COMPENSATORY MITIGATION PLAN

New Hill West Surface Mine (S-2009-09)
Monongalia County, West Virginia

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POTESTA

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1.0 INTRODUCTION

Patriot Mining Company (Patriot) is submitting an application to the United States Army Corps of Engineers (USACE), Pittsburgh District, for Department of the Army (DA) Clean Water Act (CWA) Section 404 authorization for activities related to the construction, operation and maintenance of the New Hill West Surface Mine (NHWSM) as authorized and identified by the West Virginia Department of Environmental Protection (WVDEP) as Permit No. S-2009-09, (in Patriot's Surface Mine Application (SMA)). Under Section 404 of the CWA, the USACE regulates the discharge of dredged and fill material into the "waters of the United States" (jurisdictional waters) and any activities in waters within the USACE's jurisdiction requires authorization from the agency in the form of a Section 404 permit. The NHWSM permit, as issued by the WVDEP, would necessitate the placement of materials into jurisdictional waters. Project mapping may be found in **Appendix A**. Jurisdictional information may be found in **Appendix B**.

Under Section 404 of the CWA an applicant for a DA Permit must comply with provisions found in Section 404(b)(1) as well as other applicable regulations and statutes. Section 404(b)(1) guidelines require that applicants mitigate by avoiding potential impacts to aquatic resources to the maximum extent practicable. The "Memorandum of Agreement Between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act Section 404(b)(1) Guidelines" (1990 MOA) outlines the specific mitigation sequence (appropriate and practicable avoidance, minimization, and compensation) that must be followed before considering compensatory mitigation for the proposed project. The first step in the mitigation sequence is to evaluate and design, redesign if necessary, the project in a manner that avoids, if practicable, impacts to jurisdictional waters. If such impacts to waters cannot be avoided by redesigning or relocating the project, the next step in the process requires the applicant to take appropriate and practicable steps to minimize adverse impacts. Such minimization efforts may be addressed through project modifications or permit conditions. For example, Patriot has proposed to incorporate best management practices (BMPs) to the maximum extent possible and use the best technology currently available as part of their mining plans. Patriot has avoided impacts to waters through the use of an existing side-hill fill and has also minimized impacts to waters by only temporarily impacting waters, most of which have been previously disturbed. Additionally, through the use of the approximate original contour (AOC) model developed by the WVDEP, Patriot has maximized the amount of mine spoil returned to the mined area while minimizing the amount of mine spoil placed in excess spoil disposal sites which in this case, is located outside of jurisdictional waters (side-hill fill). Finally, applicants are required to provide compensatory mitigation to off-set the unavoidable impacts to aquatic resources lost or adversely affected by authorized activities. These steps (requirements) are considered to be essential to meeting the overall objective of the CWA which is to restore and maintain the chemical, physical and biological integrity of the nation's waters.

In addition to Section 404(b)(1) guidelines, projects authorized by the USACE should be consistent with the mitigation rules found in 33 CFR Part 332 Compensatory Mitigation for Losses of Aquatic Resources (Mitigation Rule) (33 U.S.C. 401 et seq.: 33 U.SS.C. 1344; and Pub. L. 108-136). In general, both of the December 24, 2002, Regulatory Guidance Letter No. 02-02 (RGL 02-02) and the 1990 MOA guidelines suggest that compensatory mitigation be undertaken, when practicable, in areas adjacent to or contiguous to the project site (on-site); however, off-site mitigation may be considered if on-site mitigation is not practicably available, **or** when off-site mitigation provides more ecological benefit to the watershed than on-site mitigation (RGL 02-02). Also, new regulations for mitigation practices (Mitigation Rule) were finalized in 2008 and these regulations suggest a preference for the use of mitigation banks and in-lieu fee programs prior to use of permittee-responsible mitigation. The rule does not make the use of these types of mitigation mandatory, but instead leaves such discretion to the District Engineer (DE) to determine the appropriate mitigation type for the area. In making such a determination, the DE must take into consideration the availability of programs in the vicinity of the project and whether an appropriate number and resource type of credits are available.

In general, the Mitigation Rule indicates that mitigation sites should be located within the same watershed as the impact site and should be located where the likelihood of successfully off-setting the unavoidable impacts to lost aquatic resources is the greatest. Watershed scale features that should be considered when making a determination of the appropriate mitigation type include: (i) aquatic habitat diversity; (ii) habitat connectivity; (iii) relationships to hydrologic sources; (iv) land use trends; (v) ecological benefits; and, (vi) compatibility with adjacent land uses. When evaluating on-site versus off-site opportunities, the USACE typically considers: (i) likelihood of success; (ii) ecological sustainability; (iii) practicability of long-term monitoring and maintenance; and, (iv) the relative costs of mitigation alternatives.

The proposed mitigation types contained in this Compensatory Mitigation Plan (CMP) have been developed consistent with the above mentioned guidance in an effort to offset the unavoidable impacts associated with the proposed project. This mitigation plan has been formatted to conform with the USACE's requirements under RGL 08-03. Also, Section 401 of the CWA requires the DE to obtain a certification from the WVDEP that the proposed project is consistent with the State's water quality standards; therefore, the mitigation measures proposed in the CMP also designed to comply with any compensatory mitigation requirements imposed by the WVDEP as a part of its certification process. Compliance with these compensatory mitigation measures required Patriot to assess mitigation opportunities both on and off-site at the proposed project area. As part of this evaluation process, Patriot evaluated properties not only exhibiting mitigation potential but sites with the potential for overall watershed benefit.

