freedom of Information Act Reading Room
1000 Independence Avenue, SW, 1G-033
Washington, DC 20585

Ms. Jo Ann Yuill
National Energy Technology Laboratory
Department of Energy
PO Box 10940
Pittsburgh, PA 15236

APPENDIX B

CONSULTATIONS

This appendix contains copies of consultation letters sent by DOE to fulfill its responsibilities under the *National Historic Preservation Act*.

Cliff Whyte - RE: BAC Test bore

From: "Young, William" <William.Young@cityofboston.gov>
To: "Cliff Whyte" <Cliff.Whyte@NETL.DOE.GOV>
Date: 4/14/2011 10:03 AM
Subject: RE: BAC Test bore

Thank you for your message, Mr. Whyte. As I have previously explained to BAC personnel, the Boston Landmarks Commission has no jurisdiction over the BAC campus, which lies within the boundaries of the Back Bay Architectural District, established by Chapter 625 of the Acts of 1966, as amended. Moreover, the Back Bay Architectural Commission's review authority is limited to exterior architectural features; it does not extend to below-grade conditions. As such, the sole aspect of the program, as I understand it, that would be subject to BBAC mandate would be the surface treatment of the test area.

I hope this information is helpful to your understanding.

Very truly,

BACK BAY ARCHITECTURAL COMMISSION

William S. Young
Senior Preservation Planner
City of Boston
Environment Department
Boston City Hall, Room 805
Boston, MA 02201
Telephone 617.635.3850
Facsimile 617.635.3435
william.young@cityofboston.gov

From: Cliff Whyte [mailto:Cliff.Whyte@NETL.DOE.GOV]
Sent: Thursday, April 14, 2011 9:56 AM
To: Young, William
Cc: Brett Aristegui; Juliana Heynes; steven.macneil@the-BAC.edu
Subject: BAC Test bore

Mr. Young-
I am a NEPA Compliance Officer for the U.S. Department of Energy. DOE is proposing to provide financial assistance for a project in Boston. The Boston Architectural College (BAC) is proposing to bore a test well between 951 Boylston Street and 320 Newbury Street at Hereford Street as part of the Urban Sustainability Initiative for Renovation of Public Alley #444. BAC has contacted the Massachusetts Historical Commission regarding this project. MHC responded (see attachment 1) that the project is in the Back Bay Historic District and Back Bay Architectural District. MHC recommended that DOE make a finding that the test bore have no adverse effect on the significant historic and archaeological characteristics, although they did note the note that the test bore could cause vibration effects to adjacent historic masonry buildings. Further, they recommended that DOE consult with the Boston Landmarks Commission and the Back Bay Architectural Commission in accordance with 36 CFR 800.2(a)(4).

It is my understanding that you are the appropriate point of contact for both the Boston Landmarks Commission and the Back Bay Architectural Commission. As such, I am requesting that you notify me of any concerns or

issues these entities may have with the drilling of a test bore/test well at this location. Please find attachments which indicate the location of the test bore, which is located on BAC property. The test bore/test well is proposed to be 6-8 inches in diameter and 1,500 feet in depth. This test will draw water and soil cuttings into a mud pan and water FRAC tank. Filter bags will be used to filter the water. The test bore/test well will remain on the site and likely utilized as a geothermal well for the project.

The test bore/test well is necessary to obtain data for the design of the geothermal heating and cooling portion of the project. Once this data is obtained, a design and location of an additional 7 - 10 geothermal wells will be complete, along with details for incorporating this system into BAC buildings. Other than the test bore/test well, no other physical construction activities will be conducted at this time.

Please also note that DOE intends to prepare an Environmental Assessment for the overall project. As part of the NEPA process, DOE and BAC will provide you with the entire project design when complete for review and comment and solicit your input for inclusion in the Environmental Assessment.

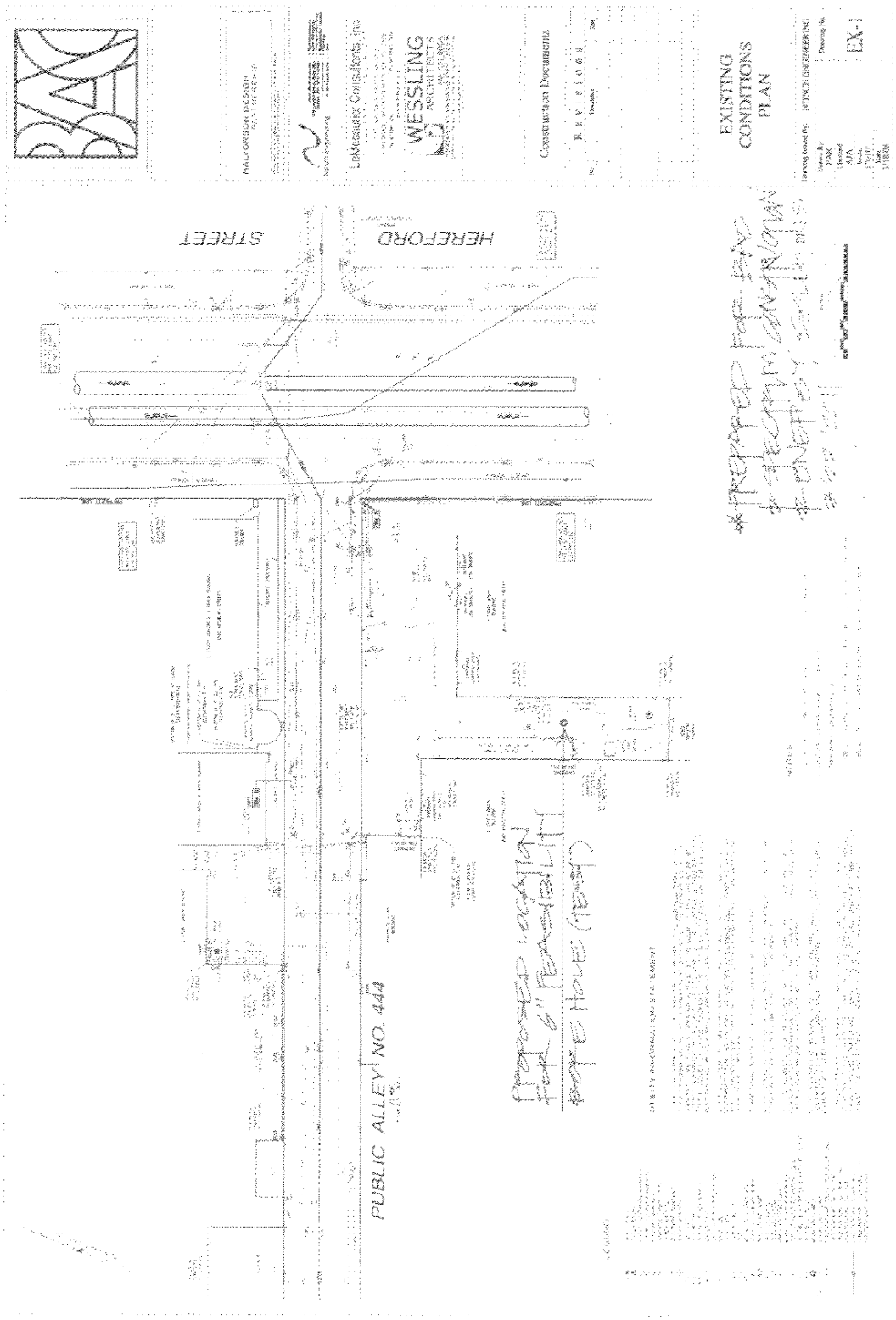
Again, we are requesting your comments (on behalf of both the Boston Landmarks Commission and the Back Bay Architectural Commission) on initiating the test bore/test well at this time. If you have any questions, please do not hesitate to contact me at your earliest convenience.

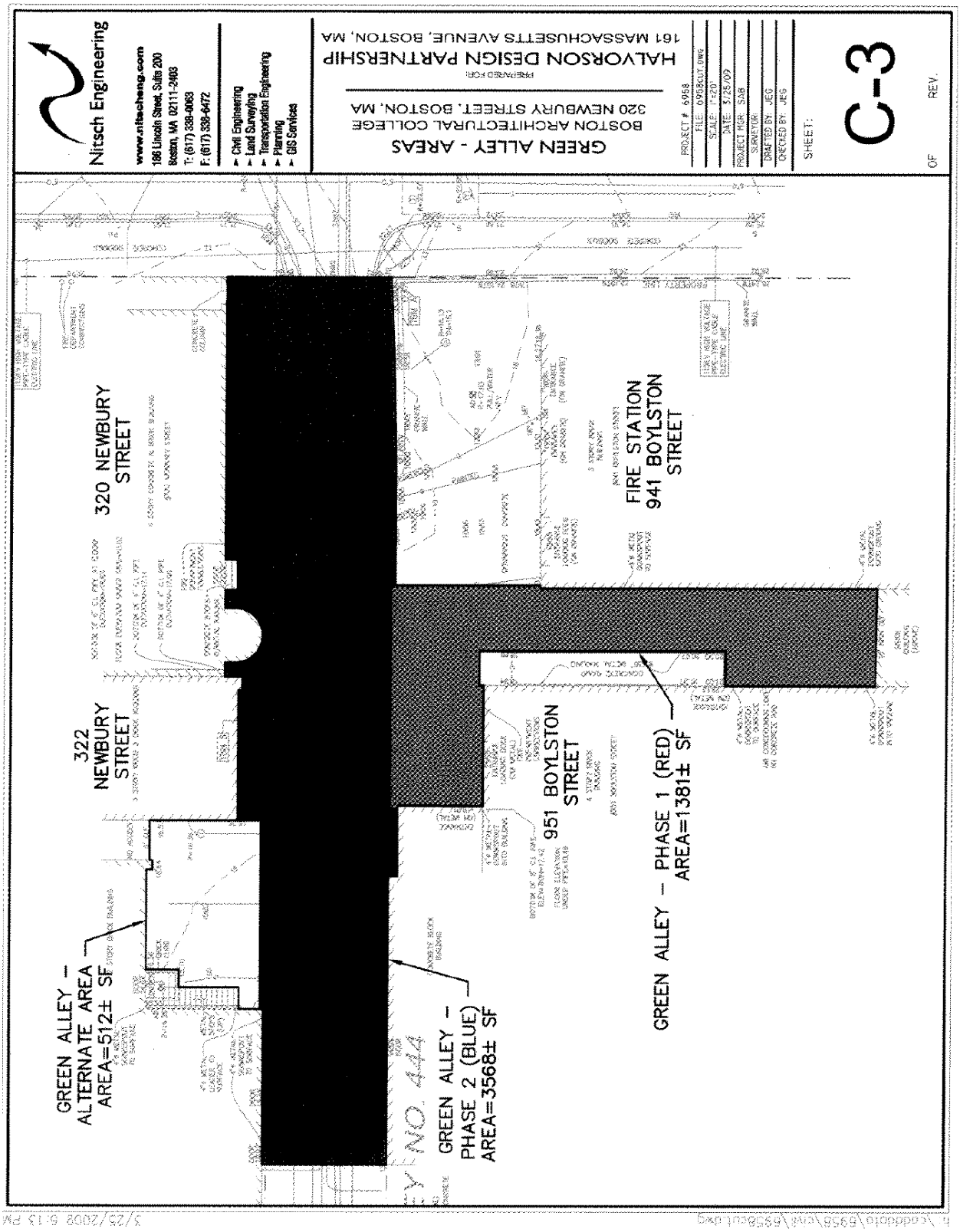
Thank you,
Cliff

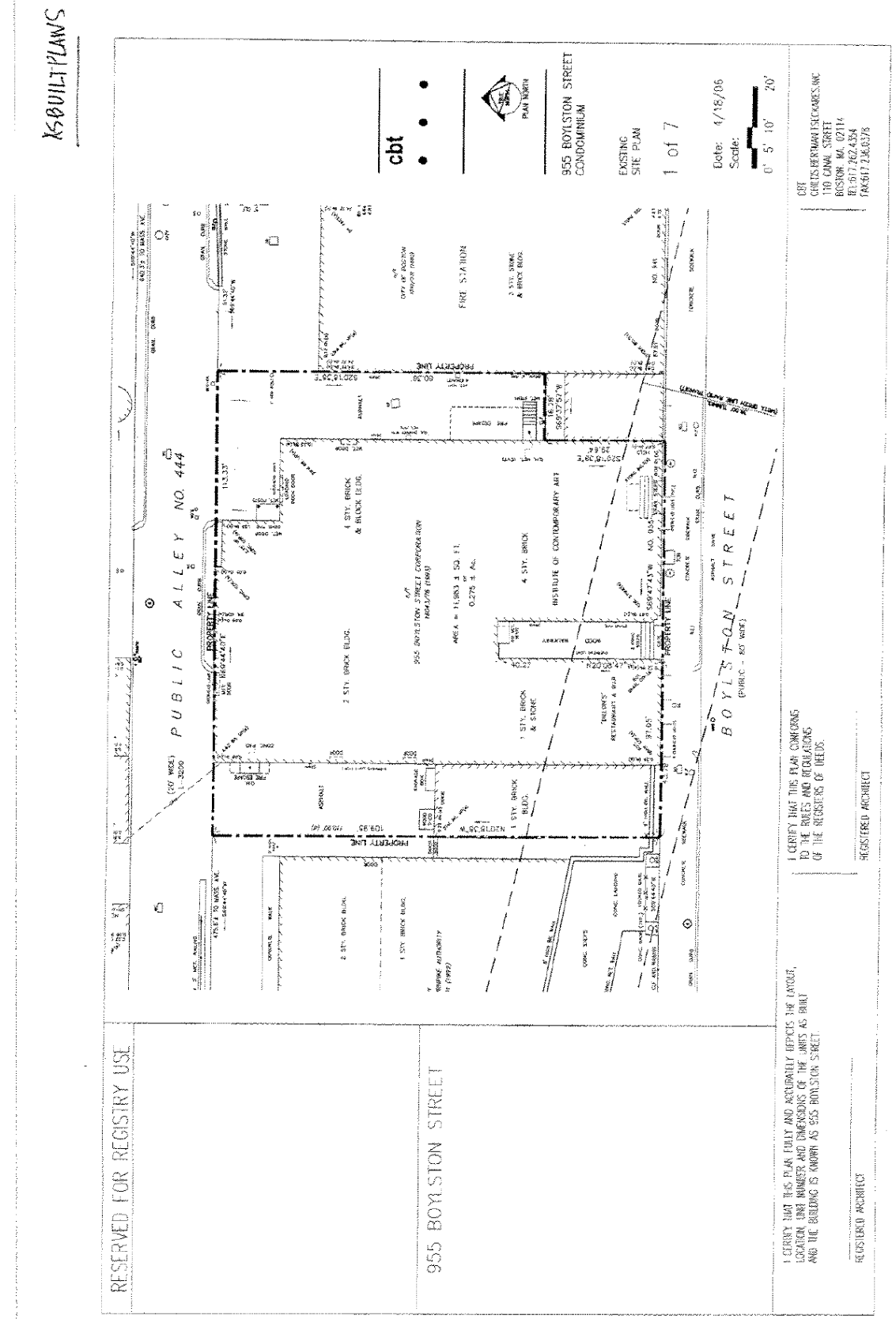
****

Cliff Whyte, General Engineer
U.S. Department of Energy
National Energy Technology Laboratory

