

2 SITE / CIVIL

2.1 Design Criteria

2.1.1 Codes and Standards

The latest edition of the codes, standards, orders, and guides referred to in this section will be followed, with a reference point of August 2008 being the anticipated design completion date. All work will be in accordance with BNL's Implementation Plan for DOE 413.3, "Program and Project Management for the Acquisition of Capital Assets."

2.1.2 DOE Orders

DOE O5480.4 – Environmental Protection, Safety and Health Protection Standards
DOE O413.3A – Program and Project Management for the Acquisition of Capital Assets
DOE O414.1C – Quality Assurance
DOE O420.1B – Facility Safety
DOE O420.2B – Safety of Accelerator Facilities

2.1.3 Codes, Standards, and Guides

10CFR851 Worker Safety and Health Program
Building Code of New York State (NYSBC) – 2002 Edition
American Concrete Institute
Building Code Requirements for Structural Concrete (ACI 318-99)
BNL Standards Based Management System Subject Areas
New York State and Suffolk County Department of Health Codes
American National Standards Institute
ANSI 117.1 Accessible and Useable Buildings and Facilities
American Society for Testing Materials Standards
National Institute of Standards and Technology
Occupational Safety and Health Administration (OSHA)
New York State Fire Prevention Code - 2002 Edition
ACGIH Standards
Americans with Disabilities Act Accessibility Guideline (ADAAG)
Leadership in Energy and Environmental Design (LEED) 2.2
LEED for Labs

2.2 Site Description

The location for the proposed NSLS-II site is based upon several criteria and includes the ability to comply with environmental requirements; the ability to meet research mission objectives; the physical proximity to collaborative BNL research facilities in the new Center for Functional Nanomaterials (CFN) and the existing NSLS, constructability factors related to site conditions; economic factors affecting project cost; conformance with BNL strategic planning goals and the ability to support future expansion and long beam lines. The site selected for construction of the NSLS-II meets all of the criteria indicated above. The site design also responds to these criteria. The NSLS-II site plan is shown in Figure 2.1.

