**Introduction**

The Paterson Greenhouse facility is located on the campus of Auburn University. The client has requested a design for a water collection, detention, and distribution system in order to reuse water used for irrigation. The current system has the irrigation water leaving the site through a degraded gravel trench and into a small creek. Recycling the water will provide cost savings and prevent further erosion of the creek flowing adjacent to property. The proposed project will account for the available land to work with, flooding during heavy rain events, and continued functionality of the sprinklers.

**Design Objectives**

- Create a collection system design that will effectively intercept peak season runoff and 25-year storm event runoff from two and a half acres of gravel nursery pads and route it to a retention pond for detention and treatment, while maintaining one foot of freeboard in the design.
- Design a pump station that will pump the reclaimed water from the retention pond into a hydropneumatic tank so that water can be reused for irrigation on-demand.

**Dry Enhanced Swale Design and Details**

In order to create a collection system that effectively intercepts the peak season irrigation and storm runoff from a 25-year storm, an enhanced dry swale was designed. This was designed to utilize the space allotted while also treating and filtering the runoff water. The enhanced swale collects the water, treats it, and sends it downhill into the retention pond for further treatment and storage. Details of the enhanced swale are shown below.

**Wet Extended Detention Pond Design and Details**

The wet extended detention pond is designed to hold 12,614 ft³ of water collected from the nursery pads. The pond was designed to hold 10,367 ft³ more than what is required to irrigate the nursery pads in one day in order to act as a sink for the rest of the property. This allows the pads to be watered for five days from the stored water without any rainfall. Due to the lack of appropriate soils, the pond will require a liner. This will ensure that there is little to no seepage during periods where the soil is dry.

**Pressure Tank and Pump Design**

To move the collected water from the wet extended detention pond back to the sprinklers, an irrigation pump and hydropneumatic tank were sized and selected to meet the peak-season operational flowrate of 116 gallons per minute. The purpose of the pump is to move water uphill for irrigation reuse. The hydropneumatic tank is needed to store the reclaimed water and prevent pump wear due to rapid pump cycling while the sprinklers are being turned on and off during daily operation. The selected pump is 79% efficient and rated for 9.77 horsepower. Peak operation would require 6.65 horsepower. The selected tank is a 400-gallon cylindrical horizontal hydropneumatic tank 8.25 feet in length with a diameter of 3 feet.

**Cost Analysis**

The average yearly cost of water is currently $33,507. With the reclamation system, this is reduced to $13,480. Factoring in the average yearly cost savings of $20,027 and total project cost of $515,235, the estimated payback period is around 26 years.

**Summary**

The proposed design will satisfy the objectives listed for this project. A dry enhanced swale will capture, treat, and convey the water toward a wet extended detention pond. The pond will treat the water for any remaining harmful chemicals. The selected pump will convey the water to a pressurized tank where it will be used to feed the sprinkler heads, thus saving the university money by recycling and reusing the irrigation and stormwater runoff. The proposed system will save approximately $20,000 per year in water costs.

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**Paterson Nursery Irrigation Water Reclamation Project**

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