City of Palmhurst Low Impact Development Bioretention Project

TCEQ Supplemental Environmental Project Program

TCEQ Contract 2017-0371

Final Report

Project Team

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Executive Summary

In this project, the Lower Rio Grande Valley (LRGV) TPDES Stormwater Task Force (Task Force), the Research, Applied Technology, Education and Service, Inc.-Rio Grande Valley (RATES-RGV) and the University of Texas Rio Grande Valley (UTRGV) collaborated with the City of Palmhurst to design and construct a bioretention system at Shary Chapel Municipal Park in the City of Palmhurst. The objective of the bioretention system implementation was to manage and improve non-point source (NPS) flows, help mitigate flooding and drainage issues, and address NPS pollution water quality concerns; this volume of runoff reduction would also remove pollutants from stormwater runoff and enhance the quality of water in and around the selected site.

One bioretention system containing three cells was designed by UTRGV Master of Science student Zenaida S. Guerrero, an intern with the City of Weslaco, and constructed in September 2019 at the Shary Chapel Municipal Park located south of Mile 4 road and Shary Road in Palmhurst, Texas. The design was overseen by UTRGV faculty, Andrew Ernest, Ph.D., P.E., Javier Guerrero, M.S., E.I.T., and Ahmed Mahmoud, Ph.D. The system was designed to collect the stormwater runoff from the parking lot and other areas in the park to provide some treatment before discharge it to the sewer system. Each cell contains a different bioretention media to test and measure effectiveness of each media in reducing the runoff volume and pollutants associated in the runoff for the research purposes. UTRGV civil engineering students helped in the design, and observed the construction progress to demonstrate LID technology and practices applications.

Task 1: Planning

UTRGV and RATES-RGV assisted the City of Palmhurst in planning several meetings to engage students and provide project information and technical guidance. The planning and design activities for this project were conducted through the participation of:

- City of Palmhurst: Project leader
- UTRGV: subcontractor, civil design team and technical advisors.
- Task Force and RATES-RGV: technical advisors.
- Atlas Engineering Consultants: Geotechnical consultants

Project leaders and the City of Palmhurst coordinated a geotechnical study to test infiltration capacity of natural soils at the site. For the study, it was found that the project location soil characteristics are either lean clay with sand or clayey sand.

Using the soil characterization and the survey conducted by the City of Palmhurst, project leaders developed the engineering design of the bioretention system. Table 1 is a listing of the planning and design meetings conducted for the project.

Table 1. Summary of planning and design meetings for the SEP project

Date	Participants	Topics discussed
February 1st, 2018	UTRGV City of Palmhurst Atlas Engineering Consultants	Scope of the project Green Infrastructure Bioretention rationale
June 25th, 2019	UTRGV City of Palmhurst	Schedule the geo-tech
August 7th, 2018	UTRGV City of Palmhurst	Discuss the geo-tech study results
August 10th, 2018	UTRGV City of Palmhurst	Site visit to decide the exact location of the bioretention cell in the park
August 29th, 2018	UTRGV City of Palmhurst	Discuss the city drainage policy and materials selection
September 24th, 2018	UTRGV City of Palmhurst	Site visit to explore the initial design options and city recommendations
January 14th, 2019	UTRGV City of Palmhurst	Discuss the initial project design and site visit for modifying the design.
February 5th, 2019	UTRGV City of Palmhurst	Modified design drawings and the city plans for starting the construction
April 2nd, 2019	UTRGV City of Palmhurst	Discuss the final project drawings and city approval
August 13th, 2019	UTRGV City of Palmhurst	Check the ordered material if it meets the specifications

Task 2: Design

UTRGV students designed the bioretention system for the City of Palmhurst. Before construction, several field site visits were conducted by the project stakeholders to discuss and decide the optimum location for the bioretention cell. The final bioretention system included three treatment cells with locally sourced sandy clay loam, washed sand, and recycled concrete.

Each cell has a perforated underdrain to collect the infiltrate and discharge it to the detention system (Figure 1).

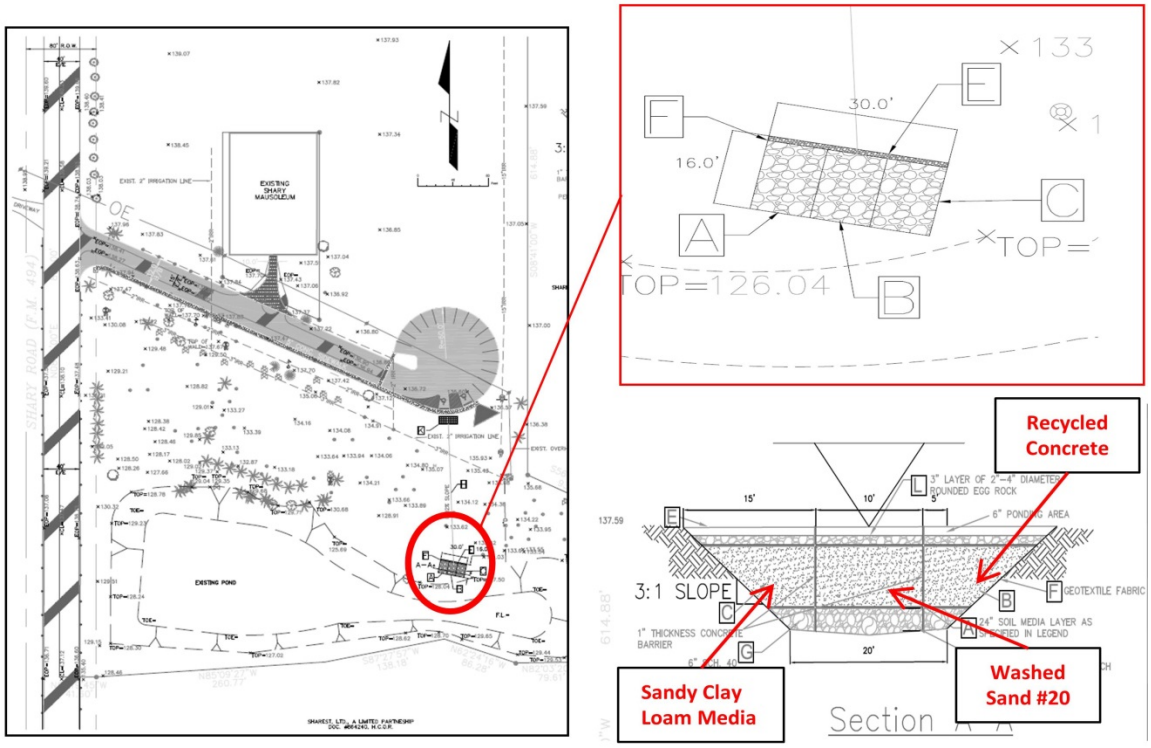

Figure 1. Plan view of three treatment cells and cross-section view of each cell showing the type of media used in the project.

Task 3: Construction

In September 6th, 2019, the construction started based on a design developed by UTRGV and approved by the City. Figure 2 shows the bioretention system location before construction. The construction was completed in November 2019, figures 3-6 shows the different phases during and after the construction.

Figure 2. Bioretention location and site before the construction starts.

Figure 3. Construction starts at the site and materials used.

Figure 4. Excavation at the site and pipe installment.

Figure 5. Bioretention three cells build up and different media used for each cell.

Figure 6. Bioretention cell surface cover and site after construction.