Laid Bare: Debating an Expanded Role for Infrastructure at the World Trade Center

ROBERT ARENS
California Polytechnic State University at San Luis Obispo

Figure 1. The WTC bathtub prior to rebuilding of the 1/9 subway lines (seen middle ground).

HIGH LINE, LOW LINE

On the West Side of New York City an abandoned elevated railway line has been transformed into one of the most unique and appealing public spaces in New York (fig. 2, top). With its second phase now complete, the High Line project is an indisputable success; a third phase reaching north to the West Side Rail Yards is planned and partially funded. As a one-mile long elevated greenway, the High Line provides a respite from New York's traffic while allowing views of the Hudson River framed by neighboring buildings. In just over two years of existence the High Line has already spawned open-air cafes, public art installations, numerous performances and over 30 new buildings in the area. Delegations of planners from other cities visit regularly to study its magic with the aim of possibly replicating it on their home turf.

Across town, discussions are taking place to convert a defunct underground streetcar terminal into a subterranean park, possibly with fiber-optic technology to channel in enough natural light for plants to thrive (fig. 2, bottom). The High Line's future counterpart, the Low Line, is an abandoned 1.5-acre cavern under the Delancey Street approach to the Williamsburg Bridge. Three blocks in length, the space is a remnant from a time when trolleys would cross the bridge to turn around before their return trip to Brooklyn.

Figure 2. The High Line (top), and a proposal for the Low Line by RAAD Studio.

Although there are no specific plans in place, city planners are excited about the prospect of a park in an area of the city, the Lower East Side, that significantly lacks public space. The likelihood that the project will move forward is buoyed by the City's hope that if, like the High Line, the Low Line could stimulate future financial development in the area, it would help jumpstart the adjacent Seward Park Urban Renewal Area (SPURA), a five-block zone above the Low Line that is the largest tract of undeveloped city-owned land in south of 96th Street.

These two projects underscore several lessons in urbanism. First, they demonstrate the powerful potential of transportation infrastructure to transform the design (and very nature) of public space in our cities. Second, since both the rail line and the trolley turnaround were no longer in use, the projects remind us that urban renewal policies should resist the quick removal of seemingly obsolete aspects of the built environment; sometimes it takes years for potential uses to arise, but saving these spaces provides for future opportunities. Third, the High Line and the Low Line, by their very names, illustrate how the approach to public space can expand beyond the primary urban theater of the street to include realms both above and below the traditional datum.

Then there's Lower Manhattan.

SEVENTY FEET BELOW GROUND LEVEL

One result of the tragic circumstances of the World Trade Center's demise was the possibility to rethink the site, not from the ground up, but from 70 feet below ground level to the depth of Lower Manhattan's bedrock. After months of debris removal, a space of tremendous potential emerged from beneath the rubble: an enormous sixteen-acre void made possible by a unique foundation system. This powerful space, which came to be known as "the bathtub", was a realm made sacred by the tragedy that played out on its surface. The fact that the void was laced with infrastructure in the form of subway and commuter rail lines made it even more resonant (fig. 1).

This paper examines how the subterranean world of the WTC site (and, by extension, Lower Manhattan), once laid bare, became the inspiration for framing not only the memory of 9/11, but all major redevelopment decisions at Ground Zero. Discussed are proposals that explored the resultant void for its potential to lend conceptual and physical form to the site and in doing so reveal the subterranean world and its infrastructure, aspects of life so vital to the city of New York yet so invisible on its surface. The emphasis of the discussion is on several designers, including the site's master planner, who saw the void as a thickened urban surface that could, like the High Line and Low Line projects, yield new public spaces in the city. Also discussed are the forces that ultimately led to a diminished role for infrastructure in the final master plan for the site, as is the influence that unrealized WTC designs may have had on the acceptance of infrastructure as a vital factor in the urban landscape. This influence contributed to the viability of the High Line and Low Line projects and expanded discussions of urbanism in the contemporary American city.