Based on the above guidance, which requires the applicant provide compensatory mitigation that is both appropriate and practicable, it was determined that the watershed would be best served by through both on-site restoration and off-site restoration/enhancement in areas that have been identified as sufficiently degraded to warrant restoration activities that would improve the physical, biological, and chemical integrity of the watershed unit as a whole. Developing and implementing mitigation measures for the selected sites would be used to off-set losses to aquatic resources associated with Patriot's project. The CMP is based on a watershed approach which encourages the use of mitigation sites that maintain and improve the quality and quantity of aquatic resources in the watershed through strategic selection of compensatory mitigation projects (Heggem et al. 2000). Also, the development of the CMP assumes that the level of information and analysis reported in this document is commensurate with the scope and scale of New Hill West Surface Mine and the impacts associated with the proposed project.

This CMP has also been designed to assist in the National Environmental Policy Act (NEPA) analysis which may also consider mitigation as an integral element in the design of an action. This document includes implementation methods for mitigation and monitoring similar to those suggested in Council for Environmental Quality's (CEQ) Memorandum for Heads of Federal Departments and Agencies, Draft Guidance for NEPA Mitigation and Monitoring. Additional NEPA information may be found in this documents companion document, referred to as the Environmental Information Document (EID) for this project which is also being supplied to the USACE.

2.0 PROJECT DESCRIPTION

Patriot is proposing to develop and construct the New Hill West Surface Mine. The proposed project includes the construction, operation, and maintenance, in tributaries (unnamed) of Scotts Run, of the New Hill West Surface Mine. As proposed, the project would result in temporary impact to tributaries that fall within the permit boundary (in the mining area). The project would include the use of an existing side-hill fill which would not require additional impacts to jurisdictional waters. The proposed project is located within 0.5 miles of Cassville, West Virginia, in the Western District of Monongalia County, West Virginia.

Specifically, development of the New Hill West Surface Mine would allow extraction, through the use of surface mining methods (area mining), in the following coal seams contained in the Dunkard and Monongahela Groups: Waynesburg and Waynesburg A and associated splits and riders of these seams. The development and operation of the proposed surface mine would generate approximately 29 million cubic yards (CY) of overburden (includes swell factor) with approximately 0.94 million CY of excess overburden material for placement in the proposed side-hill fill as described above. The remaining overburden generated in the mining process would be placed back in the mined areas as a part of the reclamation process.

Potesta & Associates, Inc. (POTESTA) performed field investigations of the proposed project area which included portions of the upper Scotts Run watershed. This documentation has been submitted to the USACE and field verification has been performed. As of the submittal data of this application, the USACE has not completed a final jurisdictional determination on these properties; however, based on agency interaction to date, Patriot does not anticipate the findings of the final jurisdictional determination to result in impacts different than those identified in this document. Impact tables are provided in the permit application for this project.

For wetland delineations, POTESTA utilized the *On-site Routine Determination/Delineation* Method as described in the 1987 Corps of Engineers Wetlands Delineation Manual for the delineation of wetlands encountered. As established by this manual, the sites were assessed for the presence of the following three criteria: hydrophytic vegetation, hydric soils, and wetland hydrology. In the areas where in one or more of these criteria were disturbed due to man-made, seasonal, or other conditional, a determination was made as to whether or not the missing criteria would have been present under normal circumstances. Plant species were identified utilizing Flora of West Virginia (Strausbaugh and Core, 2nd Edition) and U. S. Fish and Wildlife Service National List of Plant Species that Occur in Wetlands (Region 3) found on the U.S. Department of Agriculture Wetland Indicator Status site (http://plants.usda.gov/wetland.html). Soil Survey data (The Soil Survey Geographic (SSURGO) database for Marion and Monongalia Counties, West Virginia) was also reviewed for the delineation area. Additionally, the DRAFT Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual Eastern Mountains and Piedmont Region (USACE, 2009) was utilized to assist in the determination of atypical wetland areas. While this regional supplement is in draft form, it was used as an aid in wetland evaluation. Work completed as a part of this evaluation was also consistent with the technical memorandums issued by the United States Environmental Protection Agency (USEPA)/USACE with regard to evaluating "water of the US" post-*Rapanos*.

