

# SiDE

## Silver Brook Daylighting Efforts

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## Mission Statement

The University of Delaware recently developed the Science, Technology and Advanced Research (STAR) Campus. This new campus accounts for 22% of the University’s land holdings and houses facilities that will be used for research and development in energy, the environment, national security and defense, health and life sciences, and land use. The new campus strives to promote environmental health through implementation of best practices for stormwater and promoting natural areas and green spaces. To accomplish this task, the currently underground Silver Brook that runs underneath the new campus will be daylighted by 2030 and its surrounding area will be transformed into a greener setting.

## Watershed Characteristics

Silver Brook is a tributary of the Christina River, one of four drinking water intake streams in Delaware. Silver Brook flows first into Christina Creek which then discharges into the Christina River, many segments of which do not meet water quality standards for dissolved oxygen, nutrients, and bacteria. The Christina River is one of only 6 trout streams in Delaware and is overseen by the Christina Conservancy. The Silver Brook watershed currently consists of 43% urban and 57% pervious material. Table 1 describes the hydrologic soil groups found in the Silver Brook watershed. The total watershed area consists of 736 square acres.

Table 1. Hydrologic Soil Groups of the Silver Brook watershed

Hydrologic Soil Group— Summary by Map Unit — New Castle County, Delaware (DE003)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ErB	Elsinboro-Delanco-Urban land complex, 0 to 8 percent slopes	B	205.4	27.9%
GhB	Gleneig-Wheaton-Urban land complex, 0 to 8 percent slopes	B	33.2	4.5%
Hw	Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded	B/D	7.1	1.0%
MtB	Mattapex silt loam, 2 to 5 percent slopes	C	10.7	1.5%
MuB	Mattapex-Urban land complex, 0 to 5 percent slopes	C	88.0	12.0%
OtA	Othello silt loam, 0 to 2 percent slopes	C/D	9.3	1.3%
Up	Urban land		311.3	42.3%
UzC	Udorthents, 0 to 10 percent slopes	A	29.9	4.1%
VoB	Urban land-Othello complex, 0 to 5 percent slopes		31.5	4.3%
WoB	Woodstown loam, 2 to 5 percent slopes	C	9.6	1.3%
<b>Totals for Area of Interest</b>			<b>736.1</b>	<b>100.0%</b>

## History of the Silver Brook

This proposal focuses on an underground segment of Silver Brook. The site in need of restoration was the location of a Chrysler Plant from 1951 to 2008. When the Chrysler plant was built, Silver Brook was relocated underground in an 84” culvert. In 2009, the University of Delaware purchased the site and began redeveloping it as the Science and Technology Campus (STAR Campus). The portion of STAR that was formerly the Chrysler plant is currently owned by 1743 Holdings LLC, a wholly-owned subsidiary of the University of Delaware. The Silver Brook drains areas of the University’s main campus, the STAR Campus, residential neighborhoods, and over 100 acres of industrial impervious surfaces from the former Chrysler plant site. Figure 1 shows the Silver Brook Watershed and underground Silver Brook culvert.



Figure 1. Silver Brook Watershed and Culvert

## Location of the Silver Brook Restoration Site

The Silver Brook currently runs underneath the STAR campus in an underground culvert. The stream enters the culvert on the north side of the railway and continues south toward Route 4, where it is resurfaces. STAR campus is directly to the west of the University of Delaware College of Agriculture and Natural Resources. The site is bounded to the north by the Norfolk Southern and Amtrak train lines, to the east by South College Avenue and the south by Route 4. The western end of the site is a point where Route 4 and the train lines come together. Figure 2 shows the location of the Silver Brook in relation to University of Delaware campuses.



Figure 2. Location of the Silver Brook Restoration Site

## Regulations

The Final Plan of Remedial Action set by DNREC as of April 18, 2012 meets the requirements of the Hazardous Substance Cleanup Act. It requires that the former location of the Chrysler Newark Assembly Plant Site records an Environmental Covenant consistent with Delaware's Uniform Environmental Covenants Act on the property deed; it will therefore restrict installation and use of groundwater wells for drinking water supply, identify the site as located within a Groundwater Management Zone, and restrict the property to non-residential use. The Final Plan also requires the development and implementation of a Contaminated Materials Management Plan (CMMP) to ensure all contaminated materials encountered during intrusive activities are handled properly.

