Design Overview

Architecture

This new office building is the third and final structure of a three phase project that will help with the continued revitalization of the local area. The 10-story building provides efficient and productive work spaces, state-of-the-art technology, one main lobby, two secondary lobbies, three paver terraces located on the second, third, and fourth levels, and includes three levels of parking. With well-located core services, the office building has the flexibility to meet the needs of small, medium, and large space users. This LEED Silver certified building offers tenants direct access to MACR Train Service, Virginia Railway Express trains, and Amtrak, as well as Metrobus systems and Washington's Metrorail. Existing low-scale surroundings also offer tenants high visibility, access to natural light and air, and spectacular views of Washington, DC.

Major National Model Codes

- 1991 ADA
- ASHRAE 90.1
- 1986 ANSI A117.1-86
- CABO 95 Model Energy Code
- 1996 BOCA Nation Building Code
- 1996 NFPA National Electrical Code
- 1995 ICC – International Plumbing Code
- 1996 ICC – International Mechanical Code
- 1996 BOCA National Fire Prevention Code
- 1996 BOCA National Property Maintenance Code
- 1999 Supplement – The District of Columbia Construction Codes
- 1993 ASME A17.1-93 Safety Code for Elevators and Escalators – 1994 Addendum

Zoning

District C-3-C: Permits matter-of-right high density development, including office, retail, housing, and mixed uses to a maximum lot occupancy of 80% for residential use, a maximum FAR of 6.0 for residential and 2.0 FAR for other permitted uses, and a maximum height of ninety (90) feet (www. dcoz.dc.gov/info/districts.shtm)

Building Envelope

The office building's envelope features a glass curtain wall system with granite stone panels on three elevations. The East elevation displays a different curtain wall pattern than the West elevation, however the two designs converge on the North elevation of the building. Furthermore the South wall is shared with the adjacent second building of the three phase project, thus no exterior envelope is present. The one-story high glass and granite panels are put into place by a crane, starting at one end

of the building and making its way across to the other side. The remainder of the building envelope consists of handset stone between the curtain wall units and exterior columns of the building.

The roofing system for this project is a material called Thermoplastic single-ply roofing membranes (TPO); it is designed to combine the durability of rubber with the proven performance of hot-air weldable seams. TPO has been tested as having excellent resistance to ozone, ultraviolent, chemical exposure, and is environmentally friendly and safe to install.

Building Systems Summary

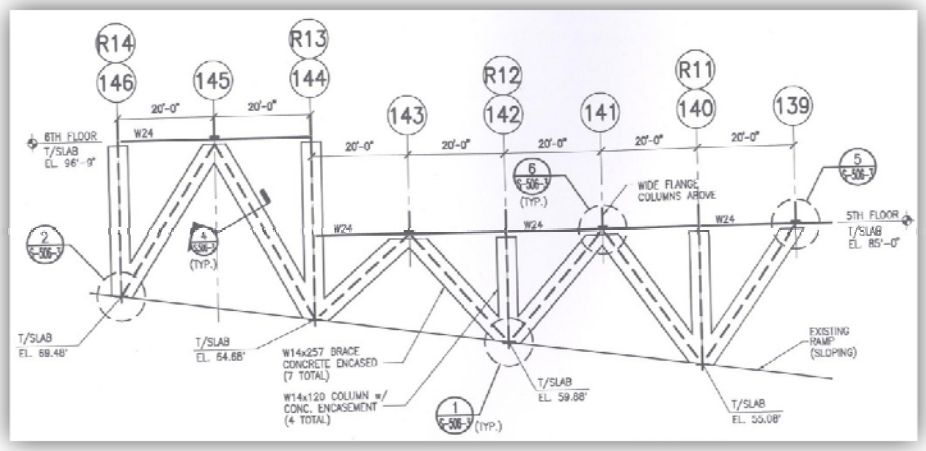
Table 2: Building Systems Summary

YES	NO	WORK SCOPE
	x	Demolition Required
x		Structural Steel Frame
x		Cast in Place Concrete
	x	Precast Concrete
x		Mechanical System
x		Electrical System
	x	Masonry
x		Curtain Wall
x		Support of Excavation

Structural Steel Frame

The structural steel for this building is located on the West side and is positioned directly above the M Street Ramp. This portion of the building was designed to fit the ramp's form, thus clear spanning was used to allowing for two way traffic underneath of the steel structure. The structure steel will utilize the ramp's current foundation and structural system to support its loads on one side. The ramp was pre-engineered to compensate for the steel's load during the construction of the first building. In order for the steel structure to connect to the ramp, seven (7) wide flange beams encased in concrete (W14X257) must brace diagonally four (4) wide flange columns encased in concrete (W 14X120) thus transferring the loads down to the ramp's foundation. See Figure 1 below for reference.

