OPERATION AND MAINTENANCE PLAN

MORGAN RUN ROSS (MR ROSS)
ACID MINE DRAINAGE TREATMENT SYSTEM

DECATUR TOWNSHIP, CLEARFIELD COUNTY
PENNSYLVANIA

Prepared For:

CLEARFIELD COUNTY CONSERVATION DISTRICT

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OPERATION AND MAINTENANCE PLAN

MORGAN RUN ROSS (MR ROSS) ACID MINE DRAINAGE TREATMENT SYSTEM

BACKGROUND

The Morgan Run Ross (MR Ross) Acid Mine Drainage (AMD) Treatment System was constructed in the spring and summer of 2012, and has been treating AMD since August 2012. The project site is located in Decatur Township, Clearfield County, Pennsylvania. The project was constructed on property owned by Randy and Anita Ross. A project location map is provided in Appendix A.

This project was constructed to treat AMD discharges known as the Morgan Run Ross discharges located at the project site. These discharges consist of groundwater seepage and discharge from abandoned underground coal mines and surface water flows from two tributaries (Channel 1 and Channel 3) that flow from formerly-mined areas to the east. The tributaries are also degraded by AMD. These flows combine to form an unnamed tributary to Morgan Run. This treatment system was constructed to remove metals, primarily acidity, aluminum, and iron before the AMD degrades the unnamed tributary to Morgan Run and Morgan Run. Morgan Run is a tributary to Clearfield Creek.

Water quality and flow data collection conducted prior to and during project design monitored the individual AMD flow contributions to the site, and leaving the MR Ross site. Average flow and water quality for the combined AMD flows leaving the MR Ross site were as follows:

Flow	199 gallons per minute
pH	3.5 s.u.
Acidity	57.3 mg/l
Alkalinity	0.0 mg/l
Iron	3.9 mg/l
Aluminum	2.2 mg/l
Manganese	8.3 mg/l
Sulfate	238.1 mg/l

*mg/l = milligrams per liter

The treatment system consists of a vertical flow pond (VFP1), a vertical flow pond/limestone cell (VFP2) that was originally designed as a vertical flow pond but constructed as a limestone cell due to budgetary constraints, and two settling basins (SB1 and SB2). Flow from the AMD discharges enters the vertical flow pond (VFP1) as groundwater seepage that exits the ground at

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the normal pool elevation or as deep mine discharge directly into the limestone of the vertical flow pond. Surface flow from Channel 1 enters the vertical flow pond (VFP1), and surface flow from Channel 3 enters the vertical flow pond/limestone cell (VFP2). The treatment system discharges to an unnamed tributary to Morgan Run.

The original treatment system design concept included two vertical flow ponds, two settling basins, and a rock-lined (limestone) channel for the treatment of AMD. Due to funding constraints, the compost was not installed in the vertical flow pond/limestone cell (VFP2), which was originally proposed as a vertical flow pond with two feet of compost. The rock-lined (limestone) channel was also omitted from the treatment system, and a small section of rock-lined channel was installed using native on-site material to prevent erosion. If needed, based on water quality chemistry, and as funding allows, the rock-lined channel could be added to the existing treatment system, and compost added to the vertical flow pond/limestone cell to create a vertical flow pond.

Wetland and stream impacts associated with this project were authorized under a Waiver 16 Restoration Waiver (EA 17-007) from the Pennsylvania Department of Environmental Protection. Joint Permit and Federal Authorization for wetland and stream impacts was granted by the U.S. Army Corps of Engineers (USACOE) authorization WL1709508 and General Permit 7 No: GP 071711502.

A National Pollutant Discharge Elimination System (NPDES) Permit for Stormwater Associated with Construction Activities was not issued for this project, as determined by the Department of Environmental Protection and the Clearfield County Conservation District. Erosion and Sediment Pollution Control Plan approval was issued for the project by the Department of Environmental Protection as part of the Environmental Assessment process. All permits and authorizations were issued to the Clearfield Creek Watershed Association.

The Clearfield County Conservation District conducted the project. The treatment system was designed by Alder Run Engineering, LLC, of Osceola Mills, PA, and New Miles of Blue Stream, of Mansfield, PA and constructed by E.M. Brown, Inc., Clearfield, PA. Construction oversight was also provided by Alder Run Engineering and New Miles of Blue Stream. The Clearfield Creek Watershed Association assisted with the project by serving as the permittee for the wetland and stream encroachment permitting and obtaining supplemental construction funds from the Office of Surface Mining.

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DESCRIPTION OF TREATMENT SYSTEM COMPONENTS

The treatment system consists of one vertical flow wetland (VFP1), one vertical flow wetland/limestone cell (VPF2), and two settling basins. Each treatment system component is discussed in detail in the following paragraphs. As-built drawings are provided in Appendix A to illustrate the treatment system components as they were constructed.

SYSTEM INFLOW AND BYPASS

Flow from the AMD discharges enters vertical flow pond 1 (VFP1) as groundwater seepage that exits the ground at the normal pool elevation or as deep mine discharge directly into the limestone of the vertical flow pond. Surface flow from Channel 1 also enters vertical flow pond 1 (VFP1) over the rock apron located on the eastern end of the AMD treatment system.

A bypass pipe system consisting of perforated and solid PVC pipe and concrete manholes was provided to bypass the groundwater AMD discharges around the treatment system to allow for flow regulation and treatment system maintenance activities. The bypass pipe discharges to the unnamed tributary to Morgan Run near the settling basin 2 discharge. Flows in Channels 1 and 2 are intermittent, so maintenance activities could be performed during periods when there is no flow into the treatment system provided that the groundwater AMD discharges are directed in to the bypass system and Channels 1 and 2 are dry.

The bypass system also allows for regulation of groundwater flows into vertical flow pond 1 (VFP1). During construction, excavation activities exposed the abandoned underground mine in the northeast corner of vertical flow pond 1 (VFP1). At that time, outflow from the mine was several times larger than the design flow for the treatment system. A perforated collection pipe was constructed in a similar manner to a French drain, with the perforated pipe bedded in aggregate. The deep mine discharge first enters the perforated pipe. The perforated pipe connects to a solid wall pipe with a gate valve. When the gate valve is open, the mine discharge can pass through the valve and into the bypass pipe system. When the gate valve is closed, the mine discharge cannot enter the bypass pipe system, so flow enters vertical flow pond 1 (VFP1). The valve can be partially opened or closed to control the rate of inflow into the vertical flow pond 1 (VFP1). After a period of several weeks, the mine pool elevation affected by construction stabilized, and flows have remained fairly steady. The bypass gate valve (valve F described later in this narrative) should remain fully open unless there is a drastic change in groundwater flow rates and/or maintenance activities on the treatment system are necessary. See photo 1.

Surface flow from Channel 3 enters the vertical flow pond/limestone cell (VFP2). Surface flows in Channel 3 are intermittent. Due to elevation and space constraints, there is no method to bypass flow from Channel 3 around the treatment system.

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VERTICAL FLOW POND 1 (VFP1)

Vertical flow pond 1 (VFP1) receives surface flow from Channel 1 and subsurface flow from the existing deep mine discharges. A bypass pipe system with valve allows flows to be controlled and/or the system to be taken off line.

Vertical flow pond 1 (VFP1) and settling basin 1 have been designed to treat the MR ROSS discharge, which contributes an average of 150 gpm of AMD to these treatment system components. The water quality has average parameters of a pH of 3.5, acidity of 60 mg/L, iron concentrations of 8.0 mg/L, aluminum of 2.0 mg/L, and manganese of 6 mg/L. The design flow was 150 gpm, although the emergency spillway has been sized to convey more than the maximum measured downstream flow of 400 gpm. Flows in excess of the capacity of the system will discharge into settling basin 1 via a rock-lined spillway.

Vertical flow pond 1 (VFP1) consists of a limestone layer under a layer of compost. Geotextile was placed underneath the limestone, and between the limestone and the compost. The geotextile serves to separate the limestone from the underlying earthen layer, to prevent the limestone from sinking into the earthen layer, and to prevent the compost from washing down into the limestone. The earthen layer below the limestone was compacted to prevent leakage from the cell. The pond is filled with limestone having a high calcium carbonate content to add alkalinity to the AMD discharges. A layer of mushroom compost two feet thick was placed over the limestone.

The pond has a perforated underdrain system designed to help flush aluminum precipitates from the limestone. Three one-inch diameter perforations were provided per linear foot of underdrain, which is 6-inches in diameter. A 12-inch diameter header pipe collects the flow from the underdrain and discharges the flow to the outlet structure.

By flushing the pond regularly, we hope to remove all precipitates from the limestone. Cleanout ports were provided to allow access to the underdrain for inspection and maintenance, as discussed later in this narrative. A drain and valve were provided to allow for flushing of the pond.

The vertical flow pond 1 (VFP1) outlet is a standard inline water level control structure housed in a pipe casing with lid. The lid must be removed to access the inline structure. The structure contains adjustable stoplogs which have been set at the appropriate level to ensure that the pond contains a minimum of two feet of water over the top of the compost. This structure can discharge at all times via flow over the top of the stoplogs.

Stoplogs in the outlet structure were adjusted to their final elevation at the completion of construction. The stoplogs should be adjusted to maintain a water surface elevation that is two feet above the top of the compost in the pond during normal flow conditions, and a maximum of three feet above the compost during high flows.

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A rock-lined emergency spillway has also been installed for vertical flow pond 1 (VFP1). The emergency spillway will activate only if the discharge capacity of the outlet structure is exceeded, which should only occur very rarely if the outlet structure becomes clogged. The spillway discharges to settling basin 1, so water discharging through the emergency spillway will still be treated in the settling basin and vertical flow pond/settling basin 2.

The spillways throughout the treatment system were designed to allow slow vehicular traffic to cross the spillway, as access across the spillways was desired by the landowner. As needed, additional aggregate may be added to the spillway to provide easier vehicular access across the spillway.

Elevation change throughout the treatment system was minimal. As a result, the water surface elevation in settling basin 1, the next downgradient treatment structure, is higher than the elevation of the underdrain in vertical flow pond 1 (VFP1). An automatic flushing inline water level control structure was considered as the outlet for vertical flow pond 1 (VFP1), but the flushing would be governed by the water surface elevation in settling basin 1, and the cell would not completely flush.

Manual flushing of the system is necessary. A gate valve has been provided to allow for flushing of the pond. Flushing twice per year is recommended, with an absolute minimum flushing frequency of once per year. Flushing is recommended during higher flow periods in the spring and fall when inflows to the system will quickly replace water removed during the flush cycle.

To flush vertical flow pond 1 (VFP1), close valve B to direct flow in the bypass pipe into settling basin 2. Open valve C to allow flow from the bypass pipe into settling basin 2, and open valve G to allow flow from the vertical flow pond underdrain to enter the bypass pipe. See also valve section later in this narrative. See photo 2.

Vertical flow pond 1 (VFP1) should be flushed into settling basin 2 instead of settling basin 1 because of the minimal elevation change between settling basin 1 and vertical flow pond 1 (VFP1). Flushing to settling basin 2 using valve G will allow a more complete flush of the limestone then flushing the pond to settling basin 1 by removing the stoplogs from the inline water level control structure. Flushing shall occur until the water surface elevation is lowered to the top of the compost. In times of large accumulations of precipitate in the flush water, the water surface elevation may be drawn down below the elevation of the top of the compost for a short period, provided that inflows are sufficient to quickly inundate the compost again.

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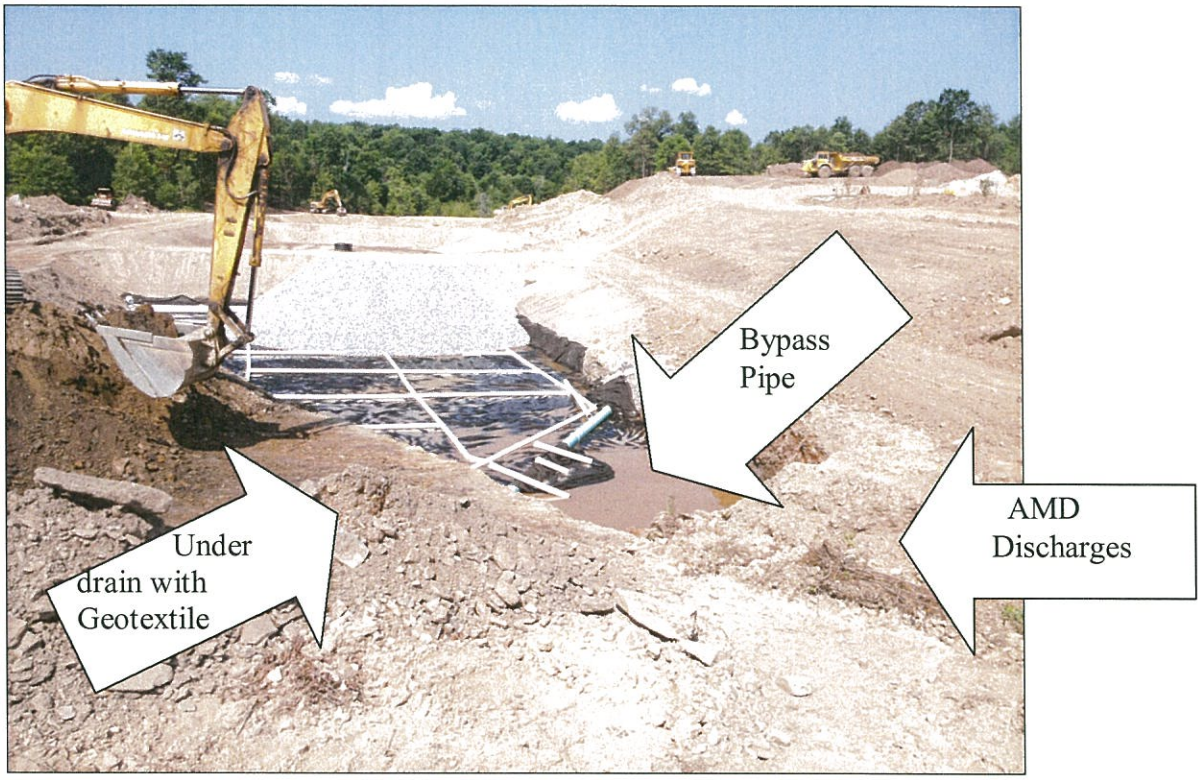