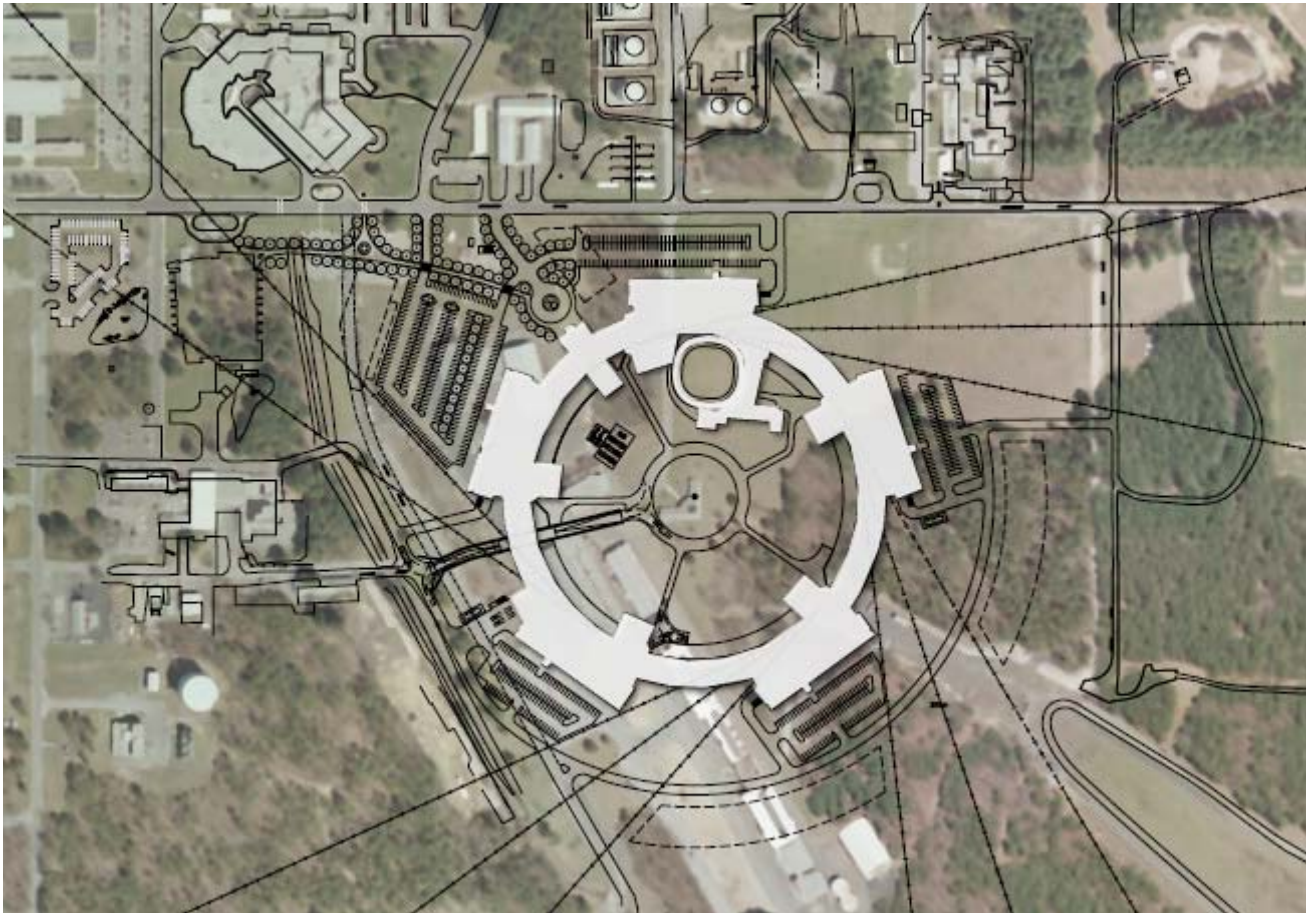


Figure 2.1 NSLS-II Site Plan.

2.3 Campus Planning

The site is approximately 50 acres located at the southeast corner of the intersection of Brookhaven Avenue and Groves Street on the BNL campus. Master planning envisions Brookhaven Avenue becoming the primary east–west arterial street through the BNL campus. Land adjacent to Brookhaven Avenue is considered desirable for current and future building projects at BNL, including NSLS-II. The architectural vocabulary along this axis is transforming in character from traditional masonry aesthetics to the west to an advanced technology image to the east.

Located at this strategic location along Brookhaven Avenue and together with the CFN, NSLS-II will form a significant “sciences” focal point, and further emphasize BNL’s commitment to newer facilities that promote leading-edge discoveries.

Locating NSLS-II here allows for future extended beamlines of up to 1000 m in length. These may eventually project eastward along Brookhaven Avenue, or have a disposition that is to the southeast or the south. The site accommodates many future options for BNL.

The adjacencies that NSLS-II will leverage at this site are highly advantageous. The existing NSLS building located diagonally across Brookhaven Avenue to the northwest, will promote ease of interaction between that building and NSLS-II. This is particularly important since many of the NSLS-II staff will office

in the existing NSLS building. This location will also simplify the relocation of equipment and staff between the two facilities. Additionally, the site is situated directly adjacent to the CFN (across Groves Street to the west). This adjacency will provide for unparalleled opportunities of collaborative research between two of the nation's premier science facilities. Locations for the potential Joint Photon Source Institute (JPSI) building have also been proposed, one near the Operations Center another in the northwest corner of the site or possibly across Brookhaven Avenue just east of the existing NSLS. This building would be a separate structure, physically disconnected from NSLS-II, but with a public space landscaped with pedestrian walkways in between the two buildings. Space for possible future scientific buildings are also shown on the site plan immediately outside of the Loop Road.

2.4 Access, Traffic, Parking

The site is bounded by Brookhaven Avenue on the north, Groves Street on the west and Fifth Street on the east. This configuration will provide easy access to all parts of the facility. The main entrance of the Operations Center Building will face the present intersection of Brookhaven Avenue and Groves Street. (Following construction of the NSLS-II Groves Street will no longer extend all the way to Brookhaven Avenue, but rather terminate at Bell Avenue.) This northwest orientation of the main entrance of the Operations Center Building achieves the objective of minimizing the walking distances to the existing NSLS. Traffic into the primary NSLS-II parking lot will be from Brookhaven Avenue, and a drop-off, circle drive will be provided at the main entrance of the Operations Center Building. Groves Street will be discontinued between Bell and Brookhaven Avenues, but will be connected to the NSLS-II Loop Road that will be constructed around most of the outer perimeter of the building site. NSLS-II will also have access points from Bell Avenue and Rowland Street. The Loop Road will serve most of the Lab Office Buildings and also provide for service road access around the site.

