5.3 Multi-Site Green Infrastructure Practices

Figure 5-1 summarizes the structural BMPs which have been identified as opportunities on UW–Madison campus. As discussed previously, this Green Infrastructure and Stormwater Management Master Plan includes recommendations ranging from site-based to multi-site, or district-based practices. The multi-site practices are intended to cover larger tributary areas than just one building project or development block. In most cases, the intent is to capture and treat stormwater that is already being collected through existing campus infrastructure, and divert it to a treatment device or area to address a larger quantity of runoff. This offers the opportunity to capture and treat polluted runoff from streets and other campus spaces not necessarily associated with a particular building site.

These identified multi-site practices are described in more detail by campus district below. WinSLAMM modeling was performed based on the assumed design parameters described for each BMP located within the permit boundary. The modeling approach was similar to that described in Section 4.1 for existing conditions. The cumulative impact of the proposed BMPs with regards to permit compliance within the permit boundary is summarized in a later section.

As shown in Figure 5-1, most of the redevelopment sites on South Campus are confined to smaller blocks so green infrastructure practices would primarily be implemented on a site-by-site basis. Site-based green infrastructure on South Campus in particular should consider green roofs since sites are often limited in space and green roofs offer additional usable open space. Green roofs are not specifically referenced on Figure 5-1 as they would be incorporated into building projects on a per-project basis. Consideration should also be given to providing stormwater detention as portions of the public storm sewer system in the South Campus are under capacity and low-lying, creating flooding issues downstream such as along Regent Street. UW–Madison should follow the city's recommendations for peak flow control in this area on a project by project basis.

