American Excelsior Company®

Recyclex® TRM-V
Fly Ash Landfill Capping Project

Case Study – Vegetated Long-Term Solution

Introduction

In 2019, a coal fired power plant in Illinois was scheduled to be retired. The decision to close the plant was made to address the recently approved revisions to the Multi-Pollutant Standards rule from the Illinois Pollution Control Board.

As a part of the plant retirement, the owners laid out a plan for the permanent closure of the two ash ponds located on the property.

This project is a terrific example of how turf reinforcement mats (TRMs) can be integrated as part of a vegetated solution. TRMs provide long-term protection and a host of other benefits (see Figure 1).

Figure 1. Retired Fly Ash Landfill with Vegetated Swales Reinforced with Recyclex® TRM-V

850 Avenue H E | Arlington, TX 76011
Phone 1-800-777-SOIL | Fax 817-385-3585 | www.Curlex.com | Form#340/W1221R1224

Background

In 1976, the Duck Creek Power Plant was commissioned to supply power to the surrounding area. The power plant was a bituminous coal facility generating 441 MW of energy. The plant was owned by Ameren, an Illinois power company, until March 2013 when it was purchased by Dynegy, who later merged with Vistra Energy.

Ash ponds are also known as a surface impoundment or ash basins. They are engineered containment structures. They are typically located on the sites of fossil fuel power plants. Details of the two ponds at this site are provided in Figure 2. These structures are designed for the disposal of two types of waste byproduct: bottom ash and fly ash (see Figure 3). These waste products are generated during the coal combustion process. The pond structure is utilized as a landfill to prevent the release of contaminants into the environment.

Ash ponds utilize gravity to settle out large particulates and reduce the total suspended solids (TSS) from the power plant's wastewater before treatment. These containment basins are generally built using a ringed embankment of various heights. The height is determined by the capacity needs of the site. Many embankments are designed using specifications associated with embankment dams and include clay cores to prevent seepage and failure. According to the EPA, as of 2012, there were 735 surface impoundments in the United States.

<u>Ash Pond 1</u>
Commissioned: 1976
Surface Acres: 58 acres
Storage Capacity: 1,900 acre-feet

<u>Ash Pond 2</u>
Commissioned: 1994
Surface Area: 85 acres
Storage Capacity: 800 acre-feet

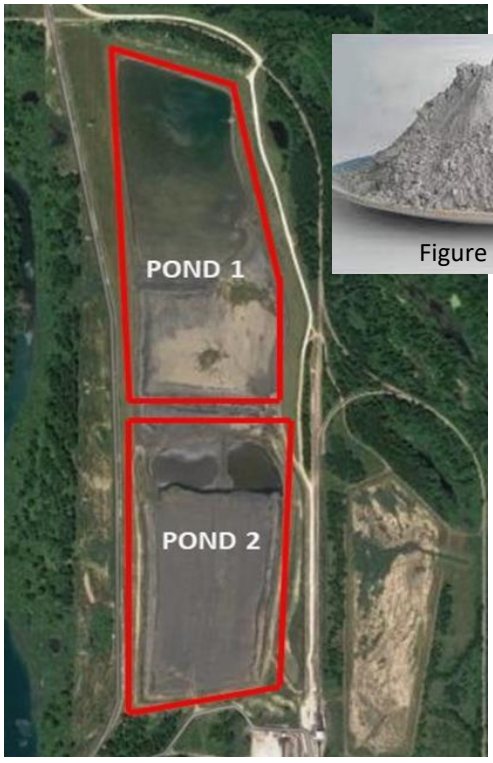

Figure 2. Ash Ponds 1 and 2


Figure 3. Fly Ash

Project Team

Vistra Energy hired the engineering team of Civil & Environmental Consultants, Inc. (CEC) from Pittsburgh, PA, to develop the final closure design solution and create specifications for the Best Management Practices (BMPs) to be used on the project. Central Landscaping of Princeville, IL, was hired to complete the swale stabilization work on site. Many of the erosion control and sediment control products used were manufactured by American Excelsior Company.

Design Solutions

Upon closure of the two ash ponds, the owner was faced with engineering a solution to stabilize and contain approximately 143 surface acres of residual ash. A time-tested closure design would be implemented at both pond locations (see Figure 4). As part of the capping design, the plan would require a layer of clay soil to minimize seepage of surface water into the stabilized pond core. The clay layer and crowned surface design would significantly increase rainfall runoff.

This runoff would require a system of swales designed to handle flow volumes and shear stress levels that vegetation alone would not withstand. To prevent damage to the containment structure, the solution needed to provide long-term support to the channels, eliminate erosion, be easy to maintain, re-vegetate quickly, and blend in with the environment.

