Executive Summary

In 2002 the Allegheny Land Trust (ALT) purchased the Wingfield Pines property in Upper St Clair Township, Allegheny County, PA. The site is an abandoned golf course along Chartiers Creek. The property was purchased with funding provided by the DCNR and private foundations, with the understanding that its long-term use would be conservation oriented. The property contains a large iron-polluted discharge from an abandoned underground coal mine. The discharge is the first major inflow of untreated mine water to Chartiers Creek and degrades the stream. In 2002, ALT received a Growing Greener grant whose purpose was to identify a treatment solution and develops construction plans for the selected option. ALT subsequently hired Hedin Environmental (HE), a local firm that specializes in passive treatment projects. HE's investigation indicated that the discharge was suitable for reliable passive treatment and sufficient land acreage was present on the ALT property. Several treatment system layouts were developed by HE. ALT selected a layout that provides full treatment of the water while also facilitating access to the system for educational purposes. The design was developed into a construction package. Permitting issues were investigated, and a permitting package was developed. The project was completed on budget and on time in June 2004.

This proposal requests funds to construct the Wingfield Pines passive treatment system. The plans, developed through the original Growing Greener grant are attached. The system will treat the 1500-2000 gpm discharge is a series of five settling ponds (3.7 acres) followed by a large (3.7 acre) constructed wetland. A construction budget has been estimated that is based on the developed plans and Hedin Environmental's experience with the construction of similar projects in western Pennsylvania. The project will be managed for ALT by the Western Pennsylvania Conservancy. Hedin Environmental will provide construction oversight and assist with construction-related project management activities. The total cost of the project is estimated at $949,826. Matching is valued at $169,000. The grant request is for $780,826.

The treatment system will accumulate about 100,000 lb/yr of iron oxide. HE has agreed to maintain the system in return for ownership of the sludge. It will be recovered and processed to a saleable condition at a future date. This arrangement limits the O&M requirements of the system.

The project will provide a major resource for environmental education in southwestern PA. The treatment system has been designed with several easily accessible viewing locations to accommodate educational uses by the community and school classes. The Township of Upper St Clair is developing a community park on an adjacent property. Funding for an environmental education center, located on that property, has already been received. We expect that the passive treatment system will be a central component of education regarding the area's mining history, environmental impacts of those activities, and the innovative methods used to resolve the water pollution problems.

Wingfield Pines Passive Treatment System

Construction Narrative

October 1, 2008

Project Overview

This project involves the construction of a passive treatment system for a large deep mine discharge. The discharge is located on property owned by the Allegheny Land Trust in the Township of Upper St Clair, Allegheny County, PA. The site is a former surface mine and golf course. The discharge currently flows from a concrete structure, through a small pond, down a channel, and through a culvert into Chartiers Creek.

The treatment system will function by aerating and retaining the mine water so that dissolved iron will oxidize to form an iron solid and settle. The system contains the following components:

1. the water will be collected in an anoxic manner from its current discharge structure;
2. the collected water will be piped, by gravity, 950-feet in a buried 24-inch diameter HDPE transfer pipe;
3. the transfer pipe will connect to a 420 ft long 24-inch HDPE pipe that will discharge the flow into Pond 1;
4. the water will flow from Pond 1 into a series of four settling ponds;
5. water will exit and enter each pond through 50 ft long troughs;
6. the final pond will discharge to a large constructed treatment wetland planted with native wetland species;
7. a small perennial stream flowing from the east will be directed in new channel that will discharge into the constructed wetland
8. the abandoned stream channel will be reconstructed as a small wetland that replaces wetlands impacted by the project
9. approximately 11,500 CY of excess cut will be moved to the southern side of the existing East-West berm

Project Management

Allegheny Land Trust (ALT) is the property and project owner. ALT is the recipient of all project funding and holds all project permits. The Prime Contractor will develop a contract with ALT who will pay all approved invoices. The project engineer is Hedin Environmental (HE). HE developed the treatment system design, developed the permit applications, and will monitor construction activities. All invoices, modifications, and change orders must be approved by HE. Construction inspection will be conducted the PADEP Bureau of Abandoned Mine Reclamation (BAMR).