POTESTA made stream determinations based on measurements obtained using the bed and bank definition of a streambed, as well as the WVDEP's October 1999 Memorandum, "*Guidance for Delineation of Ephemeral/Intermittent Streams*," as well as more recently issued memorandum (Re: CWA Jurisdiction Following the U.S. Supreme Court Decision In *Rapanos v. Untied States*) and a second memorandum (Memorandum for the Field: Coordination on JDs under CWA Section 303 in light of *SWANCC* and *Rapanos* Supreme Court decisions). The WVDEP memorandum defines ephemeral channels as those which "flow only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice, and which has a channel bottom that is always above the local water table." Intermittent channels are defined in this document as "a stream or reach of a stream that is below the local water table for at least some part of the year and obtains its flow from both surface run-off and groundwater discharge." As defined, this type of channel may have no flow during sustained periods of no precipitation and will support life which does not require residence in flowing waters for a continuous period of at least six months. Section 38 CSR2.2.69 of the West Virginia Surface Mine Reclamation Regulations (Rules) defines intermittent channels as "A stream or reach of a stream that drains a watershed of at least one square mile; or a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface run-off and ground water discharge." Section 38 CSR 2.2.87 of the same Rules defines perennial waterbodies as "a stream or portion of a stream that flows continuously." **Table 2-a** contains a list of streams that were delineated, but will not necessarily be impacted, as a result of the proposed project.

TABLE 2-a

Streams Delineated in the Upper Scotts Run Watershed

Name of Stream or Stream Section		
ID	**401 Naming System**	**Aquatic Resources Report Naming**
Tributary No. 1	First Left Unnamed Tributary of the Thirteenth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 1-1	Unnamed Tributary of the First Left Unnamed Tributary of the Thirteenth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 4	Twelfth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of Scotts Run
Tributary No. 5	Eleventh Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of Scotts Run
Tributary No. 6	First Right Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 7	Second Right Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run (5+30 to 20+86)	Unnamed Tributary of Scotts Run
	Ninth Left Descending Unnamed Tributary of Scotts Run (0+00 to 5+30)	
Tributary No. 7-1	Second Left Unnamed Tributary of the Second Right Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 7-2	Third Left Unnamed Tributary of the Second Right Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 7-3	First Left Unnamed Tributary of the Second Right Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 8	First Left Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 8-1	Unnamed Tributary of the First Left Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 9	Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 9-1	Second Left Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 9-2	Third Left Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 9-3	Fourth Left Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of an Unnamed Tributary of Scotts Run
Tributary No. 9-4	Fifth Left Unnamed Tributary of the Ninth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of an Unnamed Tributary of an Unnamed Tributary of Scotts Run

Name of Stream or Stream Section		
ID	401 Naming System	Aquatic Resources Report Naming
Tributary No. 10	Tenth Left Descending Unnamed Tributary of Scotts Run	Unnamed Tributary of Scotts Run

Permanent impacts, for the purpose of this document, are defined as impacts to aquatic resources which cannot be restored post mining. Temporary impacts, for the purpose of this document, are defined as the temporary interruption of segments of channel due resource recovery. As noted, these impacts are classified as temporary because these areas would be restored and/or enhanced, as close as practical, to their pre-disturbance configuration following the mining operation.

The development of the project area of the mining project would result in the unavoidable permanent impacts to approximately 0.064 acres of waters of the U.S. (jurisdictional waters). In addition to the permanent impacts, approximately 4,118 linear feet or 0.240 acre of jurisdictional waters would be temporarily impacted by the proposed activity. In total, unavoidable impacts associated with the proposed surface mining project would impact approximately 4,118 linear feet or 0.240 acre of stream and 0.064 acre of wetland all of which have been identified by the USACE as jurisdictional waters. A summary of the impacts to waters of the U.S. is provided in **Table 2-b** and are as follows:

- **Mine-Through No. 1** – The proposed project would result in mining through approximately 465 linear feet (0.029 acre) of intermittent channel (in Tributary No. 1) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 1-1** – The proposed project would result in mining through approximately 325 linear feet (0.007 acre) of intermittent channel (in Tributary No. 1-1) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 4** – The proposed project would result in mining through approximately 422 linear feet (0.012 acre) of ephemeral channel (in Tributary No. 4) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 5** – The proposed project would result in mining through approximately 86 linear feet (0.002 acre) of intermittent channel (in Tributary No. 5) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 6** – The proposed project would result in mining through approximately 100 linear feet (0.007 acre) of intermittent channel and 469 linear feet (0.026 acre) of ephemeral channel (in Tributary No. 6) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 7** – The proposed project would result in mining through approximately 870 linear feet (0.078 acre) of intermittent channel and 652 linear feet (0.037 acre) of ephemeral channel (in Tributary No. 7) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 7-1** – The proposed project would result in mining through approximately 37 linear feet (0.001 acre) of ephemeral channel (in Tributary No. 7-1) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 7-3** – The proposed project would result in mining through approximately 209 linear feet (0.006 acre) of ephemeral channel (in Tributary No. 7-3) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 8** – The proposed project would result in mining through approximately 139 linear feet (0.017 acre) of intermittent channel (in Tributary No. 8) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 9** – The proposed project would result in mining through approximately 127 linear feet (0.009 acre) of intermittent channel (in Tributary No. 9) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mine-Through No. 10** – The proposed project would result in mining through approximately 217 linear feet (0.009 acre) of ephemeral channel (in Tributary No. 10) temporarily removing the stream so that mineral resources may be recovered from below the streambed.

- **Mining Area** – Within the permit area three small emergent wetlands would be permanently impacted by the proposed mining activities. These aquatic resources are located within the permit area and would be impacted as a result of resource recovery activities. The wetlands are as follows:

  - **Wetland No**. 1 – 0.005 acre
  - **Wetland No**. 2 – 0.030 acre
  - **Wetland No**. 3 – 0.029 acre

These impacts are summarized in **Table 2-b** with delineation mapping in **Appendix B**.