304-285-2098 Office
cliff.whyte@netl.doe.gov


EXISTING CONDITIONS PLAN
EX-1
HEREFORD STREET
PUBLIC ALLEY NO. 444


Nitsch Engineering
www.nitscheng.com
100 Lincoln Street, Suite 200
Boston, MA 02111-2483
T: (617) 338-0063
F: (617) 338-6472
Civil Engineering
Land Surveying
Transportation Engineering
Planning
GIS Services
GREEN ALLEY - AREAS
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
PROJECT # 6958
FILE: 6958cut.dwg
SCALE: 1"=20'
DATE: 3/25/09
PROJECT MGR: SAB
DRAFTED BY: JEG
CHECKED BY: JEG
SHEET:
C-3
OF
REV.
320 NEWBURY STREET
322 NEWBURY STREET
951 BOYLSTON STREET
FIRE STATION
941 BOYLSTON STREET
GREEN ALLEY - ALTERNATE AREA
AREA=512± SF
GREEN ALLEY - PHASE 2 (BLUE)
AREA=3568± SF
GREEN ALLEY - PHASE 1 (RED)
AREA=1381± SF
NO. 44
3/25/2009 5:13 PM


KS BUILT PLANS
RESERVED FOR REGISTRY USE
955 BOYLSTON STREET
cbt
955 BOYLSTON STREET
CONDOMINIUM
EXISTING
SITE PLAN
1 of 7
Date: 4/18/06
Scale:
0' 5' 10' 20'
PUBLIC ALLEY NO. 444
BOYLSTON STREET
(PUBLIC - 80' WIDE)
4 STY. BRICK & BLOCK BLDG.
2 STY. BRICK BLDG.
1 STY. BRICK & STONE
1 STY. BRICK BLDG.
4 STY. BRICK
3 STY. STONE & BRICK BLDG.
FIRE STATION
955 BOYLSTON STREET CONDOMINIUM
AREA = 11,983 ± SQ. FT.
0.275 ± AC.
PROPERTY LINE
I CERTIFY THAT THIS PLAN FULLY AND ACCURATELY DEPICTS THE LAYOUT, LOCATION, UNIT NUMBER AND DIMENSIONS OF THE UNITS AS BUILT AND THE BUILDING AS KNOWN AS 955 BOYLSTON STREET.
REGISTERED ARCHITECT
I CERTIFY THAT THIS PLAN COMPLIES TO THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS.
REGISTERED ARCHITECT
CBT
CHRISTOPHERSON TESCHARES, INC
110 CANAL STREET
BOSTON, MA. 02114
TEL 617.262.4334
FAX 617.736.8378

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

April 1, 2011

Brett Aristegui
US Department of Energy
National Energy Technology Laboratory
Mail Stop 920-215
PO Box 10940
Pittsburgh PA 15236-0940

RE: The Boston Architectural College Urban Sustainability Initiative for Renovation of Public Alley #444 & Geothermal Heating & Cooling System, Between 951 Boylston Street & 320 Newbury Street at Hereford Street, Boston, MA. MHC #RC.49863. USDOE/NETL #DE-EE0003518.

Dear Mr. Aristegui:

Staff of the Massachusetts Historical Commission (MHC), the office of the State Historic Preservation Officer, have reviewed the additional information submitted for the project referenced above, received by the MHC on March 23, 2011.

At this time, the US Department of Energy's (DOE) applicant proposes to drill a six-inch diameter bore between 941 and 951 Boylston Street as a feasibility test bore. The proposed drilling method will employ a "Down the Hole Hammer" (DTHH) air rotary drill. The MHC understands that the purpose of the test bore is to assist in the development of project plans and specifications for the proposed geothermal heating & cooling system.

The project is located within the Back Bay Historic District (MHC #BOS.BT), which is listed in the National Register of Historic Places. The project location may be sensitive for containing significant archaeological features preserved below the late 19th-century fill. The project is also located in the Back Bay Architectural District (BOS.BW), a local historic district.

The test bore could cause vibration effects to adjacent historic masonry buildings. The test bore could encounter intact soils beneath the urban fill that may contain archaeological features. If the drilling method is capable, observations should be recorded of the depth of the urban fill in the bore location, and the depths and contents of strata underlying the fill. This information should be reported to the MHC.

The MHC recommends that the DOE make a finding that the six-inch diameter test bore between 941 and 951 Boylston Street will have "no adverse effect" (36 CFR 800.5(b)) on the significant historic and archaeological characteristics of the Back Bay Historic District and the Back Bay Architectural District, provided, however, that if any vibration effects to nearby historic buildings occur, that the drilling cease and consultation occur with the MHC and with other consulting parties.

The Boston Landmarks Commission and the Back Bay Architectural Commission may be among those interested in being "consulting parties" (36 CFR 800.2) to this review. The MHC recommends that the Department of Energy contact these groups to determine their interest (36 CFR 800.2(a)(4)).
The applicant should submit copies of future submittals to the DOE, the MHC and all other consulting parties. Any consulting party comments should be addressed to the DOE, with copies to the applicant and to the MHC and all other consulting parties.

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

The project plan submitted on March 23, 2011, clarifies the location of the project in relation to historic buildings. The project is adjacent to the Boston Ladder 15 and Engine 33 Firehouse (BOS.2691) at 943-951 Boylston Street; the Back Bay Police Station (BOS.2692) at 955 Boylston Street; and, Boston Division 16 Police Station (BOS.2693) at 957 Boylston Street. Other historic buildings in the project area vicinity are located on the south side of Newbury Street (e.g., 320 to 328 Newbury Street).

The MHC looks forward to reviewing detailed project plans, specifications, and any relevant engineering studies for the geothermal heating and cooling system and "Green Alley" project when they become available. Since potential project effects may include vibrations and changes to the water table that could affect the structural integrity and stability of historic buildings, these issues should be discussed in the project materials to be submitted.

These comments are offered to assist in compliance with Sections 106 of the National Historic Preservation Act of 1966 as amended. Please contact Edward L. Bell or Brandee Loughlin if you have any questions.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc:
Dr. F.G. Gosling, US Department of Energy
James T. Dunn, Boston Architectural College
Steven Macneil, Boston Architectural College
Boston Landmarks Commission
Back Bay Architectural Commission

NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA
U.S. DEPARTMENT OF ENERGY

April 14, 2011

Executive Director Brona Simon
Historic Preservation Office
220 Morrissey Boulevard
Boston, MA 02125

Subject: Boston Architectural College's Urban Sustainability Initiative Renovation of Green Alley #444, Boston, Massachusetts

Dear Director Simon:

The U.S. Department of Energy (DOE) proposes to provide a $1.6 million grant to Boston Architectural College (BAC) for its "Urban Sustainability Initiative Renovation of Green Alley #444." This financial assistance, based on a FY2010 congressional earmark, would allow BAC to design, construct and implement the renovation of Public Alley #444 in Boston's Historic Back Bay District. The project would include the installation of 7 to 10 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution into the benefiting facilities. The Green Alley would reduce storm water runoff into the Charles River Basin and become an ongoing tool for the BAC curriculum and community public education. DOE is planning to prepare an Environmental Assessment for the purpose of complying with NEPA.

At this time, BAC has requested approval to drill a test bore/test well on BAC property to obtain data necessary to complete the design of the geothermal heating and cooling portion of the project. DOE is considering allowing this activity as an "Interim Action". BAC provided DOE with correspondence from your office dated 1 April 2011 regarding this specific activity. Enclosed, please find this correspondence and drawings indicating the location of the test bore/test well. Further, DOE has contacted Mr. William Young as per your recommendation to consult with the Boston Landmarks Commission and the Back Bay Architectural District. Mr. Young had no comments on the test bore/test well and his remarks are enclosed for your reference.

Based on the information available, DOE has determined that the drilling of the test bore/test well would not cause any adverse effects to any historic or archeological resources at the project site. However, DOE is seeking your concurrence with this determination in accordance with Section 106 obligations.

Please forward the results of your review and any requests for additional information to the Department's National Energy Technology Laboratory using the contact information provided below.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507
Cliff.Whyte@netl.doe.gov • Voice (304) 285-2098 • Fax (304) 285-4403 • www.netl.doe.gov

Mr. Cliff Whyte
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P. O. Box 880, MS B07
Morgantown, WV 26507-0880
Telephone: (304) 285-2098
Email: Cliff.Whyte@netl.doe.gov

Again, please note that DOE intends to prepare an Environmental Assessment for the overall project. As part of the NEPA process, DOE and BAC will provide your office, the Boston Landmarks Commission, and the Back Bay Architectural Commission with the entire project design when complete for review and comment and solicit your input for inclusion in the Environmental Assessment. Thank you for your assistance in this matter.

Sincerely,

Cliff Whyte
NEPA Compliance Officer

Enclosures

CITY OF BOSTON
THE ENVIRONMENT DEPARTMENT

Boston City Hall, Room 805 • Boston, MA 02201 • 617/635-3850 • FAX: 617/635-3435

16 August 2011

BACK BAY ARCHITECTURAL COMMISSION

Boston Architectural College
320 Newbury Street
Boston, MA 02115
ATTN: Art Byers, Facilities Manager

CERTIFICATE OF APPROPRIATENESS

NOTICE OF DECISION
Application 12.101 (BB)
951 Boylston Street; 320 Newbury Street

Dear Mr. Byers:

At a public hearing held at Boston City Hall on 10 August 2011 the Back Bay Architectural Commission reviewed your application for a Certificate of Appropriateness for the replacement of paving materials, the introduction of plant material against a projecting stair tower, and the installation of a bollard and lighting fixtures at the rear elevations of 951 Boylston Street and 320 Newbury Street. This work is understood to be part of a so-called "Green Alley" campaign, involving the adjustment of the grade, the capture of runoff and the improvement of the appearance of the public space spanning the subject buildings. Of these, 951 Boylston Street is a former police station in the Romanesque Revival style built to the designs of Arthur Vinal in 1884; 320 Newbury Street, a late example of the International Style, was purpose-built for the Boston Architectural College, as it is now called, in 1966.

Endorsing both the general and specific aims of the project, the commission voted to approve your application substantially as submitted. In its decision, the commission requested that particular attention be directed to the green wall (as the stair-tower plant material has been called), evaluating the success and viability of the plant material after the passage of two years. If by that time the vine has failed to establish itself, the commission may seek the removal of the supporting grid. The commission observed that ongoing monitoring may be beneficial to ensure that the plant material is maintained in a flourishing condition. Further, the commission emphasized that its acceptance of the green wall, to soften an architecturally undistinguished and volumetrically intrusive stair tower, is not to be construed as a precedent for the introduction of a comparable feature at a more aesthetically significant location. The commission moreover understood that there will be no exterior electrical conduit or junction boxes for the lighting fixtures for the 320 Newbury Street building, whose sleek design it found compatible with that property. Finally, it was the understanding of the commission that the geothermal wells are anticipated to have no impact on the water table.

This determination is based on documentation presented at the hearing. Statutory reviews by other agencies in conflict with this decision may affect the status of this certificate, which is valid for one year from its date of issue. The applicant is required to notify the commission of any changes to this proposal, and failure to do so may affect the status of this certificate. Please present this certificate at the Inspectional Services Department (1010 Massachusetts Avenue) when applying for permits. Finally, please submit photographs of the completed work to confirm compliance with the terms of this certificate.

Thanking you for your cooperation with the commission,

Very truly,

William S. Young
Senior Preservation Planner

RECORD OF VOTE ON APPLICATION 12.101
MOTION by Connor; SECOND by Moss
AFFIRMATIVE: Casendino, Christiansen, Connor, Quinn, Wojciechowski, Cherubino, da Silva, Demetriades, Moss
NEGATIVE: (None)

cc: A. Casendino, Chairman

NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA
U.S. DEPARTMENT OF ENERGY

September 23, 2011

Ms. Brona Simon, State Historic Preservation Officer
Historic Preservation Office
220 Morrisey Boulevard
Boston, MA 02125-3314

SUBJECT: Environmental Assessment for the Boston Architectural College's Urban Sustainability Initiative for Renovation of Public Alley #444, Boston, Massachusetts

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) has determined, following a review conducted in accordance with the DOE's National Environmental Policy Act (NEPA) Implementing Procedures, that preparation of an Environmental Assessment (EA) is the appropriate level of environmental review for the Urban Sustainability Initiative's Renovation of Public Alley #444 located in Boston, Massachusetts.