Figure 2: Wide Flange Beams and Columns



The composite decking for the 5th and 6th Floor in the steel structure utilizes two different methods of floor systems. Flooring north of line 144 use 5" lightweight concrete fill reinforced with #6 @ 6" E.W. at mid-depth over 1-1/2" composite metal deck (gal., 19 GA. Min) and flooring south of the 144 uses 3-1/4" lightweight concrete fill over 1-1/2" composite metal deck (gal. 20 GA. min.) reinforced with W.W.F. 6x6 – W2.1xW2.1. These two methods are used to provide adequate blast resistance in case of terrorist threats from the road, such as car booms. All other floors in the steel structure utilize the 3-1/4" lightweight concrete method.

Both cranes used on the job site were Peiner SK-415 Tower Cranes. The South crane has a jib height of 224'-5", weighs about 20 ton, and has a maximum hook radius of 180'-5". The North Crane has a jib height of 203'-5", weighs about 20 ton, and has a maximum hook radius of 213'-5". The locations of both tower cranes are shown on the site plan on page 14.

Cast in Place Concrete

The mat slab foundation, the four underground levels, and the post tensioned floor decks are made of cast in place concrete. The mat slab is 4'-6" thick at 5000psi normal weight reinforced concrete and has a minimum 4" thick mud slab at 4000psi normal weight concrete underneath it to aid in stopping water penetration. Directly on top of the mat slab is an 8" layer of granular fill with a 6" minimum topping slab as the floor's finish. The underground level and ground level floors are of 9" thick two-way reinforced concrete slab with 3-1/2" thick drop panels at 500psi normal weighted concrete. The post tension floor above grade is 12" thick at 5000 psi normal weight concrete and once the strength reaches 3000psi tensioning of the cables can occur. Most of the concrete was placed with crane and bucket or by direct chute. The Plywood was used to form the post tension slabs, columns, and walls.

Mechanical System

The majority of the mechanical equipment is located on the P3 Level in the Chiller Plant and on the Roof. The Chiller Plant contains four (4) chillers with a nominal capacity of 500 tons, five (5) condenser water pumps, five (5) primary chilled water pumps, two (2) secondary chilled water pumps, and one (1) heat exchanger. The Roof has four (4) cooling towers with a nominal capacity of 650 tons, one (1) condenser water pump, two (2) primary chilled water pumps, one (1) secondary chilled water pump, and one (1) heat exchanger. On both sides of the building core from the Lower Level to 10th Floor are three (3) water cooled air conditioning units (AHU) per a floor ranging from 4000 CFM to 23400 CFM supply, thus totaling thirty (30) AHU in the building.

The mechanical system for this building is split into two systems, the primary and the secondary. The primary system's cooled condenser water is pumped through the chillers and used to cool the water in the chilled water system. The used hot condenser water is sent back to the cooling towers to remove heat, and then the process is repeated. The secondary condenser water system provides water to the AHU throughout the building and then returns the hot water to the cooling towers to remove the heat, and then the process is once again repeated. From then on the AHUs cool the outside air, brought in through outdoor air riser supply vents, and distribute it to the VAVs found throughout each floor in the building.

The building's sprinkler system was designed and installed in accordance with NFPA 13. The office building, Ground Floor to the 10th Floor, is fully sprinkled with an automatic wet pipe system pressurized at 175 psig. Class 1 standpipes are also present in the stairwells of the office building. The below grade parking garage, P3 Level to the Lower Level, is fully sprinkled as well with a pre-action system that is pressurized at the same psig as the wet pipe system. A pre-action sprinkler system employs the basic concept of a dry pipe system, in that the water is not normally contained within the pipes, thus the water is held from the piping by an electronic operated valve. Furthermore, all of the main structural, as well as all interior framing members have various layers of spray-on fireproofing.

Electrical System

The building's electricity runs through three switchboards, each of 4000 A, 265/460 volts, 3 phase, and 4 wire systems. Power is fed from the PEPCO transformer vaults, located underground outside the building's foundation wall, into the switchgear room on the Lower Level. Transformers, located on every level of each riser, provide step down voltages from 480/277 volts to 120/208 volts power, thus making it suitable for normal use of computers, vacuum cleaners, and corridor lighting. Most lighting fixtures in the building are fluorescent because it adds efficiency to the design and helps to attain the appropriate LEED points.

The backup generator is sized at 750 kw and 208/120 volts, this would provide power to all emergency lighting, fire alarms, stair pressure fans, smoke removal fans, fire pump, emergency for elevators, and selected circuits for security if the power should ever fail.

Curtain Wall

The office building's envelope features a glass curtain wall system with granite stone panels on three elevations. The East elevation displays a different curtain wall pattern than the West elevation; however the two designs converge on the North elevation of the building. Furthermore the South wall is shared with the adjacent second building of the three phase project, thus no exterior envelope is present. The one-story high glass and granite panels are put into place by crane, starting at one end of the building and making its way across to the other side. In the field, the curtain wall units connect into their specified places by using male and female extrusions that snap together to form a continuous envelope. The remainder of the building envelope consists of handset stone between the curtain wall units and exterior columns of the building. The design responsibility is held in part by the architect and curtain wall consultant, but the curtain wall subcontractor is required to submit calculations and the connection details required to properly attach the units to the structure.