TABLE 2-b

Stream Impacts Associated with New Hill West Surface Mine (S-2009-09)

Impact Structure (Stream)	Permanent Impacts						Temporary Impacts					
	Perennial		Intermittent		Ephemeral		Perennial		Intermittent		Ephemeral	
	Length (ft)	Acres	Length (ft)	Acres	Length (ft)	Acres	Length (ft)	Acres	Length (ft)	Acres	Length (ft)	Acres
Mine-Through No. 1 (Tributary No. 1)	---	---	---	---	---	---	---	---	465	0.029	---	---
Mine-Through No. 1-1 (Tributary No. 1-1)	---	---	---	---	---	---	---	---	325	0.007	---	---
Mine-Through No. 4 (Tributary No. 4)	---	---	---	---	---	---	---	---	---	---	422	0.012
Mine-Through No. 5 (Tributary No. 5)	---	---	---	---	---	---	---	---	86	0.002	---	---
Mine-Through No. 6 (Tributary No. 6)	---	---	---	---	---	---	---	---	100	0.007	469	0.026
Mine-Through No. 7 (Tributary No. 7)	---	---	---	---	---	---	---	---	870	0.078	652	0.037
Mine-Through No. 7-1 (Tributary No. 7-1)	---	---	---	---	---	---	---	---	---	---	37	0.001
Mine-Through No. 7-3 (Tributary No. 7-3)	---	---	---	---	---	---	---	---	---	---	206	0.006
Mine-Through No. 8 (Tributary No. 8)	---	---	---	---	---	---	---	---	139	0.017	---	---
Mine-Through No. 9 (Tributary No. 9)	---	---	---	---	---	---	---	---	127	0.009	---	---
Mine-Through No. 10 (Tributary No. 10)	---	---	---	---	---	---	---	---	---	---	217	0.009
Cumulative Total Stream Impacts	---	---	---	---	---	---	---	---	2,112	0.149	2,006	0.097

The proposed operation, with the use of an existing side-hill fill and limited permanent impacts, represents the least environmentally damaging practical alternate that allows for maximizing the resource recovery. Coal extracted from the proposed surface mine would be hauled off-site to a preparation plant and/or loadout to be marketed.

Initial development and mining activities associated with the New Hill West Surface Mine would require placement of dredged and fill material into channels that have been previously identified as jurisdictional waters or "waters of the United States," more specifically 13 segments of such waters within the proposed project area. The impacts will be contained primarily within the upper Scotts Run.

3.0 BASELINE CONDITIONS

Baseline conditions described in this section of the CMP provide a summary of the general ecological conditions in the Scotts Run watershed which contains both the proposed project area and mitigation sites on Scotts Run. Also included in this section is a brief summary of the general watershed condition of the several 14-digit watersheds in the vicinity of Scotts Run. This constructed drainage area (Scotts Run, Wades Run, and Guston Run watersheds (Focus Watershed – 7 merged 14 HUC units)) are a subset of the Monongahela River and are being used for evaluation of cumulative impacts. These watersheds have an estimated total drainage area of 9,420.21 acres (approximately 14.72 square miles) and compose approximately 41.93 percent of the Mon-12 drainage area. Because of the relative size of the proposed project (225 acres), it was determined that using the 12-digit HUC may water down potential cumulative impacts. This data is being included to provide the USACE with data regarding the condition of the three drainages as it relates to consideration of the impacts associated with the unavoidable loss of aquatic resources resulting from the construction and operations of the proposed New Hill West Surface Mine. Additionally, this information should support the use of a watershed approach for evaluating and/or determining appropriate mitigation for the proposed project which is both practicable and capable of compensating for the aquatic resource lost as well as supporting the sustainability or improvement of aquatic resources in the watershed.

3.1 Mining

The history of the Scotts Run watershed has been well documented in books and articles, particularly with regard to the mining industry and its rise and fall prior to the great depression.

Scotts Run is part of the Fairmont Coal Field. Commercial development of this field began in 1852 with the completion of the Baltimore and Ohio Railroad. During the late 1800s, principle development of the Fairmont field occurred near Clarksburg and Fairmont along the railroads path (Ross, 1994). The coal industry in Monongalia County developed much later with one of the first operations opening in 1890 by the Hutchinson Coal Company (Beechwood Mine).

Coal companies and speculators began to accumulate mineral rights on Scotts Run in the late nineteenth century (Lewis, 1994). In 1899, Monongalia County produced approximately 57,000 tons of coal. In 1914, that total rose to 400,000 tons. Early mining in Monongalia County was primarily done by residents, outcrops chipped away to heat homes and businesses. In the early 1900s, the Morgantown and Dunkard Valley Railway put in an electric trolley service in Scotts Run, connecting Morgantown with Cassville. Prior to this, Cassville was connected to Morgantown by a single dirt road known as the Dunkard Creek Turnpike. When rich coal seems were uncovered in this drainage, it soon became evident that the trolley line would not be capable of accommodating the booming coal industry. In 1914 tracks for the Morgantown and Wheeling Railroad entered the Scotts Run watershed. By 1916, this line was completed to Brave, Pennsylvania (Ross, 1994).