DOE's proposed action and subject of the EA is to provide a financial assistance grant of $1.6 million to the Boston Architectural College (BAC) for its Urban Sustainability Initiative Renovation of Public Alley #444 in Boston's Historic Back Bay District. This financial assistance, based on a FY2010 congressional earmark, would allow BAC to design, construct and implement the renovation of Public Alley #444 and would include the installation of 13 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution providing energy efficiencies that will in-turn benefit the facilities.

The first project activity would be the Phase II (Green Alley) located in Public Alley #444 between 320 Newbury Street and 951 Boylston Street, Boston, Massachusetts. The Green Alley will reduce the storm water runoff into the Charles River Basin in one of its most significantly polluted sections and provide improved aesthetics to Public Alley #444. Improvements include permeable pavers, a green trellis, new sidewalks and curbing as well as improved lighting.

The second project activity is the installation of 13 standing column geothermal wells to approximately 1,500 ft. and two or three bleed injection wells to approximately 200 ft (*SEE Attachments [blue shaded area]*). The project is located at the rear of 951 Boylston Street, Boston, Massachusetts and the parking area adjacent to Public Alley #444 in Boston's Historic Back Bay. The open loop geothermal well heat pump system makes use of the constant mid 50 degree temperatures of the earth by circulating fluid through closed pipes exchanging the heat of the earth in the winter, and returning the heat of the building to the earth in the summer. When completed, the system will run on a standard HVAC system, use no fossil fuels, produce no emissions, run silently, and once capped, will be invisible to the public. BAC's 1,500 ft. test borehole was recently completed in May which yielded positive results for geothermal applications.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

Subsequently, a pump down test was performed to further investigate geothermal applications and design parameters.

In accordance with DOE NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to states and private entities. In compliance with these regulations and DOE's procedures, the EA will examine the potential environmental impacts of the proposed action and the No-Action Alternative and will identify any unavoidable adverse environmental impacts of the proposed action. This EA (*when final*) will fulfill DOE's obligations under NEPA and provide DOE with the information needed to make an informed decision to provide financial assistance for the Green Alley Phase II and the Geothermal Solution project at the BAC.

DOE's NETL is currently preparing the Draft EA for this project and estimates that it will be made available for public comment in November 2011. At this time we anticipate a 30-day public comment period for this proposed project. A hard copy of the Draft EA will be sent to your office, where you may again respond to any specific comments or concerns you may have with the project.

DOE is initiating informal consultation and requesting any additional information you may have on properties of historic or archaeological significance within the vicinity of the BAC project and any comments or concerns you have on the potential for this project to affect these properties. This information is being requested to aid in the preparation of the EA and to meet DOE's obligations under Section 106 of the *National Historic Preservation Act* of 1966 *as amended*. If you have any such information, require additional information, or have any questions or comments about the BAC project, please contact DOE's NETL using the contact information provided below:

ATTN: Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
Office phone: 304-285-5219
Email: fred.pozzuto@netl.doe.gov

Sincerely,

Fred E. Pozzuto
Environmental Manager / NEPA Compliance Officer

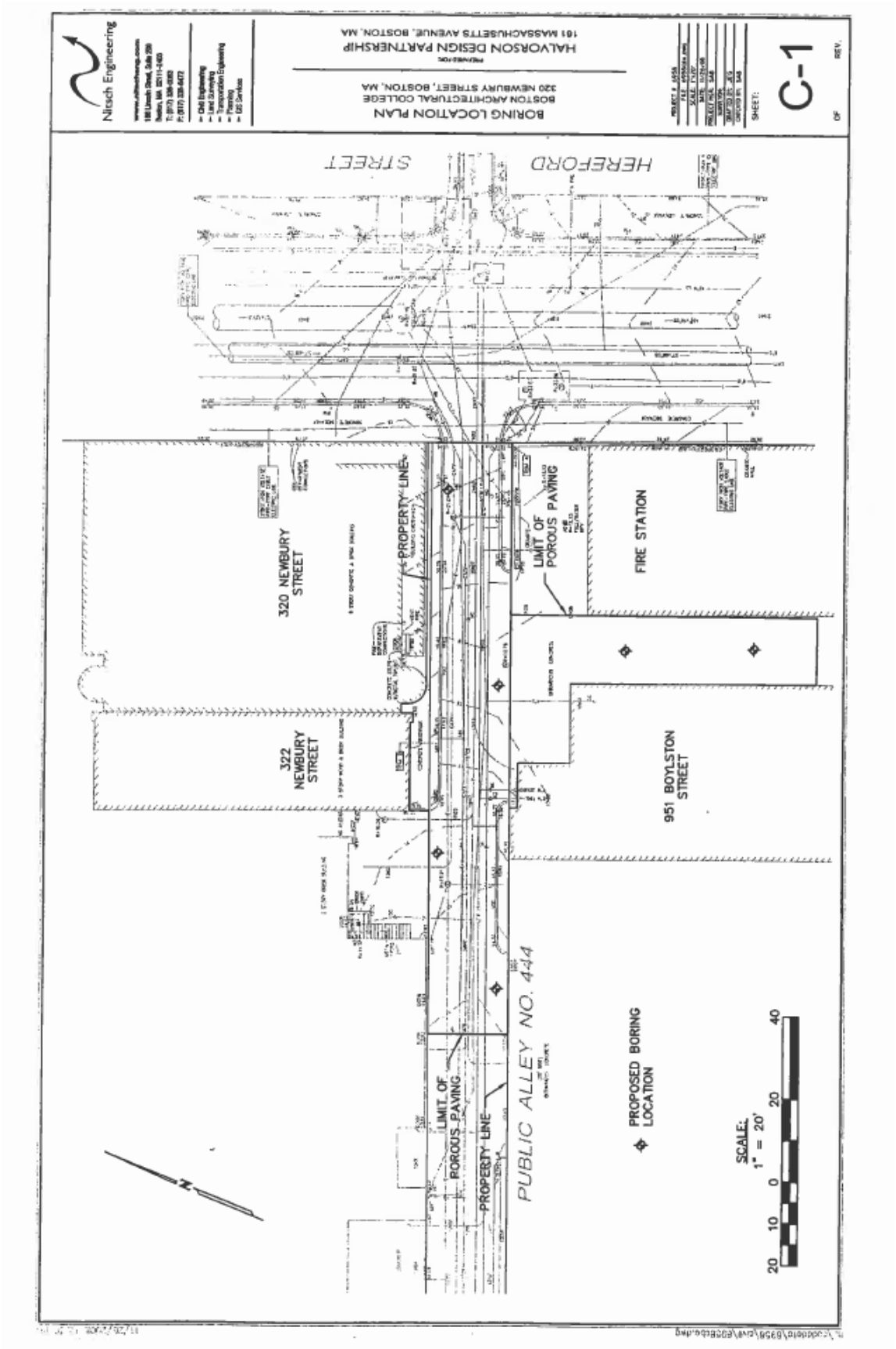
Attachments

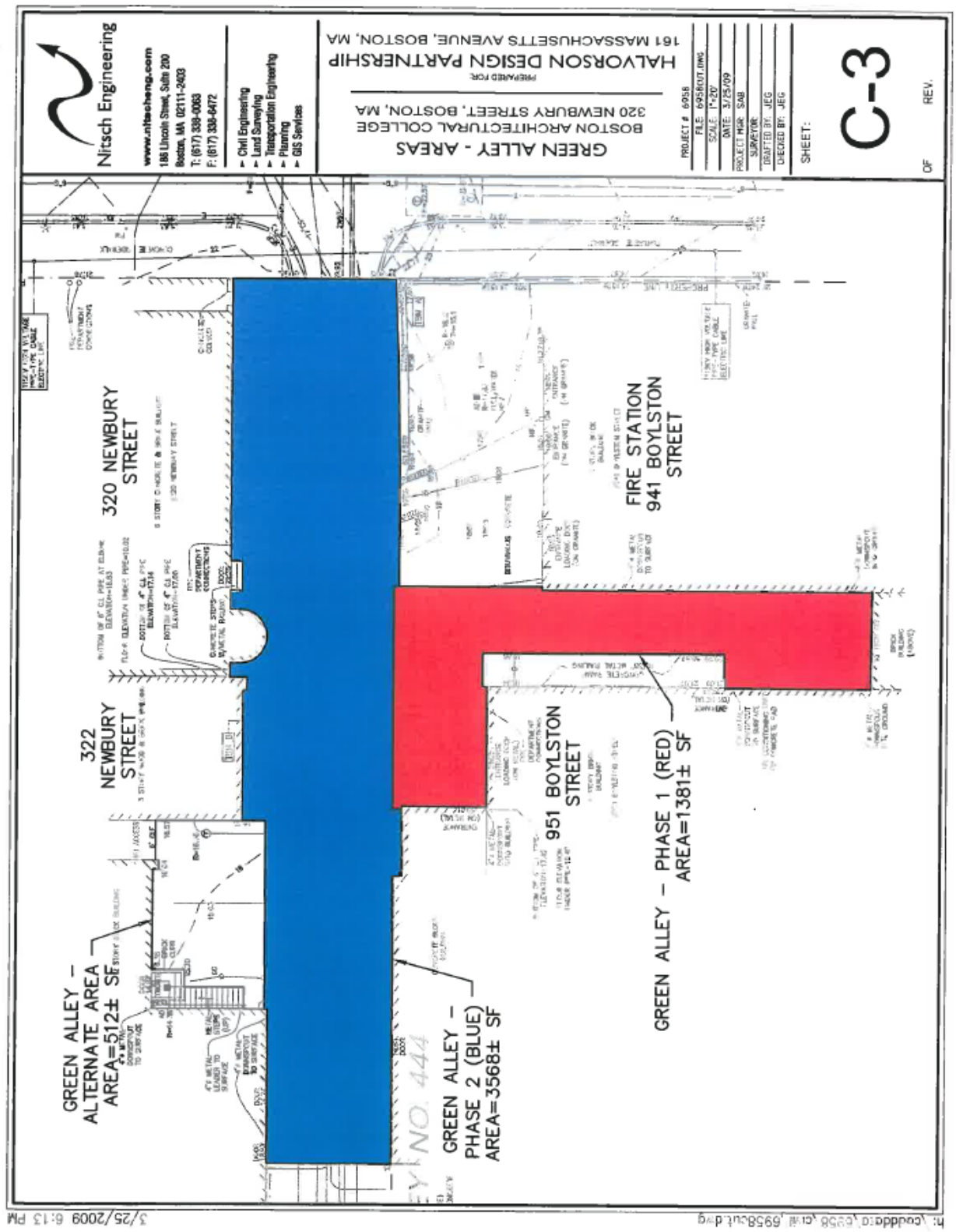
CF (w/attachments):

BSA Environmental (Mr. J. Beaver)
Boston Architectural College (Mr. S. Macneil)

Aerial View

SCALE: 1" = 300'


Nitsch Engineering
BORING LOCATION PLAN
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
C-1
HEREFORD STREET
320 NEWBURY STREET
322 NEWBURY STREET
PROPERTY LINE
LIMIT OF POROUS PAVING
FIRE STATION
951 BOYLSTON STREET
PUBLIC ALLEY NO. 444
PROPOSED BORING LOCATION
SCALE: 1" = 20'
20 10 0 20 40


Nitsch Engineering
www.nitscheng.com
186 Lincoln Street, Suite 200
Boston, MA 02111-2403
T: (617) 338-0063
F: (617) 338-6472
Civil Engineering
Land Surveying
Transportation Engineering
Planning
GIS Services
GREEN ALLEY - AREAS
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
PREPARED FOR:
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
PROJECT # 6958
FILE: 6958cut.dwg
SCALE: 1"=20'
DATE: 3/25/09
PROJECT MGR: SAB
SURVEYOR:
DRAFTED BY: JEG
CHECKED BY: JEG
SHEET:
C-3
OF
REV.
320 NEWBURY STREET
322 NEWBURY STREET
FIRE STATION
941 BOYLSTON STREET
951 BOYLSTON STREET
GREEN ALLEY - ALTERNATE AREA AREA=512± SF
GREEN ALLEY - PHASE 2 (BLUE) AREA=3568± SF
GREEN ALLEY - PHASE 1 (RED) AREA=1381± SF
3/25/2009 6:13 PM

NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA
U.S. DEPARTMENT OF ENERGY

September 23, 2011

Ms. Ellen Lipsey, Executive Director
Boston Landmarks Commission
1 City Hall Square
Room 805
Boston, MA 02201

SUBJECT: Environmental Assessment for the Boston Architectural College's Urban Sustainability Initiative for Renovation of Public Alley #444, Boston, Massachusetts

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) has determined, following a review conducted in accordance with the DOE's National Environmental Policy Act (NEPA) Implementing Procedures, that preparation of an Environmental Assessment (EA) is the appropriate level of environmental review for the Urban Sustainability Initiative's Renovation of Public Alley #444 located in Boston, Massachusetts.

DOE's proposed action and subject of the EA is to provide a financial assistance grant of $1.6 million to the Boston Architectural College (BAC) for its Urban Sustainability Initiative Renovation of Public Alley #444 in Boston's Historic Back Bay District. This financial assistance, based on a FY2010 congressional earmark, would allow BAC to design, construct and implement the renovation of Public Alley #444 and would include the installation of 13 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution providing energy efficiencies that will in-turn benefit the facilities.