THE FOOTPRINTS BECOME HALLOWED

In the months following 9/11, the public outpouring of emotions was often channeled into visions for

rebuilding the World Trade Center site. The first organized attempt to collect the responses of architects and artists was an exhibit initiated by the gallery owner Max Protetch who put out a call to 125 individuals or firms to submit their ideas for Ground Zero. Sixty-five invitees declined the offer, many feeling that the lack of temporal distance from the event and/or programmatic outline for the site's future prevented true critical responses. The other sixty respondents presented visions that were exhibited in the gallery and collected in a book. Not surprisingly, most of the schemes were conceptual, emotion-laden responses that emphasized memorializing the lost.

Although the entire site could have been considered hallowed ground, solemnity seemed to condense at the tower footprints. In no fewer than 21 of 60 proposals the footprints were marked with pools or voids as few designers could conceive of built form powerful enough to displace the 200' x 200' twin footprints. In fact, by 2003 when the WTC Memorial Competition Guidelines were published, entrants were required to "Make visible the footprints of the original World Trade Center."[1] The following year, Governor George Pataki would pledge to the victims' families that nothing would ever be built over this now hallowed part of the site.

Several contributors to the exhibit considered the *entire* bathtub the embodiment of hallowed ground. These designers sought to create a new type of memorial, both extruded from life at the street-level yet connected to the subterranean realm under the streets of New York. In doing so, they created memorial precincts based on absence rather than presence and formed not by the hand of a designer but by the site and its infrastructure. In doing so they strongly influenced the eventual master plan for the entire site.

One of the most restrained yet emotive of schemes came from Eric Owen Moss who proposed no buildings whatsoever at the site. Calling his proposal "Two Pairs of Shadows," he left the bathtub void and inscribed it with four enormous shadow lines. Recognizing the power of the subterranean world beneath all of Manhattan, Moss wrote, "Hollow the site, Down to the river wall, Down to the trains, Deep down."[2] Reaching westward from the site, the shadows were the re-creation of those cast by the towers when each was struck and when each collapsed. In his written statement, Moss described the shadows as "The first pair: The way in and the way down and the way up and the way out. The second pair: Seats...only in shadow"[3]

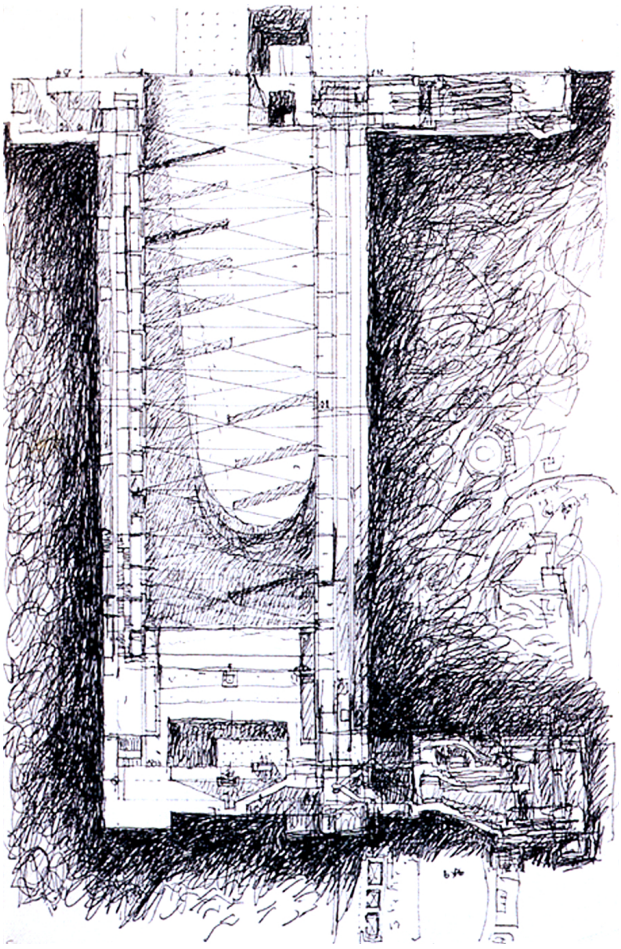

Figure 3. Samuel Mockbee's proposal from the 2001 exhibition at the Max Protetch Gallery.