Environmental investigations performed on Unit-4 of the site above the Silver Brook include:

- 1985: DNREC Preliminary Assessment of entire site on behalf of the US EPA, recommended further investigation due to detection of perchloroethylene and trichloroethylene in the Newark municipal wells that was possibly due to contamination on site
- 2008: ATC environmental consulting firm conducted Phase I and II Environmental Site Assessments on behalf of Chrysler. The Former Paint Mix Area was labeled as a Recognized Environmental Condition (REC) due to release of paint purge solvents
- 2008: Duffield Associates conducted Phase I and II Environmental Site Assessments on behalf of 1743 Holdings, LLC. 6 soil samples and 4 groundwater samples were collected and analyzed for Priority Pollutant List metals, Target Compound List Volatile Organic Compounds, and total petroleum hydrocarbons, of which no soils exceeded Delaware's Uniform Risk-Based Remediation Standards (URS) values but 2 groundwater samples had elevated concentrations of arsenic, chromium, and lead
- 2010: Duffield Associates submit Limited Current Conditions Assessment to DNREC-SIRS characterizing the extent of impact on soils and groundwater
- 2011: Duffield Associates conducted Limited Current Conditions Assessment to assess the potential of substances of concern migrating which concluded there was no migration

## **Goals and Objectives**

- Excavate Silver Brook
- Increase green space on STAR Campus around Silver Brook and eventually connect to other green spaces on campus
- Improve water quality of the Silver Brook
- Improve the ecological conditions of the Silver Brook and the landscape around the Silver Brook such as decreasing impervious areas
- Decrease flooding on STAR Campus by adding more green space and reducing runoff

## **Problems and Solutions**

If the pipe is removed to daylight the Silver Brook, there will be runoff that was diverted by the pipe. Also, the likelihood of contamination getting into the Christiana River is increased by the amount of impervious surfaces for Silver Brook watershed, nearing 40% coverage. Impervious cover contributes to flash floods during storms, and decreases infiltration to recharge groundwater. This environmental problem can be solved by adding more green space such as a Riparian buffer consisting of native plant species, which slow erosion and support local wildlife. STAR campus can turn areas that were pavement into green space to decrease runoff. For example, a stormwater strategy could be to add green corridors that are greenways that combine pedestrian and bicycle pathways. A solution to removing the pipe could be to create a new stormwater plan to deal with the extra runoff.



Figure 3. Proposal of Green Space

A problem in daylighting the Silver Brook is that there are hazardous material surrounding the pipes that contain the Silver Brook. Coal, ash and slag were used in the insulation for the culvert piping, and to prevent this material getting into the Silver Brook, involvement of outside organizations is needed to properly dispose of the coal, ash and slag. Also, historical processes that occurred adjacent to the Former Paint Mix Building, including a release of paint purge solvent consisting of xylenes, toluene and methyl ethyl ketone from a 7,500-gallon underground storage tank, have resulted in negative environmental impacts. Currently, Duffield Associates is conducting a Brownfield Investigation, but this investigation must be completed to make sure contamination is completely gone before action can be taken to create green space.

Restoring a brownfield site is an expensive undertaking, as it requires the involvement of multiple resources and organizations. There are plans to incorporate stormwater systems into the area, which is costly in itself, but preventing groundwater contamination calls for specialists in planning, environmental science, and engineering. Given enough time and funds, they must measure contamination and create ways to prevent it in the future, which then requires further funding. The EPA has a Brownfields Program and Land Revitalization Program which provide financial aid to projects involving clean-up and restoration of areas containing hazardous waste (ie. brownfields)



so that they may be sustainably used. About 1,000 grants have been awarded, averaging \$200,000 per grant. The average cost of remediating a brownfield site is \$602,000.

## **Conclusion**

The Silver Brook runs through an area formerly occupied by Chrysler and was contaminated by hazardous materials that leached into the soil. Part of the Silver Brook is confined to a pipe lined with coal, ash, and slag which also contribute to water contamination. Numerous site assessments have been conducted to evaluate the Silver Brook and it has been concluded that pollution will not migrate. There are plans to convert areas of the watershed to green space, including Riparian buffers to reduce runoff from STAR campus' impervious surfaces. Hopefully, the Silver Brook has a successful remediation and is daylighted.

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