Support of Excavation

Since there are four levels of the building underground, support was needed for a deep excavation. Sheeting and shoring along with tiebacks were used for the support system. This support system avoids having a congested site. The absence of interior obstructions makes the excavation process much easier. This support system is mainly used in projects where space is limited and congestion needs to be avoided.

Ground water levels were found to be at about 13 to 35 feet below the existing surface grades. Thus during excavation a temporary dewatering system was installed and will not be removed until the building structure is complete.

Local Conditions

There is no mandatory method of construction used in Washington, DC, however in 1899 Congress passed a law that limited the height of all buildings constructed in this region. Thus the most common forms of construction are pre-cast, cast-in-place, and post tension, these methods use concrete to obtain more floors out of a building with a restricted height. Cast-in-place and post tension were the methods employed to build The Office Building, as well as structural steel for the portion of the building that canopies over the M Street ramp.

Due to a constricted site and its location there is limited parking on or near the site. The Office Building has direct access to MACR Train Service, Virginia Railway Express trains, and Amtrak, as well as Metrobus systems and Washington's Metrorail. Thus workers are encouraged to either take public transportation to work or they can park close by at a parking garage at their expense. It is also stated in Balfour Beatty Construction's subcontractor handbook and subcontract that onsite parking cannot be provided or allowed. Balfour Beatty Construction rents office space and associated parking spaces from the owner outside of the contract for the duration of the project.

When interior construction starts, two (2) thirty cubic yard dumpsters will be placed on-site and inside of the building. The waste in the dumpsters will be removed from the site by Northern Virginia Waste (NOVA) Company and taken to their recycling center. There, NOVA will recycle or salvage reusable materials contained in the waste that was created from the project. To help achieve LEED points the Office Building must recycle or salvage for re-use a minimum of 50% by weight of the waste generated on-site.

The soils found on-site ranged from three different types; high plasticity clay that generally consisted of sand with variable amounts of silt, clay and gravel, high plasticity clay with inter-bedded layers of low to high plasticity silt and clay, or high plasticity silt with loose to medium dense sands. The excavation required for the project is below the water table, thus there has been a lot of de-watering needed before pouring the mat slab foundation.

Site Plan of Existing Conditions

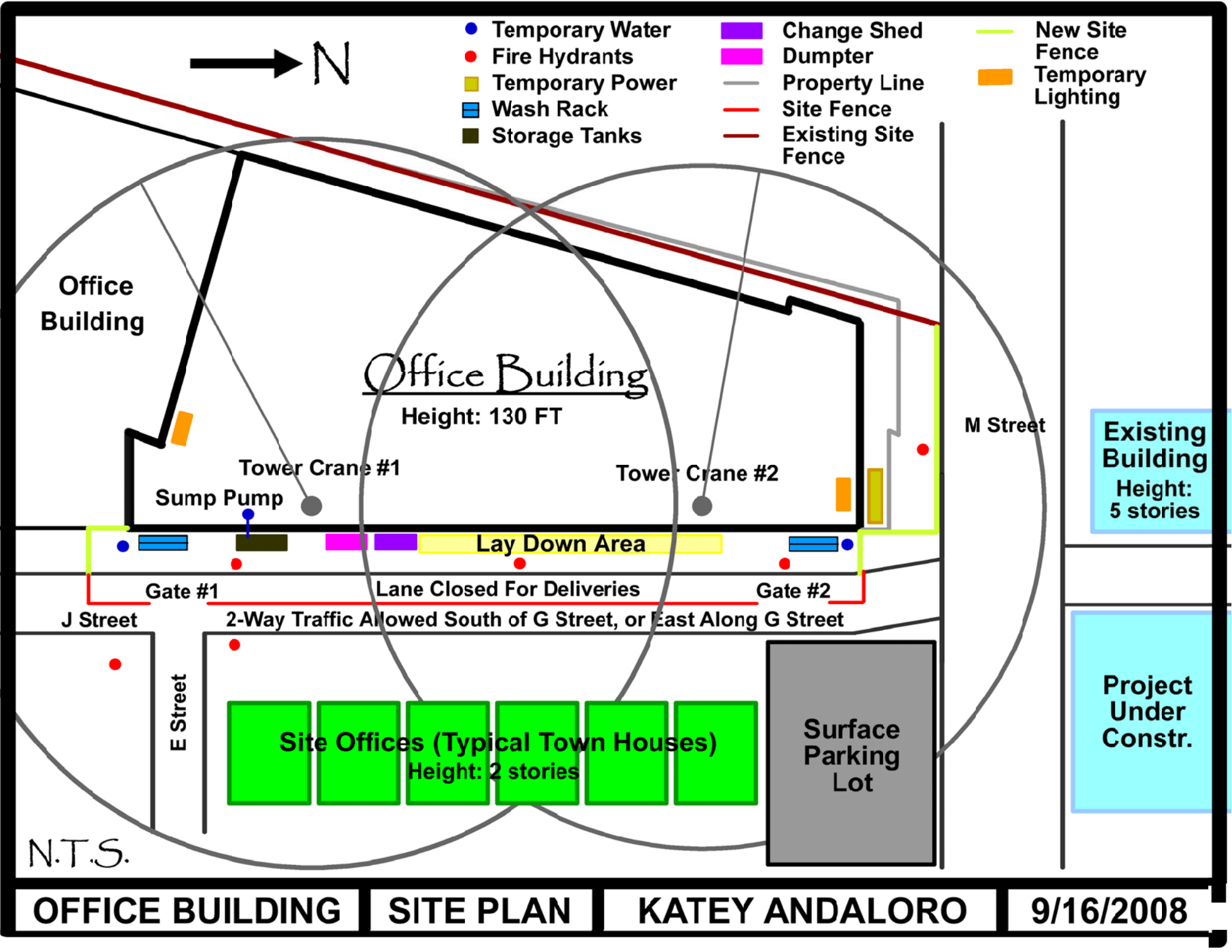
The Office Building is a 5.5 acre site located in Washington, DC and the third of three phases.