The first project activity would be the Phase II (Green Alley) located in Public Alley #444 between 320 Newbury Street and 951 Boylston Street, Boston, Massachusetts. The Green Alley will reduce the storm water runoff into the Charles River Basin in one of its most significantly polluted sections and provide improved aesthetics to Public Alley #444. Improvements include permeable pavers, a green trellis, new sidewalks and curbing as well as improved lighting.

The second project activity is the installation of 13 standing column geothermal wells to approximately 1,500 ft. and two or three bleed injection wells to approximately 200 ft (*SEE Attachments [blue shaded area]*). The project is located at the rear of 951 Boylston Street, Boston, Massachusetts and the parking area adjacent to Public Alley #444 in Boston's Historic Back Bay. The open loop geothermal well heat pump system makes use of the constant mid 50 degree temperatures of the earth by circulating fluid through closed pipes exchanging the heat of the earth in the winter, and returning the heat of the building to the earth in the summer. When completed, the system will run on a standard HVAC system, use no fossil fuels, produce no emissions, run silently, and once capped, will be invisible to the public. BAC's 1,500 ft. test borehole was recently completed in May which yielded positive results for geothermal applications.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

Subsequently, a pump down test was performed to further investigate geothermal applications and design parameters.

In accordance with DOE NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to states and private entities. In compliance with these regulations and DOE's procedures, the EA will examine the potential environmental impacts of the proposed action and the No-Action Alternative and will identify any unavoidable adverse environmental impacts of the proposed action. This EA (*when final*) will fulfill DOE's obligations under NEPA and provide DOE with the information needed to make an informed decision to provide financial assistance for the Green Alley Phase II and the Geothermal Solution project at the BAC.

DOE's NETL is currently preparing the Draft EA for this project and estimates that it will be made available for public comment in November 2011. At this time we anticipate a 30-day public comment period for this proposed project. A hard copy of the Draft EA will be sent to your office, where you may again respond to any specific comments or concerns you may have with the project.

DOE is initiating informal consultation and requesting any additional information you may have on properties of historic or archaeological significance within the vicinity of the BAC project and any comments or concerns you have on the potential for this project to affect these properties. This information is being requested to aid in the preparation of the EA and to meet DOE's obligations under Section 106 of the *National Historic Preservation Act* of 1966 *as amended*. If you have any such information, require additional information, or have any questions or comments about the BAC project, please contact DOE's NETL using the contact information provided below:

ATTN: Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
Office phone: 304-285-5219
Email: fred.pozzuto@netl.doe.gov

Sincerely,

Fred E. Pozzuto
Environmental Manager / NEPA Compliance Officer

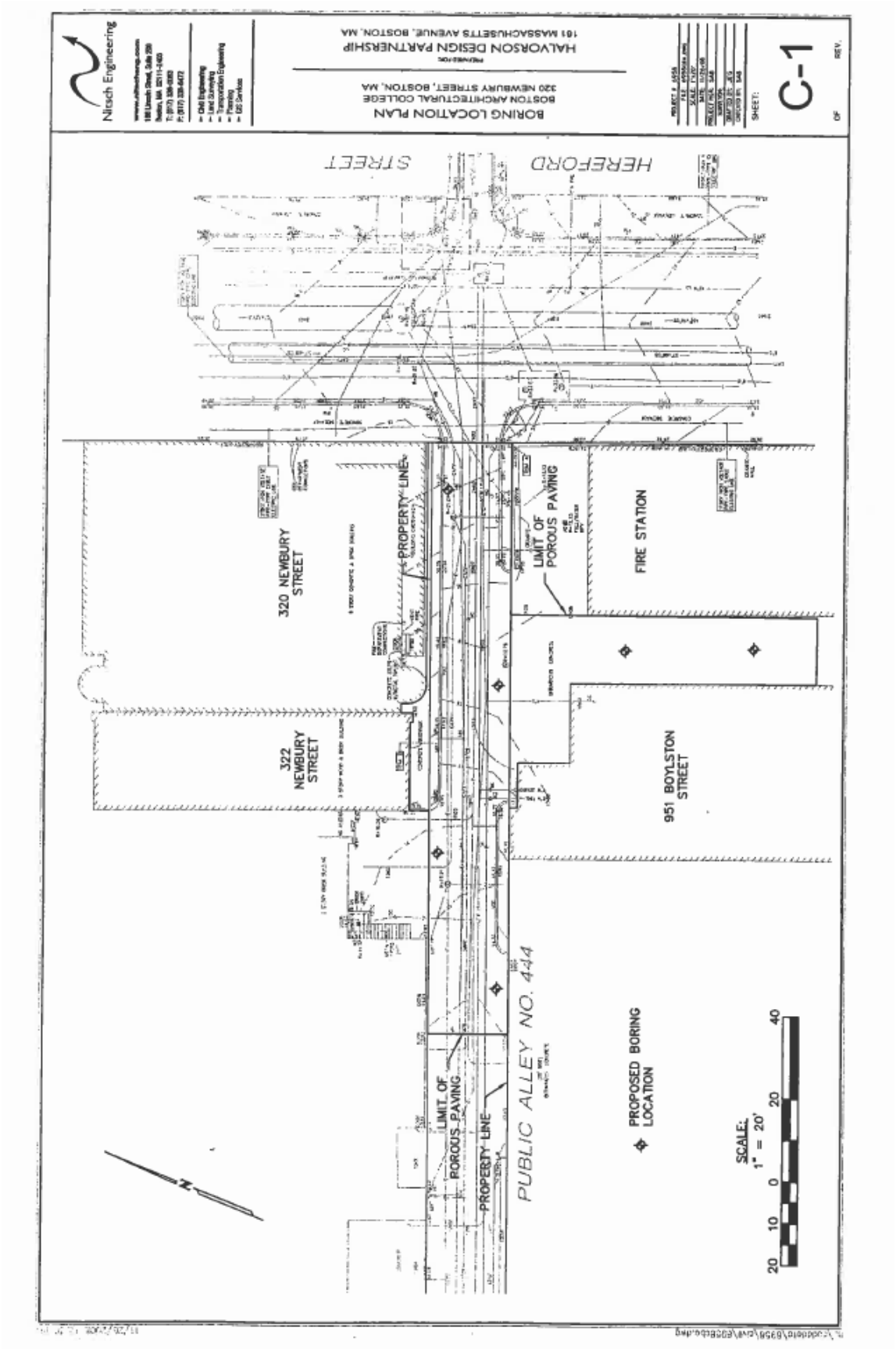
Attachments

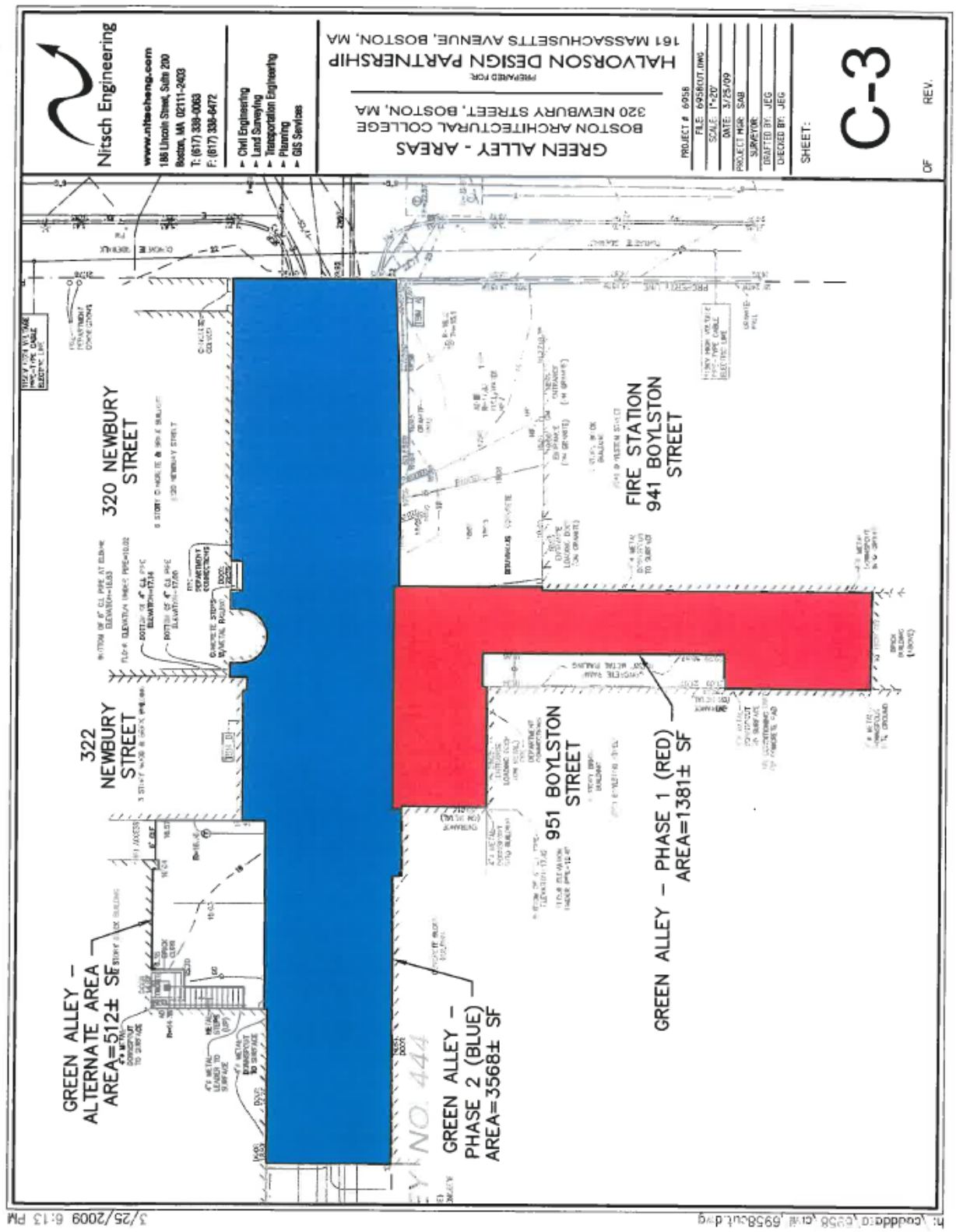
CF (w/attachments):

BSA Environmental (Mr. J. Beaver)
Boston Architectural College (Mr. S. Macneil)

Aerial View

SCALE: 1" = 300'


Nitsch Engineering
BORING LOCATION PLAN
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
C-1
HEREFORD STREET
320 NEWBURY STREET
322 NEWBURY STREET
PROPERTY LINE
LIMIT OF POROUS PAVING
FIRE STATION
951 BOYLSTON STREET
PUBLIC ALLEY NO. 444
PROPOSED BORING LOCATION
SCALE: 1" = 20'
20 10 0 20 40


Nitsch Engineering
www.nitscheng.com
186 Lincoln Street, Suite 200
Boston, MA 02111-2403
T: (617) 338-0063
F: (617) 338-6472
Civil Engineering
Land Surveying
Transportation Engineering
Planning
GIS Services
GREEN ALLEY - AREAS
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
PREPARED FOR:
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
PROJECT # 6958
FILE: 6958cut.dwg
SCALE: 1"=20'
DATE: 3/25/09
PROJECT MGR: SAB
SURVEYOR:
DRAFTED BY: JEG
CHECKED BY: JEG
SHEET:
C-3
OF
REV.
320 NEWBURY STREET
322 NEWBURY STREET
951 BOYLSTON STREET
FIRE STATION
941 BOYLSTON STREET
GREEN ALLEY - ALTERNATE AREA AREA=512± SF
GREEN ALLEY - PHASE 2 (BLUE) AREA=3568± SF
GREEN ALLEY - PHASE 1 (RED) AREA=1381± SF
3/25/2009 6:13 PM

NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA
U.S. DEPARTMENT OF ENERGY

September 23, 2011

Mr. William F. Galvin, Sec. of the Commonwealth
Massachusetts Historical Commission
220 Morrisey Boulevard
Boston, MA 02125-3314

SUBJECT: Environmental Assessment for the Boston Architectural College's Urban Sustainability Initiative for Renovation of Public Alley #444, Boston, Massachusetts

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) has determined, following a review conducted in accordance with the DOE's National Environmental Policy Act (NEPA) Implementing Procedures, that preparation of an Environmental Assessment (EA) is the appropriate level of environmental review for the Urban Sustainability Initiative's Renovation of Public Alley #444 located in Boston, Massachusetts.

DOE's proposed action and subject of the EA is to provide a financial assistance grant of $1.6 million to the Boston Architectural College (BAC) for its Urban Sustainability Initiative Renovation of Public Alley #444 in Boston's Historic Back Bay District. This financial assistance, based on a FY2010 congressional earmark, would allow BAC to design, construct and implement the renovation of Public Alley #444 and would include the installation of 13 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution providing energy efficiencies that will in-turn benefit the facilities.

The first project activity would be the Phase II (Green Alley) located in Public Alley #444 between 320 Newbury Street and 951 Boylston Street, Boston, Massachusetts. The Green Alley will reduce the storm water runoff into the Charles River Basin in one of its most significantly polluted sections and provide improved aesthetics to Public Alley #444. Improvements include permeable pavers, a green trellis, new sidewalks and curbing as well as improved lighting.