Project Website
The construction documents and information regarding the project and bidding process are available at http://www.hedinenv.com/wingfield.htm.

Project Permits
The project has received a construction NPDES permit from the Allegheny County Conservation District; an approved Erosion and Sediment Control Plan, a Water Obstruction and Encroachment permit from the PA Department of Environmental Protection; a Section 404 permit from the US Army Corps of Engineers; and a Grading Permit from the Township of Upper St. Clair. Copies of the permits are available from ALT. The contractor is expected to review the permits and assure that the construction aspects of the project are completed in a manner consistent with permit requirements.

Project Schedule
The Project must be initiated no later than February 17, 2009. The target completion date is July 17, 2009.

Construction Plans
The construction plans are shown on sheets 1, 2, and 3. The plans were developed on 1" = 50' and 1' contour elevation mapping developed in 2003 by D.E.M. Surveying, P.C. (Brookville PA). The plans were developed using AutoCAD and a DWG file will be provided to the contractor upon request.

Construction Narrative
This document is the Construction Narrative. Several changes to the construction plans are contained in the narrative and supersede the plans. These changes are clearly NOTED.

Erosion and Sediment Control (Budget item B)
The approved E&S Control Plan is available on the project web site. The E&S Control Plan should be implemented by the Contractor as required.

Clearing and Grubbing
There is negligible vegetative clearing and grubbing. The Owner wishes to preserve all large trees. Trees that must be removed should be either removed from the site or chipped and incorporated into the constructed wetland substrate.

Several asphalt tennis courts are present that must be removed. Remnants of the pre-existing drainage/irrigation system may be encountered. Asphalt debris and piping produced by excavation should be disposed of in the fill area.

Mine Water Collection (Budget Item C)
The goals of the mine water collection are to: 1) capture the water in an anoxic manner, 2) connect to the transfer pipe, and 3) to eliminate all leakage of mine water from the current discharge area.

The discharge currently flows from the abandoned deep mine into the bottom of several vertically stacked 72-in diameter (ID) concrete pipes. The elevation of the bottom of the vertical pipes is ~811.5 ft and the top is currently 832 ft. Modifications to the vertical pipe are shown on Sheet 2. The concrete pipe should be modified so that its top is 835 ft. The additional 3-feet extension pipe should be reinforced concrete or another material that is approved by the Engineer. The top of the concrete pipe should be capped with a concrete lid that includes a manhole. The manhole should be able to be secured to prevent unauthorized access. The connections between the existing pipe and new pipe and the concrete lid must all be watertight.

The discharge will be collected from the concrete pipe into a 24-in diameter schedule 40 PVC plastic pipe that passes through the concrete pipe wall and connects to plastic pipe that transfers the collected flow to the treatment system The vertical PVC collection pipe should be upcapped and hung within the concrete pipe and suspended 2.5 feet above the bottom. The lower 6 feet of the pipe should be perforated with 48 2" diameter holes.

The discharge originally flowed from a hole broken through the concrete pipe. The pipe was modified in 2003 to allow manipulation of the water level. The modification included placement of a "drain pipe" in the hole and sealing around the pipe with concrete (see drawing on Sheet 2). The end drain pipe is currently capped. Within the length of pipe between the concrete structure and the capped end is a tee connection where a riser pipe is positioned next to the concrete pipe. The top of this riser is at an approximate elevation of 832 and serves as the current discharge. The Contractor may remove or uncap the drain pipe, which should lower the elevation of the discharge in the vertical concrete pipe to below 826 ft and facilitate the installation of the collection system. At all times during construction, the mine drainage discharge must flow into the existing pond and channel to Chartiers Creek. When the collection system is complete, the drain pipe hole should be completely sealed and all leakage eliminated.

The design of the system will ensure that water is collected and transferred anoxically to the treatment system. However, solids that may form at the top of the vertical concrete pipe could sink and be drawn into the collection system. To prevent this, the Contractor shall install a fabric trap within the pipe at approximately 829.5 ft. A rigid plastic screen spanning the inside of the concrete pipe of approximately 6 feet in diameter is to be affixed horizontally (hung or attached to concrete side walls) at an elevation of 829.5 feet. A circular piece of fabric will be placed on this screen to collect any precipitates that fall after forming at the top of the water. This piece of fabric must be able to be retrieved through the manhole in the top of the concrete lid so that any collected material can be periodically removed.