Photo 1: Vertical Flow Pond 1 During Construction

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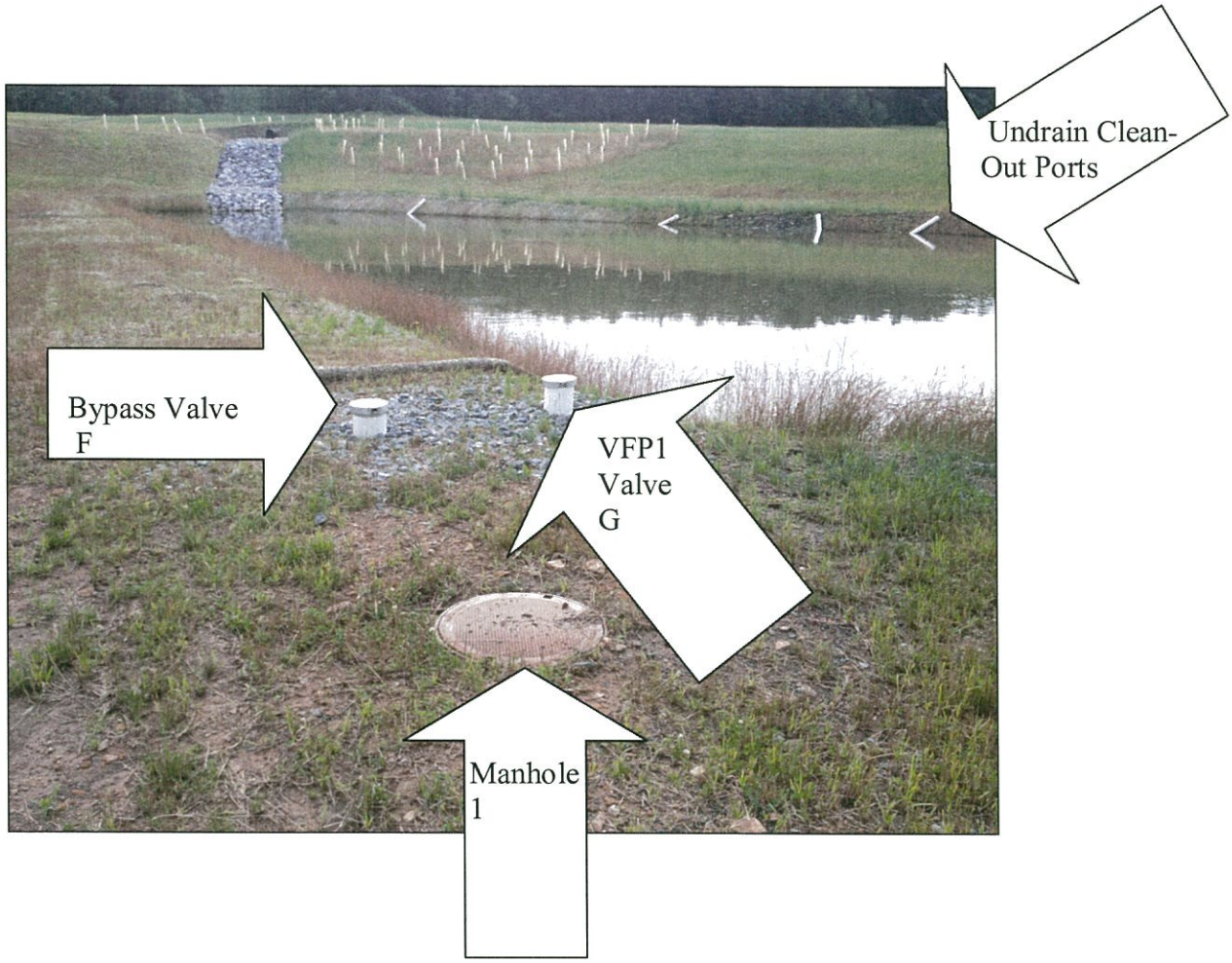

Photo 2: Bypass Valve and Bypass pipe Cleanout.

SETTLING BASIN 1

Outflow from vertical flow pond 1 (VFP1) discharges to settling basin 1. The settling basin provides time for settling and removal of metals precipitates. Settling basin 1 discharges to vertical flow pond 2/limestone cell (VFP2).

Discharge from the basin is controlled by an inlet water level control structure manufactured by AgriDrain, Inc. The outlet structure discharge pipe flows to rip rap inflow protection in vertical flow pond/limestone cell 2 (VFP2), which dissipates energy from the discharge and protects the embankment of VFP2 from erosion. See photo 3.

A rock-lined emergency spillway that discharges to the vertical flow pond/limestone cell 2 (VFP2) has been provided for the basin for discharge of high flows in emergency situations. The

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emergency spillway will activate only if the discharge capacity of the outlet structure is exceeded, which should only occur very rarely if the outlet structure becomes clogged.

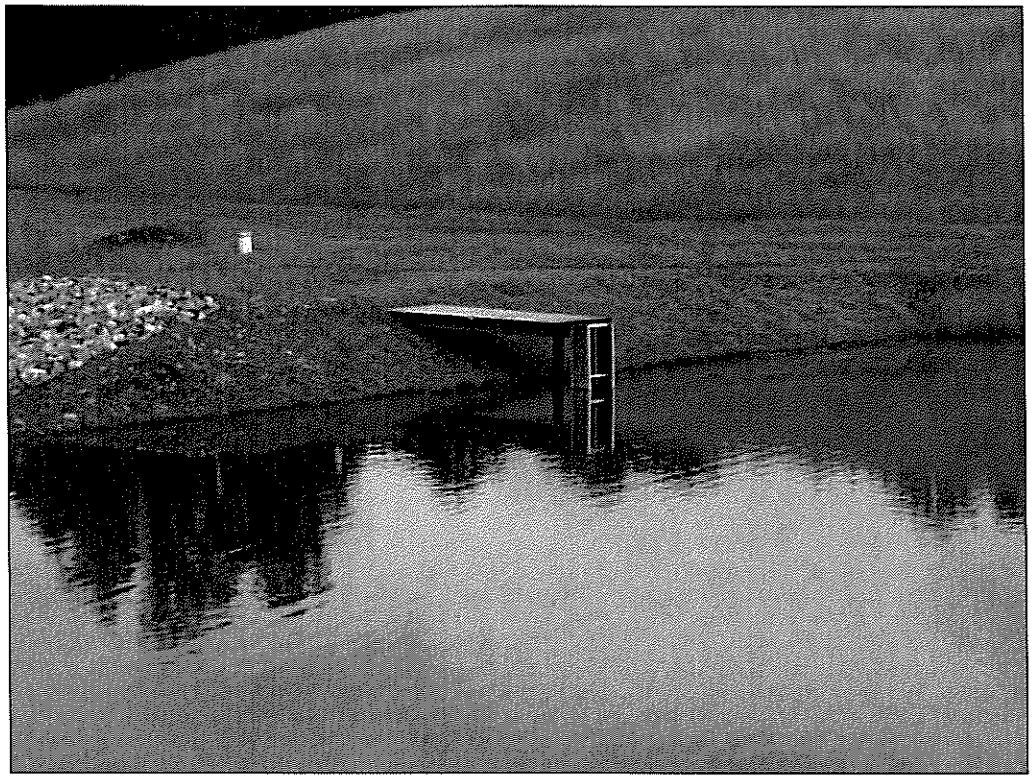

Photo 3: Settling Basin 1 Outlet

A valve and drain pipe have been provided to dewater the bottom of the settling basin for cleaning and removal of precipitates. The valve is housed in a pipe casing, and the lid must be removed to access the valve. The valve can be opened to dewater the basin, but this should only be done in preparation for cleaning the basin, as this action has the potential to release precipitates into the receiving stream. Cleaning the basin should only be necessary on an estimated frequency of 15-20 years.

The inlet water level control structure that serves as the basin outlet can be used to adjust the water level in the basin, although the water level was adjusted to what should be its final elevation at the completion of construction. The structure contains stoplogs that are located in the open face of the inlet water level control structure, and these stoplogs can be moved to adjust the water level. Stoplogs were adjusted to their permanent elevation, which is shown on the site plans, at the completion of construction. A wooden dock structure has been constructed to allow access to the inlet structure without walking in the water of the settling basin.

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VERTICAL FLOW POND/LIMESTONE CELL 2 (VFP2)

Vertical flow pond/limestone cell 2 (VFP2) receives surface flow from Channel 3 and discharge from settling basin 1, which contains treated water. In addition to the AMD discharges at the Ross site which will be treated by vertical flow pond 1 (VFP1) and settling basin 1, there is a side channel (Channel 3) that contributes flow to the lower portion of the MR ROSS site. This flow produces an average of 120 gpm of AMD to an unnamed tributary to Morgan Run. The water quality has average parameters of a pH of 4.3, acidity of 30 mg/L, iron concentrations of less than 1.0 mg/L, aluminum of 4.0 mg/L, and manganese of 7 mg/L. This flow will mix with the effluent from settling basin 1 in vertical flow pond/limestone cell 2 (VFP2). The effluent from settling basin 1 should be fully-treated, so the design of VFP 2 was based on a combined design flow of 270 gpm with the water quality chemistry from the side channel. Flows in excess of the capacity of the system will discharge into settling basin 2 via a rock-lined spillway, which was sized to convey greater than the maximum measured downstream flow of 400 gpm.

This pond was originally designed as a vertical flow pond, but the compost was not installed due to funding constraints. The pond currently operates as an open, flushing limestone cell. It could easily be converted to a vertical flow pond by adding 2 feet of compost, and it was constructed to the original plan elevations and dimensions of the vertical flow pond so that additional excavation and significant modifications would not be necessary to convert the pond to a vertical flow pond by adding the compost. The majority of the iron loading in the AMD discharge is treated in vertical flow pond 1, and aluminum and acidity are the primary pollutants reaching this pond, so the elimination of the compost was deemed to be acceptable and without a high risk of coating the aluminum with iron in the absence of the compost.

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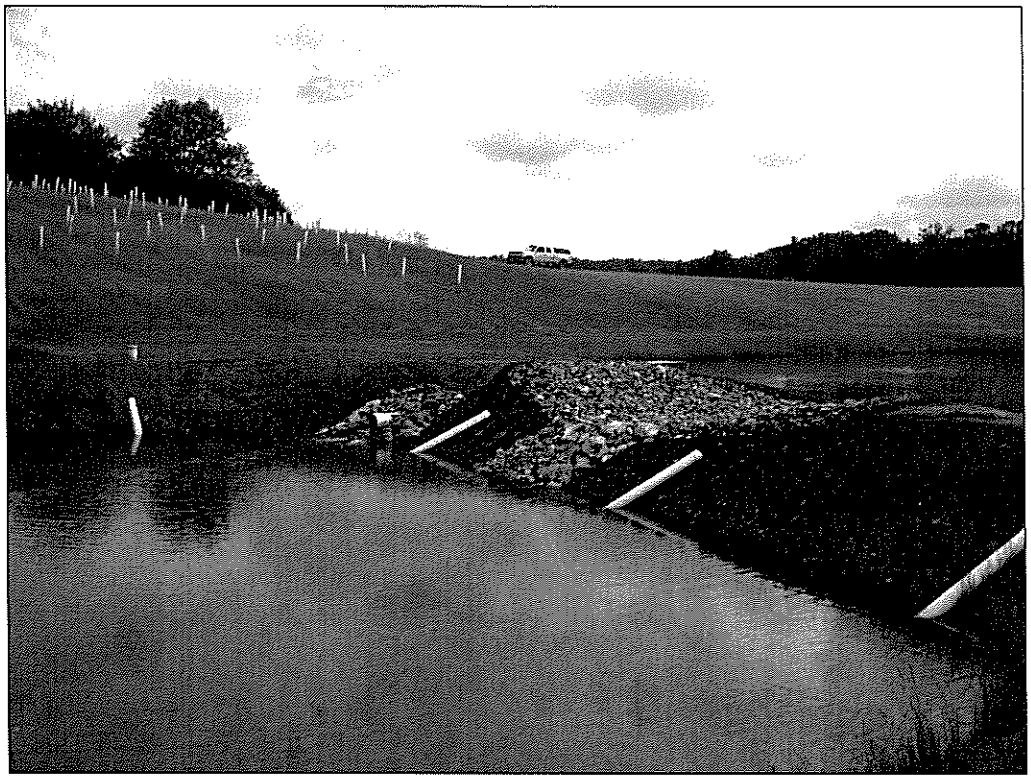

Photo 4: Vertical Flow Pond/Limestone Cell 2 (VFP2) with Underdrain Cleanout Ports

Vertical flow pond/limestone cell 2 (VFP2) consists of a limestone layer. Geotextile was placed underneath the limestone. The geotextile serves to separate the limestone from the underlying earthen layer and, to prevent the limestone from sinking into the earthen layer. The earthen layer below the limestone was compacted to prevent leakage from the cell. The pond is filled with limestone having a high calcium carbonate content to add alkalinity to the AMD discharges.

The pond has a perforated underdrain system designed to help flush aluminum precipitates from the limestone. Three one-inch diameter perforations were provided per linear foot of underdrain, which is 6-inches in diameter. A 12-inch diameter header pipe collects the flow from the underdrain and discharges the flow to the outlet structure.

By flushing the pond regularly, we hope to remove all precipitates from the limestone. Cleanout ports were provided to allow access to the underdrain for inspection and maintenance, as discussed later in this narrative. A drain and valve were provided to allow for flushing of the pond.

The vertical flow pond 2 (VFP2) outlet is a standard inline water level control structure housed in a pipe casing with lid. The lid must be removed to access the inline structure. The structure contains adjustable stoplogs which have been set at the appropriate level to ensure that the pond contains a minimum of two feet of water over the top of the limestone. This structure can discharge at all times via flow over the top of the stoplogs.

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Stoplogs in the outlet structure were adjusted to their final elevation at the completion of construction. The stoplogs should be adjusted to maintain a water surface elevation that is two feet above the top of the limestone in the pond during normal flow conditions.

A rock-lined emergency spillway was installed for vertical flow pond 2 (VFP2). The emergency spillway will activate only if the discharge capacity of the outlet structure is exceeded, which should only occur very rarely if the outlet structure becomes clogged. The spillway discharges to settling basin 2, so water discharging through the emergency spillway will still be treated in settling basin 2.

The spillways throughout the treatment system were designed to allow slow vehicular traffic to cross the spillway, as access across the spillways was desired by the landowner. As needed, additional aggregate may be added to the spillway to provide easier vehicular access across the spillway.

Elevation change throughout the treatment system was minimal. As a result, the water surface elevation in settling basin 2, the next downgradient treatment structure, is higher than the elevation of the underdrain in vertical flow pond/limestone cell 2 (VFP2). An automatic flushing inline water level control structure was considered as the outlet for vertical flow pond./limestone cell 2 (VFP2), but the flushing would be governed by the water surface elevation in settling basin 1, and the cell would not completely flush.