Parking immediately west of the Operations Center Building and LOB-5 will serve the NSLS-II, and possibly the future JPSI building. All parking will be situated an appropriate distance away from the new structures to accommodate potential security measures/guidelines.

Each of the Lab Office Buildings will have an entrance serving the occupants of that building. Approximately 100 parking spaces will be provided at each LOB within convenient walking distance. Bicycle racks will be provided near each building entrance. Fire Department access will be provided to each LOB, but said access will remain a minimum of 40 feet away from the structure (establishing a "stay clear zone").

Service vehicles will access the "center" of NSLS-II via a tunnel under the Ring Building. The tunnel will allow emergency vehicles as well as delivery of large equipment to enter this "center". It will be required to comply with NYDOT requirements, and will be at least 19 ft wide (with a minimum 14'-2" clearance as it travels under the Ring Building). The ramps in and out will have a slope not to exceed 8 percent grade.

Pedestrian traffic will be accommodated by careful placement of sidewalks between the existing NSLS, the CFN, and NSLS-II.

2.5 Vibration Survey

Pre-design vibration surveys of the building site were conducted by Colin Gordon Associates and additional site baseline vibration measurements and analysis have been performed by BNL staff. The purpose of the surveys were to evaluate the ability of the proposed NSLS-II to meet stated vibration criteria. The data and analysis indicate the site existing background or cultural vibration levels are low and that there are no particular vibration characteristics that would adversely affect the performance of the NSLS-II scientific equipment. Results indicate the site is quiet "vibrationally" and capable of meeting the proposed vibration and stability criteria. A minimum 100 foot building setback along both Brookhaven Avenue and Groves Street will be maintained from the Experimental Floor to minimize the potential negative vibration impacts of passing traffic on these roads. Specific vibration criteria for NSLS-II are described elsewhere in this

document (Section 3 – Architecture) . Additional analysis and independent technical review by the Stability Task Force have also been performed and are available for review.

2.5.1 Experimental Hall

Data were collected in mid-afternoon at six locations at the NSLS-II site and processed to obtain one-third octave band velocity spectra. Results indicate the site will easily meet all vibration criteria for VC-E, but will not meet NIST-A criteria below a frequency of 5 Hz. It is believed that the low-frequency component which exceeds NIST-A is due to nearby traffic, probably on the Long Island Expressway and the William Floyd Parkway.

It is anticipated that the heavy floor slab of NSLS-II will reduce the amplitude at most frequencies, yielding a more favorable comparison to the criteria. Additional data was therefore taken on the floor slab of the nearby CFN (partially complete at the time) in the late evening hours. The analysis indicated that the slabs of the CFN will meet NIST-A criteria during the nighttime hours. These data are thought to be representative of the eventual nighttime performance of the Experimental Hall in NSLS-II.

2.5.2 Accelerator Tunnel

To evaluate the Accelerator Tunnel, survey data were transformed to displacement Power Spectral Density (PSD) spectra. This is the desired format for storage ring vibration criteria. When calculated over the range of 4 to 50 Hz, the calculated R values do not meet the stated criteria of R less than 25 nm. However, it was noted that the data below 6 or 7 Hz was contaminated by system noise due to an instrument cable. If the criteria are modified slightly to calculate R from 6 to 50 Hz or from 8 to 50 Hz, thereby eliminating the questionable data, the R values will generally meet the stated criteria of less than 25 nm.

Supplemental data collected in the CFN microscopy lab again validates the hypothesis that the heavy building slab will make a significant difference in the vibration data. Measurements taken at 7:30 pm and at 11:40 pm both yielded results that met the RMS amplitude criteria for NSLS-II of 25 nm. Again, it is anticipated that the improvement in vibration results due to the floor slabs at CFN will translate to improvements in the NSLS-II data.

Overall, the vibration study indicates that following the installation of the floor slab for the Accelerator Tunnel and the Experimental Hall, which will significantly stiffen the site, the vibration environment will be comparable to that of other leading light source facilities around the world.

Numerical models were constructed which allow examination of such design issues as placement of the Support Building with respect to the Ring, and even the placement of equipment within the Support Building. These models were calibrated using known and measurable performance of source data at several other facilities, including APS, RHIC, CFN and SPring8.