It is possible that the most cost effective manner for installing the collection system will involve the removal of a portion of the existing concrete pipe and its replacement with pipe specially formed to facilitate the installation of the collection system. In this event, the contractor will provide a plan for the Engineer to review and approve before proceeding. The Engineer will consider alternative collection plans as long as the goals are achieved and the installed structure has a lifetime of at least 25 years.

At completion of the collection system, no water can be leaking from any part of the concrete structure or at the area where the PVC pipe passes through the concrete.

System Bypass (Budget Item C)

The PVC collection pipe will pass through the wall of the vertical concrete pipe and connect to a bypass system shown in (location shown on Sheet 1; detail shown on Figure A attached to this document). All pipe at the bypass will be 24 in diameter schedule 40 PVC. The bypass consists of two 24 inch stainless steel gate valves; one placed on the transfer pipe and the other on bypass pipe. During system operations, the valve on the transfer pipe will be open and bypass valve closed. During shutdown, the valve on the transfer pipe will be closed and the bypass valve opened so that the full flow discharges to the existing mine drainage pond at the northern end of the site. The valves should be placed on a compacted gravel pad and backfilled to protect them from vandalism. Each valve should have a valve box that allows access to the valve mechanism. The Contractor must demonstrate to the Engineer that that the valves and diversion system operate as intended.

Transfer Pipe (Budget Item C)

The 24 inch transfer valve will connect to a 24 in diameter plastic pipe that carries the flow approximately 930 feet to the treatment system. The pipe will be SDR 32.5 HDPE pipe that is welded together according to manufacturer specifications. The location of the transfer pipe location is shown on Sheet 1. The pipe will exit the concrete structure at 827.0 ft (invert elevation) and maintain this elevation at the bypass system and then will slope downward (at ~0.7%) so that it passes 2.0 feet below the bottom of the stream diversion (822.5 ft – invert elev.). The HDPE transfer pipe will then rise so that it passes two feet above the sanitary sewer (827.0 ft). The pipe will then extend to the east-west berm (at 829 ft) where it will switch to schedule 40 PVC prior to the 90 degree turn and connection to the Pond 1 influent pipe.

The pipe will be installed by excavating a trench, placing a bed of 6 inches of AASHTO 2A aggregate, and backfilling with at least one foot of suitable material (no stones > 3"). This requirement supersedes final grading shown on Sheet 1 for a small swale between the treatment system and the reconstructed stream channel. The Contractor will place clean fill in this area so that the transfer pipe is covered in a manner that does not detract from the treatment system's aesthetics. The Contractor will present the Engineer with a revised grading plan for this area that must be approved before implementation.

The Transfer Pipe will NOT contain cleanouts. This supersedes the pipe layout shown on Sheet 1.

Before backfilling, the Contractor will demonstrate that the pipe is competent by filling it with mine water.

Pond 1 Influent Pipe (Budget Item D)

The mine water will be introduced into Pond 1 via a 430 ft long pipe that is drilled with holes so that water is released at numerous locations along the pipe's full length. The pipe must be filled with water at all times so that anoxic conditions are maintained within. The flooded conditions will be maintained by water level control box and overflow discharge placed at the southeast corner of Pond 1. A detail of the piping associated with the water level control structure is on Sheet 3.

The HDPE transfer pipe will change to schedule 40 PVC prior to the 90 degree elbow that will connect to the Pond 1 influent pipe. After the 90 degree turn the influent pipe will connect via a T-connection to a water level control box that discharges to the eastern end of Pond 1. The water level control box will be a 6 foot AgriDrain Model – INLINE06X24P or similar structure and will be installed according to manufacturer's requirements. All connection into and out of the water level control box will be made with schedule 40 PVC. The PVC discharge pipe from the box will be directed into the pond and directly discharge onto the surface of the water (water elevation to be 828.5 feet in pond 1). The discharge pipe will be fully supported with a 6" thick layer of AASHTO 2A aggregate that is three feet wide. The Contractor will provide the Owner with a tool for removing stop logs that control the water elevation in the box. Surface grading around the flow control box will be at 833 ft. and slope down to the pond at a 2:1 slope. In addition, grading at the T connection shall be at 833 ft and slope down to expose the Pond 1 influent pipe at a 2:1 slope. This requirement supersedes final grading shown on Sheet 1.