Several other schemes proposed dramatic subterranean realms that cut through bedrock to Manhattan's depths. Barbara Stauffacher Solomon and Nellie King Solomon envisioned cuts as deep as the towers were tall, with one shaft filled with water and the other with a kaleidoscope of mirrors. Samuel Mockbee took this idea one step further (fig. 3). He proposed public spaces such as a memorial chapel and cultural center at the bottom of a chasm cut 911 feet into the site. Elevators and spiraling walkways would take visitors into the depths where they could gaze up to the surface and the rebuilt towers above. Mockbee and the Solomons under-

stood that a subterranean approach was not appropriate everywhere, but given the unique nature of the WTC site, engaging its depths was a possible, if not necessary, approach. Mockbee alone saw the depths as a space to be occupied: the underground was no longer just a place for commuters, but also a place for mourners and the public-at-large.

THE POWER OF THE VOID

In summer 2002, the Port Authority of New York and New Jersey along with the Lower Manhattan Development Corporation hired several architecture and planning firms to generate six development frameworks for the site. When presented to the public in July 2002, the plans were soundly rejected as too dense in their planning, too commercial in their programming, and too uninspired in their vision. Although four of the six plans included the footprints as part of a memorial precinct, the public still responded that the memorial be the top priority on the site and that the footprints be treated as "remarkable symbols"[4]

The Port Authority and the LMDC, realizing they could not move forward on redevelopment without more positive public support, regrouped and created an invited competition in which seven teams of architects were asked to create Innovative Design Studies for the WTC site. The guidelines asked participants to define, but not design, a memorial precinct, the design for which would be determined in a separate competition. Furthermore, the brief expressed "a preference for preserving the footprints of the Twin Towers for memorial space and precluding commercial development on those locations."[5]

In keeping with the competition brief, all nine proposals respected the tower footprints. Schemes by Petersen Littenberg and United Architects went further than most by carving voids to bedrock, recognizing the lowest level of the site as an enduring symbol critical to the memorial experience. The proposal by Studio Daniel Libeskind went further still.

In his first stage submittal, Libeskind partially restored the street grid to the site by allowing Greenwich Street to bisect the site in the north-south direction and Fulton Street to bisect it east-to-west. Since the tower footprints occurred in the southwest quadrant of this new configuration, it was the natural location for the memorial precinct. Rather than locating the memorial at grade, however, Libeskind followed the approach exemplified in the "Two Shadows" project by Eric Owen Moss. Namely, Libeskind proposed a void for the entire bathtub west of Greenwich and south of Fulton (fig. 4).

When the design teams were assembled at the start of the competition, they were invited to descend into the bathtub. Libeskind found this experience so moving and the slurry wall foundation so stirring that he sensed the opportunity to ground his proposal with the experience. He decided to extend the public realm from the vibrant space of the city at grade into the solemn space of the bathtub, and create a memorial precinct at bedrock defined by the enduring infrastructure of the site. To Libeskind the void was not only powerful in its physical presence, but also in its symbolism: as destructive as the terrorist attack was, it could not destroy the foundations of the site. Since the disaster had exposed the underbelly of New York's transit system to the light of day at this one charged location made the strategy even more appealing: commuter rail lines, subway platforms, and subterranean pedestrian concourses could become part of this extraordinary setting for the future memorial. Libeskind appropriately titled his entry "Memory Foundations."