First Site Plan

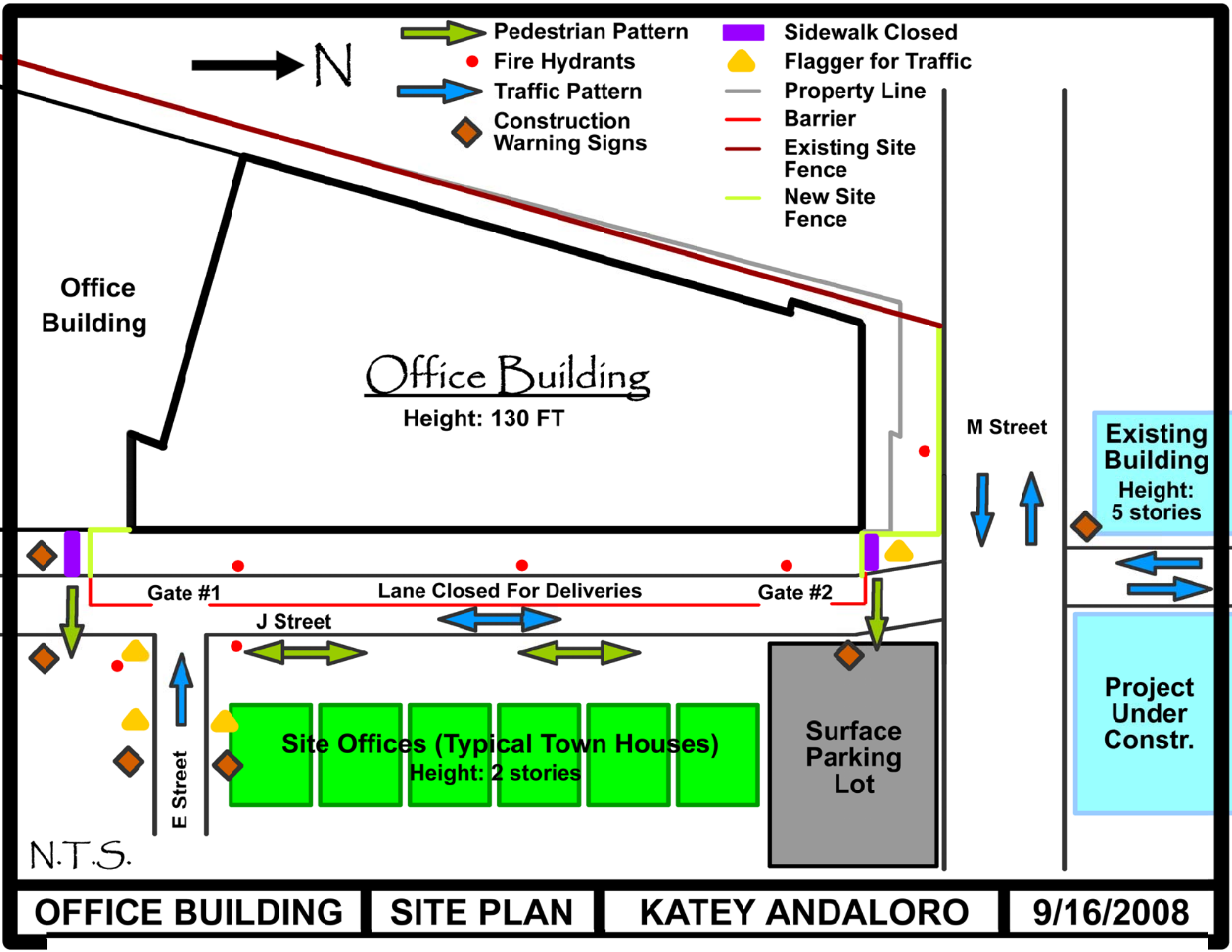
Due to the site's location, storage is limited to the east location of the site. To help limit site congestion the south bound lane on J Street will be closed for the duration of the project. This will allow for more flexibility in organizing the lay down area. Furthermore, as build construction progresses and with the completion of the parking levels, equipment and materials will be stored inside of the building until needed. Parking for this project is scarce, thus parking for the project team is located directly behind the townhouses and parking for the laborers is represented as Surface Parking as shown on the Site Plan. In the beginning of construction, the site offices are located in the town houses directly across J Street. After the topping out celebration in June of 2008, the site offices will move inside the building and relocate to the P1 and Lower Levels. This site plan also shows neighboring buildings, temporary utilities, and construction boundaries.