By 1921, the total tons of coal mined in Monongalia County had increased 10-fold to 4.4 million tons. In 1904, 27 percent of the taxable acres on Scotts Run were controlled by coal mining companies (Yeager, 1994). By 1910, this number increased to 44 percent. In 1914 this number increased to 55 percent. By 1930, coal companies controlled 71 percent of the taxable acres on Scotts Run. At the peak of mining in Scotts Run (1923), 77 percent of the property was controlled by mining companies and 36 (or 37 (Ross, 1994)) mines owned by 33 different companies were extracting coal from underground. The watershed has been called one to the most intensively developed coal districts in the United States. Between 1917 and 1942, when most of coal ownership in the watershed was consolidated, a minimum of 73 coal companies operated in Scotts Run.

Scotts Run is located on the eastern outcrop of the Pittsburgh seam providing easy entry into what has been identified as one of the most economically important coal seam in the world (Lewis, 1994). The Sewickley, located above the Pittsburgh, was considered the best quality locomotive coal in the nation. The coal fields opened up in Scotts Run just as the WWI demand for coal increased market need. Additionally, Scotts Run, located on the Monongahela River, which carried freight towards Pittsburgh and the Ohio River and the railroad had opened up Monongalia County. Generally, developers in the coal industry lease land based on acre. In Scotts Run the coal was leased both by the acre and by the seam which allowed for tremendous development. In most instances, early coal in the Pittsburgh and Sewickley seams in Scotts Run was held by two different parties which could create dangerous mining conditions and conflict.

Mining in Scotts Run peaked in 1923. During the late 1920s, the mining companies and miners began bitter strikes and lockouts that lasted approximately seven years (until 1931). Families were impoverished and may companies fell into bankruptcy. By the time the strike was over, the watershed had entered into the Great Depression. With the hard economic times and the seven-year strike, Scotts Run became the bleak face of the Depression in the American coal fields, even drawing the attention of first lady Eleanor Roosevelt.

By the end of the 1930s, some of the still operating mines in Scotts Run had become mechanized. While mechanization resulted in increased production, it also created more mining hazards. During World War II, three mining disasters occurred on Scotts Run (Rakes, 1994). In the 1940s and 1950s, coal ownership in the Scotts Run watershed was restructured, going from several smaller tracks to one larger track, primarily owned by Consolidation Coal Company.

The WVDEP has several permits on record in the Scotts Run watershed. Consolidation Coal Company permitted several underground mines in the watershed in the early 1980s. Shafer Brothers, as well as other operators have permitted surface mining along with Patriot in the watershed. The NHWSM is located in an area that has been previously mined. There is an existing permit which would account for 85 acres of the NHWSM operation and older operations have occurred in and adjacent to the permit area.

Active and inactive surface and underground mining operations in the focus watershed are listed in **Table 3-a**. Several of these mines have been reclaimed and have achieved there designated Post Mining Land Use (PMLU). As noted in Patriot's Alternative Analysis (found in Section 3.0 of Patriot's EID), the Waynesburg and Waynesburg A are always mined using surface mining methods in this watershed.

Previous surface mining in the Waynesburg and Waynesburg A coals has been conducted by Patriot Mining Company at adjacent sites, including the New Hill (S-2010-01) and New Hill East (S-2010-04) surface mines to the east; Guston Run North (S-1002-00); Guston Run South (S-2010-06); Patriot/Metz (S-1005-00) and Guston Run South Extension (S-2006-07) surface mines to the north and northeast; and Scotts Run surface mine (S-1002-97) to the east-southeast; however, previous surfacing of the Waynesburg and Waynesburg A have occurred in the NHWSM project area. Nine permits have been in completely bond released and include permits I-0663-00, S-0016-80, S-1003-94 (Bethel North Surface Mine), S-1018-89, S-1029-89 (Badzek #1), S-1036-90, S-1038-91 (Chisler Knob), S-1065-86, and U-02119-83. The permit S-1005-00 (12/14/2000) has been Incremental Phase I Bond Release. The S-1002-00 permit (Guston Run North Surface Mine) is in Incremental Phase 3 Bond Release (01/31/2008). The S-2010-01 (New Hill Surface Mine) has been Incremental #3 Phase 3 bond release since 12/10/2007. Permits S-0055-80 (09/30/1991), S-0117-75 (08/12/1991), and S-1016-88 (05/27/1992) have been Phase 1 Bond Released. Permit S-1016-89 has been Phase 2 Released (08/22/1996). The Guston Run South and Guston Run South Extension mines are active, and New Hill East surface mine is inactive. The New Hill, Guston Run North and Scotts Run surface mines are fully reclaimed. Deep mining below drainage level has been conducted in the Sewickley and Pittsburgh coal seams, which lie approximately 300 feet and 400 feet, respectively, beneath the Waynesburg coal. Workings of the Osage Coal Company Osage Mine and Consolidation Coal Company Pursglove No. 15 Mine are present beneath the proposed permit area.