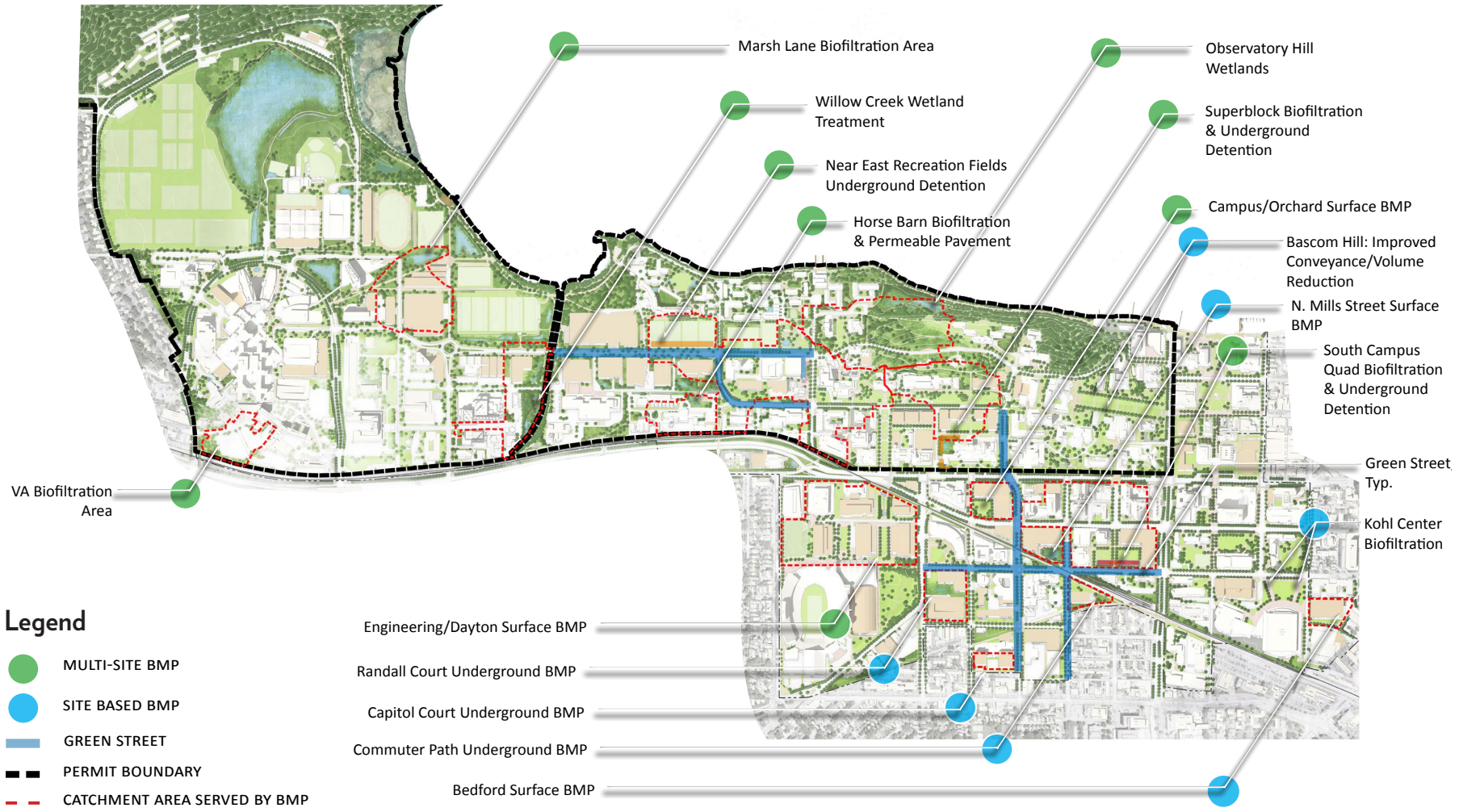


Figure 5-1 Green Infrastructure Opportunities

West Campus

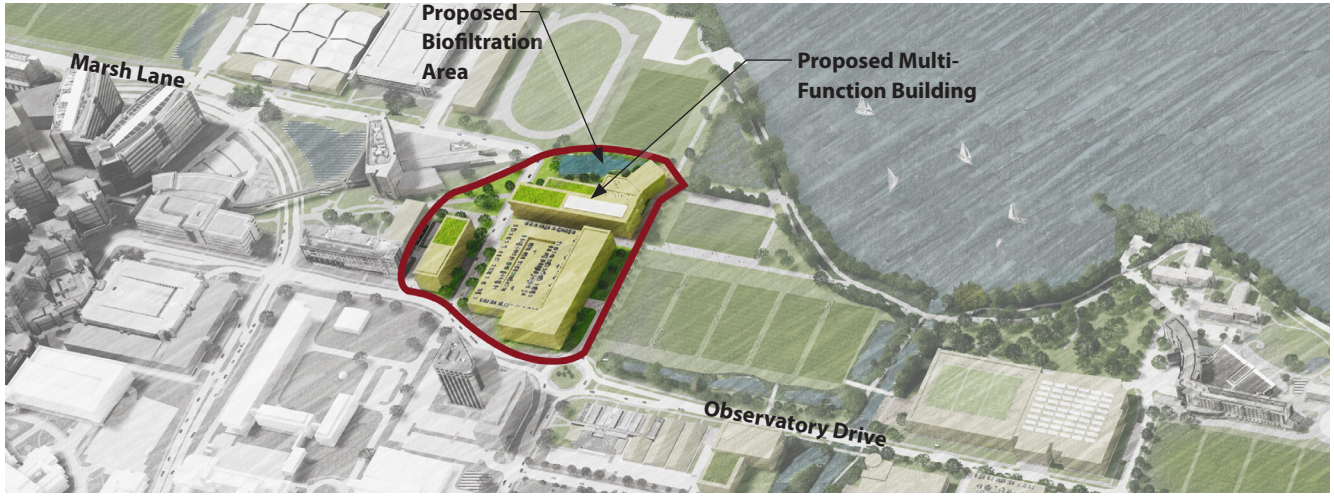
Marsh Lane Biofiltration Area

The Master Plan shows the existing soccer and track complex to be relocated to the existing Lot 60 footprint, and replaced with new academic buildings. This provides an opportunity to create a BMP that can treat runoff from about 9.9 acres, bounded on the south by Observatory Drive (shown in Figure 5-3).

This BMP is envisioned either as a biofiltration area, constructed wetland or wet pond. The goal is to capture approximately 3,100 pounds per year of TSS on an average annual basis (Figure 5-4).

This BMP could also provide additional benefits such as pollutant capture, peak flow and volume reductions, and ecosystem services. It could be designed to have accessible boardwalks or paths through or around it, or bench seating with a natural aesthetic and interpretive signs for community awareness and education.

Figure 5-2 Cross Section Rendering of a Biofiltration Area With Wet Pool



Potential Catchment Area: 9.9 acres

Design Assumptions:
Surface Area: 9,100 sf
Max Depth: 28 inches
Primary Control: 6 inches

Model Results:
TSS Captured: 3,100 lbs/year
Trapping Efficiency: 74%

Figure 5-3 Birds-Eye View of Potential Catchment Area for Proposed Marsh Lane Biofiltration Area

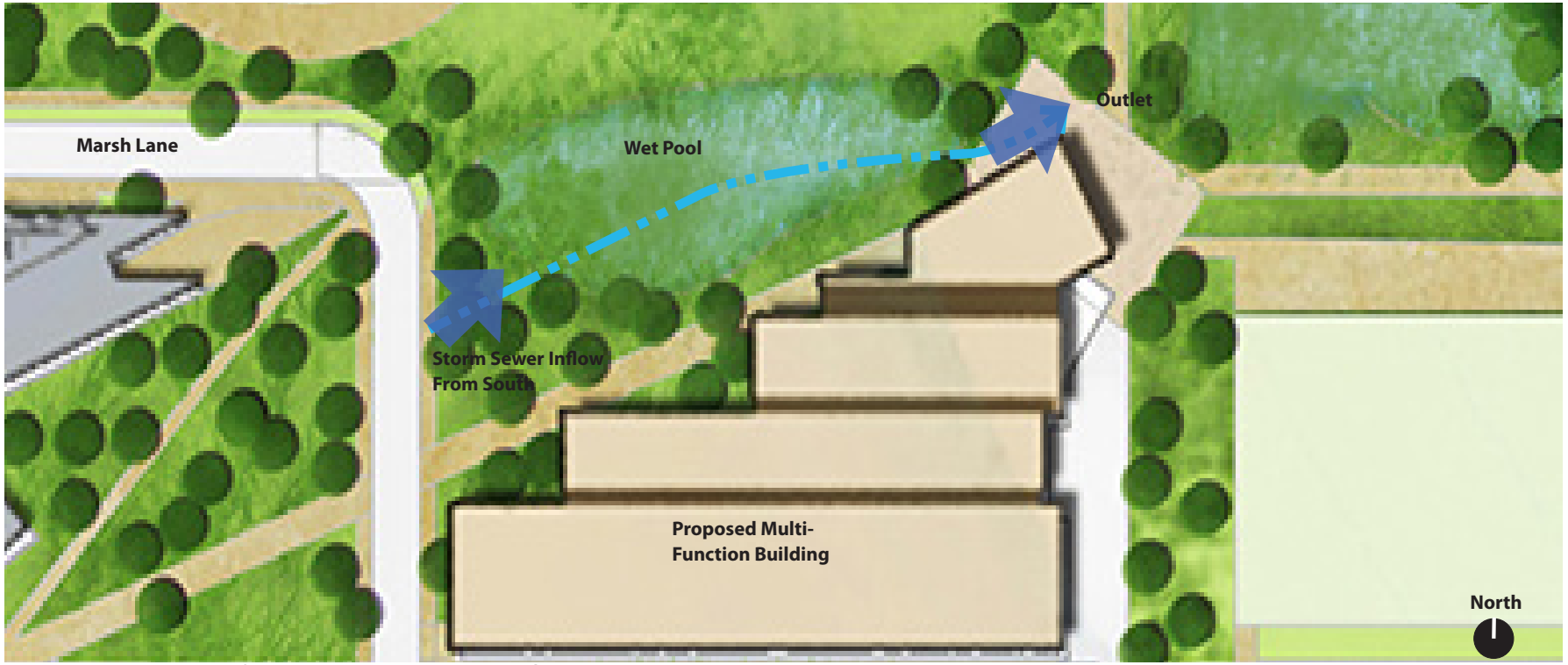


Figure 5-4 Close-Up of Proposed Marsh Lane Biofiltration Area

Near West Campus

Veterans Administration (VA) Biofiltration Area

Although the Veterans Administration (VA) facilities located on Campus Drive and University Bay Drive are not owned by UW–Madison, the VA property falls within the UW–Madison's WPDES permit boundary agreement with the City of Madison. Therefore, the UW–Madison has incentive to control stormwater runoff from the VA facilities including their large surface parking lots. Any project of this nature would need to be a partnership between the UW–Madison and the VA.