The primary flow will pass by the water level control box and enter a pipeline that runs the length of the east-west berm and discharges at multiple locations to Pond 1. The pipeline will be constructed with 24 in diameter SDR 32.5 HDPE pipe. The pipe will be placed on the existing east-west berm on a three-ft wide level bench set at 829 ft elevation. A detail of the pipe's installation is shown on Sheet 3. The bench will be constructed by excavating a 6-inch deep trench and filling to a level 6 inch depth with AASHTO 2A aggregate. The aggregate will be underlain with a PennDot class 2, type A geotextile. The HDPE transfer pipe will be underlain by a plastic liner of at least 40 mil thickness that will extend into Pond 1, placed on the slope in a tidy manner, secured in place with plastic or stainless steel staples, and keyed into the ground both above the pipe and into Pond 1. The transfer pipe will be placed on the gravel pad and secured into place with concrete bumper blocks (5" x 9" x 6') placed every 25 ft (on center) along the pipe. Each bumper block will be secure to the ground with 4 ft long metal stakes.

The end of the Pond 1 influent pipeline will be capped.

The Pond 1 influent pipe will be drilled with approximately 400 discharge holes of 0.5 inch diameter. The drilling will occur after the pipe is installed and determined to be level by the Contractor and Engineer. The drilling pattern will be provided by the Engineer after the pipe is installed.

Pond Construction (Budget Item E)
Five ponds will be constructed that are connected serially. All ponds have a common bottom at 825 ft. The elevation of the top of the common berm that separates the ponds is at 830 ft. The berm width ranges between 10 and 15 feet. The berms slopes are 2:1, except for the southern bank of Pond 1 which is the east-west berm and follows the existing 7:1 grade.

All ponds and berms must be constructed with approved clay soils obtained onsite from areas where excavation is required. A soil investigation discovered good clay in the center of the site. The Contractor will expose the site subsoils and the Engineer will identify those materials to be used for pond bottom and berm construction. Excess cut will be disposed of on site (see below). All berms will be constructed in 6 inch lifts and compacted. The pond bottoms will be overexcavated to the degree necessary to assure that the pond bottoms have at least 6 inches of approved soil that will be compacted.

Pond Bottoms (Budget Item F) The bottoms of the ponds will have an aggregate base that will facilitate later removal of iron sludge. The bottoms will be covered with 6 inches of ASHTO #3 aggregate that will be rolled in to a level and compacted condition. The gravel will not extend up the pond side slopes.

Sanitary Sewer (Budget Item G)
The treatment system is being constructed on top of an existing sanitary sewer. The location is shown on Sheet 1 and in cross section A-B on Sheet 2. The location of the sewer will be clearly marked by the Contractor. The sewer is shallowly buried in the eastern portion of the project area and more deeply buried in the western portion. Trucks and heavy equipment will only cross the sewer in the western portion of the project area. A crossing area will be identified by the Engineer.

The system has been designed so that a primary berm is centered on the sewer and will be 15 feet wide. The area atop the sewer will be cleared of vegetation and the berms will be developed on top of the existing soils. Soils on top of the sewer will not be excavated without prior approval by the Engineer.

There is an existing sewer manhole in the project area (Sheet 1). The primary berm is centered on the manhole. The current elevation of the manhole is 828.4 ft. The manhole will be extended so that it is flush with the final berm surface at 830 ft (Figure B).

The sewer's condition within the project area will be documented before and after the project. The Contractor will "TV" the sewer before and after the project. The video tapes will be provided to the Township of Upper St Clair who must approve their condition before work on top of the sewer commences.

