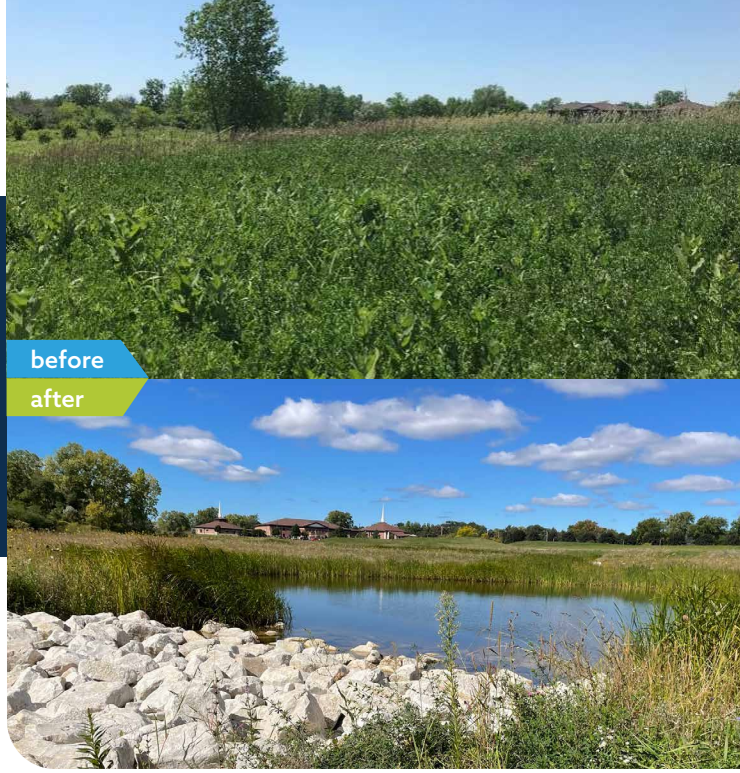
AQUALIS

MILWAUKEE, WIS.

CONSTRUCTED STORMWATER WETLAND FOR NEW TESTAMENT CHURCH



The Milwaukee Metropolitan Sewerage District (MMSD), in partnership with Corvias Infrastructure Solutions, embarked on an ambitious Green Infrastructure (GI) initiative to transform stormwater management in Milwaukee. Central to this effort is a state-of-the-art Constructed Stormwater Wetland (CSW) at New Testament Church (NTC), a groundbreaking 4.7-acre project designed to capture, treat and store 1.86 million gallons of stormwater annually. The CSW is strategically situated within the Menomonee River Watershed, capturing and treating stormwater runoff from a 98.4-acre drainage area. This effort contributes towards MMSD's overarching 2050 vision of achieving zero combined sewer overflows, with a goal to alleviate localized flooding and enhance water quality.

AQUALIS (formerly Stormwater Solutions Engineering, LLC) played a pivotal role in bringing this vision to life. Through meticulous planning, seamless coordination and technical expertise our AQUALIS engineers addressed the immediate stormwater challenges and laid the groundwork for long-term environmental resilience.

PROBLEM

Stormwater management long posed as a challenge for the New Testament Church (NTC) property and surrounding land. The NTC site spans across four parcels and intersects runoff from various sources, including upstream developments and municipal storm sewers. This interconnection of stormwater led to significant unregulated flows into a tributary of the Little Menomonee River. Historically, the land had undergone various alterations, including agricultural use, parking lot construction and the installation of storm sewers. These usages and changes altered the hydrology, impairing the natural drainage patterns. Without appropriate stormwater management, runoff from the site overwhelmed the Little Menomonee River with pollutants such as phosphorus, fecal coliform and total suspended solids. The municipal storm sewer was sending untreated runoff into this already impaired water body, worsening downstream flooding and pollution, and threatening both urban infrastructure and the local ecosystem. Furthermore, the project had to comply with regulatory requirements, including TMDL (Total Daily Maximum Load) mandates and MS4 (Municipal Separate Storm Sewer System) permits, while balancing the practical needs of landowners and long-term maintenance commitments. Addressing these interwoven technical, regulatory and environmental challenges required a strategic approach built on innovative engineering and collaborative stakeholder engagement.