Manual flushing of the system is necessary. A gate valve has been provided to allow for flushing of the pond. Flushing twice per year is recommended, with an absolute minimum flushing frequency of once per year. Flushing is recommended during higher flow periods in the spring and fall when inflows to the system will quickly replace water removed during the flush cycle.

To flush vertical flow pond/limestone cell 2 (VFP2), close valve B to direct flow in the bypass pipe into settling basin 2. Open valve C to allow flow from the bypass pipe into settling basin 2, and open valve D to allow flow from the vertical flow pond/limestone cell underdrain to enter the bypass pipe. See also valve section later in this narrative.

Vertical flow pond/limestone cell 2 (VFP2) should be flushed into settling basin 2. Flushing can be accomplished following the procedures described in the preceeding paragraph or by removing the stoplogs from the inline water level control structure. Flushing shall occur until the vertical flow pond/limestone cell 2 is completely drained.

SETTLING BASIN 2

Outflow from vertical flow pond/limestone cell 2 (VFP2) discharges to settling basin 2. The settling basin provides time for settling and removal of metals precipitates. Settling basin 2 discharges to a rock apron at the unnamed tributary to Morgan Run.

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Discharge from the basin is controlled by an inlet water level control structure manufactured by AgriDrain, Inc. The outlet structure discharge pipe flows to a rock apron which dissipates energy from the discharge and protects the channel of the unnamed tributary from erosion.

A rock-lined emergency spillway that discharges to wetlands below settling basin 2 has been provided for the basin for discharge of high flows in emergency situations. The emergency spillway will activate only if the discharge capacity of the outlet structure is exceeded, which should only occur very rarely if the outlet structure becomes clogged.

A valve and drain pipe have been provided to dewater the bottom of the settling basin for cleaning and removal of precipitates. The valve is housed in a pipe casing, and the lid must be removed to access the valve. The valve can be opened to dewater the basin, but this should only be done in preparation for cleaning the basin, as this action has the potential to release precipitates into the receiving stream. During dewatering activities, flow from settling basin 1 should be directed into settling basin 2 to provide for some settling of the discharge prior to release into the unnamed tributary to Morgan Run. See valve information provided later in this narrative for information on how to discharge settling basin 1 into settling basin 2. Cleaning the basin should only be necessary on an estimated frequency of 15-20 years.

The inlet water level control structure that serves as the basin outlet can be used to adjust the water level in the basin, although the water level was adjusted to what should be its final elevation at the completion of construction. The structure contains stoplogs that are located in the open face of the inlet water level control structure, and these stoplogs can be moved to adjust the water level. Stoplogs were adjusted to their permanent elevation, which is shown on the site plans, at the completion of construction. A wooden dock structure has been constructed to allow access to the inlet structure without walking in the water of the settling basin. See photo 5.

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Photo 5: Dock Structure at Settling Basin 2 Outlet

LIMESTONE CHANNEL

A limestone channel was originally proposed at Channel 3 to add alkalinity before Channel 3 discharges to vertical flow pond/limestone cell 3. This channel was not constructed as planned due to funding constraints. In order to address the severe erosion that had occurred at the channel outlet, large site rock was used to construct a rock apron. See photo 6.

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Photo 6: Rock Channel Lining at Channel 3

OPERATION OF SYSTEM COMPONENTS

INLINE WATER LEVEL CONTROL STRUCTURES

Inline water level control structures were installed to control the discharge from the vertical flow pond (VFP1) and vertical flow pond/limestone cell (VFP2). The inline water level control structures installed at this site were provided with a locking top on the inline box to allow the box to be locked to prevent unauthorized personnel from accessing the structure. The top (and lock) must be removed to access the stoplogs.

The inline boxes were installed in plastic pipe casing, and the casing has lids to prevent water from entering the casing. The need to remove the pipe casing lid should occur infrequently, and the casing lid can be removed if necessary. The top of the casing and the top of the inline box must be removed to access the adjustable stoplogs inside the inline box. See photo 7.

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Photo 7: Inline Water Level Control Structure in Casing

Each stoplog in the inline water level control structures has a rubber seal on the bottom and sides of the stoplog. The hooks on the back of the stoplogs point down (toward the bottom), with the arch of the hook pointing up. The flat side of the stoplog without the hooks should face into the direction of flow. The rubber seal should be placed on the bottom when installing stoplogs. The bottom stoplog in the stack has a thicker rubber seal on the bottom than the other stoplogs.

A handle that can be used to aid in the addition or removal of the stoplogs is either kept inside the structure boxes or the pipe casings, or stored by the Clearfield County Conservation District. It is advisable to keep the handle dry and not in contact with AMD. The flat base of the handle can be used to push down stoplogs, while the bars on the handle can be used to catch the hooks and pull upwards to remove stoplogs. Stoplogs must be pushed down tightly so that they seal together and do not allow flow between the stoplogs. Any debris such as small rocks or straw between the stoplogs will not allow the stoplogs to seal properly. Pressing on stoplogs with debris in between will quickly ruin the seals and cause the stoplogs to leak.

If the stoplogs are not sealed properly in place, as indicated by flow through the inlinet water level control structures when the stoplogs are in place, there may be debris that has washed into the seals. Debris will prevent the seals from closing properly and will allow flow between or around the seals. Debris should be removed to prevent damage to the seals. In order to flush the debris from the seals, use the handle to remove the stoplogs with the sealing problem. Allow high flow through the inllinet water level control structure for at least several minutes, then re-install the stoplogs. If the water level was recently drawn down, such as when a vertical flow

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pond has recently been flushed, it may take several hours to build up enough hydraulic head or water depth in the pond to obtain enough flow volume and velocity to flush debris from the seals. Flow should be allowed to accumulate in the pond for several hours before attempting to flush the debris from the seals.

INLET WATER LEVEL CONTROL STRUCTURE

Inlet water level control structures were installed to control the discharge from the settling basins. These structures allow discharge from the top of the water in the basins, which should contain the least amount of precipitates. The inlet water level control structures installed in the settling basins were furnished with a wooden dock structure to allow dry access to the adjustable stoplogs located in the open, front face of the inlet box. Stoplogs can be adjusted or added/removed after as desired to adjust the water level in the settling basins. See photo 8.

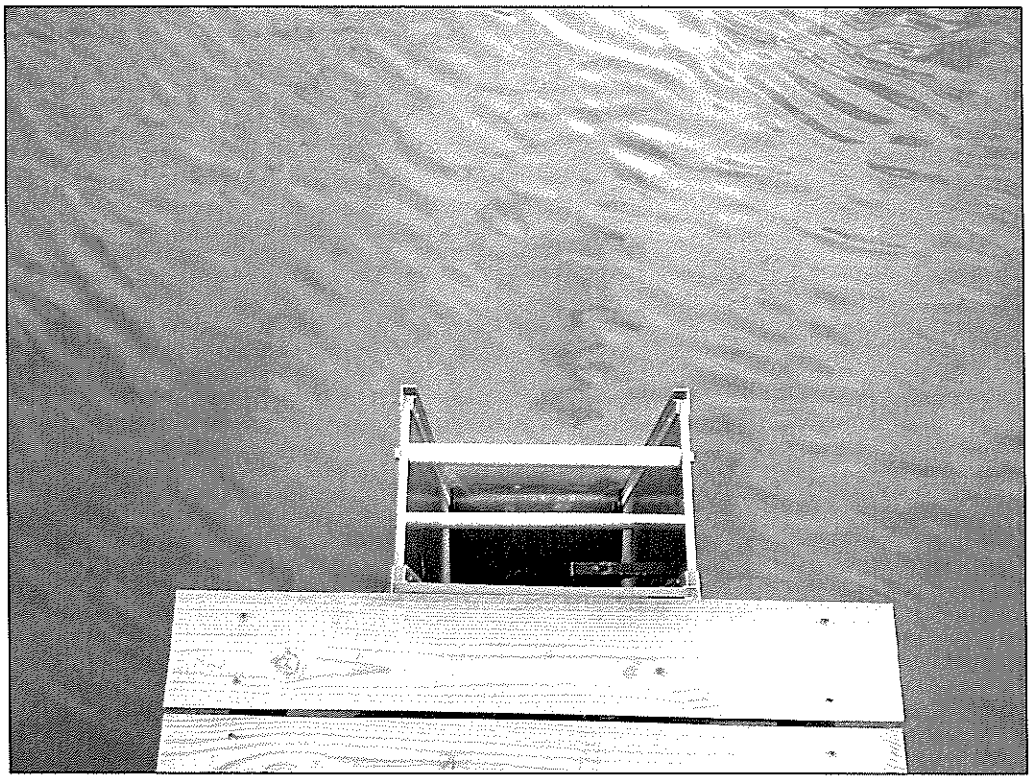

Photo 8: Inlet Water Level Control Structure at Settling Basin 1

Each stoplog has a rubber seal on the bottom and sides of the stoplog. The hooks on the back of the stoplogs point down (toward the bottom), with the arch of the hook pointing up. The flat side of the stoplog without the hooks should face into the direction of flow. The rubber seal should be placed on the bottom when installing stoplogs. The bottom stoplog in the stack has a thicker rubber seal on the bottom than the other stoplogs.

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A handle that can be used to aid in the addition or removal of the stoplogs is either stored by the Clearfield County Conservation District, stored inside the inlet box, or mounted to the dock. It is advisable to keep the handle dry and not in contact with AMD. The flat base of the handle can be used to push down stoplogs, while the bars on the handle can be used to catch the hooks and pull upwards to remove stoplogs. Stoplogs must be pushed down tightly so that they seal together and do not allow flow between the stoplogs. Any debris such as small rocks or straw between the stoplogs will not allow the stoplogs to seal properly. Pressing on stoplogs with debris in between will quickly ruin the seals and cause the stoplogs to leak.

If the stoplogs are not sealed properly in place, as indicated by flow through the inlet water level control structures when the stoplogs are in place, there may be debris that has washed into the seals. Debris will prevent the seals from closing properly and will allow flow between or around the seals. Debris should be removed to prevent damage to the seals. In order to flush the debris from the seals, use the handle to remove the stoplogs with the sealing problem. Allow high flow through the inlet water level control structure for at least several minutes, then re-install the stoplogs. If the basin water level was recently drawn down, it may take several hours to build up enough hydraulic head or water depth in the basin to obtain enough flow volume and velocity to flush debris from the seals. Flow should be allowed to accumulate in the basin for several hours before attempting to flush the debris from the seals.

VALVES

Manually-operated gate valves were installed in several locations throughout the treatment system to allow for flushing and draining of the treatment system components, and to control the amount of groundwater AMD discharge into the vertical flow pond (VFP 1). Valve B, as shown on the As-Built Drawing provided in Appendix A, is the only valve that shall remain open on a regular basis during normal treatment system functioning. The other valves will only be opened to flush or drain the treatment system, or to direct groundwater discharges around the treatment system.

Valves E and A and the associated drain pipes should be used only to dewater the settling basins for maintenance because opening these valves will draw water from the lower elevations of the basins, which has the potential to release metals precipitates from the settling basins. A filter bag should be placed on the drain pipes before opening the settling basin valves. These valves should remain fully closed during normal system operation. Photo 9 shows several valves listed in Tables 1 and 2 below.

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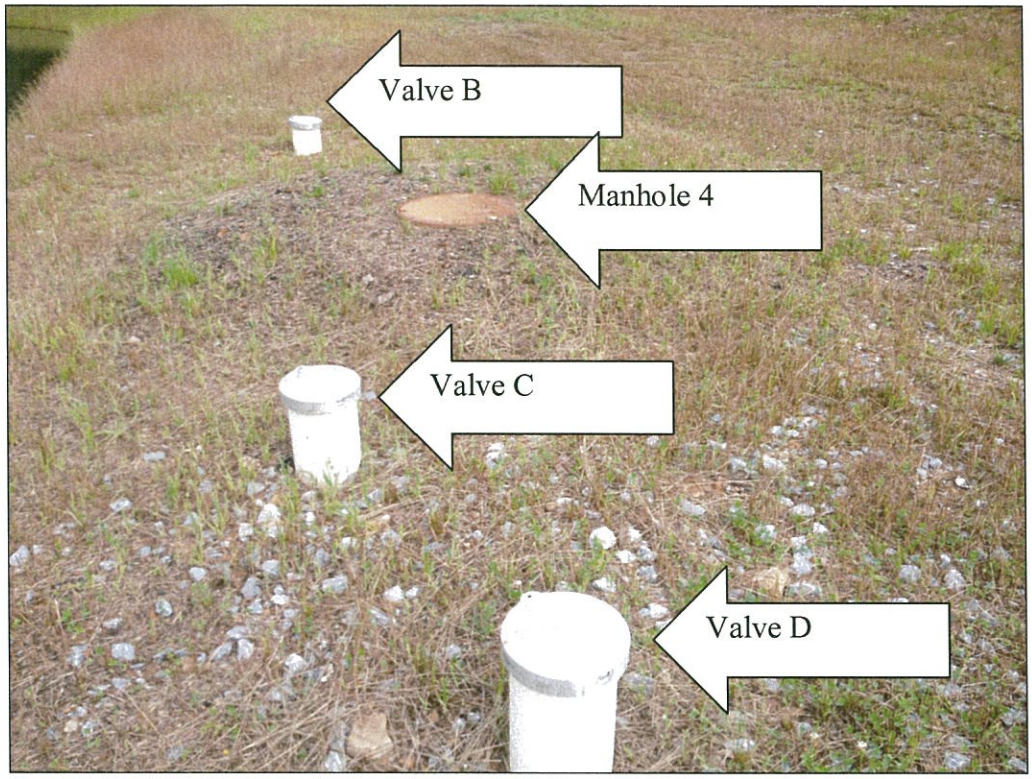

Photo 9: Valve Casings and Manhole

Table 1 provides description of each valve and the necessary position of the valve (open or closed) during anticipated operation and maintenance activities.