One of the key studies involved a comparison of placing the Support Building inside the ring versus outside of it. The preliminary results at this time suggest that placement inside the ring would lead to lower vertical ring displacement, and that if the mechanical systems were placed on a structurally supported floor (rather than a slab on grade) there would be further benefit, providing placement within the building were considered. The differences are quite dramatic, as indicated below:

Table 2.1 Service Building Vibration Comparison

Service Building Location	Floor Type	Equipment Location	Vertical Ring Displacement
Outside	Slab-on-grade	Middle	16.0 nm
Inside	Structurally Supported	Inner area	15.0 nm
		Middle area	2.6 nm
		Outer area	8.8 nm

Modeling studies will continue, refining issues that have already been addressed in a preliminary way and examining additional variables.

One parameter which will be considered will be the use of polymer-modified concrete to mitigate cultural and mechanical vibrations that might be transmitted through the slab. This was employed in the CFN, and measurements there indicate that vibration attenuation with distance can be doubled by the use of a 6" topping poured over an 8" structural slab, where the topping is treated with a particular polymer admixture and fiber reinforcement.

2.6 EMI/RFI Survey

Pre-design electromagnetic interference surveys were conducted on June 14th and September 19th, 2006 by VitaTech Engineering, LLC. Several types of measurements were taken to characterize the site:

- AC Extremely Low Frequency Electromagnetic Interference (ELF EMI)
- DC Electromagnetic Interference
- Radiofrequency Interference (RFI)

The site demonstrated no ambient electromagnetic or radio frequency interference that would adversely affect the performance of NSLS-II scientific equipment. The nearby NWS Doppler radar facility does not appear to have a problematic effect with respect to RFI.

The site is generally undeveloped and therefore should be relatively free of large electromagnetic fields above the ambient background. Buried electrical power feeders running east-west along Brookhaven Avenue and north-south along Seventh Street are sources of EMI that need to be considered. A 100 foot building setback along Brookhaven Avenue will allow fields to largely decay without impacting the building's performance. The feeder along Seventh Street will be relocated away from the NSLS-II building footprint and will not impact the facility.

2.6.1 AC ELF Electromagnetic Interference

AC ELF EMI fields are substantial along Brookhaven Avenue due to the existing underground electrical feeders, ranging up to 3.36 mG. These flux densities drop off rapidly to the south, reaching approximately 0.1 mG at the 100 foot building setback line, and dropping further to essentially zero beyond that point. Likewise, flux densities peak at approximately 0.4 mG above the buried electrical power lines at Seventh Street, but drop off very rapidly to the east. As a point of reference, flux densities of up to 0.3 mG are acceptable for high-accuracy instruments such as TEMs, SEMs, and E-beam writers, which will be used in the CFN. There are currently no instruments planned for NSLS-II that will have these sensitivities.

2.6.2 DC Electromagnetic Interference

DC Electromagnetic Interference is caused by ferromagnetic masses in motion, typically objects such as elevators, trains, cars, buses, etc. There is potential for DC EMI due to regular traffic along Brookhaven Avenue to the north, as well as along Fifth Avenue to the east. Analysis by VitaTech indicates that between 40 to 130 feet south of Brookhaven Avenue the DC fields will be such that instrumentation with dB/dt

differential DC EMI and resultant RMS thresholds between 1 mG and 0.1 mG will meet the specifications. Between 130 to 200 feet, instruments with a threshold of 0.1 mG to 0.01 mG will meet the specifications (197 feet is the predicted 0.01 mG isoline). Similar separation distances will apply to north-south traffic along Fifth Street.

2.6.3 Radiofrequency Interference

The RFI site measurements indicated very low electric field strength across a range of frequencies from 100 kHz to 18 GHz. The NEXRAD Doppler weather radar that is located only 2,200 ft away operates at a frequency of 2877 MHz. The existing NSLS building has experienced RFI impacts from the NEXRAD radar, causing the need for RF shielding around select laboratory and research areas to reduce the problem. A similar remediation approach will be used at NSLS-II (if needed); shielding will be provided specifically at the hatches based on scientific requirements (rather than providing general shielding for the entire building).

Electric field strength RF levels were recorded on September 19, 2006 by VitaTech Engineering at a point approximately in the center of the NSLS-II site. Data over a broad spectrum of frequencies indicated elevated RF levels at a number of frequencies (from various sources, including the NEXRAD radar). In all cases, the electric field strength RF levels were below 1V/m, which is the typical threshold for scientific instrumentation.

