Bio-Swale and Stormwater Capture and Reuse Project
IEPA IGIG Grant

Final Report
Agreement Number IGIG1301

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May 20, 2015

Prepared For:
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This report was prepared using Illinois Green Infrastructure Grant funds distributed through the Illinois Environmental Protection Agency. The findings and recommendations contained herein are not necessarily those of the funding agencies.

Pre-Construction Conditions

The Bio-Swale and Water Reuse Project is located on the City of Springfield Maintenance Facility. The project site was 100% impervious and contains the City's sewer garage, vehicle and equipment storage, the City's salt dome, and areas for stockpiling aggregate and debris as shown in Figure 1.

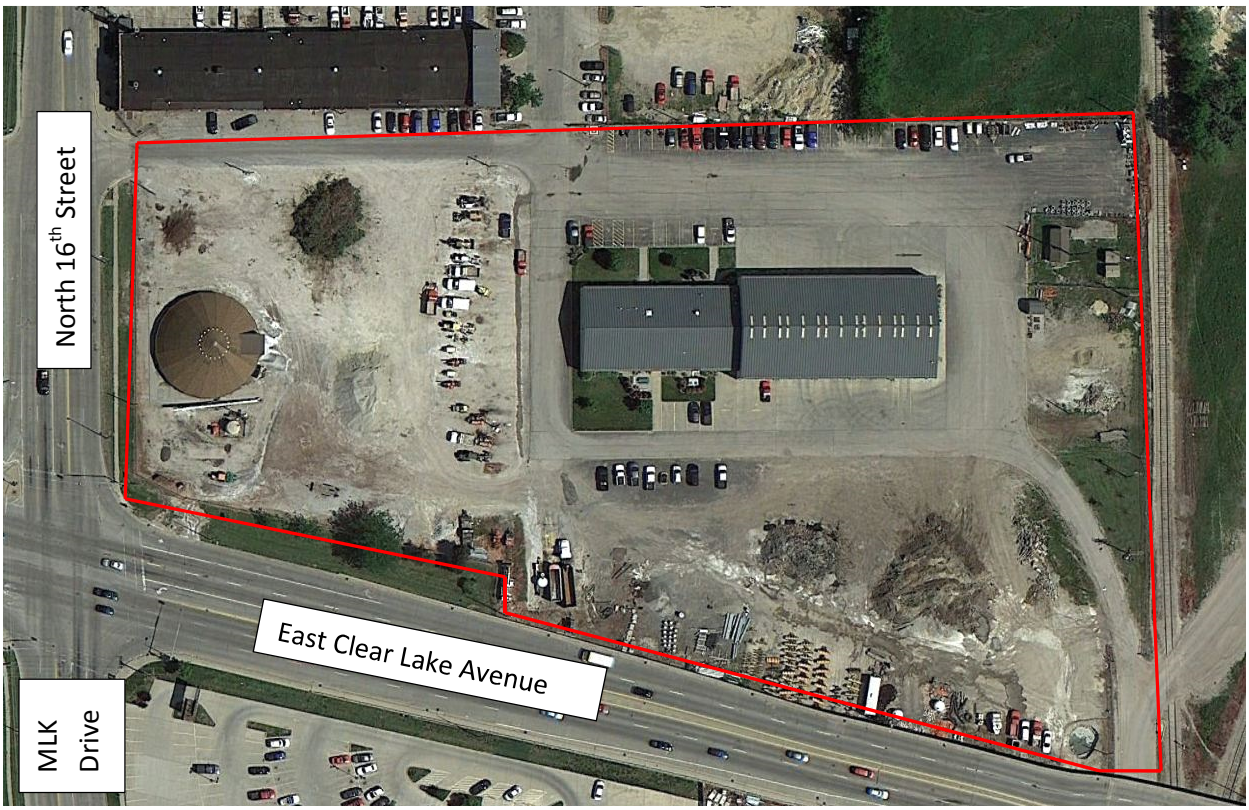

Figure 1: Pre-Construction Conditions of City Maintenance Facility (Image from GoogleEarth)

The site has a drainage area of 5 acres. Prior to construction, the existing facility had drainage issues with runoff from the west side of the site flowing overland and onto E. Clear Lake Avenue. The site has a high potential to have suspended solids in the storm runoff due to the salt dome and the temporary storage areas for many miscellaneous items (e.g. vegetation, recycled asphalt, soil and rock). On site, there are five area inlets that pipe the site drainage to the City's combined sewer.