A biofiltration practice is recommended for the southeast corner of the VA's surface parking lot in an area that is currently lawn (Figure 5-7). Minor re-grading may be required but the parking lot already drains in that direction. The BMP would receive untreated runoff from the parking lot and adjacent areas (approximately 4.2 acres, shown in Figure 5-6). The goal is to capture a minimum of 1,500 lbs of TSS on an average annual basis.

Figure 5-5 Parking Lot Median Bio Filters

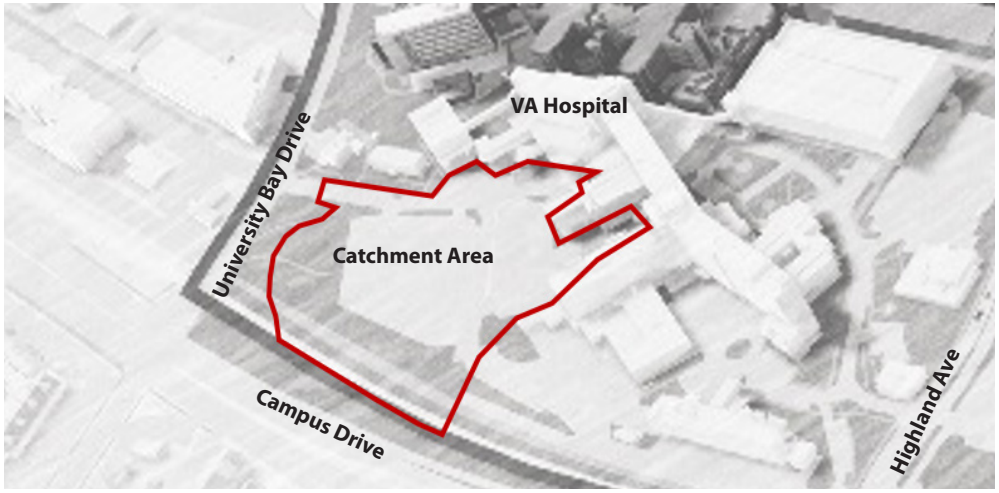


Figure 5-6 Birds-Eye View of Potential Catchment Area to VA Biofiltration Area

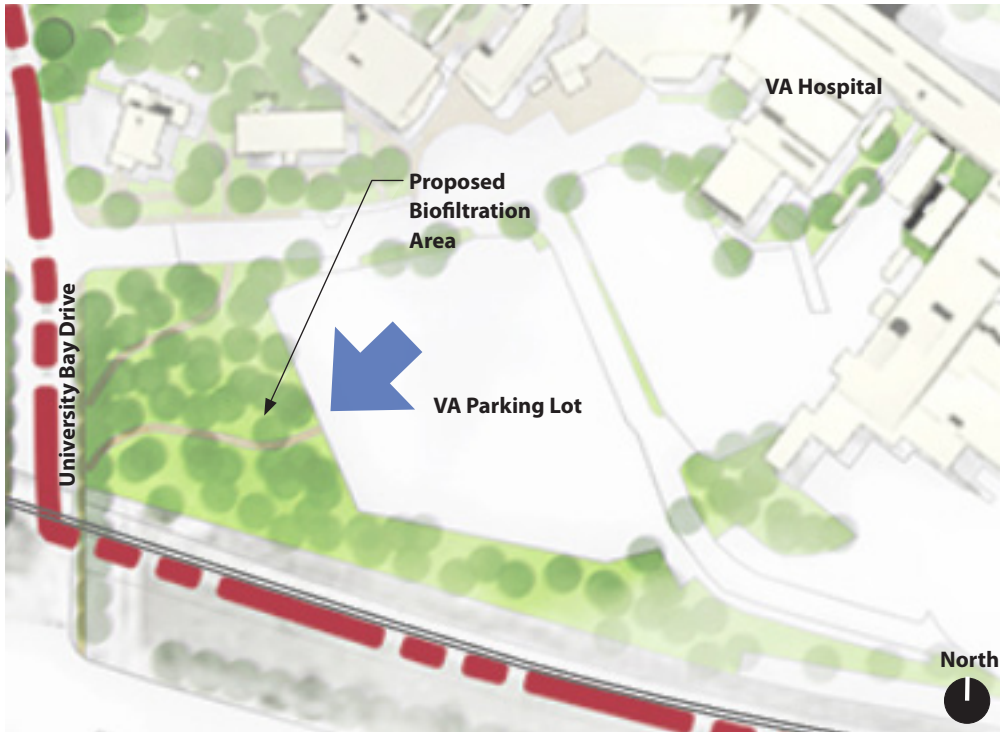


Figure 5-7 Proposed Biofiltration Area at VA Parking Lot

Potential Catchment Area: 4.2 acres

Design Assumptions:
Surface Area: 3,000 sf
Max Depth: 2 feet
Model Results:

TSS Captured: 1,500 lbs/year
Trapping Efficiency: 79%

Near West Campus

Horse Barn Biofiltration & Permeable Pavement

A biofiltration area is recommended near the Horse Barn that would collect and treat runoff from an area of approximately 4.4 acres. The goal is to capture approximately 1,500 lbs of TSS per year on an average annual basis (see Figure 5-9). The assumed area of the biofiltration area is 5,200 square feet and the max depth is approximately 14 inches.

In addition, the parking lot south of the horse barn near the old Meat and Muscle Building has poor drainage due to steam tunnels cutting it off from the storm sewer system to the north. This is an area that has been identified as a possible permeable pavement project to provide better drainage.