The second project activity is the installation of 13 standing column geothermal wells to approximately 1,500 ft. and two or three bleed injection wells to approximately 200 ft (*SEE Attachments [blue shaded area]*). The project is located at the rear of 951 Boylston Street, Boston, Massachusetts and the parking area adjacent to Public Alley #444 in Boston's Historic Back Bay. The open loop geothermal well heat pump system makes use of the constant mid 50 degree temperatures of the earth by circulating fluid through closed pipes exchanging the heat of the earth in the winter, and returning the heat of the building to the earth in the summer. When completed, the system will run on a standard HVAC system, use no fossil fuels, produce no emissions, run silently, and once capped, will be invisible to the public. BAC's 1,500 ft. test borehole was recently completed in May which yielded positive results for geothermal applications.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

Subsequently, a pump down test was performed to further investigate geothermal applications and design parameters.

In accordance with DOE NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to states and private entities. In compliance with these regulations and DOE's procedures, the EA will examine the potential environmental impacts of the proposed action and the No-Action Alternative and will identify any unavoidable adverse environmental impacts of the proposed action. This EA (*when final*) will fulfill DOE's obligations under NEPA and provide DOE with the information needed to make an informed decision to provide financial assistance for the Green Alley Phase II and the Geothermal Solution project at the BAC.

DOE's NETL is currently preparing the Draft EA for this project and estimates that it will be made available for public comment in November 2011. At this time we anticipate a 30-day public comment period for this proposed project. A hard copy of the Draft EA will be sent to your office, where you may again respond to any specific comments or concerns you may have with the project.

DOE is initiating informal consultation and requesting any additional information you may have on properties of historic or archaeological significance within the vicinity of the BAC project and any comments or concerns you have on the potential for this project to affect these properties. This information is being requested to aid in the preparation of the EA and to meet DOE's obligations under Section 106 of the *National Historic Preservation Act* of 1966 *as amended*. If you have any such information, require additional information, or have any questions or comments about the BAC project, please contact DOE's NETL using the contact information provided below:

ATTN: Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
Office phone: 304-285-5219
Email: fred.pozzuto@netl.doe.gov

Sincerely,

Fred E. Pozzuto
Environmental Manager / NEPA Compliance Officer

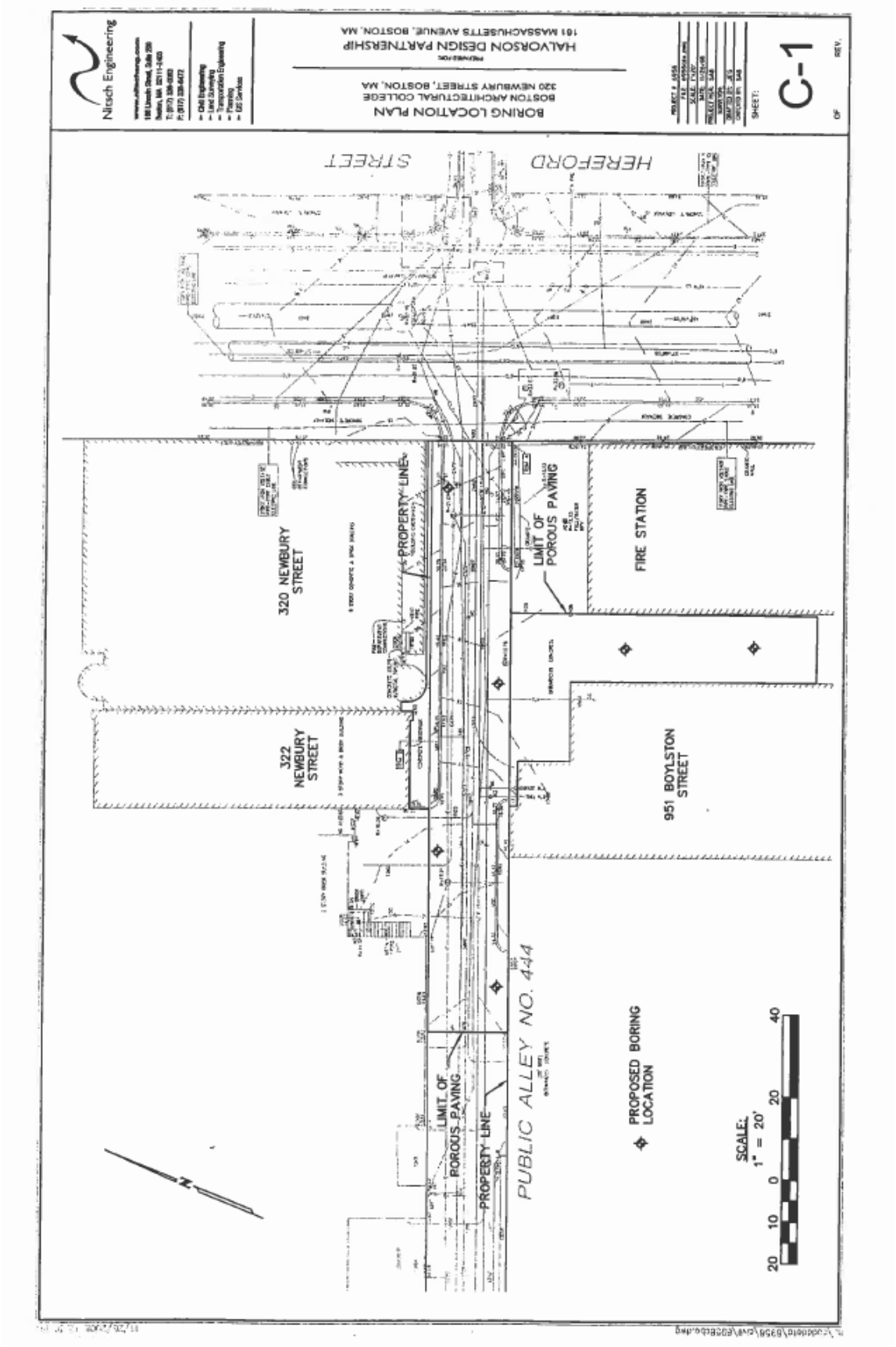
Attachments

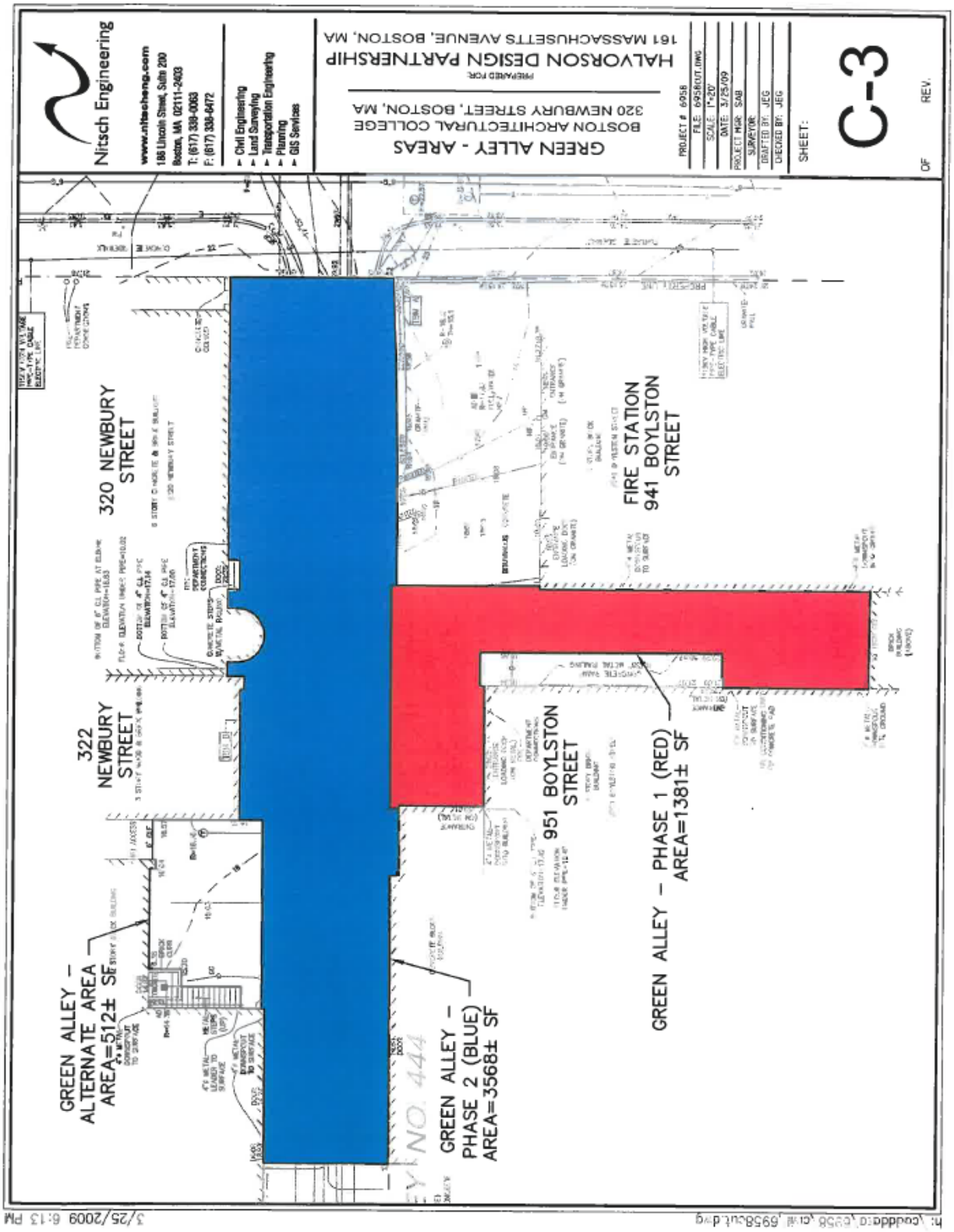
CF (w/attachments):

BSA Environmental (Mr. J. Beaver)
Boston Architectural College (Mr. S. Macneil)

Aerial View

SCALE: 1" = 300'


Nitsch Engineering
BORING LOCATION PLAN
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
C-1
HEREFORD STREET
320 NEWBURY STREET
322 NEWBURY STREET
PROPERTY LINE
LIMIT OF POROUS PAVING
FIRE STATION
951 BOYLSTON STREET
PUBLIC ALLEY NO. 444
PROPOSED BORING LOCATION
SCALE: 1" = 20'
20 10 0 20 40


Nitsch Engineering
www.nitscheng.com
186 Lincoln Street, Suite 200
Boston, MA 02111-2403
T: (617) 338-0063
F: (617) 338-6472
Civil Engineering
Land Surveying
Transportation Engineering
Planning
GIS Services
GREEN ALLEY - AREAS
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
PREPARED FOR:
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
PROJECT # 6958
FILE: 6958cut.dwg
SCALE: 1"=20'
DATE: 3/25/09
PROJECT MGR: SAB
SURVEYOR:
DRAFTED BY: JEG
CHECKED BY: JEG
SHEET:
C-3
OF
REV.
320 NEWBURY STREET
322 NEWBURY STREET
FIRE STATION
941 BOYLSTON STREET
951 BOYLSTON STREET
GREEN ALLEY - ALTERNATE AREA AREA=512± SF
GREEN ALLEY - PHASE 2 (BLUE) AREA=3568± SF
GREEN ALLEY - PHASE 1 (RED) AREA=1381± SF
3/25/2009 6:13 PM

NETL NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA
U.S. DEPARTMENT OF ENERGY

September 23, 2011

Mr. William Young
Back Bay Architectural Commission
1 City Hall Square
Room 805
Boston, MA 02201

SUBJECT: Environmental Assessment for the Boston Architectural College's Urban Sustainability Initiative for Renovation of Public Alley #444, Boston, Massachusetts

The U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) has determined, following a review conducted in accordance with the DOE's National Environmental Policy Act (NEPA) Implementing Procedures, that preparation of an Environmental Assessment (EA) is the appropriate level of environmental review for the Urban Sustainability Initiative's Renovation of Public Alley #444 located in Boston, Massachusetts.

DOE's proposed action and subject of the EA is to provide a financial assistance grant of $1.6 million to the Boston Architectural College (BAC) for its Urban Sustainability Initiative Renovation of Public Alley #444 in Boston's Historic Back Bay District. This financial assistance, based on a FY2010 congressional earmark, would allow BAC to design, construct and implement the renovation of Public Alley #444 and would include the installation of 13 open loop geothermal wells to provide heating and cooling energy to BAC's facilities; the installation of a green screen trellis system, planting soils, concrete pavement, pavers, and landscaping; and mechanical upgrades (plumbing and electrical) to accommodate the geothermal solution providing energy efficiencies that will in-turn benefit the facilities.

The first project activity would be the Phase II (Green Alley) located in Public Alley #444 between 320 Newbury Street and 951 Boylston Street, Boston, Massachusetts. The Green Alley will reduce the storm water runoff into the Charles River Basin in one of its most significantly polluted sections and provide improved aesthetics to Public Alley #444. Improvements include permeable pavers, a green trellis, new sidewalks and curbing as well as improved lighting.

The second project activity is the installation of 13 standing column geothermal wells to approximately 1,500 ft. and two or three bleed injection wells to approximately 200 ft (*SEE Attachments [blue shaded area]*). The project is located at the rear of 951 Boylston Street, Boston, Massachusetts and the parking area adjacent to Public Alley #444 in Boston's Historic Back Bay. The open loop geothermal well heat pump system makes use of the constant mid 50 degree temperatures of the earth by circulating fluid through closed pipes exchanging the heat of the earth in the winter, and returning the heat of the building to the earth in the summer. When completed, the system will run on a standard HVAC system, use no fossil fuels, produce no emissions, run silently, and once capped, will be invisible to the public. BAC's 1,500 ft. test borehole was recently completed in May which yielded positive results for geothermal applications.

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

Subsequently, a pump down test was performed to further investigate geothermal applications and design parameters.