Table 1: Purpose and Position of Valves During Normal Treatment System Operation

VALVE	PURPOSE	POSITION DURING NORMAL OPERATION
A	Settling Basin 2 Drain—Allows Settling Basin 2 to be dewatered for maintenance	Closed
B	Bypass Pipe Valve—Allows Flow in Bypass Pipe to Be Stopped during Flushing of the Vertical Flow Ponds and Settling Basin 1 to Direct Flushing Flows into Settling Basin 2	Open
C	Settling Basin 2 Inflow Pipe—Directs Flows from Detwatering or Flushing of the Vertical Flow Ponds or Settling Basin 1 into Settling Basin 2 when Valve B is Closed and Valve C is Open	Closed
D	Vertical Flow Pond/Limestone Cell 2 Flush Pipe-Drain—Allows Vertical Flow Pond/Limestone Cell 2 to be flushed or dewatered	Closed

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VALVE	PURPOSE	POSITION DURING NORMAL OPERATION
E	Settling Basin 1 Drain—Allows Settling Basin 1 to be dewatered for maintenance	Closed
F	Bypass Pipe Valve—When Closed, Directs Deep Mine Discharge into Vertical Flow Pond 1. When Open, Directs Deep Mine Discharge into Bypass Pipe, Allowing the AMD to Bypass the Treatment System	Closed
G	Vertical Flow Pond 1 Flush Pipe/Drain—Allows VFP1 to be flushed or dewatered	Closed

Table 2 lists the position of each valve during standard operation and maintenance activities.

Table 2: Valve Positions during Standard Operation and Maintenance Activities

ACTIVITY	VALVES OPEN	VALVES CLOSED
Normal Treatment System Operation	B	A, C-G
Groundwater AMD Discharges Bypassing Treatment System	B, F	A, C-E, G
Flush Vertical Flow Pond 1 (VFP1)	C, G	A-B, D-F
Drain Vertical Flow Pond 1 (VFP1)	C, F, G	A-B, D-E
Drain Settling Basin 1	C, E, F,	A-B, D, G
Flush Vertical Flow Pond/Limestone Cell 2 (VFP2)	C, D	A-B, E-G
Drain Vertical Flow Pond/Limestone Cell 2 (VFP2)	C-E	A-B, F-G
Drain Settling Basin 2	A, B, F OR A, B, D	C-E, G OR C, E-G

Other valve position combinations can be used to partially treat the AMD without bypassing the entire AMD treatment system when select treatment system components are taken off-line for maintenance.

All valves were placed in a PVC casing with a removable cap. The cap to the valve casing can be removed as needed. The cap prevents flow into the top of the casing and prevents precipitation, debris, etc. from entering the casing, so the cap should be replaced tightly to prevent flow into the casing each time it is removed. See photo 10.

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Photo 10: Valve in Casing

A valve key is necessary to open and close the valves. A standard one inch square valve key is used to open and close these valves. Valves should be periodically opened and closed to ensure that they remain functional.

CLEANOUT PORTS

Cleanout ports have been provided at ends of the underdrain in the vertical flow pond (VFP1) and the vertical flow pond/limestone cell (VFP2). The caps on the cleanout ports can be removed for observation of flow conditions in the header. These ports will allow a plumbing snake or other instrument to be used to remove any clogs in the underdrain piping. Some future clogs from debris or precipitates can be anticipated due to the metals present in the AMD and the woody nature of the area upslope of the treatment system, which may allow debris such as leaves to make its way through the limestone. The ports were incorporated into the design to allow for future maintenance. Watertight caps prevent flow into the top of the port, although the normal and maximum design water levels in the treatment cells will be below the elevation of the top of the cleanout ports.

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OPERATION AND MAINTENANCE RESPONSIBILITIES

Site inspections and operation and maintenance will be conducted by the Morgan Run Watershed Group and/or its agents. Operation and maintenance activities and responsibilities are described in the following paragraphs of this narrative.

OPERATION ACTIVITIES

Normal day-to-day operation of the system will consist of periodic inspections followed by corrective actions to address any problems noted during the periodic inspections. The site has been designed to involve as little day-to-day operation activities as possible. Flushing of the vertical flow pond (VFP1) and vertical flow pond/limestone cell (VFP2), the primary operation activity, is performed by manually opening valves. The use of automatic flushing structures was not possible due to the lack of elevation change of the bottom of the treatment system.

Flushing of the vertical flow pond (VFP1) and vertical flow pond/limestone cell (VFP2) is recommended on at least a semi-annual basis. At minimum, these cells should be flushed on an annual basis, The manual flush can be achieved by either opening and closing valves as described earlier in this narrative, or by removing all of the stoplogs from the outlet structure. The flush should continue until the water level in the vertical flow pond reaches the top of the compost, and until the vertical flow pond/limestone cell is completely drained.

Piping, outlet structures, and water level control structures should be inspected and cleaned of debris, and the proper operation of the valves verified on a regular basis by opening and closing the valves.

INSPECTION ACTIVITIES

Inspection requirements are documented in the following paragraphs. An inspection checklist has been developed to aid with inspection activities.

INSPECTION SCHEDULE

The sites shall be inspected according to the following minimal inspection schedule:

- Following major precipitation and runoff events (including snowmelt events)—Inspect following all major precipitation events on a perpetual basis. Inspect after precipitation events in addition to the monitoring schedule provided below.
- During and immediately following construction until vegetation is established (70% uniform vegetative cover)—Inspect on a weekly basis, minimum.
- For the first year following construction—Inspect on a monthly basis.

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- For the second year following construction—Inspect on a quarterly basis.
- For later years—Inspect on a yearly basis.
- All years—Flush vertical flow pond (VFP1) and vertical flow pond/limestone cell (VFP2) on a semi-annual or yearly (minimum) basis.

INSPECTION RESPONSIBILITIES

Inspections shall be conducted by the Morgan Run Watershed Group and/or its agents.

INSPECTION INSTRUCTIONS

Inspections should be made for debris, especially in outlet structures, pipes, and spillways; areas of erosion; accumulation of sediments (except in the settling basins, where accumulation of precipitates is expected); displaced vegetation or rip rap; dead or dying vegetation; infestation by beavers or muskrats; vandalism; and problems with functionality of the system including overtopping of berms, flow through emergency spillways, and incorrect water levels.

Inspection of water quality should also be made. Samples should be collected during inspections according to the inspection schedule provided above. Samples should be analyzed for the standard AMD parameters of pH, acidity, alkalinity, conductivity, iron, aluminum, manganese, and sulfate. In the event that effluent pH at the Settling Basin 2 outlet is below 6.5, additional sampling should be conducted and more frequent monitoring of the system is recommended to determine if there are system issues that should be corrected. If funding is not available for laboratory analysis of samples, then field testing such as with a HACH kit shall be done, and the effluent pH shall be determined, at minimum.

MAINTENANCE AND CORRECTIVE ACTIONS

Any problems identified during inspections should be addressed immediately, and any necessary maintenance performed.

Maintenance activities will consist of corrective actions such as removal of debris and litter and maintenance of outlet structures, vegetation, rock linings, and rip rap. Routine maintenance will also consist of periodic flushing of the vertical flow pond (VFP1) and vertical flow pond/limestone cell (VFP2). Any problems identified during inspections should be addressed immediately.

Debris and sediment should be removed from the entire site, but especially from treatment cells and settling basins as debris could clog the outlet structures. Spillways, pipes, water level control structures, and outlet structures should be cleaned of debris to ensure proper functionality of the structures.

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Litter control shall be done any time that the site is visited. Litter is not expected to be a reoccurring problem due to limited site access, but it should be addressed if it occurs. A visual inspection will also need to be done anytime there is a period of heavy rain or storm in the area so that no litter has washed into the system from Channels 1 and 3. Any accumulated litter shall be removed from the site and disposed of properly.

Inspections for leaves should occur monthly during the fall, and any accumulated leaves should be removed from the water level control structures and outlet structures immediately. Periodic removal of sticks and leaves may be necessary.

Area of erosion should be immediately repaired either through installation of rip rap or re-establishment of vegetation. Measures such as installation of erosion control mat may be necessary. Causes of erosion should be identified and corrected to prevent future problems.

Areas of rip rap shall be inspected to ensure design thicknesses and dimensions are maintained at all times. Additional rip rap shall be added as needed to maintain the design dimensions.

Areas showing signs of animal habitation such as beaver dams at outlet structures and burrowing by muskrats shall be addressed immediately to protect the integrity of the project. Contact the Pennsylvania Game Commission for advice or assistance.

The establishment of vegetation on the site is the major component of the post-construction stormwater management plan. Any areas of dead, dying, or stressed vegetation shall be identified, and the cause of the problem identified and corrected as soon as possible.

Vegetation management shall consist of periodic mowing or brush hogging at a frequency of every two to three years to ensure that woody vegetation does not become established on the embankment. This practice should be done to prevent tree roots from growing through the embankments and causing leakage.

Correct any vandalism or damage, such as removal of stoplogs in the outlet structures or clogging of the spillways and outfall pipes.

Correct water levels have been established in the vertical flow pond (VFP1), vertical flow pond/limestone cell (VFP2), and the settling basins. Water levels should be approximately two feet above the top of compost in the vertical flow pond (VFP1) and two feet above the limestone in the vertical flow pond/limestone cell (VFP2). The maximum water level should be no higher than six inches below the emergency spillways in the settling basins, with a normal pool of approximately 12 inches below the spillway crest. Settling basin water level will fluctuate by 1-2 feet due to the flushing of the limestone cell, but the levels should not exceed the maximum water level. Should water levels be out of adjustment, remove any debris from the outlet structures and/or try to identify the problem. Contact the Clearfield County Conservation District for assistance as needed.

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Periodically oil and open and close locks to ensure the continual functioning of the locks.

Periodically open and close all valves to ensure the continual functioning of the valves.

The vertical flow pond (VFP1) and vertical flow pond/limestone cell (VFP2) will need to be flushed on a regular basis. Flushing twice per year in spring and fall is recommended, with flushing once per year in the spring being the minimum. See the sections on each of these treatment cells earlier in this narrative which describes the flushing procedures for each.

The compost and limestone in the treatment cells may need to be maintained periodically. The replacement frequency is estimated at 20 years, but depending on flows and loadings over time, some maintenance, especially of the compost, may be necessary. Limestone may need to be stirred and washed, or may need to be replaced. The areas around the treatment cells were designed to allow access from the surrounding grade down to "berm" areas around the treatment cells, and these areas area sufficiently wide to allow vehicles to park and work on the cells during maintenance activities.

The site access includes a stream crossing over an unnamed tributary to Morgan Run. Visual inspections of the stream crossing culvert and associated rock apron shall be made and any debris shall be removed at the time of inspection.

LONG TERM MAINTENANCE

Long term maintenance is expected to include the replenishment of compost and limestone in approximately 20 years, if not sooner, as described under routine maintenance. Limestone that is clogged with aluminum or coated with iron will need to be replaced. The limestone originally installed in the system will have dissolved to varying degrees, and a significant portion of the limestone should be expected to need to be replenished if not totally replaced after 20 years. The underdrain and underdrain header pipes and cleanouts should be checked to ensure that they are not clogged with precipitates, and cleaned or replaced as needed.

The compost in the vertical flow pond (VFP1) should be expected to degrade significantly after 20 years. The compost will need to be totally replaced to reestablish permeability and to provide a source of organic material.

The settling basins will also need to be cleaned out, and precipitates disposed of. Based on current flows and loadings, the need to clean the basins will occur sometime between 15-20 years, unless there are substantial changes in flows or loadings. The Morgan Run Watershed Group will address these long term maintenance needs.

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OTHER INFORMATION

ACCESS

Landowner-Grantee Agreements between the Clearfield County Conservation District and Randy and Anita Ross have been developed for long-term access to the site and site access road and operation and maintenance of the treatment system. Separate agreements were developed for the treatment system and for the site access road because access was initially planned across the Leona Morgan property, but that access was denied, and Randy and Anita Ross allowed access via their driveway. These agreements will allow for future access for monitoring and maintenance of the treatment system. Copies of the Landowner-Grantee agreements are provided in Appendix C.

The site access road contains a stream crossing of an unnamed tributary to Morgan Run. A General Permit 7 (GP7) (No. GP 071711502) was issued for the crossing. The permit was initially issued to the Clearfield Creek Watershed Association, and was later transferred to Randy and Anita Ross at the completion of construction activities.

A gate has been installed on the access road for this project to limit unauthorized access to the treatment system. A lock has been installed on the gate. The Landowner-Grantee agreement allows access through this gate for the life of the treatment system.

LOCKS AND KEYS

The following locations throughout the treatment system contain mechanisms for locking the treatment system components:

- Pipe casing tops for inline water level control structure housings; and
- Inline water level control structure locking tops.

The locks will prevent opening of the box and unauthorized adjustment of the stoplogs. The same key opens all locks on the site, including the gate on the site access. Keys and locks are maintained by the Morgan Run Watershed Group. Although outdoor-grade locks were provided, any locks in use should be oiled on a regular basis to prevent rusting of the locks.

STORAGE OF ITEMS

The extra stoplogs for the inline water level control structures and a valve stem are currently stored by Clearfield County Conservation District. In the event of an emergency, Alder Run Engineering also has a valve stem that can be used to operate the valves. Alder Run Engineering stores an extra key to the locks.