Of all the subterranean elements, Libeskind was most taken by the physical presence and engineering of the slurry wall. At the time of the twin towers' construction, this approach to foundation systems was relatively unknown in the US. Slurry walls were the ideal solution to the WTC foundations due to several key factors. The towers' height necessitated foundations that were firmly anchored into the Precambrian schist bedrock that lay 70 feet below the surface. This depth, along with the sheer size of the tower footprints called for the excavation of the practically the entire site. To do this without disturbing surrounding streets or buildings, the entire perimeter of the site had to be shored. Given the poor soil conditions at the site and the encroachment of the Hudson River the most expedient way to create a "bathtub" was using the slurry wall system. It called for digging a 70-foot deep trench and filling it with sodium bentonite. Next came a prefabricated rebar cage, then concrete. Because the slurry was heavier than river water but lighter than concrete, it could hold the form of the trench long enough for the concrete to be added; the heavier concrete displaced the slurry to the top

of the trench where it was siphoned off and used in the next pour. In other words, the WTC foundation walls are "slurry" in name only; the name refers to a single, yet crucial step of the foundation's construction rather than its actual material.

In soliciting comments on the Innovative Design schemes, the LMDC reported, "The Studio Daniel Libeskind plan received a significant response from the public. The elements that received the most attention were the memorial context and the plan's approach to restoring the skyline. Many felt Libeskind's approach to the memorial was dramatic and powerful through his use of the slurry wall and the bathtub area."[6] In his review of the proposals Mark C. Taylor wrote that the scheme represented "a distinctive meditation on the intellectual and emotional polarities that the disaster challenges us to mediate surface and depth, light and darkness, presence and absence, form and void, difference and unity, profane and sacred and loss and recovery."[7] The *New York Post* found it less inspiring, describing it as "a grotesque, anti-urban, anti-commercial eyesore seemingly conceived to suck what life remains out of the Wall Street area."[8]

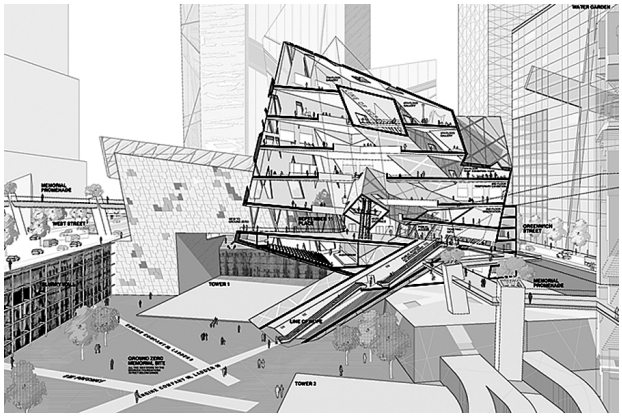

Figure 4. The memorial precinct in Daniel Libeskind's first scheme for the Innovative Designs Competition.

The Port Authority was excited by the scheme, in part because they saw a designer who held *their* métier, transportation and infrastructure, in high regard. On the other hand, they were concerned by the cost and technical difficulties required to transform the slurry wall from a hidden element with lateral support on both sides to an exposed wall with a new supplemental support added to the memorial side. Additionally, they were concerned that a void to bedrock precluded the use of valuable sub-grade space for expanded service programs at the site, such as truck security and bus parking. In the final phase of the competition between December 2002 and February 2003 when the Libeskind team and the Think team were allowed to refine their proposals, the LMDC persuaded Libeskind to keep the sunken memorial but raise its floor 40' to mitigate sub-grade planning and structural issues. Although a raised floor precluded some of the memorial experiences from the PATH platforms and tracks, many of the other interactions between infrastructure and memorial remained and access to bedrock was still provided along the western edge of the memorial precinct.