In accordance with DOE NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to states and private entities. In compliance with these regulations and DOE's procedures, the EA will examine the potential environmental impacts of the proposed action and the No-Action Alternative and will identify any unavoidable adverse environmental impacts of the proposed action. This EA (*when final*) will fulfill DOE's obligations under NEPA and provide DOE with the information needed to make an informed decision to provide financial assistance for the Green Alley Phase II and the Geothermal Solution project at the BAC.

DOE's NETL is currently preparing the Draft EA for this project and estimates that it will be made available for public comment in November 2011. At this time we anticipate a 30-day public comment period for this proposed project. A hard copy of the Draft EA will be sent to your office, where you may again respond to any specific comments or concerns you may have with the project.

DOE is initiating informal consultation and requesting any additional information you may have on properties of historic or archaeological significance within the vicinity of the BAC project and any comments or concerns you have on the potential for this project to affect these properties. This information is being requested to aid in the preparation of the EA and to meet DOE's obligations under Section 106 of the *National Historic Preservation Act* of 1966 *as amended*. If you have any such information, require additional information, or have any questions or comments about the BAC project, please contact DOE's NETL using the contact information provided below:

ATTN: Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507
Office phone: 304-285-5219
Email: fred.pozzuto@netl.doe.gov

Sincerely,

Fred E. Pozzuto
Environmental Manager / NEPA Compliance Officer

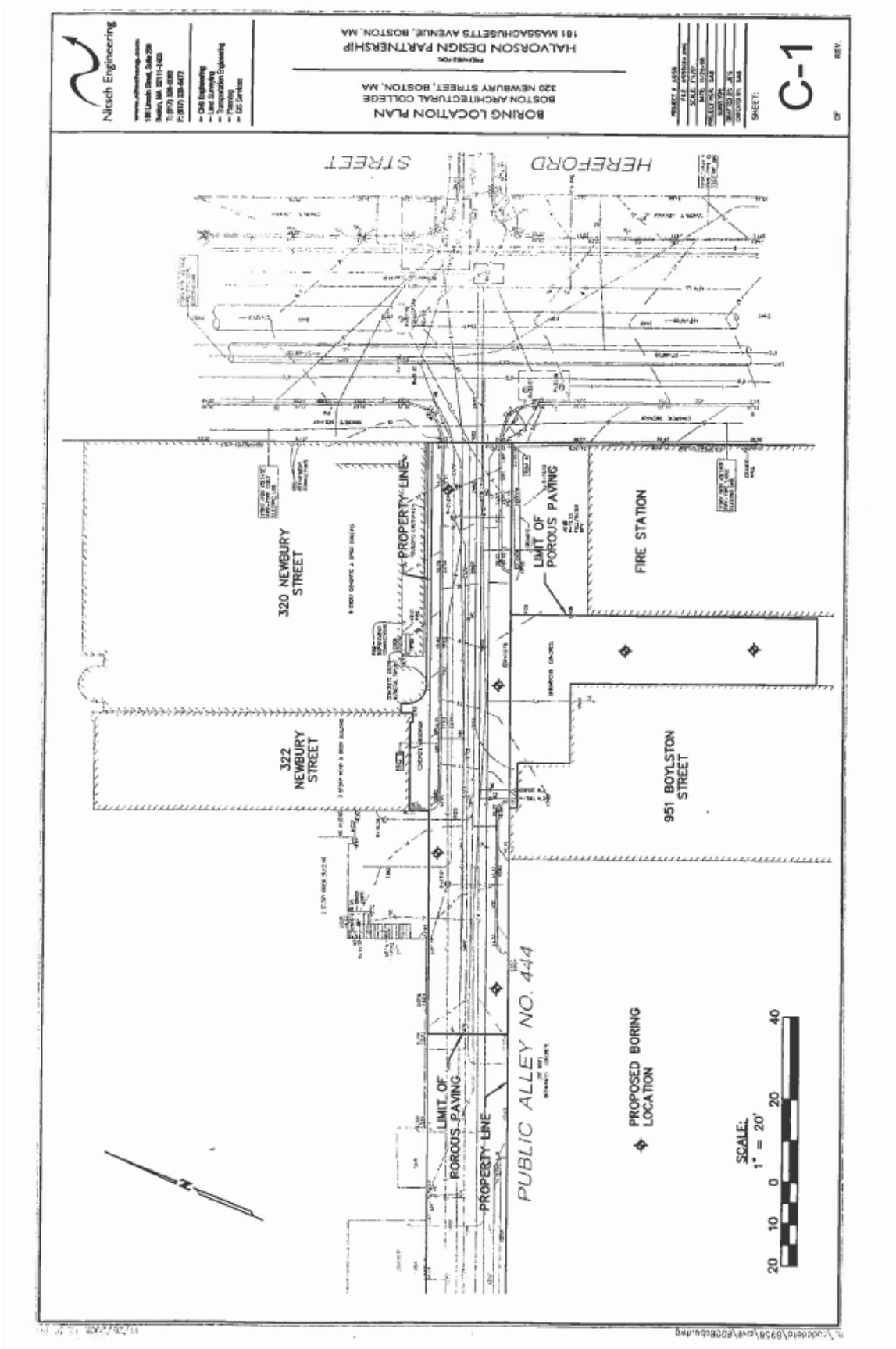
Attachments

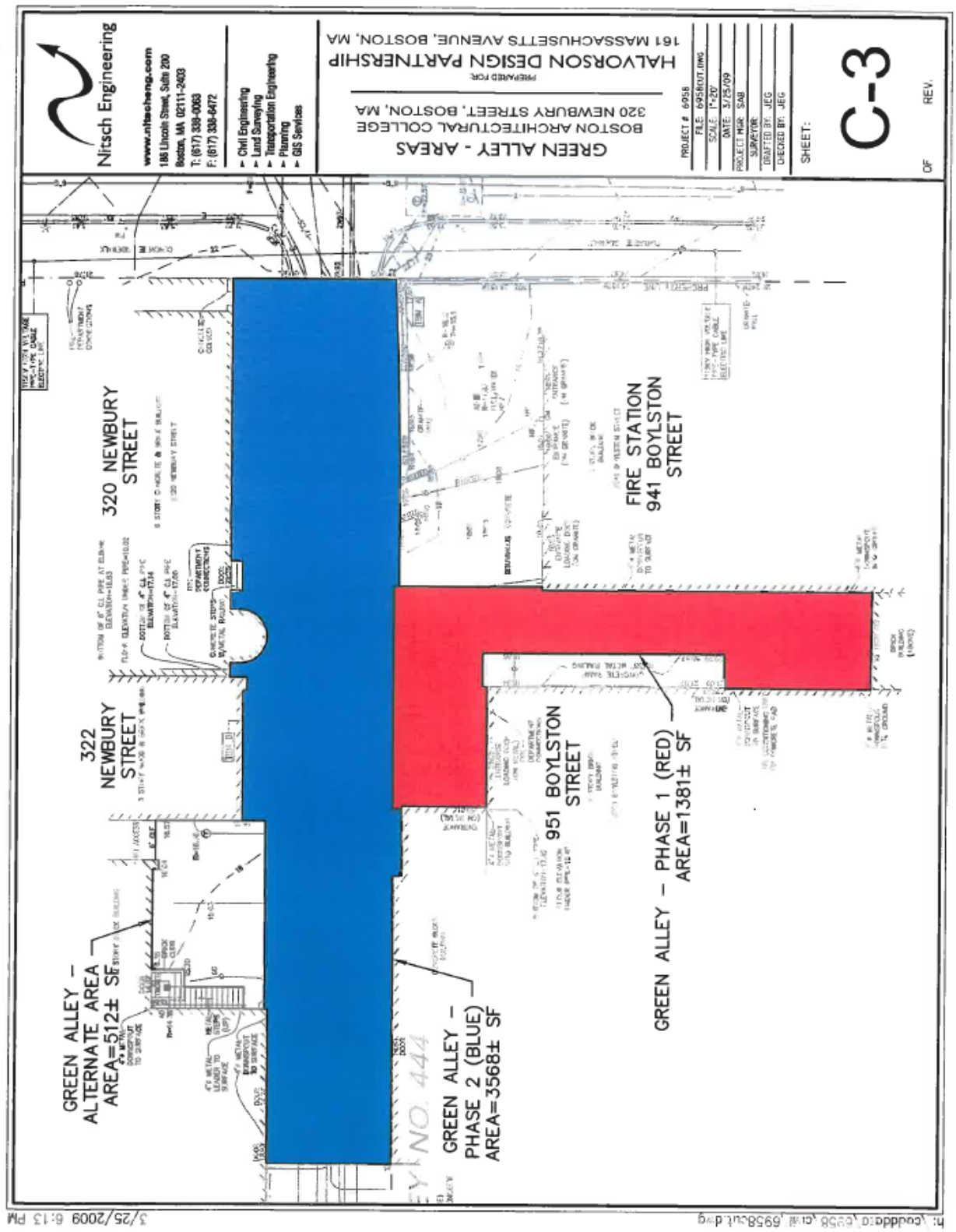
CF (w/attachments):

BSA Environmental (Mr. J. Beaver)
Boston Architectural College (Mr. S. Macneil)

Aerial View

SCALE: 1" = 300'


Nitsch Engineering
BORING LOCATION PLAN
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
C-1
HEREFORD STREET
320 NEWBURY STREET
PROPERTY LINE
LIMIT OF POROUS PAVING
FIRE STATION
322 NEWBURY STREET
951 BOYLSTON STREET
PUBLIC ALLEY NO. 444
LIMIT OF POROUS PAVING
PROPERTY LINE
PROPOSED BORING LOCATION
SCALE: 1" = 20'
20 10 0 20 40


Nitsch Engineering
www.nitscheng.com
186 Lincoln Street, Suite 200
Boston, MA 02111-2403
T: (617) 338-0063
F: (617) 338-6472
Civil Engineering
Land Surveying
Transportation Engineering
Planning
GIS Services
GREEN ALLEY - AREAS
BOSTON ARCHITECTURAL COLLEGE
320 NEWBURY STREET, BOSTON, MA
PREPARED FOR:
HALVORSON DESIGN PARTNERSHIP
161 MASSACHUSETTS AVENUE, BOSTON, MA
PROJECT # 6958
FILE: 6958cut.dwg
SCALE: 1"=20'
DATE: 3/25/09
PROJECT MGR: SAB
SURVEYOR:
DRAFTED BY: JEG
CHECKED BY: JEG
SHEET:
C-3
OF
REV.
320 NEWBURY STREET
322 NEWBURY STREET
951 BOYLSTON STREET
FIRE STATION
941 BOYLSTON STREET
GREEN ALLEY - ALTERNATE AREA AREA=512± SF
GREEN ALLEY - PHASE 2 (BLUE) AREA=3568± SF
GREEN ALLEY - PHASE 1 (RED) AREA=1381± SF
3/25/2009 6:13 PM

October 7, 2011

The Commonwealth of Massachusetts

William Francis Galvin, Secretary of the Commonwealth

Massachusetts Historical Commission

Fred E. Pozzuto
US Department of Energy
National Energy Technology Laboratory
PO Box 880
Morgantown, WV 26507-0880

RE: The Boston Architectural College Urban Sustainability Initiative for Renovation of Public Alley #444 & Geothermal Heating & Cooling System, Boston, MA. **MHC #RC.49863.**
USDOE/NETL #DE-EE0003518.

Dear Mr. Pozzuto:

Staff of the Massachusetts Historical Commission (MHC), as the office of the State Historic Preservation Officer (SHPO), have received your letter of September 23, 2011, regarding the project referenced above, on September 30, 2011.

Your letter indicates that you intend to use the the National Environmental Policy Act (NEPA) process for Section 106 purposes. Therefore, please follow the steps under 36 CFR 800.8(c) to coordinate the NEPA and Section 106 consultation process.

The project is located within the Back Bay Historic District (MHC #BOS.BT), which is listed in the National Register of Historic Places. The project location may be sensitive for containing significant archaeological features preserved below the late 19th-century fill. The project is also located in the Back Bay Architectural District (BOS.BW), a local historic district.

The information that you have provided has already been submitted to the MHC. As the MHC has previously commented on April 19, 2011, for the MHC to review and comment on this project, the MHC requires detailed project plans, specifications, and any relevant engineering studies for the geothermal heating and cooling system and "Green Alley" project. Since potential project effects may include vibrations and changes to the water table that could affect the structural integrity and stability of historic buildings, and buried archaeological resources, these potential effects should be discussed in the project materials to be submitted, with a plan to identify historic properties, evaluate effects, and resolve any adverse effects consistent with the process outlined at 36 CFR 800.4 to 800.6.

These comments are offered to assist in compliance with Sections 106 of the National Historic Preservation Act of 1966 as amended. Please contact Edward L. Bell or Brandee Loughlin if you have any questions, or require a copy of the MHC's previous comments on this project.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc:
Lee Webb, Advisory Council on Historic Preservation
Brett Aristegui, US Department of Energy
Steven Macneil, Boston Architectural College
James T. Dunn, Boston Architectural College
Boston Landmarks Commission
Back Bay Architectural Commission

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

January 4, 2012

Mr. Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P. O. Box 880, MS B07
Morgantown, WV 26507-0880
Email: fred.pozzuto@netl.doe.gov
Fax: 1-304-285-4403

RE: "BAC Public Alley #444 Draft EA Comments"

Dear Mr. Pozzuto:

In response to your letter dated December 12, 2011, RCN has reviewed the plans for the above referenced project and report the RCN has no Underground Facilities in the area and that RCN has no conflict or concerns with the proposed project.

Should you have questions or concerns, or require additional information feel free to contact me at (781) 652-8957 (office), (617) 293-0201 (cell) or (781) 652-8953 (fax).