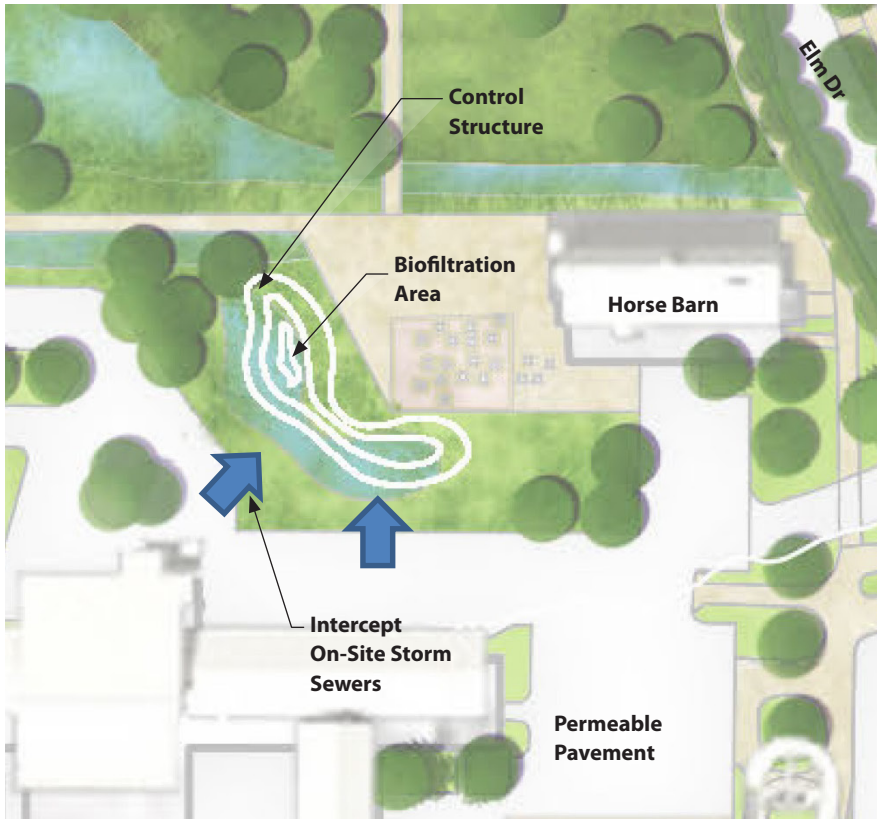


Figure 5-9 Close-Up of Horse Barn Biofiltration Area

Willow Creek Wetlands

The western banks of Willow Creek are recommended to be redesigned to accommodate constructed wetlands that are perched above the creek (see Figure 5-11). The practice will treat runoff from a tributary area of approximately 8.3 acres (see Figure 5-12). Much of this area is currently used as the existing yard for UW–Madison Grounds and is paved with direct runoff into the creek. The wetlands are shown with boardwalks and paths for passive recreation. The wetlands would also help rehabilitate the ecosystem and aesthetics of Willow Creek. The goal for the Willow Creek BMP a capture rate of approximately 2,200 pounds per year of TSS on an average annual basis.

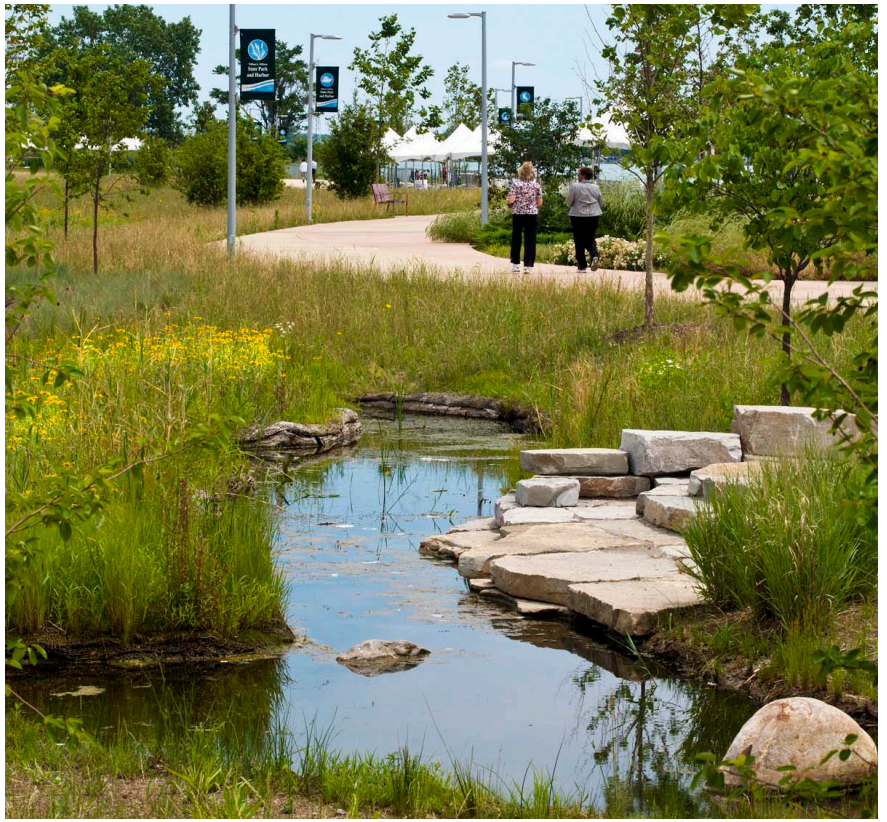


Figure 5-10 Milliken State Park Constructed Wetlands, Detroit, MI

Figure 5-11 Close-Up of Willow Creek Wetlands

Potential Catchment Area: 8.3 acres

Design Assumptions:

Surface Area: 8,400 sf
Max Depth: 18 inches
Primary Control: 6 inches

Model Results:
TSS Captured: 4,100 lbs/year
Trapping Eff: 86%

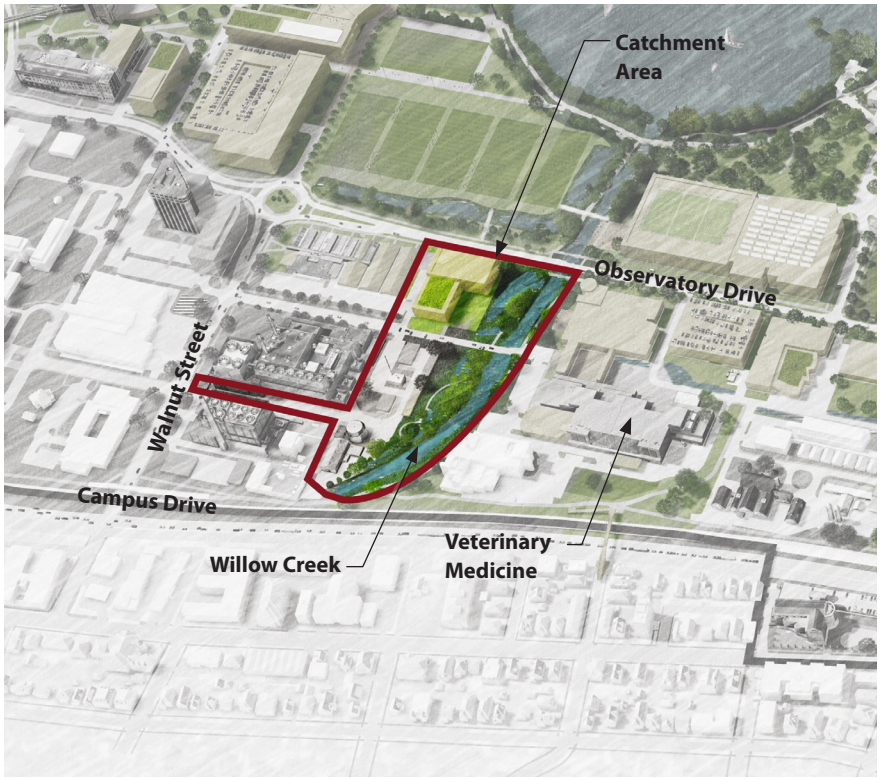


Figure 5-12 Birds-Eye View of Potential Catchment Area to Willow Creek Wetlands

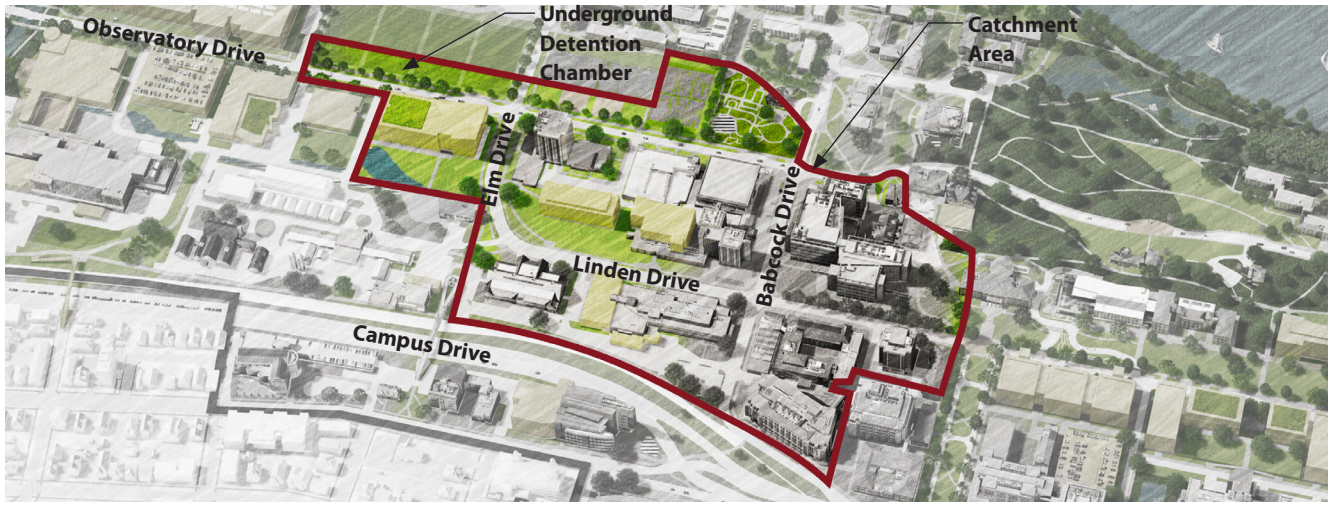
Near East Recreation Fields Underground Detention Chamber

The Near East Recreation Fields, located on Observatory Drive just west of Elm Drive, are slated to be rebuilt with synthetic turf fields in the Rec Field Master Plan. These fields also sit at the confluence of several large storm sewers that collect a 32-acre catchment area before discharging to Lake Mendota (Figure 5-14). Due to the size and depths of the storm sewer pipes and the desire to maintain the entire surface area for recreation fields, the most feasible BMP for this location is an underground chamber for treatment of TSS. This one facility, while expensive, would capture approximately 7,400 lbs of TSS per year on an average annual basis, representing approximately 4.4% of the total TSS baseline load from the permit area. Capturing this amount of TSS would significantly advance the campus toward meeting its WDNR requirements for overall TSS reduction in the permit area.

Another benefit of this site is that it is one of the few large scale practices that can be implemented in the next 5 to 20 years.

The underground chamber would need to be fairly large to achieve this goal: 13,100 square feet by a minimum of 4.8 feet deep (Figure 5-15). It is assumed that the chamber would be designed to treat the first flush of rainfall with larger storm events bypassing the chamber. The chamber would need regular inspection and cleaning. Since the chamber isn't visible, consideration should be given to providing interpretive signage to inform passers by of what the practice is accomplishing.

Figure 5-13 Underground Detention Precast Units Being Installed



Potential Catchment Area: 32 acres

Design Assumptions:
Surface Area: 13,100 sf
Max Depth: 4.8 feet
Primary Control: 12 inches

Model Results:
TSS Captured: 7,400 lbs/year
Trapping Eff: 58%

Figure 5-14 Birds-Eye View of Potential Catchment Area to Near East Recreation Fields Underground Detention