2.7 Geotechnical Survey

A geotechnical survey of the preferred site was conducted in July of 2006 and additional subsurface explorations were performed in April 2007. The explorations included 15 cone penetrometer test (CPT) soundings and ten test borings. The results indicate that the site conditions are generally uniform with 2 to 12 inches of topsoil and 2 to 9 feet of existing fill lays over medium dense to very dense sands near the proposed buildings and roadways. The sand deposits will work well for spread footings and may be suitable for reuse as compacted structural fill. The existing fill material is generally suitable for use as common fill around the site outside the building footprint.

With regard to column and wall settlement it is estimated that total settlement of spread footings will be less than 1 inch, and differential settlements will be less than 0.75 inch. This settlement will occur as loads are applied and therefore these settlements will be essentially complete by the time construction is finished. This settlement is acceptable for column and wall footings and will not effect the technical systems.

The floor slab within the experimental hall will support highly sensitive scientific equipment, and settlement of the floor slab after the equipment has been installed and calibrated must be minimized. Soils beneath the floor slab will settle in response to dead and live loads. It is anticipated that settlement will be complete within about one to two weeks after load application. Settlement resulting from floor slab dead loads and fill required beneath the floor slab is expected to occur during construction, and therefore will not contribute to post-construction settlement. However, application of substantial localized live load could cause minor post-construction settlement. We calculate the total and differential post-construction settlement from the live load to be less than 0.25 inch. Differential settlement will be less than the total settlement. For sensitive equipment where heavy beamline equipment loads are applied, it may be desirable to allow a two to three week waiting period between installation and final calibration.

Soils at the site are classified as Site Class D, "Stiff Soil Profile" in accordance with the New York State Building Code. The soil is not susceptible to liquefaction. The geotechnical report is included in the Appendix for reference.

A final set of borings will be performed prior to detailed design to fully detail the geotechnical conditions of the full building footprint in its final location. These borings in concert with other engineering factors will

form the basis of the final finished floor elevation which will be optimized for building stability, cut and fill quantities and existing utility elevations.

2.8 Topographic Survey

A preliminary topographic survey was conducted in June of 2006. That survey indicated the site to be relatively flat and well-suited for the NSLS-II. A more detailed topographic survey specifically for the NSLS-II site was conducted in September 2007. Site elevations appear to vary from 10 feet above the proposed Experimental Floor elevation, to 6 feet below said elevation; however, most of the site appears to be near the proposed floor elevation. Level grades may minimize the requirement for substantial cut and fill operations, and may work to accommodate potential future long beamlines extending up to 1000 m onto adjacent ground.

2.9 Existing Site Utilities

Existing site utilities consist of electrical power, chilled water, steam, potable water, sanitary sewers, storm drainage, and dry compressed air lines. Electrical power is wheeled to the site at 69 kV by the local electrical utility company (LIPA). This tie line has sufficient capacity for NSLS-II loads. The other site utilities are generated at BNL's central utility plants and distributed underground for use throughout the BNL campus. The distribution systems for these site utilities are of sufficient capacity to serve the NSLS-II; however, additional generating capacity will be required for chilled water and cooling tower water. Additional chiller capacity and cooling tower capacity will be added at the existing central utility plant. A separate cooling tower system for process water cooling will be located near NSLS-II.

The most significant impact NSLS-II will have on the current BNL utility infrastructure is the central chilled water system which is currently at the maximum without spare capacity to meet additional loads for the NSLS-II. As part of this project, additional chilled water capacity will be added to the existing central chilled water plant. Expanding the central chilled water plant (in lieu of constructing dedicated local capacity) provides advantages in reliability and reduced costs to the project.

Existing sanitary sewers are located parallel to and south of Brookhaven Avenue (6 in. VTP) and parallel to and west of Seventh Street (10 in. VTP). The system along Brookhaven Avenue can generally remain as is and the northerly and easterly Lab Office Buildings will be connected to this sewer line. The system along Seventh Street, extending further south parallel to and east of Groves Street, must be relocated, as it conflicts with proposed NSLS-II construction.

All utilities except chilled water will be accessed from Brookhaven Avenue. These utilities have adequate capacities and connections, enabling the routing of new site utilities through a common utility vault (underneath the Ring Building floor) and into the "center" of NSLS-II. This approach provides good access for maintenance, while also minimizing the effects of noise and vibration, when compared to running utilities through the building.