Troughs (Budget Item H)
Mine water will flow from pond to pond through troughs. Each pond will have a 50 ft long *collection* trough that collects the pond discharge and connects to a 50 ft long *distribution* trough in the next pond. Water will be transported from trough to trough through open channel that will be covered at the ground surface with grating of sufficient strength for vehicular crossing.

The locations of the troughs are shown on Sheet 1. Details of the trough construction are on Sheet 3. The sides of the troughs will be constructed with vinyl pilings. One supplier of vinyl pilings is CMI Engineering (Atlanta, Georgia). The bottoms of the troughs will be 8 inches of poured concrete. All troughs will be constructed in the same manner. The troughs will collect and distribute water through rectangular weirs that are cut into the plastic panels after the troughs are installed. The elevations of the tops of the troughs must be precisely set in the field.

The connection between the collection and distribution troughs will also be accomplished with sheet piling with a poured concrete base. The tops of the pilings will be flush with the berm surface and will be equipped with secured grating that can be removed during maintenance. The connection troughs are shown in detail on Sheet 3.

The connection between the Pond #3 collection trough and the Pond #4 distribution trough will be unique because of the presence of the sewer line. The troughs will be connected with two 15 inch diameter schedule 40 PVC pipes placed two feet apart at the western end of the parallel troughs. The panels through which the pipes connect will be modified with water-tight flanges.

Treatment Wetland (Budget Items E and I)
The Ponds discharge into a large constructed wetland that will polish the discharge and provide wildlife values. A substantial portion of the treatment wetland has already been delineated as wetland (Sheet 1). Existing wetlands should not be disturbed by project activities, except where designated by the project plans. The wetland bottom is 825 ft, which is the current surface elevation for most of the eastern portion of the treatment wetland. Limited earthmoving disturbance of these areas is required.

The wetland contains two internal berms. The berms should be constructed with on-site soil approved by the Engineer.

The eastern internal berm connects to an existing rise that currently supports several willow trees. This natural rise will act as the end of the eastern internal berm. The trees should not be cut and the area should not be disturbed without permission by the Engineer.

The treatment wetland will be vegetated with a mixture of native wetland plants. The area is divided into four zones: 1) Zone A; 2) Zone B; 3) delineated wetlands; and 4) internal berms. Figure C shows the zones and Table 1 shows the plant and seed specifications for each zone. All plants should be bare root. Zone A will be planted with

a mix of cattails and rushes. Zone B will be planted with a diverse mixture of native wetland species. Delineated wetlands will not be planted. All wet areas (including delineated wetlands) should be seeded with an obligate wetland seed mix such as Ernst Conservation Seeds Obligate Wetland Mix ERNMX-131 at a rate of 15 lb per acre. Other seed mixes will be considered by the Engineer.

The two internal wetland berms will be planted with trees (Table 1). The trees should be placed on the berm outslopes so that walking paths can be maintained down the middle of the berms. The natural willow island at the end of the eastern internal berm will not be planted.

Table 1. Planting Specifications for Wingfield Pines Treatment Wetland.

Zone	Surface area or length	Plant Spacing	Total Plants Needed	Plant choices
A	55,311 ft^2	3.0 ft	6,150	*Typha latifolia or T. augustifolia* .(Cattail) *Scirpus validus* (Soft Stem Bulrush) Cattails should comprise no more than 60% of the total plants
B	48,672 ft^2	2.0 ft	12,168	*Leersia oryzoides* (Rice Cutgrass) *Sparganium americanum* (Lesser Burreed) *Pontederia cordata* (Pickerelweed) *Peltandar virginica* (Arrow Arum) *Scirpus validus* (Softstem Bulrush) *Alisma plantago aquatica* (Water Plantain) *Carex stricta* (Tussock Sedge) *Sagittaria latifolia* (Duck Potato) *Scirpus cyperinus* (Woolgrass) No single species comprising more than 25% of total plants
Delineated Wetland	47,500 ft^2	none	none	No plantings
Berms	561 ft	4 ft	280	*Salix spp.* (Willows) *Viburnum spp.* (Arrowwood, Nannyberry, or Cranberrybush) *Cornus stonlonifera.* (Red Osier Dogwood). *Cephalanthus occidentalis* (Buttonbush) *Sambucus canadensis* (Elderberry) No single species comprising more than 40% of total plants
Wetland Seeding				
All Wet Areas	161,500 ft^2	15 lb/ac	55 lb	Obligate wetland seed mix

Stream Relocation (Budget Item J)
A small stream currently flows on a bench above the construction area and discharges into the mine water pond. The stream will be relocated into the constructed wetland as shown on Sheet 1. Details of the ditch and an energy dissipator pool are shown on Sheet 2. At the 825.5 ft elevation, the ditch will contain a pipe that collects stream baseflow and directs it into the Replacement Wetland.