Very truly yours,

Kenneth J. Bates
Senior Engineer, OSP/ISP Engineering
173 Bedford Street
Lexington, MA 02420
ken.bates@rcn.net

January 6, 2012

Fred E. Pozzuto
US Department of Energy
National Energy Technology Laboratory
PO Box 880
Morgantown, WV 26507-0880

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

RE: The Boston Architectural College Urban Sustainability Initiative for Renovation of Public Alley #444 & Geothermal Heating & Cooling System, Boston, MA. **MHC #RC.49863.**
USDOE/NETL #DE-EE0003518.

Dear Mr. Pozzuto:

Staff of the Massachusetts Historical Commission (MHC), as the office of the State Historic Preservation Officer (SHPO), have reviewed the *Draft Environmental Assessment for the Boston Architectural College's (BAC) Urban Sustainability Initiative for Renovation of Public Alley #444, Boston, Massachusetts,* received by the MHC on December 12, 2011.

The MHC looks forward to receiving the scaled project plans, specifications, and relevant engineering studies conducted, as well as the US Department of Energy's (DOE) determination of the "area of potential effect" (please see 36 CFR 800.4(a)(1) and 800.16(d)). The boring log of the six-inch diameter test bore between 941 and 951 Boylston Street test well conducted in 2011 should be included with the information submitted for the MHC's review and comment.

To further assist the DOE in its identification effort for historic properties in the area of potential effect, MHC notes that prior to the late 19th-century land-making episodes at the project location, this area appears to have been open water or wetlands close to the edge of the 17th-century shoreline. The amendment to the National Register of Historic Places nomination for the Back Bay Historic District notes the presence of Late Archaic Period to Early Woodland period (ca. 5,000-1,900 years ago) Native American fishweirs that had been constructed from wooden stakes and branches in tidal areas, later buried underneath fill. Therefore, the project area may contain archaeological deposits and features created by ancient Native Americans, and 17th to 19th-century period archaeological resources in water or wetlands, underneath the late 19th-century fill.

The DOE proposes to have a qualified archaeologist monitor the project during the project and undertake further archaeological examination should potentially significant archaeological resources be identified. The MHC requires the specific project information and engineering studies noted above to comment on DOE's proposed treatment for identification and evaluation of archaeological resources during the implementation of the project.

These comments are offered to assist in compliance with Sections 106 of the National Historic Preservation Act of 1966 as amended. Please contact Edward L. Bell or Brandee Loughlin if you have any questions, or require a copy of the MHC's previous comments on this project.

Sincerely,

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc:
Lee Webb, Advisory Council on Historic Preservation
Brett Aristegui, US Department of Energy
Al Byers, Steven Macneil, Boston Architectural College
James T. Dunn, Boston Architectural College
Boston Landmarks Commission
Back Bay Architectural Commission

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc

nationalgrid

National Grid
40 Sylvan Road
Waltham, MA 02451

January 11, 2012

Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3620 Collins Ferry Road
P.O. Box 880, MS B07
Morgantown, WV 26507

RE: BAC Public Alley #444 Draft EA Comments

Dear Mr. Pozzuto,

National Grid has received and reviewed your Draft EA for the Boston Architectural College's Urban Sustainabiliy Initiative for the Renovation of Public Alley #444.

National Grid currently owns and operates a 6-inch coated steel main in Public Alley #444. Based on the preliminary information provided, it is anticipated that there will be conflicts with the loop geothermal wells. If a conflict is confirmed, it is expected that the party requiring the relocation of our facilities would fund the required work. In order to fully determine the impacts on our facilities we request that engineering drawings complete with locations of the proposed wells, be forwarded to National Grid.

Please feel free to contact me at 781-907-2845 should any further review or assistance be needed. Please forward future correspondences to my attention at the address noted below.

Best wishes,

Melissa F. Owens

Melissa F. Owens

Lead Engineer Liaison

Project Engineering & Design, New England Public Works
40 Sylvan Road, Waltham, MA 02451
O: 781-907-2545 | C: 617-592-7850 | Melissa.Owens@us.ngrid.com

verizon

125 High Street/Oliver Tower, Floor 5
Boston, MA 02110

January 12, 2012

Mr. Fred Pozzuto
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P.O. Box 880, MS B07
Morgantown, WV 26507-0880

Re: BAC Public Alley #444 Draft EA Comments

Dear Mr. Pozzuto:

The plans that were drawn by Nitsch Engineering show the correct location of Verizon's facilities in Public Alley #444. It can't be determined at this time if the free-draining pavement will have an effect on underground utilities; however we don't see any immediate concern with the installation of these green initiatives that will improve the aesthetics of the area.

We have two conduit banks in this alley with a number of lateral connections to the various buildings abutting the alley. We are at a minimum of two feet below the road surface. The geothermal wells and other proposed facilities shown on the plans appear to have the necessary clearance from our conduit. We would ask that caution be used when excavating near our conduit system.

Sincerely,

Ellen M. Joy
Right of Way Agent

NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA

January 27, 2012

ATTN: Brona Simon, State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125

RE: Ongoing Section 106 consultations regarding the Draft Environmental Assessment (EA) of the Boston Architectural College's Urban Sustainability Initiative Renovation of Green Alley #444 Project (MHC #RC.49863) (USDOE/NETL 0003518)(DOE/EA-1885D)

Dear Ms. Simon:

In response to your letter of January 6, 2012, and my telephone discussion with Mr. Ed Bell of your office, please find attached the requested information: 1.) Existing Soil Conditions (*Pine & Swallow Environmental*); 2.) 1500' Test Borehole Drilling Overview (*Boston Architectural College*); and 3.) Sheets one of four Geothermal Engineering Plans (*Nitsch Engineering*). The Boston Architectural College's (BAC's) letter regarding the scope of duties performed by the on-site archeologist is also attached.

The Department of Energy's (DOE's) roll in this project is to provide financial assistance (*through a Congressional earmark*) under a cooperative agreement with the BAC. The DOE is not designing, contracting, or constructing this project. DOE has coordinated with BAC to provide for the services of a qualified archeologist to be present during the drilling operations. The geothermal system will consist of thirteen (13), 8 inch diameter geothermal wells. The archeologist will be present on-site when drilling operations bore through sedimentary material in the upper elevations to inspect drill cuttings for the unlikely presence of woody debris that could be attributed to Native Americans of the Late Archaic to Early Woodland Periods. If debris of a significant nature was The presence of this archeologist is only a precautionary measure. DOE concurs with BAC's archeological scope of duties and feels no more subsurface investigative work is warranted.

Moreover, as the attached plans indicate, the DOE considers the area of potential effect to be very small and limited to the surface area of these thirteen 8 inch diameter holes that would penetrate the existing sand and gravel fill material and into the alluvial sediments of the original bay.

In accordance with criteria established by the Council on Environmental Quality in its regulations implementing the procedural provisions of the National Environmental Policy Act of 1969 (*NEPA*)(40 CFR Parts 1500-1508), DOE's NEPA implementing regulations (10 CFR Part 1021.301), which rely on those criteria, and DOE Order 451.1B, *National Environmental Policy Act Compliance Program*, our office has reviewed BAC's Environmental Questionnaire (NETL Form 451.1-1/3) and found it acceptable. DOE has further prepared a Draft Environmental Assessment (EA) for this project (DOE/EA-1885D) which was out for Public Comment

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507
fred.pozzuto@netl.doe.gov Voice (304)285-5219 FAX (304)285-4403 www.netl.doe.gov

from December 12, 2011 through January 13, 2012. No adverse comments were received from the general public, or other resource agencies.

We are requesting your offices' concurrence with our approach and findings of no effect as the activities associated with this response will still need to be documented and included in the upcoming final EA for the BAC project. Please contact me at 304-285-5219 if you have any questions concerning this action.

Sincerely,

Fred E. Pozzuto
Environmental Manager / NEPA Compliance Officer

Attachments (4)

cc:

BSA Environmental (Mr. J. Beaver)
BAC (Mr. A. Byers)
DOE Golden Office (Ms. S. Sung)

BOSTON
ARCHITECTURAL
COLLEGE

Architecture
Interior Design
Landscape Architecture
Design Studies

January 26, 2012

To: Mr. Fred E. Pozzuto, P.E., P.G.
Environmental Mgr. / NEPA Compliance Officer
Environmental Compliance Division
USDOE - National Energy Technology Laboratory

RE: Duties & Responsibilities of Project Archaeologist
Award: EE0003518

Dear Mr. Pozzuto,

The Boston Architectural College will be contracting with a project archaeologist for our upcoming Green Alley / Geothermal project. The duties of the archaeologist will be the following:
1.) Be present on site for each of the anticipated thirteen (13) geothermal wells to monitor the tailings from the first 30'-40' of each well.
2.) All materials unearthed indicating the presence of materials associated with Native American fish weirs will be documented. If the archaeologist determines that the well site should be shifted by several feet in order to avoid and preserve authenticated below-ground artifacts, BAC will instruct the drill rig operators to do so.
3.) Once drilling operations exceed the anticipated 30'- 40' depth, or until the archeologist has determined drilling is beyond the existing fill/original bay interface, his/her role in the drilling operations of that particular well will cease.

We anticipate the archaeologist will be on site for approximately four (4) hours for each well.

I hope that this information is helpful.

Best regards,

320 Newbury Street
Boston MA 02115

T 617.262.5000
F 617.585.0111
www.the-bac.edu

Arthur Byers
Director of Facilities / Project Manager

BOSTON ARCHITECTURAL COLLEGE

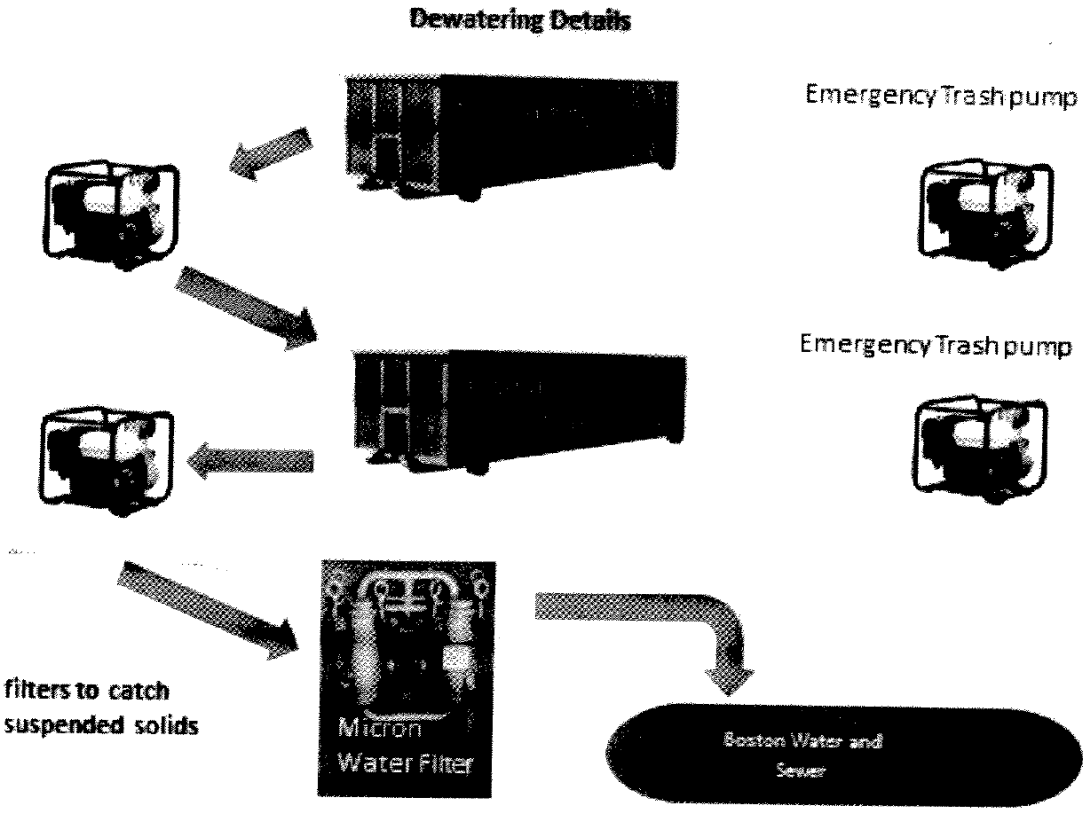
1500' Test Borehole Drilling Overview

1. Drilled and set 8" casing at 185' and continued to drill 8" until 200'. The attempt was to set casing at 200' but could not after encountering 200+ gallons per minute of water at a fracture in the bedrock.
2. Upon encountering large amounts of water and unable to advance drilling, drilling commenced for the weekend to allow for concrete to be pumped into the bottom of the well with a grout pump to seal of the fracture. It required 17 batches of cement to seal off the water.
3. When drilling operations resumed, the hammer bit was changed to a 6" hammer and drilled through the cemented area. The Cementing was successful and drilling reached 480" on first full day of drilling.
4. The following day drilling reached 780' although drilling slowed to 45 minutes to 1 hour per drill rod due to depth and water ratios. According to the water meter the well was producing 40 gallons per minute.
5. The next day drilling was able to reach 880' and then unable to advance. It was taking too long between rods and the bit was pulled up to 140 feet to begin flushing the hole. Additional air was needed.
6. With the addition of the booster system, drilling advanced to 1240' with an approximate time between drill rods of 35-45 minutes. The hole flushed out extremely well with added air.
7. Drilled and set 8" casing at 185' and continued to drill 8" until 200'. The attempt was to set casing at 200' but could not after encountering 200+ gallons per minute of water at a fracture in the bedrock.
8. Upon encountering large amounts of water and unable to advance drilling, drilling commenced for the weekend to allow for concrete to be pumped into the bottom of the well with a grout pump to seal of the fracture. It required 17 batches of cement to seal off the water.
9. When drilling operations resumed, the hammer bit was changed to a 6" hammer and drilled through the cemented area. The Cementing was successful and drilling reached 480" on first full day of drilling.
10. The following day drilling reached 780' although drilling slowed to 45 minutes to 1 hour per drill rod due to depth and water ratios. According to the water meter the well was producing 40 gallons per minute.
11. The next day drilling was able to reach 880' and then unable to advance. It was taking too long between rods and the bit was pulled up to 140 feet to begin flushing the hole. Additional air was needed.