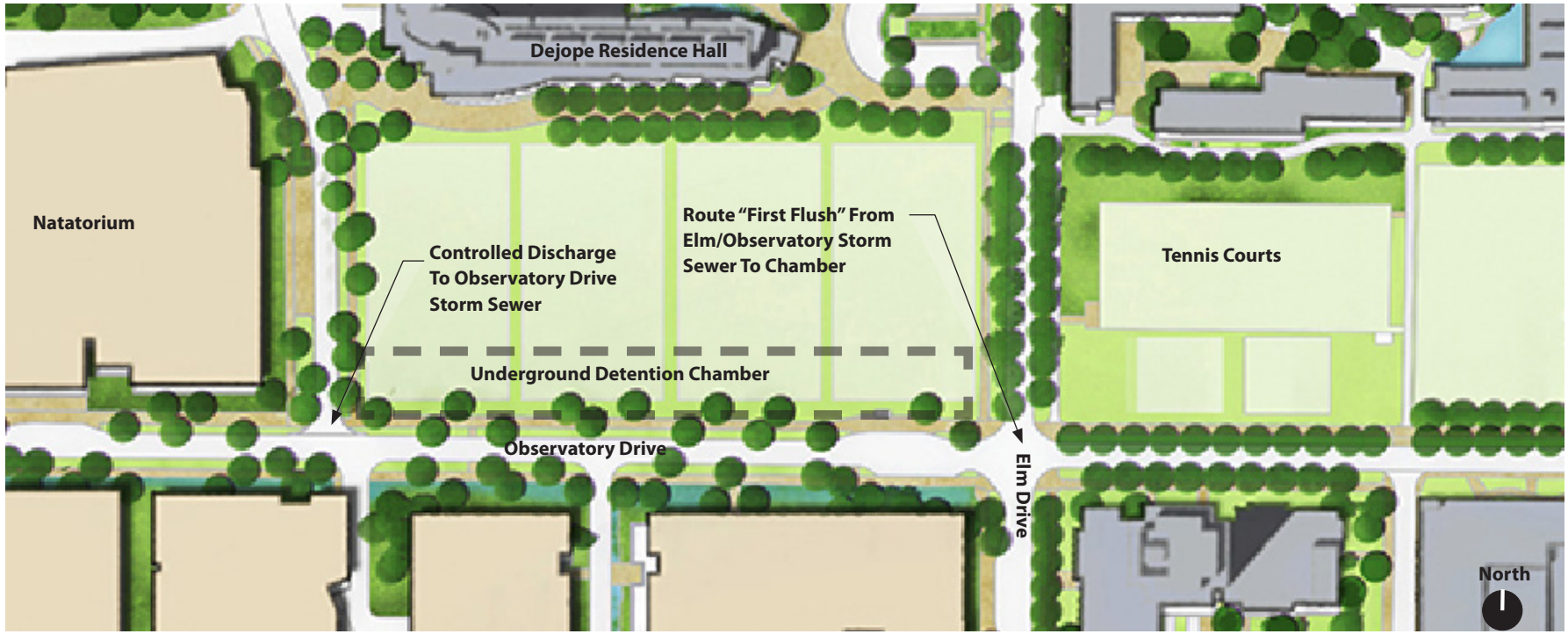


Figure 5-15 Close-Up of Underground Detention Chamber at Near East Recreation Fields

Central Campus

Observatory Hill Wetlands

One of the most transformative BMPs recommended in this plan is the removal of Lot 34 and replacement with an engineered wetland at the base of Observatory Hill. The catchment area for this practice is approximately 16 acres, and the TSS capture rate goal is nearly 3,900 lbs per year on an average annual basis. However the wetlands proposed at this location provide additional benefits beyond sediment and pollutant reduction: they are envisioned to act as a learning laboratory for students and faculty as well as an inspiring and unique environment for passive enjoyment (Figure 5-19). The Landscape Master Plan describes in more detail the aesthetic vision and plant communities proposed for this area.

The catchment area (Figure 5-18) extends from Babcock Drive to portions of Tripp Circle. This project will ultimately require some rerouting of existing storm sewers to get the proposed tributary area to drain to this BMP. Tripp Circle is identified in the Utility Master Plan as being reconstructed so this would be an opportune time to reroute the storm sewers or redirect roof drains and inlets.

Figure 5-16 Wetlands and Boardwalk, Clarksville, Tennessee

Figure 5-17 Wetlands at Sears Headquarters, Prairie Stone, Hoffman Estates, Illinois

Potential Catchment Area: 16 acres
Design Assumptions:

Surface Area: 9,600 sf
Max Depth: 4 feet
Primary Control: 6 inches

Model Results:
TSS Captured: 3,900 lbs/year
Trapping Eff: 86%

Figure 5-18 Birds-Eye View of Potential Catchment Area to Observatory Hill Wetlands