Second Site Plan

This plan shows pedestrian and traffic flow around the construction site, as well as the location of people flagging traffic and construction warning signs.



OFFICE BUILDING	SITE PLAN	KATEY ANDALORO	9/16/2008



OFFICE BUILDING	SITE PLAN	KATEY ANDALORO	9/16/2008

Site Layout Planning

Utilized Project Site Layout Plan

The following two (2) site plans depict the superstructure phase of the project, which extends from September 2006 through to September 2008. This phase best illustrates the relationship between the size of the site and its limitation with available space, considering space in Washington, DC is already limited enough. Thus, space on the project site needs to be very well planned in order to use it effectively.

As evidenced in site plan B, there are two (2) tower cranes onsite. Both tower cranes used on the job site are Peiner SK-415 Tower Cranes. The South Tower Crane has a jib height of 224'-5", weighs about 20 ton, and has a maximum hook radius of 180'-5". The North Tower Crane Tower has a jib height of 203'-5", weighs about 20 ton, and has a maximum hook radius of 213'-5". It is advised in the construction documents that neither tower crane's swing is allowed to come within 25 feet of the WMATA Metro track that is closest to the building footprint; this is mandated by the city of Washington, DC in an attempt to prevent a major accident should anything fall from the crane or the crane topple over. Even though both tower cranes are owned, operated, and primarily utilized by the concrete contractor; a contract was signed by the concrete contractor that allows other trades to employ the benefits of the tower cranes while the concrete workers are not using them.

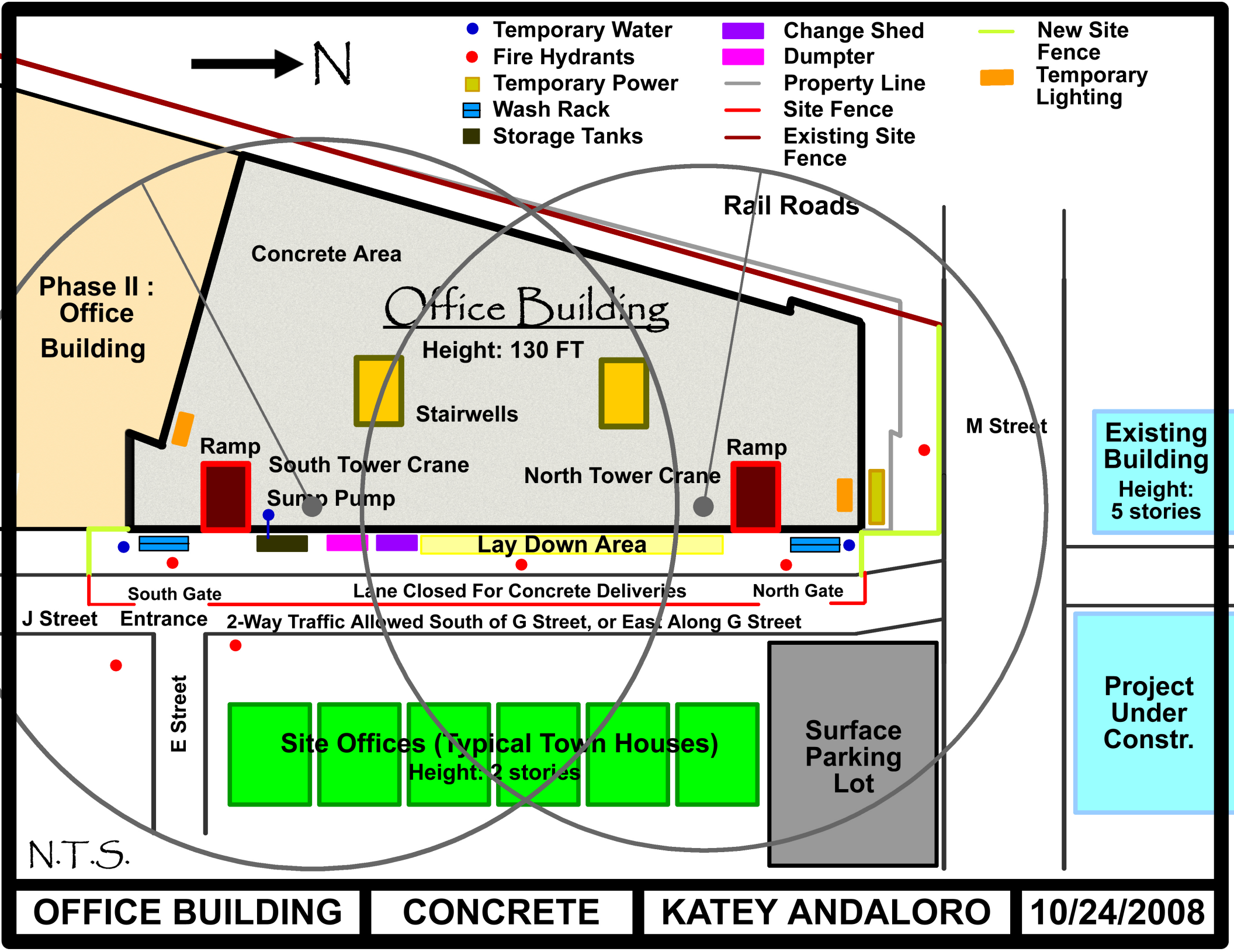
Gates are positioned at two locations around the site; one at the south end and the other at the north end of the building. Concrete/material deliveries will enter the south gate either from E Street or directly northbound from J Street, and will exit through the north gate. Thus allowing trucks to continue through the site and avoid turning around. Their unloading location will depend on which tower crane to which they will be supplying concrete/materials. Another concern about building in Washington, DC is that deliveries may arrive late due to the area. Hence establishing an appropriate time for delivery, i.e. after the rush hour or before rush hour, will increase the efficiency of the project.