The following site utilities are available at or near the site and will be used for NSLS-II:

- Potable water
- Sanitary sewers
- Storm drainage
- Chilled water
- Steam and condensate
- Compressed air
- Electrical power
- Telephone/data
- Fire alarm

2.9.1 Potable Water

Existing potable water lines are located around the perimeter of the site as follows:

- Along the north side of Brookhaven Avenue (12 in. and 10 in.)
- Parallel to and west of Seventh Street (8 in.) and extending south beyond the NSLS-II site
- Parallel to and east of Groves Street (8 in.)

The 8 in. line west of Seventh Street will need to be relocated around the footprint of the building. Connection of fire protection water and domestic water for the NSLS-II loop system will be from the relocated 8 in. line west of Seventh Street and the 12 in. line at Brookhaven Avenue and North Sixth Street. Potable water for fire protection must be maintained to existing buildings 485,497 and the RADTEC area to the south of the NSLS-II site.

2.9.2 Sanitary Sewers

Existing sanitary sewer lines are adjacent to the site on two sides. A 6 in. VTP line parallels Brookhaven Avenue on the north of the site and a 10 in. VTP west of Seventh Street meets with the 6 in. line at MH-163. The sanitary line then crosses Brookhaven to a 20 in. VTP line. The NSLS-II will connect to the 6 in. line from the Operations Center and one LOB. The remaining services will be routed to a new underground pumping station and pumped into the 10 in. VTP line.

2.9.3 Storm Drainage

Storm drainage will be collected and directed on site through a combination of both underground piping and structures, as well as overland flows. Multiple retention basins will be utilized to encourage and accelerate percolation of rainfall into the ground as near as possible to the location where it falls (as encouraged by LEED). The storm drainage system will be designed to insure that historical runoffs are not exceeded in the post NSLS-II condition. Excess storm drainage runoff will collect in retention basins and/or other storm drainage structures. Calculations to determine the current capacity of the existing open drainage channel along the west side of Groves Street will be done.

2.9.4 Chilled Water

Chilled water is a BNL campus-wide distributed utility. A joint BNL and NSLS-II funded activity will expand the BNL Central Chilled Water facility (CCWF) to meet both growing BNL chilled water loads as well as the added load for NSLS-II. The plant expansion will be a four bay plant that will install two new chillers for NSLS-II loads. NSLS-II will tie into existing central chilled water lines at Rochester Street. A chilled water supply and return header will be routed underground to the Ring Building and pass under the Ring Building through the traffic access tunnel and then be routed to supply each of the service buildings and other building loads. Underground piping will be ductile iron.

2.9.5 Steam & Condensate

Steam & Condensate lines are a BNL campus-wide distributed utility. The existing BNL Central Steam Facility (CSF) has adequate capacity to support NSLS-II requirements. NSLS-II will tie into existing steam (10 in.) & condensate (4 in.) lines just north of Brookhaven Avenue. These lines will connect at MH-47. Underground piping will be insulated steel.

2.9.6 Compressed Air

Compressed air is a BNL campus-wide distributed utility that is provided with the central chilled water distribution. NSLS-II will tie into existing site compressed air at Rochester St. and will route this piping in

concert with the chilled water piping.. A 3 in. compressed air line will be routed underground to the Ring Building and pass under the Ring Building through the traffic access tunnel. Compressed air piping will be PVC coated steel.

2.9.7 Electrical Power

For a description of electrical site utilities, see Section 10, Electrical Engineering.

2.9.8 Telephone / Data

For a description of telephone/data utilities, see Section 10.10.2, Telecommunications System.

2.9.9 Fire Alarm

For a description of fire alarms, see Section 10.10.1, Fire Alarm System.

2.10 Existing Facilities

BNL has an on-going program to remove older, inefficient, non-sustainable World War II era facilities and consolidate operations into more permanent buildings. Consistent with this program, there is a project underway to relocate BNL warehousing, shipping, and receiving operations from the WW-II era buildings at the western edge of the proposed NSLS-II site. BNL will remove buildings and structures associated with these operations prior to construction of NSLS-II.

2.10.1 Existing Conditions

A preliminary topographic survey was conducted in June 2006. That survey drawing identified 1 foot contours and major surface features. It has been the basis for the site/civil design through Title 1. A more detailed topographic survey for the specific NSLS-II site was conducted in September 2007 and will be complete in October 2007. That survey will be the basis for the site/civil design through Title 2.