Replacement Wetland (Budget Item K)
The abandoned stream channel will be reconstructed as a wetland. Sheet 1 shows the location of the location of the replacement wetland. The replacement wetland will be 555 ft long with a width that varies from 5 to 28 ft. The surface area of the wetland is 10,450 ft^2 or 0.24 acre. The Engineer will assure that this surface area is attained.

The wetland will receive water from runoff over the existing eastern highwall and from the pipe installed in the stream diversion (Sheet 2).

The wetland will be constructed with soils salvaged on-site during the treatment system construction. Soils will be salvaged from Wetlands 4, 5, 6, and 7. The Engineer will identify other suitable soils disturbed during construction activities that will be placed in the replacement wetland as a rooting substrate. The wetland will have a total depth soil depth of 18 inches.

The replacement wetland plants will be supplied by the seed bank contained in the salvaged soils and by seeding and planting. The wetland will be seeded with 3.6 lb of an obligate wetland seed mix that is equivalent to Ernst Conservation Seed Mix ERNMX-131 and planted with 1,100 bareroot plants selected from the seed mix. At least five species will be selected and no single species will comprise more than 30% of the total plants.

Excess Cut Placement (Budget Item L)
Approximately 11,500 CY of excess cut is produced by the treatment system construction. This material will be placed on the south side of the existing E-W berm as shown on Sheet 1 and in the A-B cross section on Sheet 2. The fill area is intended to provide a natural amphitheatre that can be used for public events. The shape and slopes will be maintained. The final position of the slopes will depend on the amount of material moved into the area as fill. The existing surface soils in the fill area should be removed, stored, and re-spread on the site after the final grades are established.

Final Grading and Revegetation (Budget Item M) All disturbed areas should be graded to a condition suitable for public use and seeded and mulched according to the E&S Control Plan.

Performance Bond (Budget Item O) The Contractor will post a performance bond to assure that the work is completed as indicated in the project documents and to assure that all sub-contractors are paid. The cost of the performance bond can be included in the first invoice, after the initiation of project activities.

Work Rules
The Contractor must adhere to USC's regulations concerning construction activities.

Road Bonds
The Contractor is responsible for securing all road bonds necessary to complete the project.

Prevailing Wage
This project is funded by a grant from the PADEP and is subject to prevailing wage regulations. The project is registered with the Department of Labor and Industry.

Payment Procedures
The Contractor will prepare monthly invoices that show charges against project tasks shown in the bid document. The invoice will show for each task: 1) the total value contained in the bid; 2) the amount previously invoiced to this task; 3) the current charge to this task; 4) the remaining funds for the task, and 5) percent completion of the task. Any approved modifications to the project will be added to the budget document as a new task. A copy of each invoice should be submitted to the Engineer for review and approval. The approved invoice will be submitted to ALT for payment processing.

The project is funded by a PADEP Growing Greener grant. Approved invoices will be submitted by ALT to PADEP. The payment of invoices by PADEP generally takes 6-8 weeks. The Contractor should consider this delay in invoice payment when developing his bid.

Project Closure
PADEP withholds the final 10% of project funds until an authorized DEP employee has inspected the project and approved its completion. ALT will withhold the Contractor's last 10% of payment until this approval is received from PADEP. It is anticipated that when the Contractor, Engineer, and ALT are all satisfied with the project's completion, a meeting will occur with the PADEP to request closure of the construction portion of the project. The Contractor should consider that competency of the system's features may not be assessable until the system has operated for at least one month. It is likely that the final 10% of the contract will not be paid for 3-4 months after completion of construction activities.