After completing the concrete structure of the building, the south tower crane will be removed. The north town crane will then finish erecting the steel structure located above the M Street Ramp before being removed as well. In deconstructing both tower cranes, concrete will be needed to finish and fill the slabs where the foundations for the towers cranes were once present. If both cranes were located on J Street, then all concrete work would be done all at once and they would not have to deal with filling the holes later.

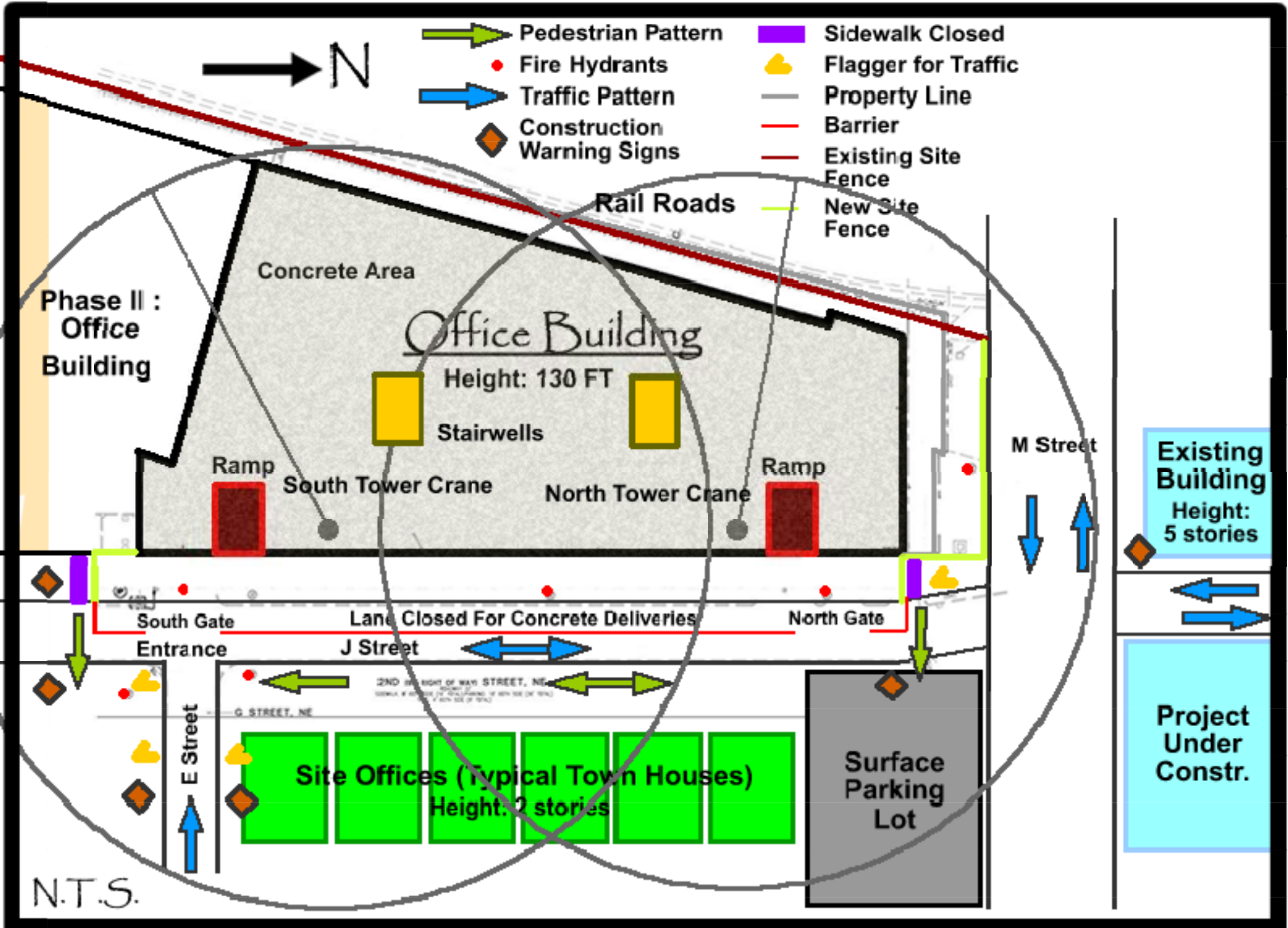
The logistics of the site plan have remained constant throughout the project. Trash chutes are located along the driving path so that dump trucks can pick and go. Parking for this project is still scarce, thus parking for the project team is located directly behind the townhouses and parking for the laborers is represented as Surface Parking as shown on the Site Plans. In the beginning of construction, the site offices were located in the town houses directly across J Street. After the topping out celebration in June of 2008, the site offices were moved inside of the building and relocated to the P1 and Lower Levels. These site plans also show neighboring buildings, temporary utilities, and construction boundaries.