The proposed construction site is relatively level with mostly open fields, previously used for recreation. As previously stated there are warehouse buildings on the western edge of the NSLS-II site that are in the process of being removed under a separate BNL project. There are also some existing trees within the NSLS-II construction site that will require removal. Additionally, there is a railroad spur running parallel to Groves Street that enters the site from the south that will need to be cut back to a point outside the NSLS-II site. This railroad spur will be available for use during construction for delivery of bulk materials (if needed). The existing tree removal and cut back of the railroad spur are part of the NSLS-II site preparation work.

Existing storm drainage is accommodated along the western edge of the NSLS-II site in an open drainage channel. However, consistent with sustainable design principles, on-site recharge/infiltration of storm drainage will be maximized with only limited overflow going to the existing open drainage channel .

2.11 Preliminary Design

2.11.1 Improvements to Land

Improvements to the land include removal of existing structures, pavements, abandoned site utilities, a railroad spur, and some unsuitable fill. Once this has occurred, grading to new finished grades, installation of all new site utilities, storm drainage, site lighting and pavements (as well as final landscaping) can take place. This WBS element will consist of two work packages:

- Site Preparation which will encompass site clearing and grubbing, isolation of utilities, and rerouting of water and electric services.;
- Site Restoration and Landscaping, which will be included in the Ring Building contract, will include site grading and earthwork, the installation of all new storm drainage features, site lighting, pavements and final seeding.

2.11.1.1 Existing Structures

Removal of the existing building structures will be performed under a separate contract prior to NSLS-II site work. Underground utilities serving these buildings will be removed back to the utility mains as part of the NSLS-II contract. An early site preparation package will be done to provide temporary services to any existing structures that are to remain.

2.11.1.2 Existing Pavements

Removal of existing pavements will be required for all of Railroad Street and Seventh Street, and parts of Groves Street. These roadways will be removed to a point that enables tie-in to new roads and parking areas constructed as part of NSLS-II.

2.11.1.3 Existing Abandoned Utilities

Existing site utility systems that are not being used or have been abandoned in place will be removed as part of the NSLS-II project. The site plan identifies several underground utility pipes that will be removed back to an approved location and terminated.

2.11.1.4 Existing Railroad Spur

The existing railroad spur that runs parallel to Groves Street will be removed to a point south of the proposed NSLS-II site. Approximately 500 feet of existing track will be removed.

2.11.1.5 Other Miscellaneous Site Work

Site clearing will be required to remove existing trees to the west of Seventh Street and in the east/southeast quadrant of the NSLS-II site. The geotechnical report indicates a one foot layer of topsoil above sand, gravel, and silt. The topsoil will be removed for construction and retained for finished grading and replacement topsoil near the end of construction. Any other unsuitable fill identified by the geotechnical report will also be removed and replaced by material from an on-site borrow pit. Final site grading will bring the site to finished grade elevations shown elsewhere in this document. The proposed finished floor elevation for NSLS-II at 70.0 feet above mean sea level (as shown/referenced in other areas of this report) was previously established following preliminary cut and fill quantity studies. These studies will be refined and recalculated during detailed design to confirm that this elevation remains the most optimum for NSLS-II.

Construction staging and access areas, as well as future lay-down yards and/or excess soil stockpile areas (out of the way of future building construction) will be designated. Construction trailers and associated contractor parking will be situated on the north side of Brookhaven Avenue. This location provides easy access to current and future construction areas, and capitalizes on existing facilities/utilities in this area previously used for this same purpose. Designated future lay-down yards and/or excess soil stockpile areas will be situated immediately south of Brookhaven Avenue (and west of Fifth Street). This location has already been mostly cleared of existing trees/vegetation (due to existing recreational ball fields here) and is relatively level. It is also adjacent to the current and future construction area, but out of the way of any actual new construction.