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APPENDICES

APPENDIX A

MAPS AND FIGURES

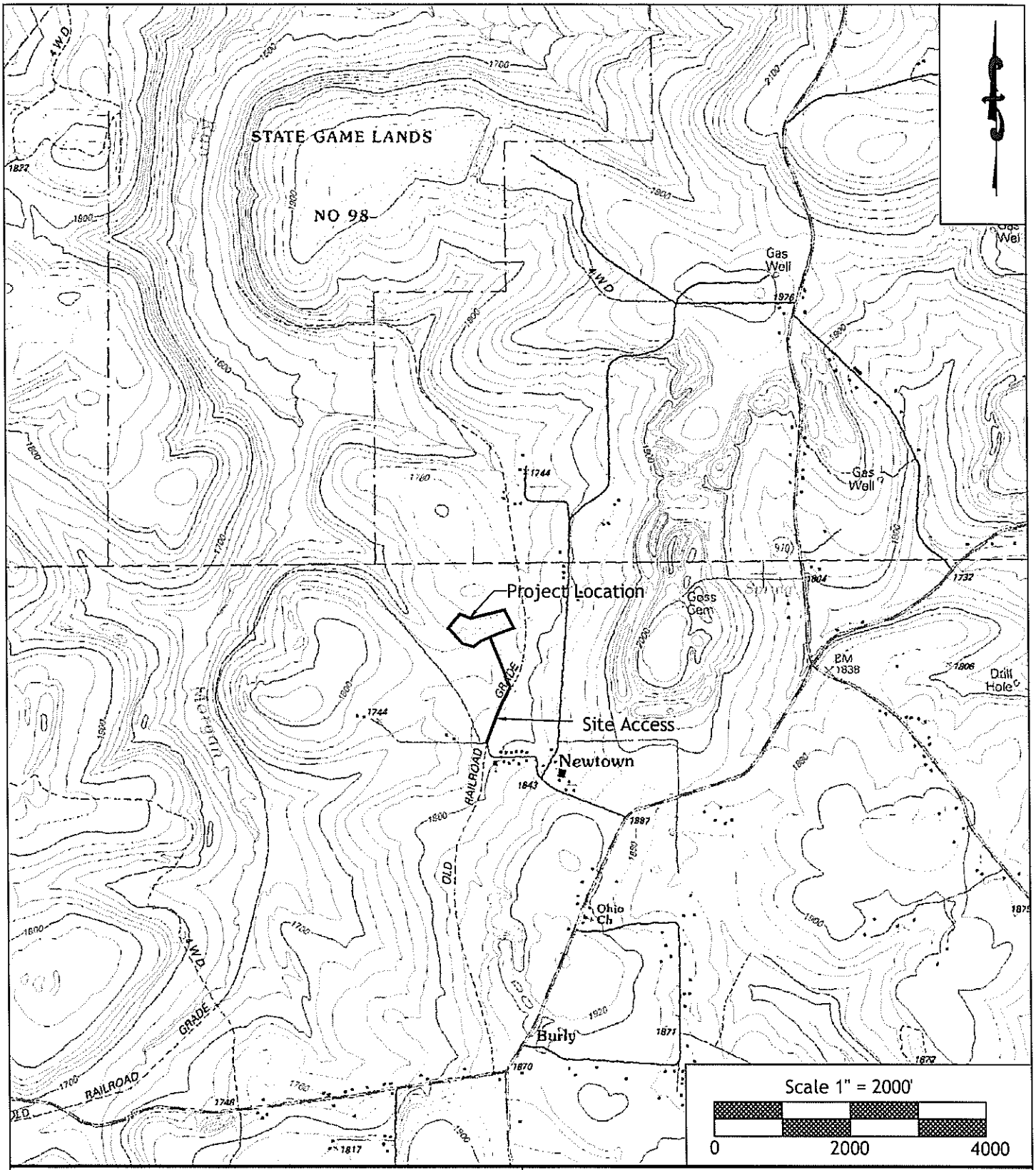


Figure title:

Figure 1: Location Map Showing Site Topography

Prepared for:

Clearfield Creek Watershed Association

Site Information:

Morgan Run Ross AMD Treatment System

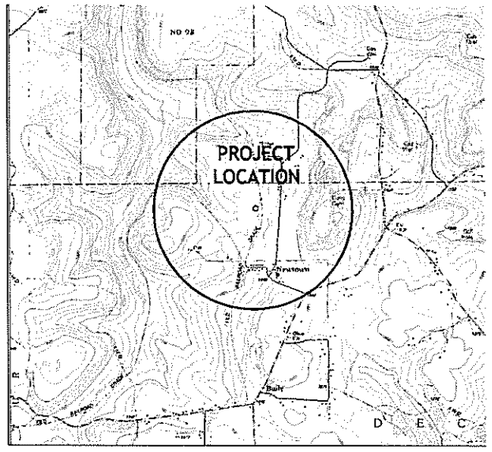
Decatur Township Clearfield County Pennsylvania

Prepared by:

ALDER RUN ENGINEERING

107 Coal Street
Osceola Mills, Pennsylvania 16666
Phone: (814) 339-6998
Fax: (814) 339-6266

Reference: United States Geological Survey, 7.5' Topographic Quadrangle: *Wallaceton Township, Pennsylvania* .



VICINITY MAP

ONE - CALL SYSTEM

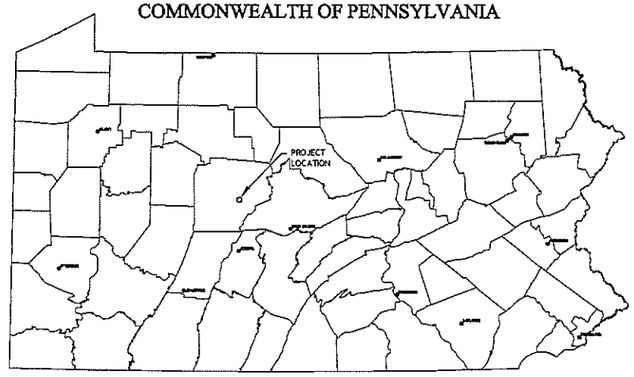
PENNSYLVANIA ONE CALL SYSTEM, INC. 1-800-242-1776 STOP CALL BEFORE YOU DIG

PENNSYLVANIA ACT 187 (1991) REQUIRES 3 WORKING DAYS NOTICE FROM EXCAVATORS WHO ARE ABOUT TO : DIG, BLAST, AUGER, BORE, GRADE, TRENCH OR DEMOLISH ANYWHERE IN THE COMMONWEALTH.

PA1 SYSTEM, INC. POCS SERIAL NUMBER 3615655

EFFECTIVE DATE : _____

COMMONWEALTH OF PENNSYLVANIA



OVERALL PROJECT LOCATION MAP

SCALE 1" = 300,000'
0 300,000 600,000

MORGAN RUN ROSS (MR ROSS)
ACID MINE DRAINAGE TREATMENT SYSTEM
AS-BUILT DRAWINGS

DECATUR TOWNSHIP, CLEARFIELD COUNTY, PENNSYLVANIA

JANUARY 7, 2013

PLAN SHEET INDEX

DRAWING NO.	SHEET	DESCRIPTION
AB-1	1 of 3	INDEX MAP AND NOTES
AB-2	2 of 3	EXISTING CONDITIONS PLAN - AREA "A"
AB-3	3 of 3	EXISTING CONDITIONS PLAN - AREA "B"

ALDER RUN ENGINEERING

107 COAL STREET
OSCEOLA MILLS, PENNSYLVANIA, 16666

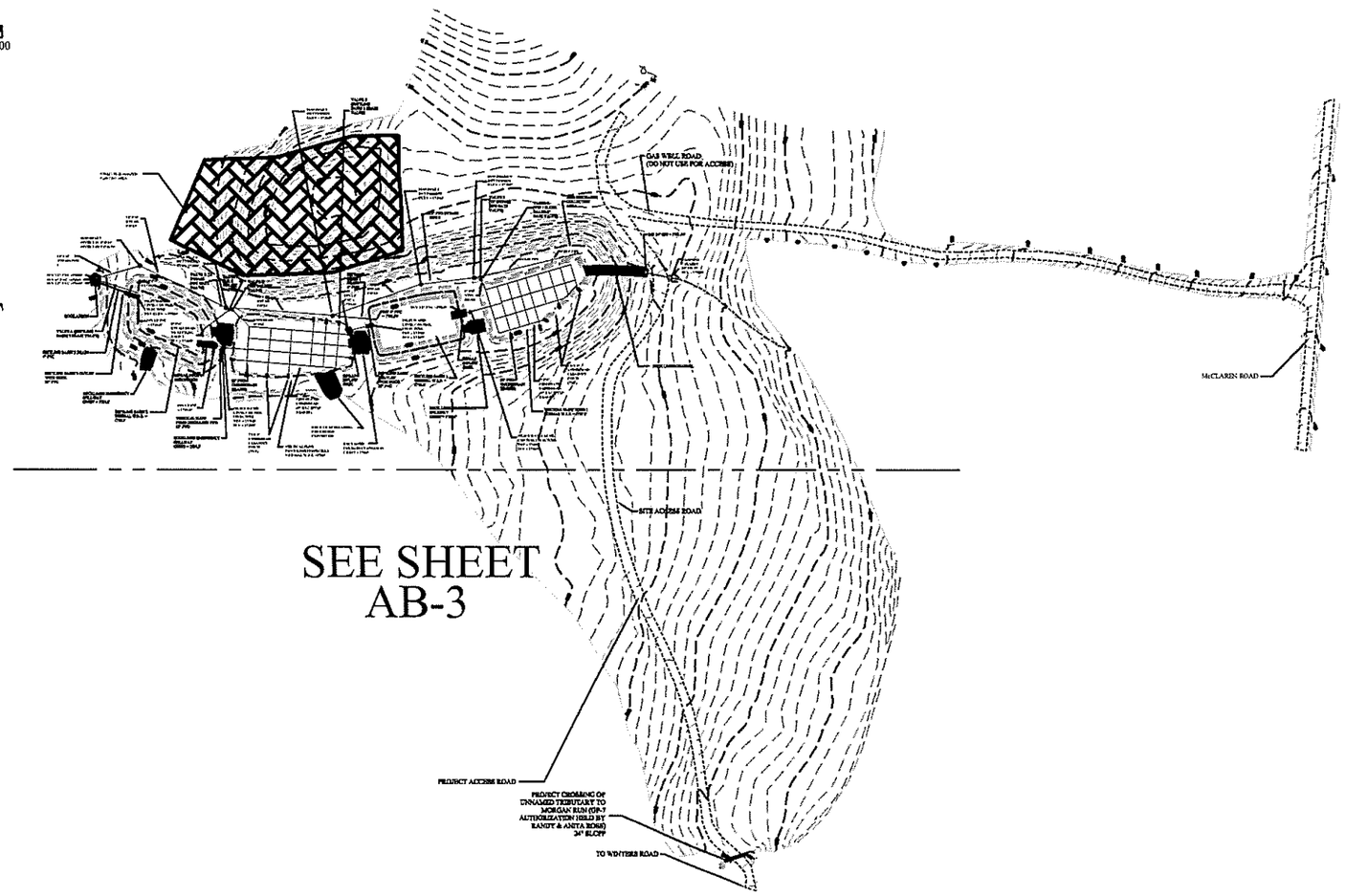
PLAN REVISIONS

REVISION NO.	DESCRIPTION	DATE

LEGEND

- EXISTING INDEX CONTOUR (C.I.=5')
- EXISTING INTERMED. CONTOUR (C.I.=1')
- EXISTING ROAD
- RIPRAP
- MATCHLINE

SCALE (FEET)
100 0 100 200



SEE SHEET AB-2

SEE SHEET AB-3

NOTES:
1. AS-BUILT SURVEY PREPARED BY LAND AND MAPPING SERVICES, 230 NORTH SECOND STREET, CLEARFIELD, PA, 16830, IN OCTOBER 2012.

SHEET NO. AB-1 1 OF 3

SEAL

Michelle M. Morrow
PE056677

REVISIONS

NO	DESCRIPTION	DATE

PREPARED BY:
ALDER RUN ENGINEERING
107 COAL STREET
OSCEOLA MILLS, PENNSYLVANIA 16666
PHONE: (814) 339-6998

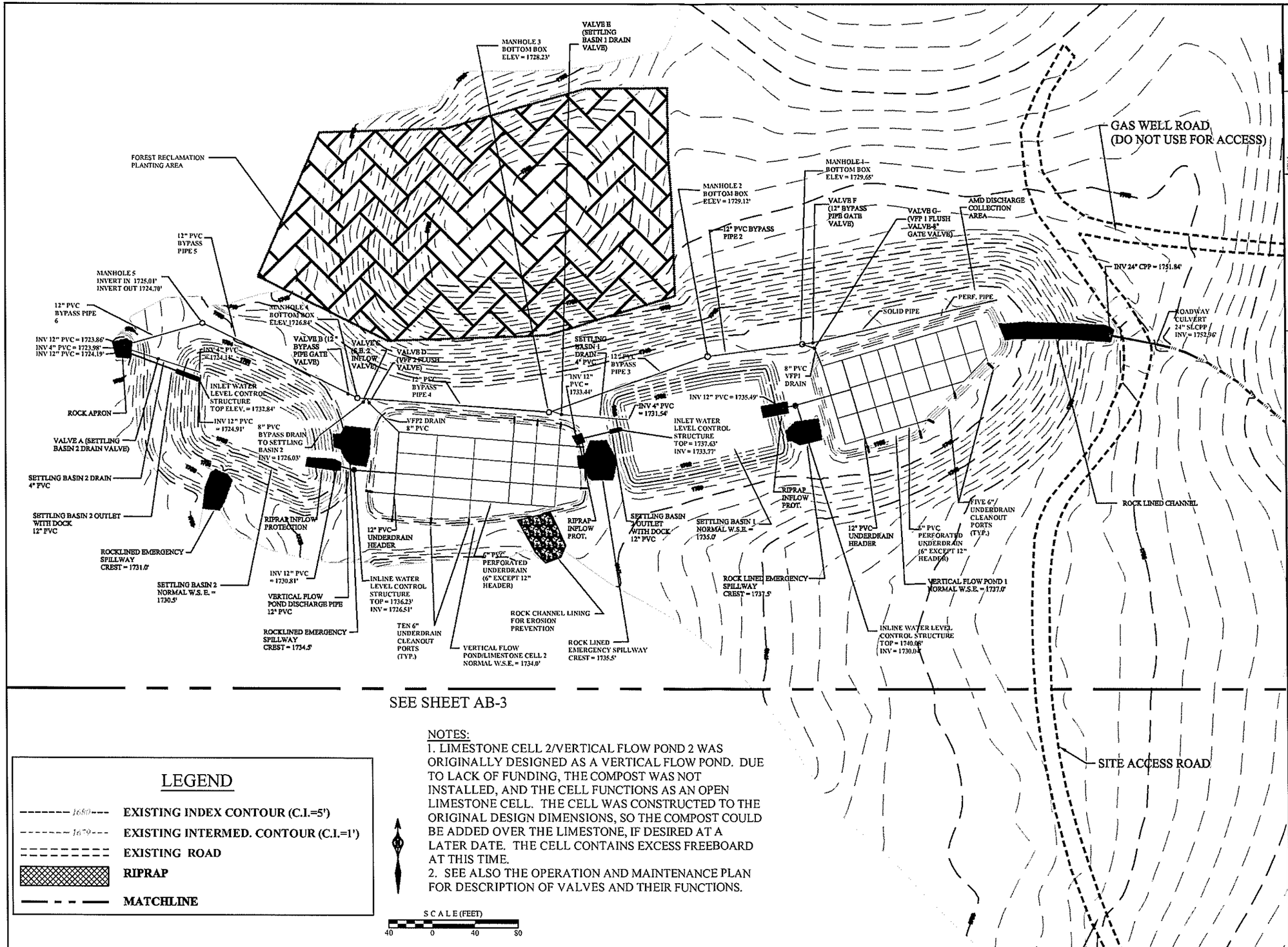
SCALE: 1" = 100'

DATE: JANUARY 7, 2013

PROJECT:
MORGAN RUN ROSS
AMD TREATMENT SYSTEM
CONSTRUCTION AS BUILT
DECATUR TOWNSHIP, CLEARFIELD COUNTY, PA

TITLE:
INDEX OF AS BUILT DRAWINGS

PREPARED FOR:
New Hales of Blue Stream NMS
1602 OREBED ROAD
MANSFIELD, PA 16933
PH: 570-662-8631



SEE SHEET AB-3

LEGEND

- EXISTING INDEX CONTOUR (C.I.=5')
- EXISTING INTERMED. CONTOUR (C.I.=1')
- EXISTING ROAD
- RIPRAP
- MATCHLINE

NOTES:

1. LIMESTONE CELL 2/VERTICAL FLOW POND 2 WAS ORIGINALLY DESIGNED AS A VERTICAL FLOW POND. DUE TO LACK OF FUNDING, THE COMPOST WAS NOT INSTALLED, AND THE CELL FUNCTIONS AS AN OPEN LIMESTONE CELL. THE CELL WAS CONSTRUCTED TO THE ORIGINAL DESIGN DIMENSIONS, SO THE COMPOST COULD BE ADDED OVER THE LIMESTONE, IF DESIRED AT A LATER DATE. THE CELL CONTAINS EXCESS FREEBOARD AT THIS TIME.
2. SEE ALSO THE OPERATION AND MAINTENANCE PLAN FOR DESCRIPTION OF VALVES AND THEIR FUNCTIONS.