The LMDC selected Libeskind's final plan and wrote in their Summary Report that, "Memory Foundations preserves and reveals the slurry walls of the bathtub of the World Trade Center site as a symbol and physical embodiment of the resilience of American democracy and freedom in withstanding the attacks of September 11th. A Memorial Garden is created 30 feet below grade as a protected courtyard within the city. While the bathtub contains multiple levels to provide needed long-term structural stability for the slurry walls, it is possible on

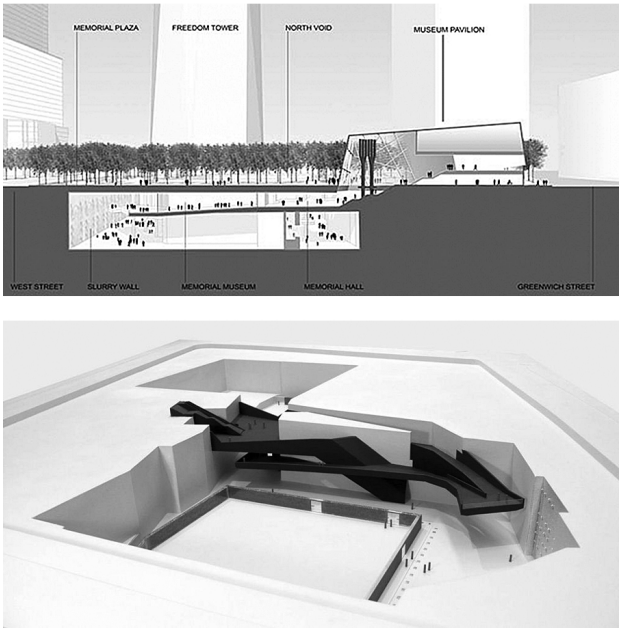

Figure 5. The transition from memorial to museum in the Arad scheme. The entry pavilion (top) provides a ramp (bottom) that leads down to the subterranean space and slurry wall below the memorial.

the west side of the site to descend some 70 feet to observe the massive slurry walls from bedrock to street level. The preserved slurry walls, together with the footprints of the twin towers, create a large, flexible 4.7-acre site for the memorial competition. An interpretive Museum sits at the center of the site, which is also one of the entrances to the bathtub Memorial Garden. At street level, Memory Foundations creates a lively public realm by restoring Greenwich and Fulton streets with a continuous street wall and at-grade retail shops and restaurants—the essence of great Manhattan streets."[9]

BACK TO SEA LEVEL

To many observers the Libeskind plan was a compelling strategy for a solemn memorial in the heart of a dense, contemporary city. Others questioned whether Libeskind had gone too far and made the entire site a memorial. This opinion was in fact held by some members of the jury for the LMDC-sponsored Memorial Competition who felt Libeskind had assigned too much symbolic value to the slurry wall and the bedrock of the site, and it doing so limited the design possibilities of the actual memorial.

The jury's ambivalence towards Libeskind's plan was reflected in the competition brief. It stated: "Competitors may, within the boundaries illustrated, create a memorial of any type, shape, height or concept. Designs should consider the neighborhood context, including the connectivity of the surrounding residential and business communities. All designs should be sensitive to the spirit and vision of Studio Daniel Libeskind's master plan for the entire site."[10] In boldface type, the brief continued, "Design concepts that propose to exceed the illustrated memorial site boundaries may be considered by the jury if, in collaboration with the LMDC, they are deemed feasible and consistent with the site plan objectives."[11]

When Kevin Rampe, then interim president of the LMDC, was asked in an interview if the brief could be broadly interpreted he replied, "It's hard to imagine that any memorial plan that would fill in the bathtub area to ground level would be consistent with the Libeskind plan. The entire memorial area will not be filled in."[12] Despite this strong endorsement of the Libeskind plan and its proposal for the sunken memorial precinct, the jury selected the proposal titled "Reflecting Absence" by Michael Arad and Peter Walker.