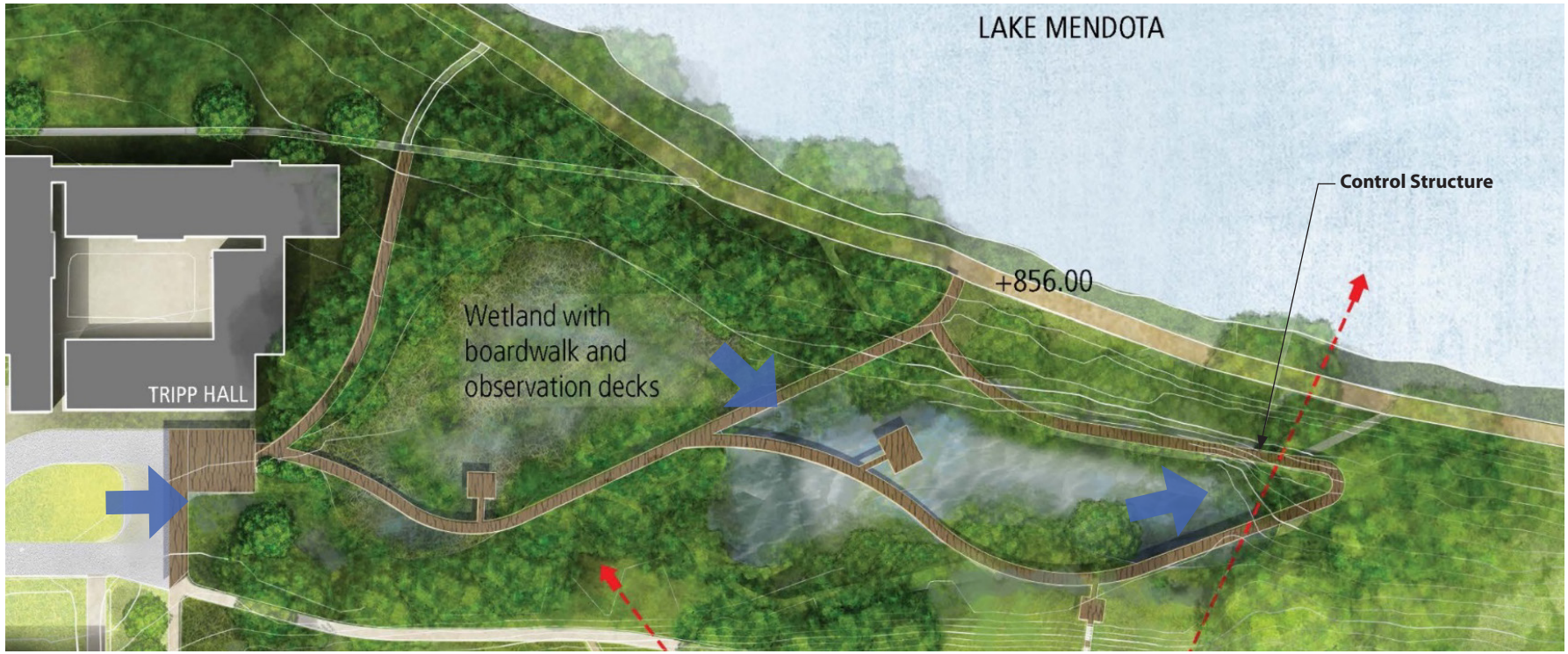


Figure 5-19 Close-Up of Proposed Observatory Hill Wetlands

Central Campus

Superblock Biofiltration and Underground Detention Chamber

The Master Plan area described as the Superblock is slated for significant redevelopment including several new buildings and the addition of two new streets through the center of the block to connect Linden Drive with University Avenue and that new north-south street with Charter Street. The Superblock includes a portion of Linden Drive, Nicholas Hall, and Agriculture Hall as well as most of the block east of Henry Mall. A new surface BMP (biofiltration) is recommended in the courtyard of the new Superblock with the intent of capturing TSS from the redevelopment area. This surface BMP could be a biofiltration area with a fairly urban or hard-edged design that would treat runoff from nearby impervious site features (streets, walks, roofs).

This surface feature may or may not be connected to a possible secondary below-grade multi-site BMP that is recommended to be constructed to treat the first flush of stormwater diverted from the existing storm sewer network at this location, which has an upstream catchment area of approximately 11 acres (see Figure 5-21). The underground chamber could be a wet or dry sump designed to capture sediment in the runoff, with the intent of capturing approximately 2,500 lbs per year on an average annual basis (Figure 5-22).

Figure 5-20 Biofiltration Area in Battle Creek, Michigan

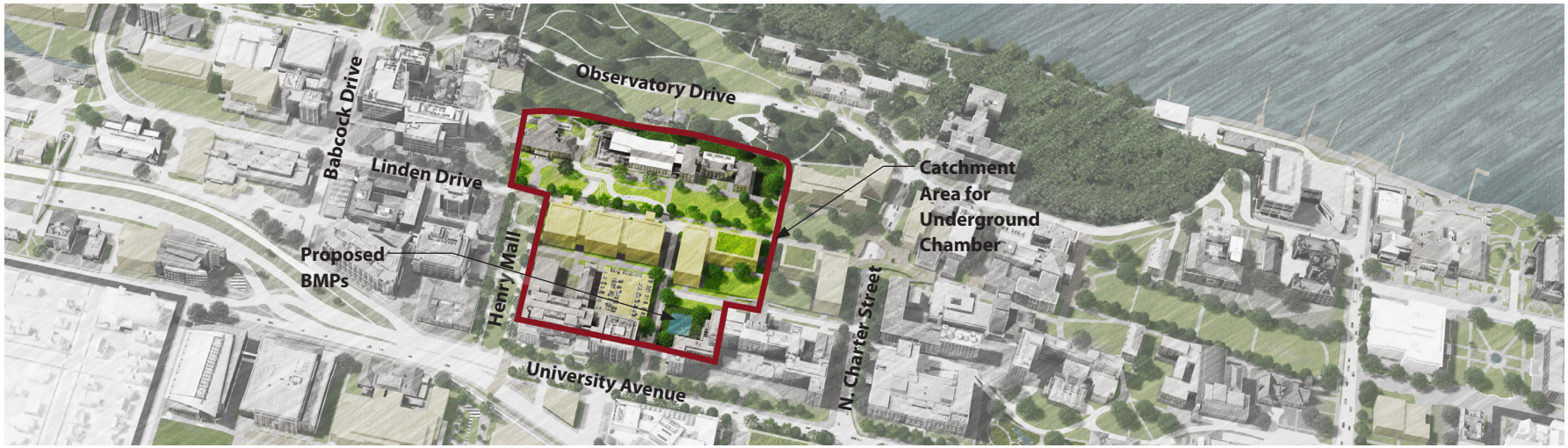


Figure 5-21 Birds-Eye View of Potential Catchment Area to Superblock Underground Detention

Underground Detention Chamber:

Potential Catchment Area: 11 acres

Design Assumptions:
Surface Area: 8,700 sf
Max Depth:2.5 feet
Primary Control: 6 inches

Model Results:
TSS Captured: 2,500 lbs/year
Trapping Eff: 71%

Figure 5-22 Close-Up of Proposed Underground Detention Chamber at Superblock

South Campus

South Campus Quad Biofiltration and Underground Detention

As with the Superblock and Near East Recreation Fields, the proposed South Campus Quad is a redevelopment project offering an opportunity to integrate a multi-site underground treatment chamber that would capture sediment from a wide tributary area. In this case the catchment area covers portions of the blocks south of University Avenue, east of N. Charter Street, down to W. Dayton Street. The South Campus Quad will also feature a surface BMP such as a biofiltration area with vertical edges, designed to fit within the urban plaza aesthetic planned for this quad. Again the surface BMP would treat runoff from the site and possibly surrounding streets or buildings. However the intent of the underground chamber is to treat the first flush from the entire 16-acre catchment area (see Figure 5-24), capturing approximately 4,300 lbs of TSS per year on an annual average basis.