SCALE (FEET)
40 0 40 80

SHEET NO. AB-2 2 OF 3

SEAL

Michelle M. Morrow
PE060677

NO.	DESCRIPTION	DATE

REVISIONS

PREPARED BY:
ALDER RUN ENGINEERING
107 COAL STREET
OSCEOLA MILLS, PENNSYLVANIA 16666
PHONE: (814) 339-6998

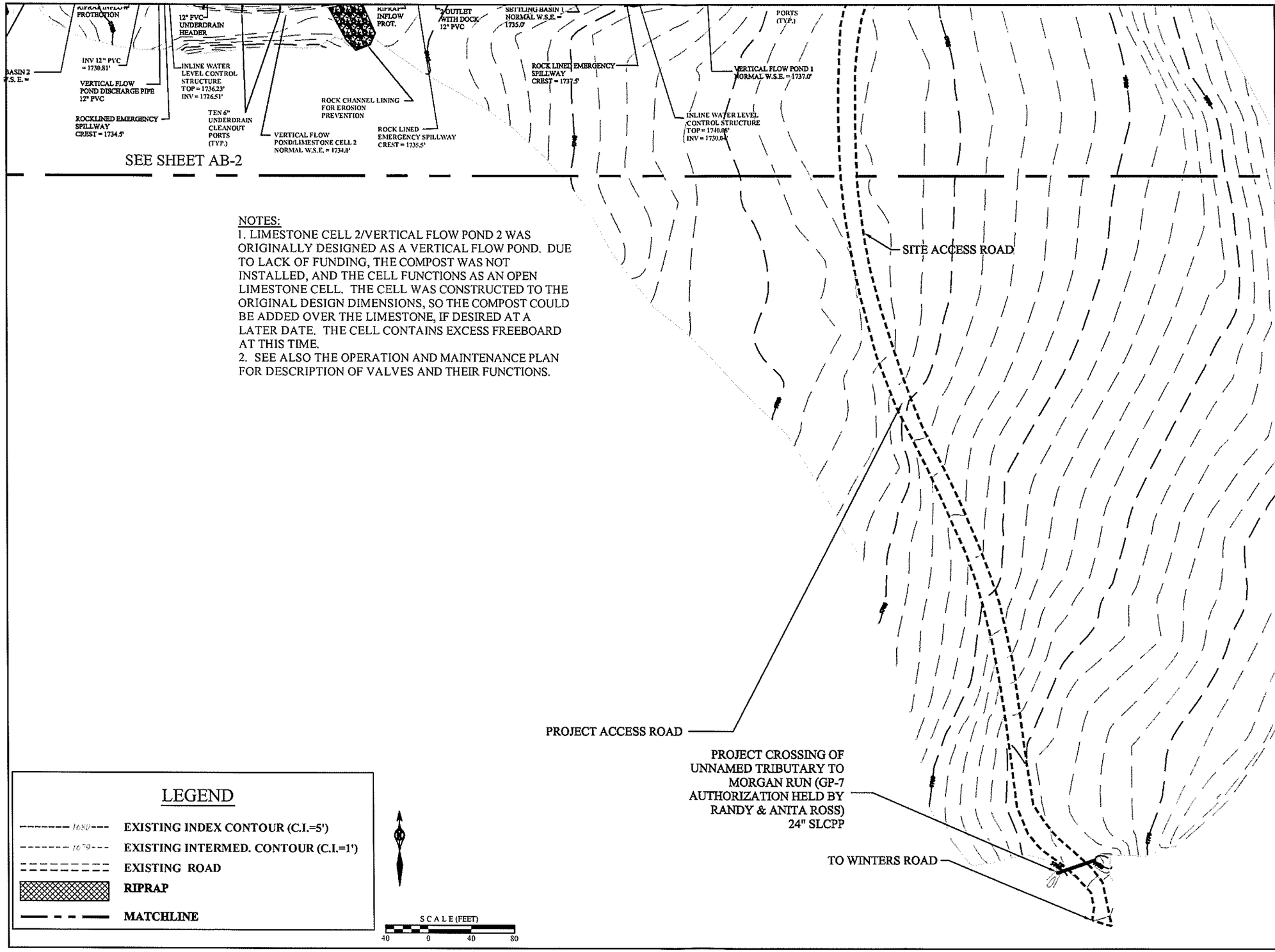
DATE: JANUARY 7, 2013

SCALE: 1" = 40'

PROJECT:
MORGAN RUN ROSS
AMD TREATMENT SYSTEM
CONSTRUCTION AS BUILT
DECATUR TOWNSHIP. CLEARFIELD COUNTY. PA

TITLE: AS BUILT DRAWING

PREPARED FOR:
New Miles of Blue Stream
NMBS
1602 OREBED ROAD
MANSFIELD, PA 16933
PH: 570-662-8631



NOTES:

1. LIMESTONE CELL 2/VERTICAL FLOW POND 2 WAS ORIGINALLY DESIGNED AS A VERTICAL FLOW POND. DUE TO LACK OF FUNDING, THE COMPOST WAS NOT INSTALLED, AND THE CELL FUNCTIONS AS AN OPEN LIMESTONE CELL. THE CELL WAS CONSTRUCTED TO THE ORIGINAL DESIGN DIMENSIONS, SO THE COMPOST COULD BE ADDED OVER THE LIMESTONE, IF DESIRED AT A LATER DATE. THE CELL CONTAINS EXCESS FREEBOARD AT THIS TIME.
2. SEE ALSO THE OPERATION AND MAINTENANCE PLAN FOR DESCRIPTION OF VALVES AND THEIR FUNCTIONS.

LEGEND

- EXISTING INDEX CONTOUR (C.I.=5')
- EXISTING INTERMED. CONTOUR (C.I.=1')
- EXISTING ROAD
- RIPRAP
- MATCHLINE

SCALE (FEET)
40 0 40 80

SHEET NO. AB-3 3 OF 3

SEAL: COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL MICHELLE M. MERROW

Michelle M. Merrow PE060677

REVISIONS

NO.	DESCRIPTION	DATE

PREPARED BY:
ALDER RUN ENGINEERING
107 COAL STREET
OSCEOLA MILLS, PENNSYLVANIA 16666
PHONE: (814) 339-6998

DATE: JANUARY 7, 2013

SCALE: 1" = 40'

PROJECT:
MORGAN RUN ROSS
AMD TREATMENT SYSTEM
CONSTRUCTION AS BUILT
DECATUR TOWNSHIP, CLEARFIELD TOWNSHIP, PA

TITLE:
AS BUILT DRAWING

PREPARED FOR:
New Miles of Blue Stream
NMBS
1602 OREBED ROAD
MANSFIELD, PA 16933
PH: 570-662-8631

APPENDIX B

OPERATION AND MAINTENANCE CHECKLIST

MORGAN RUN ROSS AMD TREATMENT SYSTEM
OPERATION AND MAINTENANCE PLAN CHECKLIST

INSPECTION INSTRUCTIONS

1. Inspect the entire treatment system

2. Look for:
   - areas of erosion or accumulation of sediments (except for accumulations of sediments in the settling basins)
   - displaced (washed out) vegetation or rip rap
   - dead or dying vegetation
   - system functionality problems
     - overtopping of berms or flow in emergency spillways
     - debris in outlet structures, pipes, or spillways
     - water levels are too low or too high
   - infestation by beavers or muskrats clogging outlets or digging in the embankments
   - vandalism
   - valves in correct position (either open or closed)

3. Check water quality:
   - effluent pH should be above 6.5
   - iron and aluminum concentrations should be below 1.0 mg/l

OPERATION AND MAINTENANCE INSTRUCTIONS

1. Remove any debris or sediment that harms the system or prevents it from working as designed.
2. Repair any areas of erosion.
3. Address any areas of damage by animals such as beaver dams and muskrats burrowing through berms.
4. Contact Clearfield County Conservation District if water levels are too low or too high.
5. Correct any vandalism or damage, such as removal of stoplogs in the outlets or clogging of the outlet pipes.
6. Follow instructions in the Operation and Maintenance Plan for flushing of vertical flow pond and vertical flow pond/limestone cell at a recommended interval of every 6 months.
7. Open and close valves at a recommended interval of every 6 months to maintain functionality.

OTHER

1. Contact Clearfield County Conservation District (814-765-8130) for technical assistance if there are questions or problems at the site that cannot be immediately and easily corrected.

APPENDIX C

LANDOWNER-GRANTEE AGREEMENTS

Document Number

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

LANDOWNER – GRANTEE AGREEMENT

This Agreement, made this May 1, 2010 (Date)

by Randy and Anita Ross

(Landowner(s))

residing at 305 N. 7th Street telephone # 717-684-0215

Columbia (city), PA 17512 (ZIP)

and *Clearfield County Conservation District* (Grantee)

The project is located at: No street address. Located north of McClarren/Eagle Eye Road near Newtown, PA (Osceola Mills, PA, Post Office, 16666)

Latitude: 40-54-52 Longitude 78-20-51

Section 1 – Agreement Provisions

A. In consideration of the benefits that incur from the investment in the property, and/or monies received, the Grantee and the undersigned Landowner agree to participate in the Pennsylvania Department of Environmental Protection "(PA DEP)" Growing Greener Grants Program and comply with the terms set forth in this Agreement.

B. Landowner represents and agrees that he/she is the sole owner of the real property on which the project is to be performed, or has secured a sufficient property interest, including any easements or right-of-ways necessary to grant access for the completion and maintenance of the project. A map of the project site, including adjacent streams and roads, is attached hereto as Exhibit A ("Premises").

1. Landowner agrees that the PA DEP and/or Grantee, its employees, agents and contractors shall have the right to enter upon the Premises to perform the work described in "Attachment D, Scope of Work of the DEP Grant Agreement." The right to enter shall also include periodic monitoring visits for the life of this Agreement.

2. By offering the Premises for implementation of this project, Landowner agrees to allow access, design preparation and implementation and repair of the Project, subject to available funds, for the duration of construction and for the time period identified in Section 1, Paragraph B (10) of this Agreement.

3. Grantee agrees that the Conservation Practices/Best Management Practices ("CP/BMPs") needed to correct the problems identified in Attachment D, "Scope of Work of the DEP Grant Agreement" shall be performed according to the: *(Circle all that apply)*

    a) The NRCS Pennsylvania Field Office Technical Guide,
    b) The Guidelines for Natural Stream Channel Design in Pennsylvania,
    c) The USDA NRCS National Engineering Handbook,
    d) A Handbook for Constructed Wetlands, Volume 4, Coalmine Drainage,
    e) The Stormwater Best Management Practices Manual,
    f) Plans developed by or certified by a Registered Professional Engineer and approved by PA DEP.

4. The CP/BMPs shall be maintained pursuant to Section 2, Paragraph C of this Agreement.

5. The ☐ Landowner ☒ Grantee shall be responsible for adherence to the standards set forth in Section 2, Paragraph C and shall not act in any manner inconsistent with the terms of this Agreement.

6. The ☒ Landowner ☒ Grantee agrees not to destroy, alter or modify the CP/BMPs, except to perform needed repairs, for the period covered by this Agreement, nor to undertake any action on land under the Landowners control which tends to defeat the purposes of this Agreement.

7. Any marketable credits toward nutrient effluent limits (nutrient reduction credits) that may be realized on account of the Commonwealth funded portion of this project and recognized by the DEP, are the property of the Commonwealth of PA, which maintains full ownership thereof. The Landowner and Grantee recognize and release all rights, claims, title or ownership to the nutrient reduction credits that are generated as a result of the Commonwealth funded portion of the work specified in this Agreement, for the time period covered by this Agreement.

8. Landowner agrees to refund all or part of the grant money paid to it, as determined by the Grantee, if before the expiration of the terms of this Agreement, the Landowner (a) destroys, alters or modifies the CP/BMPs installed, or (b) voluntarily relinquishes control or title to the land on which the CP/BMPs have been established, and the new landowner and/or operator of the land does not agree to maintain the CP/BMPs for the remainder of the terms of this Agreement. If the new landowner agrees to assume Landowner's obligations and to maintain the CP/BMPs for the remainder of the terms of this Agreement, then a new Landowner-Grantee Agreement shall be executed by the new landowner.

9. This Agreement shall be binding on the parties, their heirs, legal representatives, successors, and assigns.

10. The terms of this Agreement shall be for a period of 20 years.

Section 2 – Additional Agreement Provisions

A. Tenant provision

"Landowner" is a Tenant under a NOT APPLICABLE (Term of Lease) _____ (Oral/Written)

Lease agreement effective _____ (Date), with _____ (Landlord Name)

as Landlord, covering property located at _____ (Address)

Landowner enters this Agreement subject to the superior rights of the landlord in the Premises, and for a term subject to the duration of Landowners leasehold interest.

B. Special Conditions (Site specific concerns)

Project not to adversely affect rights of landowner or holder of mineral rights to utilize the portions of the property not affected by the project for resource or mineral extraction, timbering, or agriculture. Project will not adversely impact existing gas well on the property.