TABLE 3-a
Mining Permits in the Focus Watershed

Permit ID	Permittee	Facility	Issue Date	Expiration Date	Type	Inspection Status	Inspection Date	Original Acres Approved	Current Acres Approved	Acres Disturbed	Acres Reclaimed
I066300	PATRIOT MINING COMPANY INC		1/18/1981	1/6/2008	Surface	Completely Released	2.40	2.40	2.40	0.00	2.40
S001680	PATRIOT MINING COMPANY INC		2/15/1980	1/27/1998	Surface	Completely Released	115.00	115.00	135.90	130.60	115.00
S005580	PATRIOT MINING COMPANY INC		6/23/1980	1/27/1993	Surface	Phase 1 Released	19.00	19.00	0.00	0.00	19.00
S011775	PATRIOT MINING COMPANY INC		5/22/1975	1/5/1993	Surface	Phase 1 Released	75.00	75.30	0.00	0.00	75.00
S100200	PATRIOT MINING COMPANY INC	GUSTON RUN NORTH SURFACE MINE	1/12/2001	1/12/2006	Surface	Incremental Phase 3 Release	67.20	67.20	0.00	0.00	67.20
S100297	PATRIOT MINING COMPANY INC	SCOTTS RUN SURFACE MINE	9/5/1997	9/5/2002	Surface	RC	132.80	163.40	154.05	147.15	132.80
S100394	PATRIOT MINING COMPANY INC	BETHEL NORTH SURFACE MINE	9/14/1994	9/14/1999	Surface	Completely Released	102.00	62.00	48.25	44.80	102.00
S100495	PATRIOT MINING COMPANY INC	CHAPLIN HILL NO. 2	8/4/1995	8/4/2000	Surface	RC	239.00	241.45	225.85	209.20	239.00
S100500	PATRIOT MINING COMPANY INC	PATRIOT /METZ	9/1/2000	9/1/2005	Surface	Incremental Phase 1 Release	86.25	92.00	13.75	13.75	86.25
S100594	PATRIOT MINING COMPANY INC	CHAPLIN HILL SURF MINE # 1	2/1/1995	2/1/2000	Surface	RC	48.00	48.00	47.00	45.65	48.00

Permit ID	Permittee	Facility	Issue Date	Expiration Date	Type	Inspection Status	Inspection Date	Original Acres Approved	Current Acres Approved	Acres Disturbed	Acres Reclaimed
S100786	J & D COAL CO		2/28/1986	2/28/1991	Surface	Revoked	12.00	0.00	0.00	0.00	12.00
S101688	AMERIKOHL MINING INC		10/25/1988	10/25/1993	Surface	Phase 1 Released	224.00	239.66	0.00	0.00	224.00
S101689	MEPCO LLC		7/12/1989	7/12/1999	Surface	Phase 2 Released	53.94	53.94	0.00	0.00	53.94
S101889	LAURITA ENERGY CORPORATION		8/9/1989	8/9/1994	Surface	Completely Released	23.92	0.00	0.00	0.00	23.92
S102192	PATRIOT MINING COMPANY INC	CHISLER KNOB NORTH	4/1/1993	4/1/2003	Surface	RC	129.80	98.85	0.00	0.00	129.80
S102989	MEPCO, INC.	BADZEK # 1	10/2/1989	10/2/1999	Surface	Completely Released	43.00	43.00	35.00	35.00	43.00
S103489	PATRIOT MINING COMPANY INC	SURFACE MINE	12/6/1989	12/6/1999	Surface	A3	65.00	65.00	0.00	0.00	65.00
S103690	SHAFER BROTHERS CONSTRUCTION, INC.		5/17/1991	5/17/2001	Surface	Completely Released	50.00	71.50	71.50	68.50	50.00
S103891	PATRIOT MINING COMPANY INC	CHISLER KNOB	2/25/1992	2/25/2002	Surface	Completely Released	28.60	29.30	28.80	26.40	28.60
S106586	DIPPEL & DIPPEL COAL CO		11/3/1986	11/3/1991	Surface	Completely Released	12.00	2.00	0.00	0.00	12.00
S200607	PATRIOT MINING COMPANY INC	Guston Run South Extension #1	3/13/2008	3/13/2013	Surface	AM	44.00	45.85	0.00	0.00	44.00
S201001	PATRIOT MINING COMPANY INC	NEW HILL SURFACE MINE	7/26/2002	7/26/2007	Surface	Incremental Phase 1 Release	98.00	98.00	13.60	6.50	98.00

Permit ID	Permittee	Facility	Issue Date	Expiration Date	Type	Inspection Status	Inspection Date	Original Acres Approved	Current Acres Approved	Acres Disturbed	Acres Reclaimed
S201004	PATRIOT MINING COMPANY INC	NEW HILL/EAST	4/15/2005	4/15/2010	Surface	A2	72.00	108.65	0.00	0.00	72.00
S201006	PATRIOT MINING COMPANY INC	Guston Run South Surface Mine	2/27/2007	2/27/2012	Surface	AM	130.00	191.55	0.00	0.00	130.00
U000883	MORGANTOWN ENERGY EXPORT CO		1/7/1983	1/7/1998	Underground	Revoked	11.55	0.00	0.00	0.00	11.55
U005383	CONSOLIDATION COAL COMPANY		3/2/1983	3/2/1998	Underground	A2	146.80	124.00	60.00	57.92	146.80
U008683	CONSOLIDATION COAL COMPANY	PURSGLOVE MINE # 15	5/4/1983	5/4/1998	Underground	A2	145.00	89.18	0.50	0.50	145.00
U011983	CONSOLIDATION COAL COMPANY		6/10/1983	6/10/2008	Underground	Completely Released	369.06	26.00	26.00	26.00	369.06

** Only 1,470.70 acres of this surface mining permit fall within the focus watershed.*

Source: West Virginia Department of Environmental Protection.