The project site is located at the upper reaches of the Sugar Creek combined sewer. The combined sewer has a Combined Sewer Overflow (CSO) located immediately upstream of the Sugar Creek Wastewater Treatment Plant. The CSO discharges to Sugar Creek which is listed on the Illinois EPA's 303D list as not supporting aquatic life due to industrial point source discharges, upstream impoundments, crop productions, and municipal point source

discharges. Deductions in stormwater entering the combined sewer would reduce the overflows.

The pre-construction site did not provide treatment or detention of the site runoff.

Post-Construction Conditions

The construction improvements for the site include best management practices (BMP's) that will reduce the amount of runoff into the combined sewer system with detention and stormwater reuse, as well as provide a level of treatment to storm runoff that is discharged into the combined sewer.

The site was broken down into the east (water reuse) and the west (bio-swale) sub-projects to implement varying best management practices. The attached engineering plans and Figure 2 show the proposed construction improvements on the existing site.

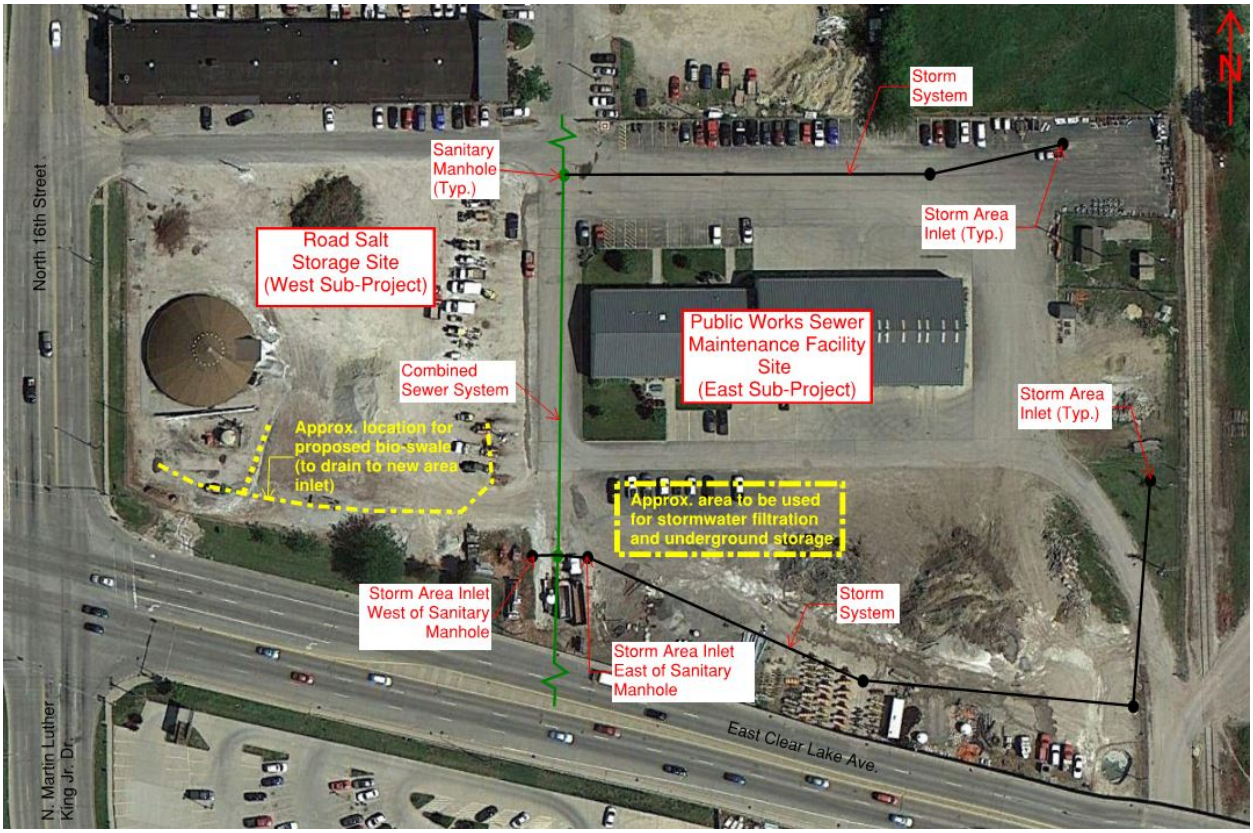

Figure 2: Construction Improvements (Image from GoogleEarth)

The east sub-project detains stormwater and provides the harvested stormwater for use to the Sewer Department for jetting sewers and watering planters. The construction consisted of installing a bypass manhole upstream of the connection to the combined sewer. The bypass manhole has a lower invert that directs the flow to a vortex style pretreatment device which removes floatables, suspended solids, and oils upstream of the underground

storage. The bypass manhole also has a backflow preventer installed on the outlet draining to the combined sewer to prevent any combined sewer overflow from entering the bypass manhole. The runoff stored in the underground storage pipes is pumped through a filter, a chlorinator, and into a clear-well holding tank where it holds enough water to fill all five of the City's jetting trucks in the morning. The City trucks will be filled by connecting to a cam-lock hose connection that pumps water from the clear-well holding tank. The clear-well holding tank is automatically filled with the underground storage water when water is available.