12. With the addition of the booster system, drilling advanced to 1240' with an approximate time between drill rods of 35-45 minutes. The hole flushed out extremely well with added air.

Dewatering Process

1. Solids dumpster was put in place on day 2. The company name was Save That Stuff. As we set the casing in, we pumped into the dumpster. The dumpster leaked due to rusting at the base and a plastic liner was installed and did not stop the leaking due to pressures. Clay water leaked out onto the alley asphalt. The alley was washed with city water into the sewer drain.
2. Dumpster Company was switched to Graham dumpsters. Save That Stuff did not have the appropriate dumpster at the time. BWSC tested the water in the solids dumpster. Results were received 2 days later as passed. Two samples were collected. The first one by the city of Boston with ph additive
3. A second dumpster was delivered from Rain for Rent and parked behind Dillon's restaurant with approval from the General Manager. The Dumpster collects the drilling liquids prior to being dispersed to the sewer.
4. Approval was received to begin dewatering from the MWRA representative Peter Wong.
5. Water is pumped by a trash pump from the liquids dumpster through dual sock filters and pumped to a city approved flow meter to measure water discharge amounts. Once passing through the flow meter the water discharges into BWSC.



Drilling Overview

Daily log of work

Tuesday May 10, 2011 – loaded drill rod on Service truck at shop; assembled necessary tooling in order

Wed May 11, - left shop at 4am. Tim drove 98 Mack service truck, Tommy 2005 Mac service truck, Joe and little Tommy pickup truck with yellow trailer and 334 Excavator. Drillers arrived in Boston at 8 am. Met with Tom Powers and Rob Thompson. Arrive at site. Unloaded all equipment on ground behind where rig will go. Worked until 10:30 pm.

Thursday may, 12- Arrived at site at 5 am to meet Davey who brought Drilling rig to the site. Set up rig into place. Dumpster arrives at 11 am. Set into place welded the vitalic elbow to the side. Begin drilling at 1 pm. Set 80' of casing into borehole.

Friday May 13- Arrived at the site and continued installing 8' casing into the borehole. Dumpster began leaking due to rust spots. Drilled to 185' of casing and cannot go further. Cuttings were leaking out of the dumpster. Paul Laframboise sprayed down blacktop to clean up alley.

It was jointly decided to resume drilling Monday morning when a new dumpster can be se into place. Drillers left site for weekend.

Monday May 15- Drillers returned to site. Dumpster was picked up at 8 am. Dumpster decided not to continue with drilling procedures and at that point Graham Dumpster Company was hired. Meanwhile drillers were on standby. Standby ran from 8:30 to 3:30. The new dumpster arrived on site. Drillers began to spin 8" casing down the borehole further with great difficulty. The decision was to attempt to drill below the casing the following day.

Tuesday May 16- Drillers attempted to drill below the casing. They were able to drill to 195' while the borehole was producing 200-400 gallons per minute and the drilling hammer would not fire. A new game-plan was decided to cement the borehole Wednesday and allow for the cement to cure during the weekend and commence drilling on the following Monday. Drillers discontinued operations at 3:30 pm on Tuesday.

Monday May 22- Drillers arrived on site at 9:30. Began drilling through cemented area. Drilling went very well as the cement appeared to plug off the high volume of water that had been encountered. Drilling progressed to 480' by the end of the day. Drilling was entirely through grey shale. Each drill rod took approximately between 25-35 minutes on average. The deeper drilling progressed the slower the drilling progressed. Drilling commenced at 7:30pm.

Tuesday May 23- Drilled most of the day with very few challenges or problems. Borehole water volume increased to 40 gallons per minute during this time. Throughout the day, approximately 8,000 gallons of water was discharged into combined sewer. As the day continued drill rods progression began to slow dramatically. B the days end, the drill rod progression was 1 hour. Drilling commenced for the day at 780'.

Wednesday May 24- To begin the day the drillers attempted to blow the borehole clear of water without success. The drillers pulled up the tools to 640', attempted to clear the borehole and were successful and it was determined that the booster pump was required. Coordination of the booster pump delivery was completed. Drilling continued to 880' with rods taking 11/2 - 2 hours. All dewatering was handled by drillers while Chad Knowles retrieved the booster from New Hampshire. Drilling dewatered 12,000 gallons to the combined sewer during this time. Drilling commenced for the day at 8pm.

Thursday May 25- Work began at 6am. Booster pump was set in place early to avoid traffic and delivery congestion. It was required to adapt the drill rig to accommodate the fittings for extra air. Drilling began at 9am. Booster pump was very successful by days end drilling reached 1,240'. Booster pump required 75 gallons of diesel and drilling rates per rod reduced to 35-45 minutes. During the day the dual sock filter plugged with clay which was addressed. With the addition of the booster pump, clearing the borehole was not a problem due to the added air pressure. At this point the added pressure shot the water out of the borehole 30'. Drilling concluded at 9pm after the borehole was cleared to avoid plugging the tools. The well is producing 45 gallons per minute. 28,980 gallons were dewatered into combined sewer.

Friday May 27- Began drilling at 6am. Flushed the borehole. It took 500psi to flush the borehole from 1240'. Drilling proceeded and drilling rates were 30 minutes increasing to 11/2 hours due to increased depth and increasing water rates at 50gpm. Finished the day at 1440'

Tuesday June 1 – Flushed the borehole and drilled remaining 60' with success. Developed the well for 6 hours and pulled the tools, cleaned the area, capped the well casing and finished working.

Mini Booster Pump

1. Booster pump delivered on May 26, 2011. It was a rental from New Hampshire.
2. The Booster was set on a 16' flatbed trailer designed for tight spaces.
3. Make and Model:

   Hurricane Compressors
   Franklin Indiana
   Phone 317-736-3800
   Fax 317-736-3801

   Model Number 6T 276 41B/100
   S/N 05070950
   Also named Center Rock Inc.

   Hurricane Tag #'s:

   1. Compressor rating: Suction 350psi Discharge 1,000psi summarize

      Compressor rating
      Suction 350 psig/cfm 1925 rpm
      Discharge 1000 psig/cfm 2275 rpm

Site layout footnotes

1. Vitalic hose runs behind rig, across length of drill rod and is tied down by rope or ratchet straps to handicap walkway. It is then welded to the 30 yard dumpster with 6" vitalic elbow welded at

45 degree angle downward. Approximately 90-100' of vitalic hose was run behind rig to dumpster.

2. 2. Rat Cave is a 15x25 enclosure connecting 951 and firehouse. It is three sided. Most commonly used for bum dwelling and rat breeding ground. Parked Bobcat 334 excavator and welder in this area. Upon completing 8" drilling we slid 8" hammer and stabilizer in this area. Very tight area, not friendly for usage. Rats are a serious concern.
3. Rig parked up tight to firehouse. Less than 12" of width. Exhaust turned bricks black.
4. Service truck was actually parked in the public alley, restricting access down the alley to one car although dumpster trucks were readily able to drive down alley without complication.
5. Safety fence was set in place by front and back or service truck to ensure pedestrian safety
6. Foremast box wedged at back of the rig wand between handicap ramp. Also at back of the rig was a ladder. To maneuver around the rig we climbed the ladder to the ramp, climbed over the railing and proceeded around the rig.
7. Trash pumps pump out of the dumpster down the public alley to storm sewer.
8. Auxiliary air trailer was parked at the fire station space on 5/26 and 5/27. The trailer was a dual axel 16' long and was set up approximately 55' from drilling operations. The booster pump increased air pressure to 500 psi.

Pine&Swallow
ENVIRONMENTAL
Landscape Science/Engineering
Principals: John C. Swallow, PhD, LSP / Robert N. Pine, PE

January 22, 2009

Halvorson Design Partnership
Bob Uhlig
161 Massachusetts Avenue
Boston, MA 02115

RE: Existing Soil Conditions-Boston Architectural College (BAC), Boston, MA
P&S Job Number: 08158

The purpose of this letter is to summarize existing soils information in the vicinity of Public Alley 444, between Boylston Street and Newbury Street, Boston, Massachusetts. To determine the feasibility of permeable pavements in the Alley, P&S was scheduled to conduct subsurface investigations in the Alley this winter, however, the City is not issuing the requisite road opening permits between the dates of November 15th to March 13th. The intent of this information is to provide some preliminary data in order to proceed with design work for proposed pervious pavement in the Alley.

Historically, the Boston Back Bay Area was filled in a series of land reclamation projects from about 1820 to 1870. The area is remnant of the saltmarshes and tidal flats that surrounded the Shawmut Peninsula of Old Boston. According to iBoston.org, Boston History and Architecture, "The Commonwealth's threat to take this land (Back Bay) under public health laws motivated business and city government to agree on a plan to fill and create the 580 acres of the Back Bay in Boston. Nine train car loads of gravel arrived every 45 minutes, day and night for nearly fifty years." The source states that the fill was hauled from nearby Needham Heights. According to the "History of Needham Massachusetts, 1711-1911", by George Kuhn Clarke, at least two hills in town were taken down and hundreds of acres were transformed into desert, by the 'Gravel Company'. This data implies that the filling of Back Bay was with a sand and gravel type material. Additional data indicates that the hills that were excavated were glacial drumlin formations consisting of glacial outwash sand and gravel and glacial till, however may be variable in composition. It is unlikely that impervious or compressible materials were used for filling.

Recently, P&S studied a January 2008 Report by CDM, "Summary of Geotechnical Exploration Program", for a project in Allston, Massachusetts, which is a few miles east of the subject site. In all boring logs reviewed, 5 to 15 feet of silty sand to fine to coarse sand and gravel fill was noted above fiberous peat or organic silt deposits. Below the organic material marine silty clay deposits were noted.

P&S also reviewed an October 2005, Environmental Report for the Institute of Contemporary Art at 955 Boylston Street by GZA. The report included boring logs from an area of Public Alley 444 immediately east of the study area for BAC, behind

867 Boston Road, Groton, MA 01450 Tel: 978-448-9511 Fax: 978-448-6645 www.pineandswallow.com

Dillon's Restaurant. The boring logs indicate that the shallow soils beneath the existing pavement consist of urban fill, described as dense fine silty sand to fine to medium sand with little gravel. Concrete, glass and brick fragments wee also noted in the fill. In each of the borings the soil below 6-7 feet below ground surface (BGS) was somewhat coarser, and described as fine to medium sand and medium sand with little fine gravel.

The GZA boring logs indicate that organic silt with root fragments were observed at 16-20' BGS. According to the logs, groundwater is located approximately 10-13 feet BGS.

The data reviewed indicates that the soils below the pavement at Public Alley 444 are at least somewhat granular and therefore are likely to have a modest ability to infiltrate water. Although the infiltration rate should be tested at multiple locations, we believe that design work should proceed with the assumption that the soils have some capacity to infiltrate water. It would be prudent to design a system of drain lines to accommodate overflow conditions, which could be eliminated upon further testing. Based upon review of available materials, it appears that impervious soil is not present in the Alleyway. Further, the Alley is congested with numerous utility corridors. Dependent upon the depth and orientation of these corridors, a preferential pathway for infiltrating water may be present, thus enhancing the infiltration capacity of the area.

We trust this information is sufficient at this time. We look forward to completion of this study to establish site-specific infiltration capacity and to perform gradation testing of soil samples collected. If you have any questions, do not hesitate to contact this office.

Sincerely,

Michael Agonis
Project Manager

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

February 21, 2012

Fred E. Pozzuto
US Department of Energy
National Energy
Technology Laboratory
PO Box 880
Morgantown, WV 26507-0880

RE: The Boston Architectural College Urban Sustainability Initiative for Renovation of Public Alley #444 & Geothermal Heating & Cooling System, Boston, MA. **MHC #RC.49863.**
USDOE/NETL #DE-EE0003518.

Dear Mr. Pozzuto:

Staff of the Massachusetts Historical Commission (MHC), as the office of the State Historic Preservation Officer (SHPO), have reviewed the additional information that you submitted for the project referenced above, received by the MHC on February 2, 2012.

The MHC recommends that the US Department of Energy (DOE) make a determination of conditional "no adverse effect" (36 CFR 800.5(b)) on the Back Bay Historic District for the undertaking, with the following condition:

> A qualified archaeologist, with a field investigation permit issued by the State Archaeologist (950 CMR 70), shall monitor the project during the project. Should potentially significant archaeological resources be identified during implementation of the project, the area of the discovery shall be protected from further impact, and the DOE and the SHPO shall be notified by the archaeologist, and the DOE and the SHPO shall then consult pursuant to 36 CFR 800.6.

These comments are offered to assist in compliance with Sections 106 of the National Historic Preservation Act of 1966 as amended. Please contact Edward L. Bell if you have any questions, or require a copy of the MHC's previous comments on this project.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc:
Lee Webb, Advisory Council on Historic Preservation
Brett Aristegui, US Department of Energy
Al Byers, Boston Architectural College
James T. Dunn, Boston Architectural College
Boston Landmarks Commission
Back Bay Architectural Commission
Joe Bagley, Boston City Archaeologist

220 Morrissey Boulevard, Boston, Massachusetts 02125
(617) 727-8470 • Fax: (617) 727-5128
www.sec.state.ma.us/mhc