3.2 Abandoned Mine Lands (AML)

According to the WVDEP GIS database and the Department of the Interiors Abandoned Mined Land Inventory System (AMLIS), there are 40 AML areas listed in the Focus watershed. One AMLIS site, the Scotts Run Portal & Drainage from underground mining (WV-005103-SGA) is located in the permit area. The last inspection at this site was conducted on October 15, 1998. This portal and impoundment are no longer visible on the site and likely occurred as a result of mining that occurred in 2002. Several of these sites are associated with poor disposal methods (old refuse piles), landslides, old highwall, and portals. While the number of sites appears high, it is not unusual for a watershed with a mining history that is more than a century old. **Figure 1** in **Appendix C** contains site locations of several of these old workings.

TABLE 3-b

Department of the Interiors AMLIS Data for the Focus Watershed

AMLIS Key	Mine Type	Priority	Type	Name	Last Update
WV001190SGA	U	2	Dangerous Impoundment	CHISLER KNOB PORTAL	8/31/2005
WV001190SGA	U	3	Water	CHISLER KNOB PORTAL	8/31/2005
WV001190SGA	U	3	Highwall	CHISLER KNOB PORTAL	8/31/2005
WV001174SGB	S	3	Highwall	WADES RUN HIGHWALL #1	5/19/2000
WV001189RMA	S	3	Highwall	CHISLER KNOR HIGHWALL	5/19/2000
WV001188SGB	P	3	GOB	CHISLER KNOB REFUSE	8/31/2005
WV004640SEA	U	1	Subsidence	OSAGE (ORINICK) SUBSIDENCESIDENCE	8/18/1995
WV003874SGA	S	2	Dangerous Highwall	MYERS HIGHWALL	12/1/1998
WV005809SGA	U	2	Portal	CASSVILLE (KEENER) OPEN PORTAL	6/13/2003
WV001103SGB	B	3	GOB	BERTHA HILL REFUSE	12/1/1998
WV002987SGA	B	2	Portal	BERTHA HILL PORTALS	12/1/1998
WV002987SGA	B	3	Highwall	BERTHA HILL PORTALS	12/1/1998
WV004920SGA	U	2	Portal	CASSVILLE (RHOADES) PORTALS	
WV002015SGA	U	2	Clogged Stream	NEW HILL BALL PARK COMPLEX	12/1/1998
WV002015SGA	U	2	Dangerous Pile/Embankment	NEW HILL BALL PARK COMPLEX	12/1/1998
WV005662SEA	U	1	Subsidence	OSAGE (WESTBROOKE) SUBSIDENCESIDENCE	8/9/2001
WV005527SEA	U	1	Subsidence	ST. STEVENS BAPTIST CHURCH SUBSIDENCESIDENCE	4/10/2000
WV004480SEA	U	1	Vertical Opening	SHRIVER VERTICAL OPENING	
WV001177SGA	P	2	Dangerous Impoundment	SCOTTS RUN PORTAL	9/21/2005
WV006049SGA	S	2	Dangerous Slide	SCOTTS RUN (SMITH) SLIDE	6/1/2005
WV000231SGA	U	1	Subsidence	WINFIELD MORGAN SUBSIDENCE	12/1/1998
WV000231SGA	U	1	Portal	WINFIELD MORGAN SUBSIDENCE	12/1/1998

AMLIS Key	Mine Type	Priority	Type	Name	Last Update
WV005103SGA	U	2	Dangerous Impoundment	SCOTTS RUN PORTAL & DRAINAGE	10/15/1998
WV001191SGA	S	2	Dangerous Highwall	PURSGLOVE STRIP	1/3/2006
WV005727SGA	U	2	Portal	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	2	Vertical Opening	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	2	Hazardous Equipment or Facilities	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	3	Haul Road	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	2	Dangerous Pile/Embankment	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	3	Slump	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	3	Mine Opening	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	2	Industrial/Residential Waste	OSAGE MINE COMPLEX	6/27/2002
WV005727SGA	U	2	Dangerous Impoundment	OSAGE MINE COMPLEX	6/27/2002
WV006075SGA	P	2	Dangerous Pile/Embankment	WADES RUN DANGEROUS EMBANKMENT	8/31/2005
WV001973SGB	U	3	Slump	RICE	12/1/1998
WV003064RMA	S	3	Highwall	MAYFIELD STRIP MINE	5/19/2000
WV003064RMA	S	2	Portal	MAYFIELD STRIP MINE	5/19/2000
WV003064RMA	S	3	Water	MAYFIELD STRIP MINE	5/19/2000
WV003064RMA	S	2	Hazardous Water Body	MAYFIELD STRIP MINE	5/19/2000
WV003830SGA	S	2	Dangerous Highwall	WADES RUN HIGHWALL #2	9/18/2006

3.3 Timbering Activities

The Scotts Run watershed has undergone extensive timbering in the last century. Many areas that were timbered in the late 1800s were done to allow for sustenance on small farms in the drainage. Aerial photography indicates that the proposed project area has been approximately 40 percent forest since the 1930s (see Land Use discussion). An extensive review of the literature revealed no data indicating the presence of old growth forests present in this drainage area.