Site Layout Plan Critique

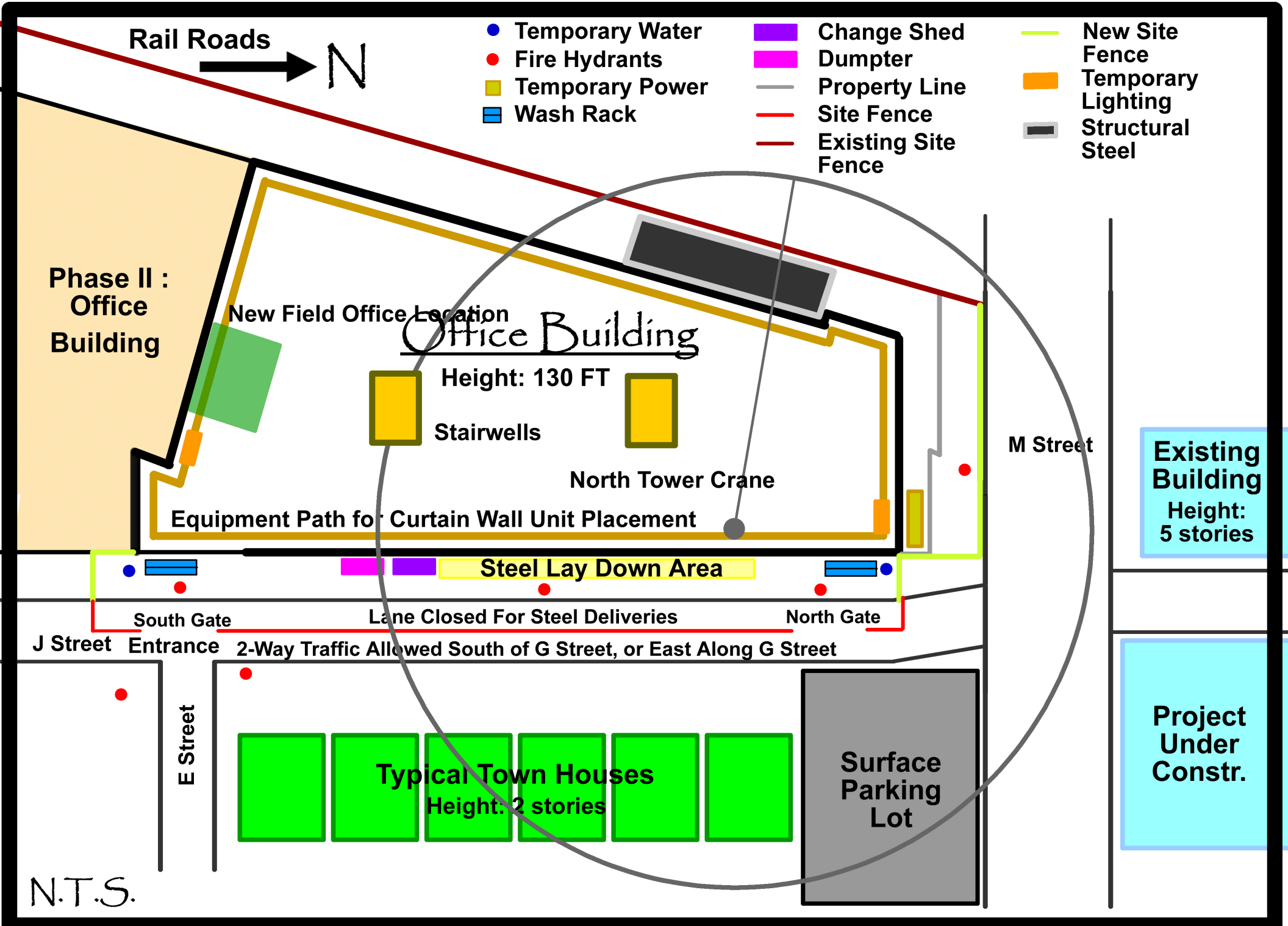
Given the location, space availability, and general surroundings of the office building, the site layout plan explained above is the best course of action to be taken in a project of this caliber.