C. Operation, Maintenance and Repair Plan (To be attached)

See Attached Operation, Maintenance, and Repair Plan

Section 3 – Agreement Signatures

(Landowner Signature)	5-1-2010 (Date)
Randy E Ross (Landowner Name Please Print)	5-1-2010 (Date)
Anita B. Ross (Landowner Signature)	5-1-2010 (Date)
Anita B. Ross (Landowner Name Please Print)	5-1-2010 (Date)
(Grantee Representative Signature) Must be an officer of the organization	5/10/10 (Date)
Dennis E. Norris (Grantee Representative Please Print)	5/10/10 (Date)

Document Number

OPERATION, MAINTENANCE AND REPAIR PLAN

Proper operation and maintenance of Best Management Practices "(BMPs)" is critical for their success and longevity. The goal of this project is the establishment of a passive treatment system for treatment of the Morgan Run Ross Acid Mine Drainage (AMD) Discharges.

(List BMPs)

for improvement of water quality.

1) Components of the Project (List all practices being installed within this project):

Installation of limestone cell	Installation of vertical flow pond (limestone and compost cell)	Construction of settling basins
Installation of associated outlet structures and piping	Installation of culvert under access road	Planting of tree species to create a forest reclamation area on materials disposal area

2) Parties agree to perform all Maintenance Tasks as described in the chart at the end of this document.

3) Allowed activities:
   - Recreational activities such as hiking and hunting that do not disrupt the underground or above-ground treatment system components
   - Maintenance of vegetation in the project area, including occasional mowing or brush-hogging, except in the Forest Reclamation Area
   - Timbering activities on adjacent lands that do not harm the treatment system infrastructure or the Forest Reclamation Area

   Prohibited activities:
   - Earth disturbance activities such as cultivation or excavation immediately over the below ground components or within the above-ground components and in the Forest Reclamation Area
   - Any other activity that would disrupt the functionality of the treatment system
   - Any activity that would disrupt the growth of trees in the Forest Reclamation Area such as widespread mowing.

4) The ☐ Landowner(s) ☒ Grantee shall be considered to be in breach of this Agreement if he/she does not maintain and repair the project in compliance with this agreement or willfully neglects any other terms of this agreement.

5) The ☒ Landowner(s) ☒ Grantee agrees to comply with all Federal, State, local laws, rules and regulations. This would include noxious weed control.

6) The ☐ Landowner(s) ☒ Grantee shall be responsible for all normal, routine maintenance and normal, routine repair of the site and project.

7) Other Special Conditions:

- Maintenance of vegetation in the Forest Reclamation Area that does not disrupt the growth of trees, including careful mowing around trees or maintenance of trees to address storm damage, insect damage, or disease is allowed.
-
-
-

Maintenance Tasks

Practice	Limestone cells and vertical flow pond
Maintenance required	Periodic flushing by opening of valves
Schedule	Once per year
Responsible Party	MRWG (Morgan Run Watershed Group), CCCD (Clearfield County Conservation District) and/or its agents
Practice	Conveyance and piping system, including access road culvert
Maintenance required	Cleanout should clogging occur
Schedule	As needed
Responsible Party	MRGW, CCCD and/or its agents
Practice	Settling basins
Maintenance required	Periodic cleaning and disposal of metals
Schedule	Every 10-20 years depending on treatment efficiency and system inflows
Responsible Party	MRGW, CCCD and/or its agents
Practice	Periodic inspection and sampling
Maintenance required	Inspection for signs of debris, erosion, clogging, animal infestation and/or other problems; collection of water samples to verify treatment success
Schedule	Weekly during construction; Monthly for one year following construction; quarterly thereafter
Responsible Party	MRGW, CCCD and/or its agents

EXHIBIT A

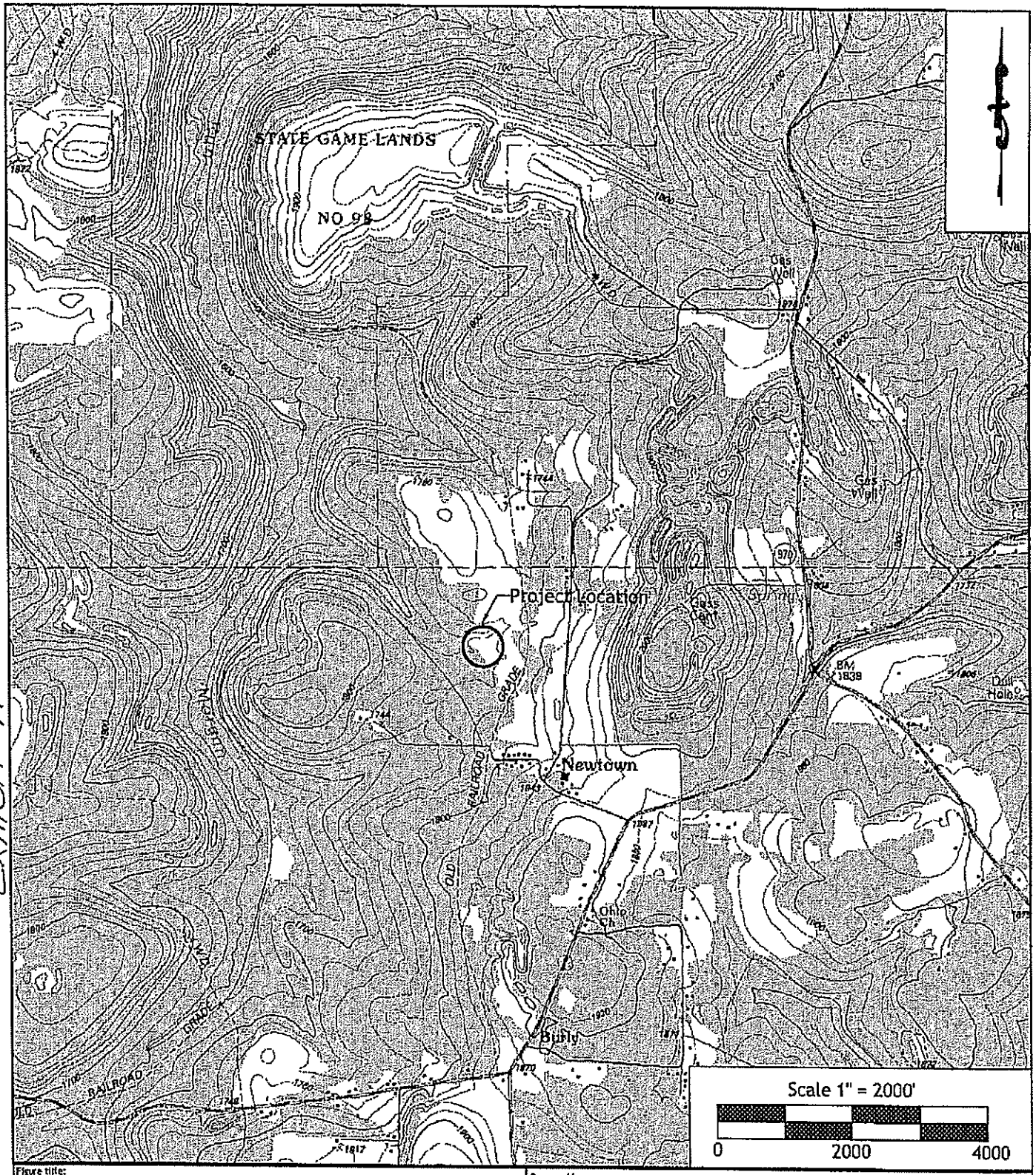


Figure title:

Figure 1: Location Map Showing Site Topography

Prepared for:

Clearfield Creek Watershed Association

Site information:

Morgan Run Ross AMD Treatment System

Decatur Township Clearfield County Pennsylvania

Prepared by:

ALDER RUN ENGINEERING
107 Coal Street
Osceola Mills, Pennsylvania 16666
Phone: (814) 339-6998
Fax: (814) 339-6266

Reference: United States Geological Survey, 7.5' Topographic Quadrangle: *Wallaceton Township, Pennsylvania*.

ATTACHMENT D

1000-FM-OA0063 Rev. 3/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

2009

Environmental Stewardship/Watershed Protection Grant

Scope of Work

(Please Type or Print Legibly)

1. Project name: Construction of the Ross Passive Treatment System
2. Grantee: Clearfield County Conservation District
3. Contact person: Kelly Williams, Watershed Specialist
4. Telephone Number: 814-765-8130
5. E-mail: kwilliamsccd@atlanticbbn.net
6. Project Location: McClarren/Eagle Eye Road (no street address), Decatur Township, Clearfield County, PA

7. Briefly identify the specific goals and objectives of the project:

The goals and objectives of the project are the construction of a passive treatment system for acid mine drainage, which will result in the restoration of 0.5 miles of Morgan Run and the elimination of pollutant loadings of approximately 140 lbs/day of acidity, 4 lbs/day of iron and 2 lbs/day of aluminum from Morgan Run.

8. Expected measurable environmental results (i.e. acres reclaimed, feet of stream bank protected, miles of stream improved, individuals trained, etc.)

0.5 miles of stream restored (from discharge to James Run); reclamation of 5 acres of poorly-reclaimed mine lands; establishment of 2 acres of Forest Reclamation Area

9. Are any permits required to complete this project? ☒ Yes ☐ No

If yes, specify.

Waiver 16 of Chapter 105 requirements for wetlands and stream impacts, NPDES Permit for Stormwater Associated with Construction Activity, Erosion and Sediment Pollution Control Plan Approval from Clearfield County Conservation District

10. Are any water samples to be collected? ☒ Yes ☐ No

If yes, identify:

a. Number of sample points 6

b. Organization providing sampling personnel Clearfield County Conservation District

c. Sample collection frequency monthly to quarterly

d. Laboratory performing analyses Mahaffey Laboratory, Curwensville, PA

If acid mine drainage is present within the project area, water samples upstream and downstream of the drainage must be collected.

11. Are any property easements required?

☒ No

☐ Yes, executed Agreement(s) provided to Department

☐ Yes, submit executed Agreement(s) prior to commencement of work

If Yes Agreement provided to Department, please identify landowner(s) _____

12. Is a Landowner-Grantee Agreement(s) required?

☐ No, not applicable for this project

☐ No, Grantee is landowner (Grantee Landowner Conditions attached)

☐ Yes, executed Agreement(s) provided to Department

☒ Yes, submit executed Agreement(s) prior to commencement of work

13. Will subcontractors be utilized? ☒ Yes ☐ No

If yes, specify the name and work function of the subcontractor and their Vendor # or describe the process by which they will be selected.

Construction Contractor--to be selected by competetive bid

New Miles of Blue Stream-; Alder Run Engineering-; Mahaffey Laboratory-:

1600-FM-OA0076 Rev. 5/2009

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Document Number

LANDOWNER – GRANTEE AGREEMENT

This Agreement, made this 10-12-2010
(Date)

by Randy and Anita Ross
Randy E. Ross Anita B. Ross
(Landowner(s))

residing at 305 N. 7th Street telephone # 717-684-0215

Columbia, PA 17512
(city) *(ZIP)*

and *Clearfield County Conservation District*
(Grantee)

Project description: Improvement to and utilization of access road between Township right-of-way and MR Ross Acid Mine Drainage Treatment System.

The Project is located at: No street address. Located west of McClarren/Eagle Eye Road near Newtown, PA (Osceola Mills, PA, Post Office, 16666)

Latitude: 40-54-52 Longitude: 78-20-51

Section 1 – Agreement Provisions

A. In consideration of the benefits that incur from the investment in the property, and/or monies received, the Grantee and the undersigned Landowner agree to participate in the Pennsylvania Department of Environmental Protection ("PA DEP") Growing Greener Grants Program and comply with the terms set forth in this Agreement.

B. Landowner represents and agrees that he/she is the sole owner of the real property on which the Project is to be performed, or has secured a sufficient property interest, including any easements or right-of-ways, necessary to grant access for the completion and maintenance of the Project. A map of the Project site, including adjacent streams and roads, is attached hereto as Exhibit A ("Premises").

1. Landowner agrees that the PA DEP and/or Grantee, its employees, agents and contractors shall have the right to enter upon the Premises to perform the work described in "Attachment D, Scope of Work" of the DEP Grant Agreement. The right to enter shall also include periodic monitoring visits for the life of this Agreement.

2. By offering the Premises for implementation of this Project, Landowner agrees to allow access, design preparation and implementation and repair of the Project for the duration of construction and for the time period identified in Section 1, Paragraph B (11) of this Agreement.

3. Grantee agrees that the Conservation Practices/Best Management Practices ("CP/BMPs") needed to correct the problems identified in "Attachment D, Scope of Work" of the DEP Grant Agreement shall be performed according to the *(Check all that apply)*:

   ☐ a) The NRCS Pennsylvania Field Office Technical Guide,
   ☐ b) The Guidelines for Natural Stream Channel Design in Pennsylvania,
   ☐ c) The USDA NRCS National Engineering Handbook,
   ☐ d) A Handbook for Constructed Wetlands, Volume 4, Coalmine Drainage,
   ☒ e) The Stormwater Best Management Practices Manual,
   ☒ f) Plans developed by or certified by a Registered Professional Engineer and approved by PA DEP.

4. The CP/BMPs shall be maintained pursuant to Section 2, Paragraph C of this Agreement.

5. The ☐ Landowner ☒ Grantee shall be responsible for adherence to the standards set forth in Section 2, Paragraph C and shall not act in any manner inconsistent with the terms of this Agreement.

6. The ☒ Landowner ☒ Grantee agrees not to destroy, alter or modify the CP/BMPs, except to perform needed repairs, for the period covered by this Agreement, nor to undertake any action on land under the Landowner's control which tends to defeat the purposes of this Agreement.

7. Any marketable credits toward nutrient effluent limits (nutrient reduction credits) that may be realized on account of the Commonwealth funded portion of this Project and recognized by the DEP, are the property of the Commonwealth of PA, which maintains full ownership thereof. The Landowner and Grantee recognize and release all rights, claims, title or ownership to the nutrient reduction credits that are generated as a result of the Commonwealth funded portion of the work specified in this Agreement, for the time period covered by this Agreement.

8. Any aquatic resource compensation credits, including but not limited to wetland, waterway, aquatic habitat, floodplain or riparian credits, realized from the Commonwealth funded portion of the project, and recognized by the Pennsylvania Department of Environmental Protection, are the property of the Commonwealth of Pennsylvania, which maintains full ownership thereof. The Landowner and Grantee recognize and release all rights, claims, title or ownership to the aquatic resource compensation credits, in perpetuity, that are generated as a result of the Commonwealth funded portion of the work specified in this Agreement.