Since South Campus is outside of the permit area, any TSS credit for the underground chamber would go to the City of Madison (and therefore is not included in the summary calculations towards the campus permit). However much of the load would likely come from city streets since those are the greatest source areas within that tributary. Therefore this practice should be considered a partnership between the UW–Madison and the City of Madison, with campus providing the land and the city funding the construction and maintenance costs.

Figure 5-23 Biofiltration Area at Centennial Hall, UW-La Crosse

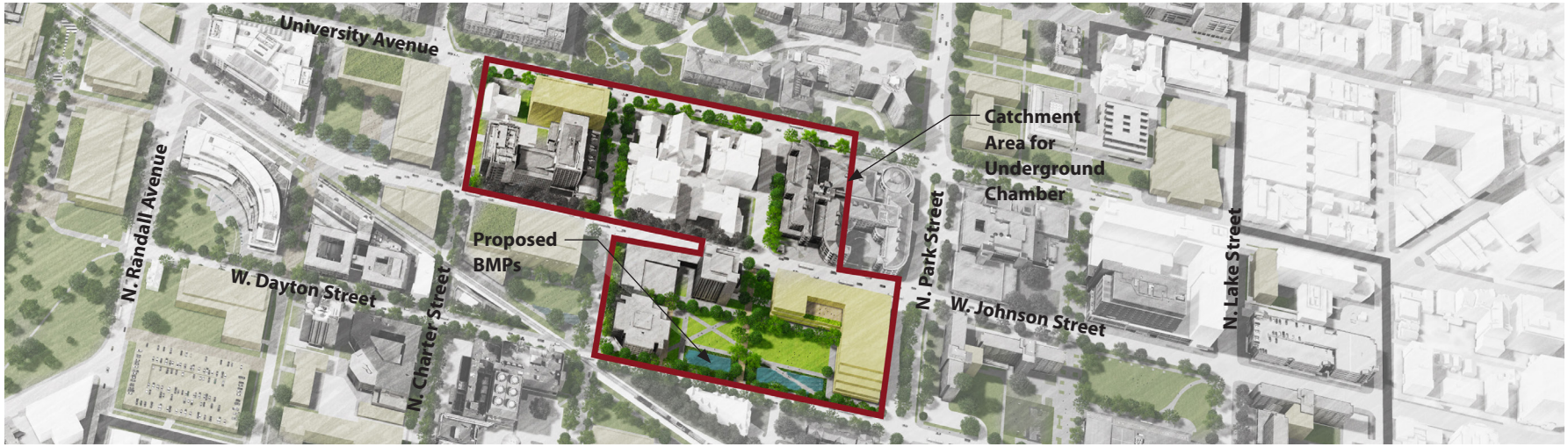


Figure 5-24 Birds-Eye View of Potential Catchment Area to South Campus Quad Underground Detention Chamber

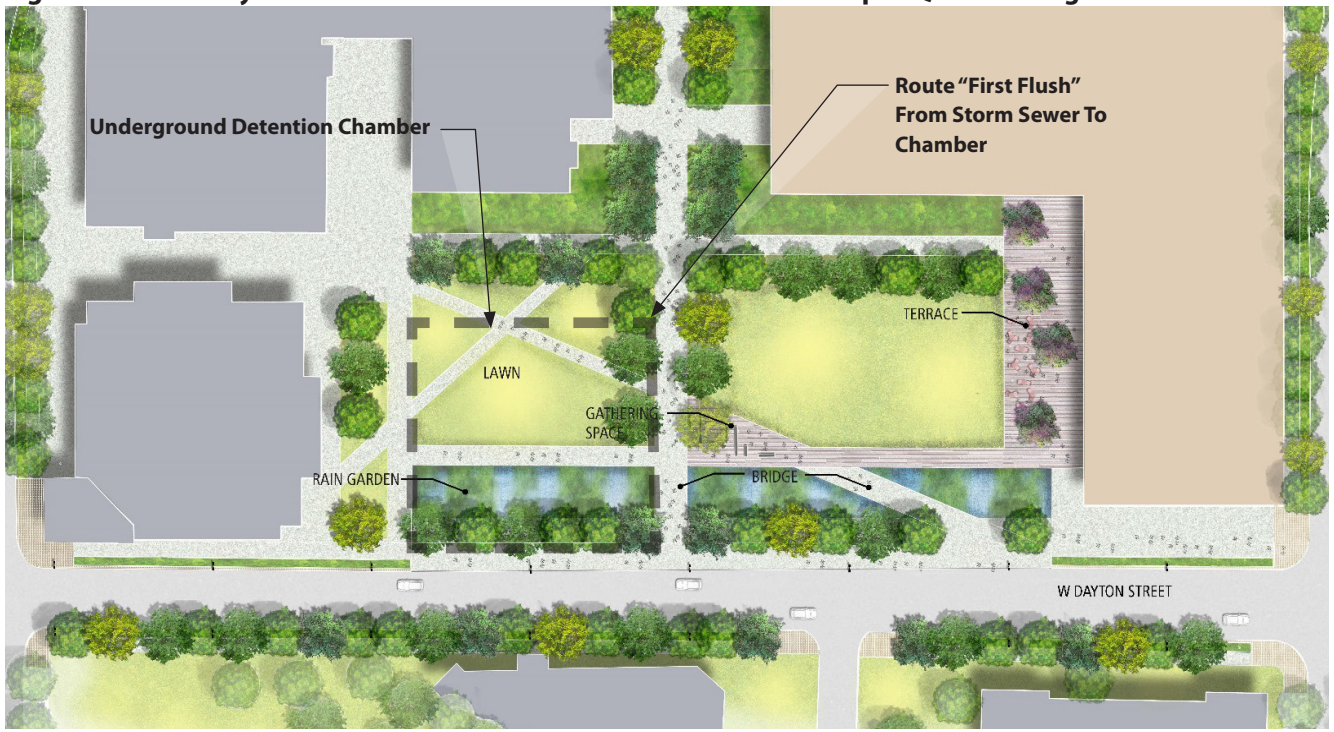


Figure 5-25 Close-Up of South Campus Quad BMPs

Underground Detention Chamber:

Potential Catchment Area: 16 acres

Design Assumptions:
Surface Area: 14,000 sf
Max Depth: 6 ft

Model Results:
TSS Captured: 4,300 lbs/year
Trapping Eff: 71%