Stormwater runoff has increased as a threat to Milwaukee's urban infrastructure and waterways and the NTC site was impacted by runoff from nearby residential, commercial and

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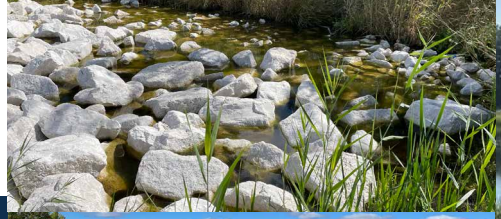

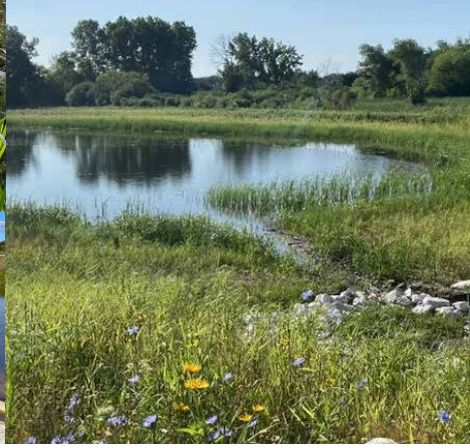

undeveloped areas that collected pollutants. These pollutants included phosphorus, fecal coliform and chloride before draining into the Little Menomonee River, a tributary as listed by the Clean Water Act (CWA). The site's close connection to the City of Milwaukee storm sewer worsened the problem, as fast-moving stormwater intensified erosion and overloaded drainage systems during heavy rain. Historical land-use practices further complicated the situation as decades of agricultural activity, followed by urban development, disrupted natural hydrology. This activity rendered areas of land vulnerable to flooding and poor infiltration. These unique challenges required an innovative and effective stormwater solution capable of reducing pollutant loads and alleviating stress on existing sewer systems.

SOLUTIONS

The AQUALIS Engineering Services Division recognized all the complexities of this site's stormwater challenges and engineered a multifaceted solution: construction of a dual-cell stormwater wetland system. AQUALIS facilitated the project's initiation coordinating with both Corvias and the property owner by conducting a detailed site analysis and managing specialized subconsultants for borings, surveys, wetland delineation and landscape architecture. AQUALIS engineers ensured the design met the rigorous environmental standards by collaborating with local agencies, including the City of Milwaukee and the Wisconsin Department of Natural Resources (WDNR).

The CSW drainage design directs the site's stormwater pathways into an upper wetland cell for initial storage and treatment and any overflow conveys over a rip-rap weir into a lower wetland cell for additional retention and pollutant removal. This two-tiered approach allows the system to retain approximately 1.86 million gallons of stormwater during a 100-year event and reduce peak flows to the Little Menomonee River {by up to 35%} for smaller storm events.

The AQUALIS engineers demonstrated expertise across multiple dimensions of the project, ensuring success by adopting a comprehensive and proactive approach. By skillfully navigating the approval processes with the City of Milwaukee and the Wisconsin Department of Natural Resources (WDNR), AQUALIS secured timely authorization for storm sewer diversions and wetland impacts. Detailed hydrology models and soil investigations informed optimized grading plans and innovative features, such as a Class C clay liner, designed to protect groundwater and enhance slope stability. Sustainability was integral to the design and native vegetation was incorporated during the wetland's final phases to boost pollutant uptake, support biodiversity and reduce long-term maintenance needs. To safeguard long-term performance, MMSD secured an 11-year Conservation Easement and structured a phased maintenance plan, including a two-year post-construction guarantee to monitor and support ecosystem establishment. By combining rigorous engineering, visionary design and deep regulatory insight, AQUALIS not only achieved the immediate objectives of the New Testament Church CSW but also exemplified AQUALIS's commitment to durability, ecological stewardship and stakeholder satisfaction. With a history of innovation and results-driven solutions AQUALIS has proven to be an indispensable partner for transformative stormwater solutions.