9. Landowner agrees to refund all or part of the grant money paid to it, as determined by the Grantee, if before the expiration of the term of this Agreement, the Landowner (a) destroys, alters or modifies the CP/BMPs installed, or (b) voluntarily relinquishes control or title to the land on which the CP/BMPs have been established, and the new landowner and/or operator of the land does not agree to maintain the CP/BMPs for the remainder of the term of this Agreement. If the new landowner agrees to assume Landowner's obligations and to maintain the CP/BMPs for the remainder of the term of this Agreement, then a new Landowner-Grantee Agreement shall be executed by the new landowner.

10. This Agreement shall be binding on the parties, their heirs, legal representatives, successors, and assigns.

11. The term of this Agreement shall be for the duration of Project construction and a period of 20 years thereafter.

Section 2 – Additional Agreement Provisions

A. Tenant provision

"Landowner" is a Tenant under a Not Applicable _____ _____
(Term of Lease) (Oral/Written)

Lease agreement effective _____, with _____
(Date) (Landlord Name)

as Landlord, covering property located at _____
(Address)

Landowner enters this Agreement subject to the superior rights of the landlord in the Premises, and for a term subject to the duration of Landowner's leasehold interest.

B. Special Conditions (Site specific concerns)

--This agreement provides for access to the Morgan Run Ross (MR Ross) Acid Mine Drainage Treatment System. Construction and operation and maintenance of the treatment system is addressed in a separate agreement.

--Condition of existing access road to be documented with photographs prior to start of construction activities, and road to be returned to a condition equal to or better than the pre-construction condition following the completion of construction activities. Roadway maintenance activities will consist primarily of application of new surface aggregate.

--Existing features along access road, such as existing pond and culverts, to be protected from harm using fencing and other barriers. Any damaged features to be repaired or replaced.

--The existing "bridge" area to be replaced with an engineered and permitted culvert structure.

--Landowner to receive a reasonable allowance for reimbursement of the costs of washing dust from the house, siding, and windows following demobilization of construction equipment and completion of project.

--Landowner to be notified of heavy hauling activities during dry conditions that have the potential to create dust so landowner has the opportunity to close windows and take other precautions to prevent dust.

--Contractor to coordinate hauling and access with landowner to minimize impacts to landowners use of property for hunting and recreation.

--Following completion of construction of the treatment system, vehicular traffic near the Ross Residence is to be minimal, and access is to only be used on an occasional basis and/or for major repairs of the treatment system, which are not foreseen at this time. Use other than occasional use will be coordinated with the property owners in advance.

--Project not to adversely affect rights of landowner or holder of mineral rights to utilize the portions of the property not affected by the project for resource or mineral extraction, timbering, or agriculture. Project will not adversely impact existing gas well on the property.

C. Operation, Maintenance and Repair Plan (To be attached)

Section 3 – Agreement Signatures

Randy E Ross — (Landowner Signature) — 10-12-2010 (Date)

Randy E Ross — (Landowner Name Please Print) — 10-12-2010 (Date)

Anita Ross — (Landowner Signature) — 10-12-2010 (Date)

Anita Ross — (Landowner Name Please Print) — 10-12-2010 (Date)

Susan G. Reed — (Grantee Representative Signature) Must be an officer of the organization — 10/27/10 (Date)

Susan G. Reed — (Grantee Representative Please Print) — 10/27/10 (Date)

Document Number

OPERATION, MAINTENANCE AND REPAIR PLAN

Proper operation and maintenance of Best Management Practices "(BMPs)" is critical for their success and longevity. The goal of this project is the establishment of an access road to provide access to the Morgan Run Ross Acid Mine Drainage Treatment Facility.

(List BMPs)

1) Components of the Project (List all practices being installed within this project):

Use of existing access road for site access and hauling of equipment and materials, including maintenance and repair of access road as needed	Installation of culvert crossing to replace existing culvert(s)	

2) Parties agree to perform all Maintenance Tasks as described in the chart at the end of this document.

3) Allowed activities:
   - Use of access road for access to residence and property for residential and recreational use
   - Use of access road for access to agricultural, timbering or other resource extraction activities, provided party responsible for such activity is responsible for maintenance and repair of damage to access road caused by such activities and access for such activities is coordinated with the construction project as to not adversely affect construction access.

   Prohibited activities:
   - Removal of aggregate or culverts provided for construction access during the period of treatment system construction.

4) The ☐ Landowner(s) ☒ Grantee shall be considered to be in breach of this Agreement if he/she does not maintain and repair the project in compliance with this agreement or willfully neglects any other terms of this agreement.

5) The ☒ Landowner(s) ☒ Grantee agrees to comply with all Federal, State, local laws, rules and regulations. This would include noxious weed control.

6) The ☐ Landowner(s) ☒ Grantee shall be responsible for all normal, routine maintenance and normal, routine repair of the site and project.

7) Other Special Conditions:
   - The Grantee shall be responsible for all normal, routine maintenance and normal, routine repair of the access road and associated culvert(s) from the start of

construction through the completion of construction activities. Landowner to resume maintenance and repair of access road following the completion of construction activities and final road inspection. Should future construction access be required (for unanticipated repairs to the treatment system or other reasons), other than occasional access for inspection, Grantee will resume responsibility for maintenance and repair of road during the time Grantee utilizes access road.

-
-

Maintenance Tasks

Practice	Access road and associated drainage culverts and E&S controls
Maintenance required	Period inspection E&S controls-removal of sediment and replacement of E&S controls (as needed) (silt fence, rock filters, sediment traps) Drainage culverts-removal of sediments, repair of rock apron and replacement of aggregate, repair of damage to culverts (as needed) Roadway surface-repair of ruts, soft areas, etc., and replacement of aggregate
Schedule	Inspection-weekly and after rain events Maintenance and repair-as needed
Responsible Party	MRWG (Morgan Run Watershed Group), CCCD (Clearfield County Conservation District) and/or its agents
Practice	
Maintenance required	
Schedule	
Responsible Party	
Practice	
Maintenance required	
Schedule	
Responsible Party	

EXHIBIT A

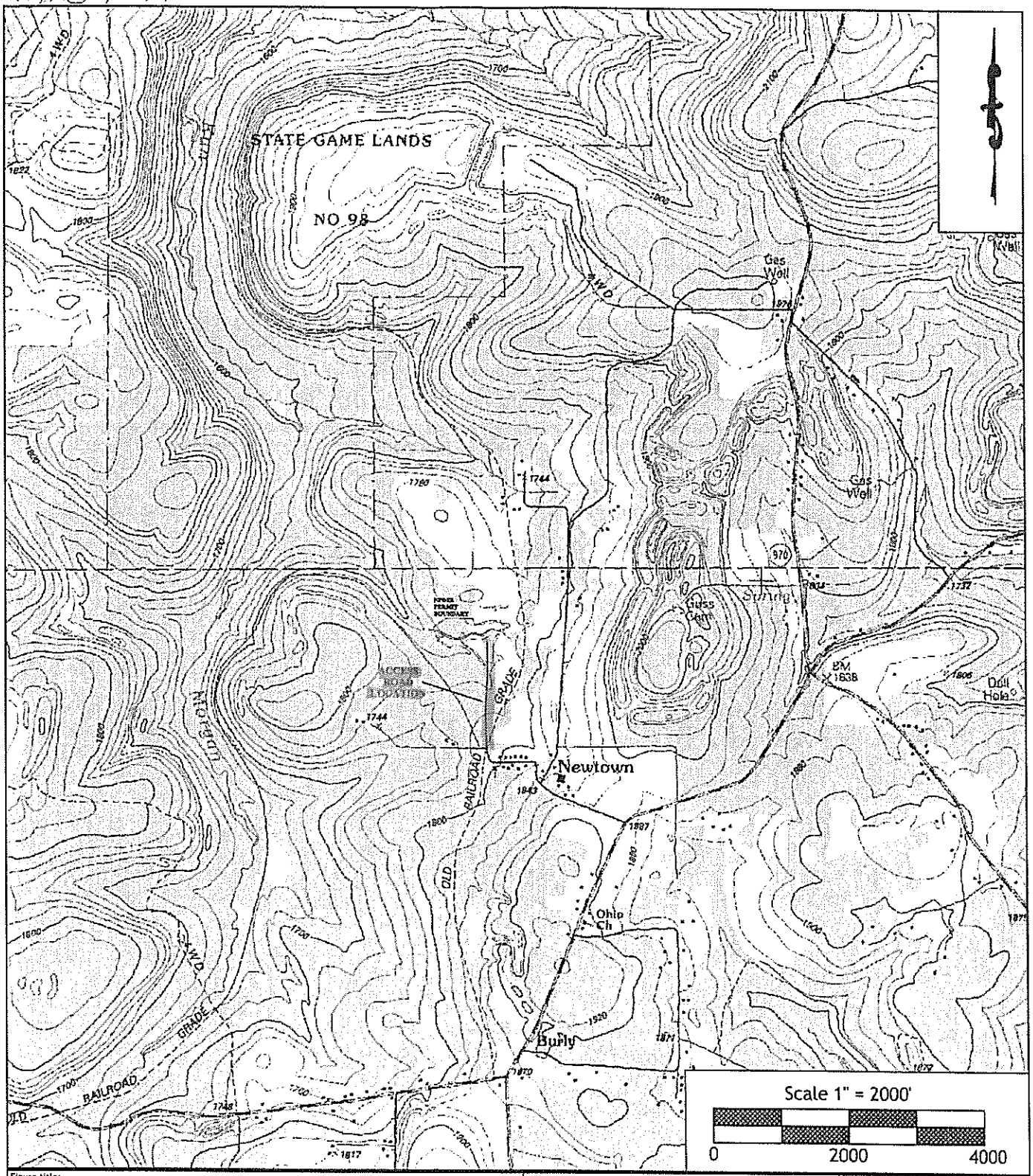


Figure title:

Figure 1: Access Road Location Map

Prepared for:

Clearfield County Conservation District

Site information:

Morgan Run Ross AMD Treatment System

Decatur Township Clearfield County Pennsylvania

Reference: United States Geological Survey, 7.5' Topographic Quadrangle: *Wallaceton, Pennsylvania*.

Prepared by:

ALDER RUN ENGINEERING

107 Coal Street
Osceola Mills, Pennsylvania 16666
Phone: (814) 339-6998
Fax: (814) 339-6998

ATTACHMENT D

1000-FM-OA0063 Rev. 3/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

2009

Environmental Stewardship/Watershed Protection Grant

Scope of Work

(Please Type or Print Legibly)

1. Project name: Construction of the Ross Passive Treatment System
2. Grantee: Clearfield County Conservation District
3. Contact person: Kelly Williams, Watershed Specialist
4. Telephone Number: 814-765-8130
5. E-mail: kwilliamsccd@atlanticbbn.net
6. Project Location: McClarren/Eagle Eye Road (no street address), Decatur Township, Clearfield County, PA

7. Briefly identify the specific goals and objectives of the project:

The goals and objectives of the project are the construction of a passive treatment system for acid mine drainage, which will result in the restoration of 0.5 miles of Morgan Run and the elimination of pollutant loadings of approximately 140 lbs/day of acidity, 4 lbs/day of iron and 2 lbs/day of aluminum from Morgan Run. This scope of work includes only the utilization of an existing access road on the Ross property between township roads and the project site.

8. Expected measurable environmental results (i.e. acres reclaimed, feet of stream bank protected, miles of stream improved, individuals trained, etc.)

0.5 miles of stream restored (from discharge to James Run); reclamation of 5 acres of poorly-reclaimed mine lands; establishment of 2 acres of Forest Reclamation Area

9. Are any permits required to complete this project? ☒ Yes ☐ No

If yes, specify.

Waiver 16 of Chapter 105 requirements for wetlands and stream impacts, NPDES Permit for Stormwater Associated with Construction Activity, Erosion and Sediment Pollution Control Plan Approval from Clearfield County Conservation District

10. Are any water samples to be collected? ☒ Yes ☐ No

If yes, identify:

a. Number of sample points 6
b. Organization providing sampling personnel Clearfield County Conservation District
c. Sample collection frequency monthly to quarterly
d. Laboratory performing analyses Mahaffey Laboratory, Curwensville, PA

If acid mine drainage is present within the project area, water samples upstream and downstream of the drainage must be collected.

11. Are any property easements required?

☒ No
☐ Yes, executed Agreement(s) provided to Department
☐ Yes, submit executed Agreement(s) prior to commencement of work

If Yes Agreement provided to Department, please identify landowner(s) _____

12. Is a Landowner-Grantee Agreement(s) required?

☐ No, not applicable for this project
☐ No, Grantee is landowner (Grantee Landowner Conditions attached)
☐ Yes, executed Agreement(s) provided to Department
☒ Yes, submit executed Agreement(s) prior to commencement of work

13. Will subcontractors be utilized? ☒ Yes ☐ No

If yes, specify the name and work function of the subcontractor and their Vendor # or describe the process by which they will be selected.

Construction Contractor--to be selected by competetive bid

New Miles of Blue Stream-; Alder Run Engineering-; Mahaffey Laboratory-:

MORGAN RUN ROSS AMD TREATMENT SYSTEM
OPERATION AND MAINTENANCE PLAN CHECKLIST

INSPECTION INSTRUCTIONS

1. Inspect the entire treatment system

2. Look for:
   - areas of erosion or accumulation of sediments (except for accumulations of sediments in the settling basins)
   - displaced (washed out) vegetation or rip rap
   - dead or dying vegetation
   - system functionality problems
     - overtopping of berms or flow in emergency spillways
     - debris in outlet structures, pipes, or spillways
     - water levels are too low or too high
   - infestation by beavers or muskrats clogging outlets or digging in the embankments
   - vandalism
   - valves in correct position (either open or closed)

3. Check water quality:
   - effluent pH should be above 6.5
   - iron and aluminum concentrations should be below 1.0 mg/l

OPERATION AND MAINTENANCE INSTRUCTIONS

1. Remove any debris or sediment that harms the system or prevents it from working as designed.
2. Repair any areas of erosion.
3. Address any areas of damage by animals such as beaver dams and muskrats burrowing through berms.
4. Contact Clearfield County Conservation District if water levels are too low or too high.
5. Correct any vandalism or damage, such as removal of stoplogs in the outlets or clogging of the outlet pipes.
6. Follow instructions in the Operation and Maintenance Plan for flushing of vertical flow pond and vertical flow pond/limestone cell at a recommended interval of every 6 months.
7. Open and close valves at a recommended interval of every 6 months to maintain functionality.

OTHER

1. Contact Clearfield County Conservation District (814-765-8130) for technical assistance if there are questions or problems at the site that cannot be immediately and easily corrected.