2.11.1.6 New Paving

New paving for NSLS-II will include:

- Curbed drives and entrances from Brookhaven Avenue and Groves Street to NSLS-II facilities
- Curbed drop-off, circle drive (with enhanced concrete paving) for the Operations Center Building's main entrance
- Parking (predominantly uncurbed) for the Operations Center Building
- Loop Road (uncurbed) around the outer perimeter of the NSLS-II site
- Access to the Loop Road from Groves Street and Fifth Street
- Parking (mostly uncurbed) for LOBs 1,4 and 5 only (parking for LOBs 2 and 3 are future)
- Truck access to the main loading dock at LOB 4 and loading platforms at LOBs 1 and 5. Fire truck access must be maintained at the locations of future LOBs 2 and 3.
- Traffic access tunnel under the Ring Building into the "center" of NSLS-II
- Service drives (uncurbed) around the infield within the "center" of NSLS-II, including individual access points to each service building
- Campus sidewalks and outdoor gathering spaces (with enhanced concrete paving) in the areas between the existing NSLS, CFN and NSLS-II

2.11.1.7 New Storm Drainage

Storm water drainage from the roofs of buildings and drainage from the paved areas will be directed by either underground pipes and/or overland flow to small retention basins (as encouraged by the LEED guidelines) to achieve the maximum possible infiltration/percolation into the ground water system. For paved areas closest to the existing open drainage channel along the west side of Groves Street, some of the storm drainage will be piped directly into this feature. A retention basin will also be required within the "center" of NSLS-II, at the infield of the Ring Building. Special drainage accommodations will be required for the traffic access tunnel under the Ring Building. Both of these areas will be designed to adequately discharge all storm drainage effectively away from NSLS-II, requiring piping and/or a sump pump associated with the low point in the traffic access tunnel. The other retention basins will be situated outside the Ring Building, and generally out of the way of any future long beamlines. Collected storm water at the retention basins will be allowed to percolate into the ground following storm events as on-site soil conditions suggest percolation will be rapid. All storm water drainage systems will be designed (as required) to meet 100 year storm design criteria.

2.11.1.8 New Landscaping

After construction, all disturbed areas will be re-vegetated with a combination of native or indigenous plant materials, seeding, sod and/or wildflowers/groundcovers to minimize the negative effects of soil erosion and allow for minimal maintenance by BNL.

2.11.1.9 Erosion and Sedimentation Control

Erosion and sedimentation control systems will be installed and utilized for the duration of the construction phase of the project. Silt fencing and stabilized construction entrances will be installed prior to the commencement of construction activities. Disturbed areas within the construction site will be stabilized as soon as practical and subsequently maintained with appropriate methods to minimize erosion of exposed earth. Temporary seeding, mulching, or crushed stone will be used to achieve stabilization.

The proposed construction activities will result in the disturbance of one (1) or more acres of land. Therefore, BNL will be required to obtain coverage under a SPDES General Permit (GP-02-01) prior to the commencement of any soil disturbance. To obtain coverage under the general permit, BNL will file a

completed Notice of Intent (NOI) with the New York State Department of Environmental Conservation (NYSDEC) affirming that a Stormwater Pollution Prevention Plan (SWPPP) has been prepared for the construction site (and will be fully implemented prior to the start of construction activities). Best Management Practices (BMP's) from the New York State Standards and Specifications for Erosion and Sediment Control will be put into place to limit the negative impacts of soil erosion. BMP's include the following:

- Sediment Traps will be located as required to minimize the amount of soil loss, and to keep soil from entering existing storm drainage systems.
- Temporary Sediment Basins will be located in watershed basins and within future permanent extended detention/retention/recharge basins.
- Temporary swales (wet and dry) will be used to convey storm water during current and future construction to soil erosion and sediment control features.
- Check dams and rock dams will be located in drainage swales as required to help filter/settle out any sediment.
- Construction access points (stabilized construction entrances with wash racks) will be employed to prevent the tracking of mud from construction vehicles onto existing roadways.
- Temporary grassing will be used to stabilize all areas of soil disturbance.
- Dust control will be utilized during dry conditions to minimize the nuisance of blowing of dust.

In addition to the above-mentioned BMP's, the contractor will be required to stage the work consistent with NYSDEC requirements, and will need to stabilize all land disturbing activity within 14 days. In the event that temporary grassing can not be performed due to cold weather conditions, mulching will be required instead. Temporary grassing of the site will be required by completion of work once grasses can be planted. Erosion control devices will need to be inspected at least weekly (and after each rain), and repaired as necessary. Erosion control devices will be properly installed prior to site disturbance as logistically feasible and depending on the staging of work. These will be maintained in good working condition until completion of the early site preparation package construction (and/or replaced when effectiveness is reduced to 50%). Finally, additional erosion control measures will be installed to control sediment and silt from leaving the site as determined necessary by the ESHQ Directorate.