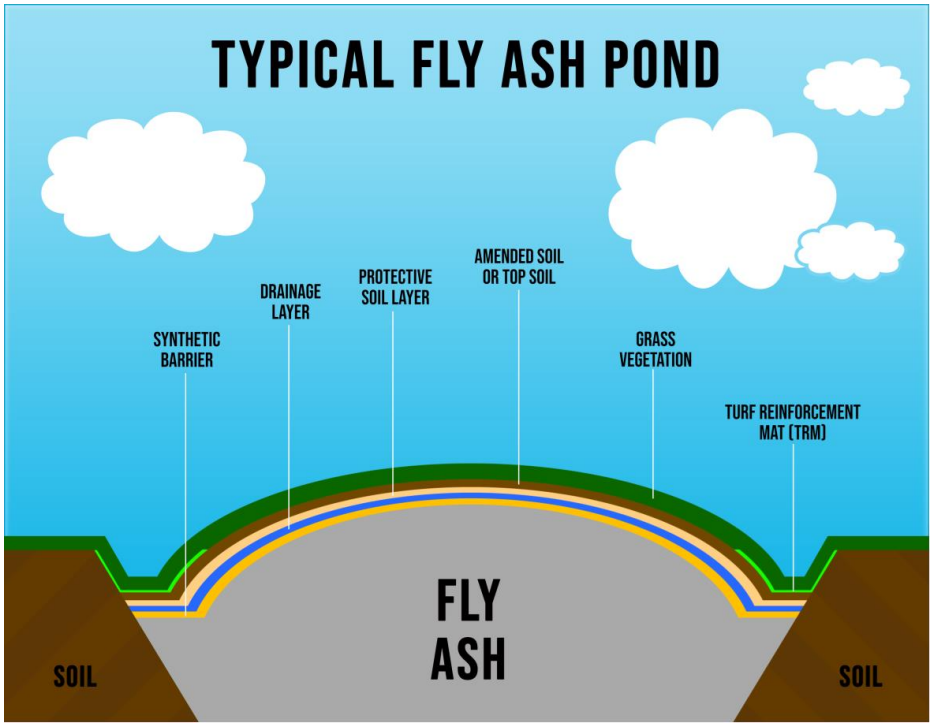

Figure 4. Typical Ash Pond Closure Design

Best Management Practice Specification

After evaluating the performance, specifications, appearance, and cost of various BMP options, the CEC team chose to use a TRM as part of a vegetative swale solution. Central Landscaping knew the ideal TRM product to use on the project was Recyclex TRM-V.

Recyclex® fibers are made from 100% post-consumer recycled poly fibers (green plastic bottles). 80% of the Recyclex fibers are 5" or greater in length. Recyclex fibers differ from the synthetic fibers used in most other TRMs on the market. They are tightly crimped and curled to allow the fibers to interlock. The fibers retain 95% memory of their original shape after loading by hydraulic events. Recyclex fibers have a specific gravity greater than 1.0. This means, unlike other TRMs, Recyclex TRMs will not float during hydraulic events. Keeping TRMs close to the seedbed means less erosion and seed migration.

Recyclex TRM-V fibers are stitched between by two strong layers of UV-resistant polypropylene netting to form a three-dimensional matrix that is designed to provide long-term support for vegetation and root systems.

Recyclex can be installed like a standard erosion control blanket by placing it over the prepared soil and seed bed. Recyclex can also be installed over the prepared bare soil, soil-filled, seeded, and then covered with a temporary erosion control blanket. This soil fill method allows the root system to grow directly through the Recyclex TRM-V and into the soil.

The environmental benefits of vegetated swales are well documented (see Figure 5).

Environmental Benefits of Vegetated Swales

Reduce velocity and increased sedimentation	Filter of contaminants like heavy metals	Safer and softer than hard armor and rip rap	Easier site access than rip rap
Less destructive installation than rip rap	Return site to natural vegetated conditions	Increased stormwater filtration	Increased stormwater infiltration
Vegetation can be mowed if desired	Cooler water discharges than hard armor	Lower carbon footprint than rip rap	Lower installed cost vs. hard armor & rip rap

Figure 5. Environmental Benefits of Vegetated Swales

The Plan

- Prior to installation of the Recyclex TRM-V, the contractor provided finish grading services and applied a seed mixture containing tall fescue, perennial ryegrass, creeping red fescue, redtop, smooth bromegrass, medium red clover, and farm rye applied in a hydromulch slurry.

The designers utilized Recyclex TRM-V for the swales with slopes which were less than .5H:1V and had shear stress expectations of less than 8 lb/ft^2.

Central Landscaping installed Recyclex TRM-V in both 8’ and 16’ wide rolls with a length of 562.5’. This configuration allowed for quick and efficient installation of the TRM. The product was installed according to American Excelsior specifications and followed the recommended staple patterns (see Figure 6).

Figure 6. Recyclex TRM-V Installation Around Pond Perimeter

Observations

- According to Central Landscaping, the vegetation establishment exceeded expectations. Furthermore, the Recyclex TRM-V has controlled all noticeable erosion and protected the containment structure (see Figure 7). Central Landscaping attributes the excellent performance to the fact that Recyclex TRM-V has a specific gravity of greater than 1 and it does not float, "When TRMs don't float during hydraulic events, the soil and seed stay in place hastening re-vegetation for improved short-term and long-term protection."

Results

- Vistra Energy, CEC, and Central Landscaping worked together to design a solution, select the correct BMPs, and execute the plan. In total more than 80,000 yd^2 of Recyclex TRM-V was installed on this project. Recyclex TRM-V was able to handle the flow volumes and shear stresses that the vegetation alone would not withstand. The design eliminated erosion and prevented undercutting and soil loss. The completed project will provide the long-term protection that the site and surrounding area requires.

Figure 7. No Erosion on Pond Where Recyclex TRM-V was Installed