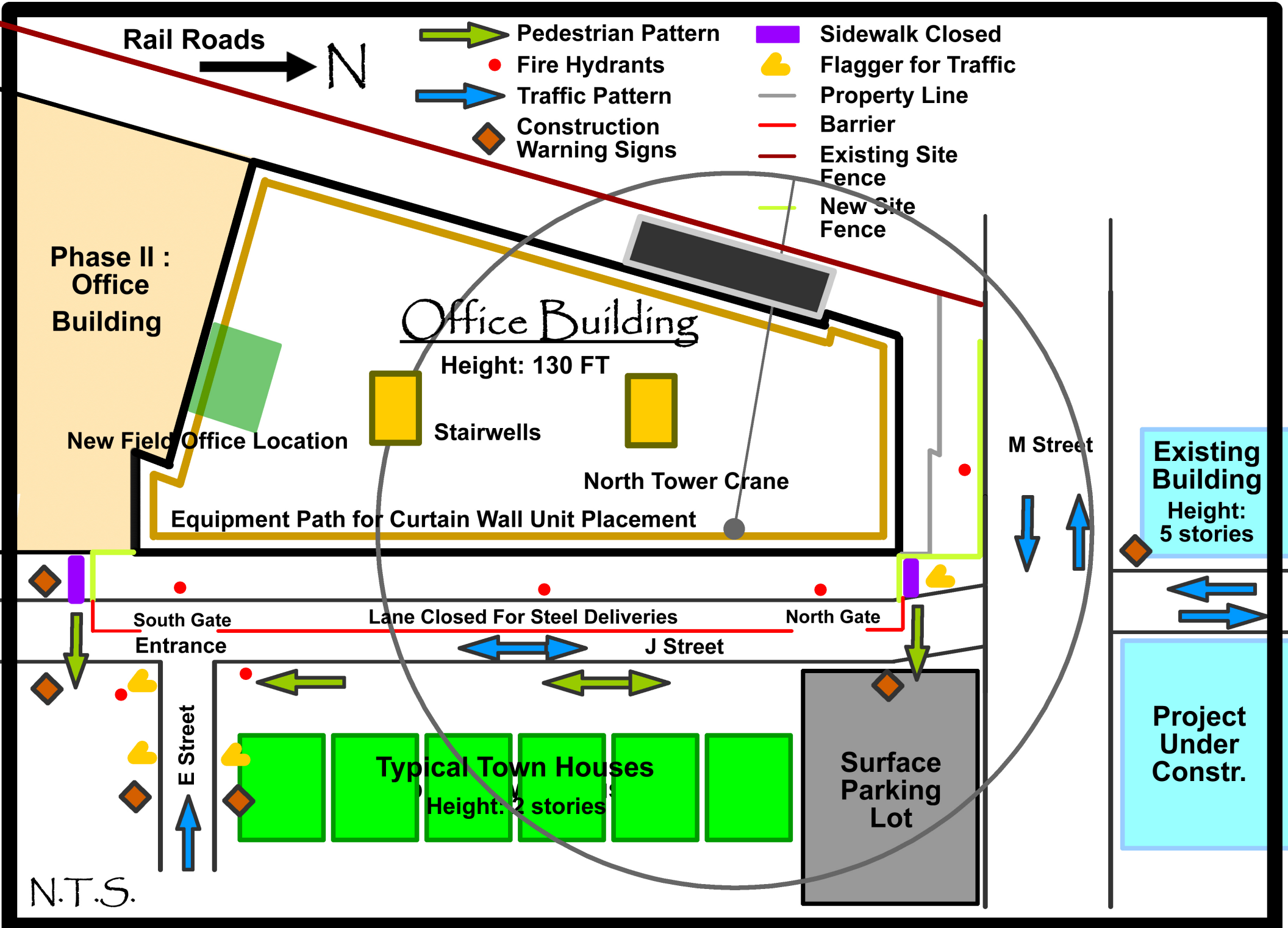
OFFICE BUILDING	CONCRETE	KATEY ANDALORO	10/24/2008



OFFICE BUILDING	CONCRETE	KATEY ANDALORO	10/24/2008



OFFICE BUILDING	STRUCTURE	KATEY ANDALORO	10/24/2008



OFFICE BUILDING	STRUCTURE	KATEY ANDALORO	10/24/2008