The Stage I version of "Reflecting Absence", selected as one of eight finalists, was authored by Arad alone. He proposed a stark, street-level plaza defined along its western edge by a new configuration for the museum and punctuated by the tower footprints and ramps for descent into the site. This abstract approach and concentration of the site's solemnity at the footprints recalled many of the proposals submitted to the 2001 Protetch exhibit. For his Stage II submittal Arad was encouraged to move the museum back to the location outlined by the master plan (southwest of the intersection of Greenwich and Fulton Streets) and to transform the plaza into a tree-filled park. To assist with the greening of his scheme, Arad enlisted the help of Peter Walker. The jury selected their scheme and commented, "In its powerful, yet simple articulation of the footprints of the Twin Towers, 'Reflecting Absence' has made the voids left by the destruction the primary symbols of our loss. While the footprints remain empty, however, the surrounding plaza's design has evolved to include beautiful groves of trees, traditional affirmations of life and rebirth. Not only does this memorial creatively address its mandate to preserve the footprints, recognize individual victims, and provide access to bedrock, it also seamlessly reconnects this site to the fabric of its urban community."[13]

In late 2012 visitors to the National September 11 Memorial and Museum (fig. 5, top) will be able to pass through a giant glade of oak trees (the Memorial opened in September 2011) on their way to the new entry pavilion designed by Snøhetta. Once there they'll travel down a ramp to a level 70' below Lower Manhattan's streets to walk on bedrock that provided the foundation for the Yamasaki towers as well as their replacements taking shape above (fig. 5, bottom). At this level of the Museum, visitors will see traces of the original footings, walk under the fountains which mark the twin towers' footprints, and gaze up at the field of tiebacks securing the slurry wall system of permanent pilings that survived the destruction of 9/11 and continue to form the vast WTC bathtub.

CONCLUSION

Recent remembrance ceremonies marking the tenth anniversary of the attacks, the opening of the September 11 Memorial, and the near topping-out of the tallest tower on the site are reasons to reassess the rebuilding effort at the WTC. This pa-

per focused on the project's potential to involve the unique subterranean and infrastructural aspects of the site in its approach to urbanism.

When the gaping WTC site was cleared and its bathtub revealed in 2002, the power of it's void and Lower Manhattan's subterranean world became clear to many designers who explored this potential in their visions for the sixteen-acre parcel. Their proposals, emotional and quixotic, inspired stakeholders, the public, the master planner, and the memorial designer to give serious consideration to the role of infrastructural elements such as tower footprints, slurry walls, bathtubs, bedrock, rail lines and subway lines in future plans for the site (although considerable backtracking can be seen in the final master plan). Although unique conditions at the WTC site make it difficult to fully generalize the project's lessons, the engagement of the spatial and programmatic opportunities below Lower Manhattan's streets have certainly contributed to broader discussions about infrastructure and urbanism and possibly nudged projects like the High Line and Low Line into existence.

ENDNOTES

1 Lower Manhattan Development Corporation, "World Trade Center Site Memorial Competition Guidelines," 19.
2 Eric Owen Moss, "Two Pairs of Shadows," in *A New World Trade Center*, Max Protetch, New York: HarperCollins, 2002), 101.
3 Ibid, 101.
4 Civic Alliance, "Preliminary Report" of Listening to the City held July 20 and 22 July 2002 at New York's Jacob Javits Center, 2.
5 From its press release "Lower Manhattan Development Corporation Announces Design Study for World Trade Center Site and Surrounding Areas," August 14,2002.
6. Lower Manhattan Development Corporation, "The Public Dialogue: Innovative Design Study."
7 Mark C. Taylor, "Beyond Mourning, Building Hopes on Ground Zero," *New York Times*, 29 December 2002.
8 Steve Cuozzo, "A New Horror—Save Us, Gov. Pataki," *New York Post*, 28 January 2003.
9 *Summary Report on the Selected Design for the WTC Site*, 4-5.
10 Lower Manhattan Development Corporation, "World Trade Center Site Memorial Competition Guidelines," 10.
11 Ibid.
12 Kevin Rampe quoted in Edward Wyatt, "Supporters Object to Efforts To Alter Ground Zero Plan," *New York Times*, 12 June 2003.
13 Lower Manhattan Development Corporation, "WTC Memorial Jury Statement for the Winning Design", 13 January 2004.