Figures 3 through 6 show the construction photos of the best management practices utilized on the east side of the project site.

Figure 3: Placement of the Underground Storage Pipes (Three 78 linear feet 96" diameter Duromaxx Storage Pipes)

Figure 4: Contech CDS 4040 Pretreatment Unit

Figure 5: Filter Building with Pump Controls and Hose Connection for City Personnel

Figure 6: East side of Project Site at Finish Grade with the BMP's buried in place.

The west sub-project utilizes bio-swales and bio-retention to reduce the suspended solids in the stormwater discharging to the combined sewer. The bio-swale is comprised of engineered media that the stormwater percolates through. A perforated drainage pipe under the bio-swale connects to the combined sewer.

The bio-swale has been seeded with salt and water tolerant vegetation. Currently, the vegetation has not been fully established on site. Since plant growth is not yet stable, the City has not performed water quality tests.

The utilization of the bio-swale eliminates the drainage issues on East Clear Lake Avenue that existed in pre-construction conditions.

See Figure 7 for the west sub-project construction photo.

Figure 7: West Sub-Project – Bio-Swale

Table 1 itemizes the permanent BMP's utilized on the entire project site.

Table 1: BMP's Utilized		
BMP	Preliminary Size (IGIG Proposal)	Final Size (Construction)
Bio-Swale	360 LF long; 12,418 Sq. Ft.	313 LF long; 13,000 sq. ft.
Vortech Pretreatment	1 Ea.	1 Ea.
Underground Storage Pipes (Cistern)	16,588 Cu. Ft.	13,170 Cu. Ft.

Table 2 summarizes the projected reductions in pollutant load.

Table 2: Projected Pollutant Load Reductions	
Pollutant/Impairment	Percent Reduction
Suspended Solids	83-92%
Turbidity	65%
Total Phosphorous	29-80%
Nitrate as N	89%
Hydrocarbons	75%
Flow (Rate and Volume)	41% and 1,403,000 gallons per year

Source: Bio-swale Performance from the State of Oregon DEQ
Pretreatment Performance from Contech

The Bio-Swale and Stormwater Capture and Reuse Project reduces the site runoff and provides treatment to a portion of the site's stormwater runoff that discharges into the combined sewer. The reduced stormwater discharge will result in less CSO's at the Sugar Creek CSO. The City will reduce the amount of potable water that is used to flush sewer and storm lines and water plantings around the city due to the implementation of this project.