Materials List
A materials list developed by the Engineer will be provided in a separate document posted on the project website.

Wingfield Pines Passive Treatment System Materials List

Materials List for Wingfield Pines Passive Treatment Project. This list is provided to assist bidders. Final determination of quantities needed to develop a bid and complete the project is the responsibility of the contractor.

Location	Item	Quantity
Discharge Collection Modification	60" diameter concrete manhole extension	3'
(note: a custom modification to the current discharge structure will be considered)	Manhole cover with lockable lid	1 each
	Solids trap (see narrative and detail)	1 each
	24" sch-40 PVC pipe (field perforated	13'
	24" sch-40 PVC 90° elbow	1 each
Bypass	24" sch-40 PVC 45° elbow	1 each
	24" sch-40 PVC T connector	1 each
	24" stainless gate valve	2 each
	24" sch-40 PVC pipe	40'
	Valve box	2 each
Mine water transfer Pipe	24" diameter SDR 32.5 HDPE pipe	920'
	HDPE → sch-40 PVC connectors	2
	AASHTO 2A bedding aggregate	92 tons
Overflow Control System	24" sch-40 PVC pipe	25'
	24" sch-40 PVC T connector	1 each
	24" sch-40 PVC 90° elbow	1 each
	AgriDrain 6 ft X 24" water level control structure	1 each
	AASHTO 2A bedding aggregate	3 tons
Pond 1 Influent Pipe	HDPE → sch-40 PVC connectors	1 each
	24" diameter SDR 32.5 HDPE pipe	415'
	24" diameter SDR 32.5 HDPE end cap	1 each
	AASHTO 2A bedding aggregate	31 tons
	PennDOT Class 2 Type A geotextile	415' X 6'
	40 mil UV resistant plastic liner	415' X 15'
	Staples to secure liner	As needed
	Concrete bumper blocks (5" X 9" X 6')	17 each
	Ribar to secure concrete bumper blocks, 4' length	34 each
Pond Bottoms	AASHTO 3 aggregate	3,300 tons
Transfer troughs	Flat vinyl panels (more detail, see table on page 3)	4,600 ft^2

Wingfield Pines Passive Treatment System Materials List

Transfer troughs (cont.)	Flat vinyl panel corners	140'
	Panel caps to support grating	152'
	Grating, 3' width suitable for pedestrian crossing	76'
	Concrete	37 CY
	Removal end plates (3' X 1.5')	8 each
	15" sch-40 PVC pipe (Ponds 3→4)	55'
	Water tight connection between vinyl sheets and 15" pipes	4 each
	AASHTO 2A bedding aggregate	3 tons
Constructed Treatment Wetland	Zone A plants (see narrative)	6,150
	Zone B plants (see narrative)	12,168
	Berm trees (see narrative)	280
	Obligate wetland seed mix	55 lb
	Energy dissipater, R-5 aggregate	30 tons
	Wetland Outlet: R-3 aggregate	31 tons
	Wetland outlet: PennDOT Class 2 Type A geotextile	35' X 20'
Constructed Replacement Wetland	Zone B plants	1,100
	Obligate wetland seed mix	4 lb
	4" PVC pipe from stream channel to wetland	175'
Stream Channel (permanent ditch #1)	PennDOT Class 2 Type A geotextile	420' X 21'
	R-3 aggregate	360 ton
	Energy dissipater, R-5 aggregate	30 ton
Sewer extension	Raise existing manhole 1.5'	1 each
E&S Control Plan	Rock construction entrance	as necessary
	30" filter fabric fence at base of fill area	300'
	Seeding, mulch, fertilizer	As needed, per E&S plan

Transfer trough panel list. All panels are 2 ft width.
The list was developed from sheet 3.

Panel Height, ft	Number of pieces
4	402
4.5	6
5	5
5.5	6
6	15
6.5	4
7	0
7.5	18
8	1
8.5	2
9	2
9.5	14
10	2
10.5	14
Total	491

End of materials list

Figure 1: Wingfield Pines Location

The discharge is shown as a red circle. The treatment system area is shaded in yellow. This map was taken from the Bridgeville and Canonsburg USGS Quad Maps