3.4 Pollutants

Section 303(d) of the CWA (and its implementing regulations) requires that Total Maximum Daily Loads (TMDLs) be developed for waterbodies identified as impaired by the State. Impaired waterbodies are those where technology-based and other required controls did not provide for the attainment of water quality standards. In 1997, the WVDEP entered into an agreement (as part of a consent decree) with the Ohio Valley Environmental Coalition, Inc (OVEC) which resulted in the USEPA developing TMDLs for streams listed on West Virginia's 1996 and 1998 Section 303(d) list of impaired streams. The Monongalia River and several tributaries were listed due to violations of water quality standards for metals and/or pH. Thirty-nine streams included on the 1998 303(d) list, in the Monongahela River watershed including the Monongahela itself. Scotts Run was on both the 1996 and 1998 lists for waters which are exceeding water quality standards for total iron, aluminum, and manganese. These exceedences were partially attributed to mine drainage (both historical and current) in the Scotts Run watershed. A TMDL was developed for the Monongahela River and its impaired tributaries these streams in 2002 and the report indicated that most of the primary point sources of metals impairments were mining-related (USEPA, 2002); particularly due to abandoned mine lands which according to the USEPA, represented a significant non-point source of water quality impairment.

3.5 Utility Activities

According to the WVDEP's database, the focus watershed contains 27 gas wells. Of the 27 wells noted in the watershed, 8 are listed as Active (**Table 3-c**). Three of plugged wells are located in the proposed permit area. Mapping is provided in **Appendix C** (**Figure 2 – Cumulative Land Use/Land Cover Mapping**).

TABLE 3-c
Gas Wells in the Focus Watershed

Permit Holder	Permit Number	Status	Well Number
FLEMING, JOHN	061-00204	Abandoned Well	1
MILLER, BROOKS F.	061-00102	Abandoned Well	1
MILLER, BROOKE F.	061-00104	Abandoned Well	2
BRAND, C.H. & DORA	061-00087	Abandoned Well	2-121736
RABER, T. E. & BELLE	061-00409	Abandoned Well	1359
BROCK, A.	061-00284	Abandoned/Ordered	290
WILLIAM R. HIGGINS HEIRS	061-00002	Abandoned/Ordered	1-237
LEMLEY, W. C.	061-00008	Active Well	9567
HENDERSON, D.	061-00405	Active Well	9587
BRAND, W. C.	061-00127	Active Well	1-1554
EVERLY, IDA MAY FOX ETAL	061-00605	Active Well	1-1835
WATERS, SUSAN BELLE	061-00350	Active Well	1-1430
BRAND, C.H. & DORA	061-00086	Active Well	1-121736
WRIGHT, D. R.	061-00408	Active Well	1273
BRAND, C. H.	061-00066	Active Well	1-1489
REED, ABRAHAM	061-00130	Plugged	1-1562
BRAND, W. C.	061-00291	Plugged	A-312
PATRIOT MINING COMPANY	061-00401	Plugged	7054
RIDGEWAY, ZACQUIL P.	061-00295	Plugged	A-315
COLE, PERRY	061-00292	Plugged	A-313
COLE, PERRY	061-00279	Plugged	A-277-BX

Permit Holder	Permit Number	Status	Well Number
KENNEDY, ADALINE	061-00024	Plugged	E-1471
MARTIN, M. E. & L. M.	061-00299	Plugged	A-321
LAWLIS, HUGH	061-00031	Plugged	1-M-283
COLE, JAMES B.	061-00296	Plugged	A-314
COX, W. I.	061-00178	Plugged	1
BAILEY, IDA M.	061-00041	Plugged	M-284

3.6 Land Use

The proposed NHWSM permit (225 acres) falls within the physiographic region of the Appalachian Plateau which consists of moderately rolls and hilly topography. Land use in the proposed project area was examined using two methods. The first method was an examination of historical aerial photographs from the West Virginia Division of Geology and Economic Survey. These historical photos date back to 1938 and distinctions between woodland and grassland are possible. In the 1938 aerial photo, approximately 58 percent of the proposed project area was grassland. It is likely that the permit area was used for pasture. During this timeframe it is too difficult to determine if mining had occurred in the proposed project area. In the 1953 aerial photograph, approximately 50.5 percent of the proposed project area was grassland, while mining was evident in a small southeastern portion (9 percent). In the 1967 aerial photo, it appears that both mining and wooded areas have increased by approximately 4 percent with a corresponding loss of grassland. The latest aerial is a 2007, which was merged with land cover data, indicating that approximately 40 percent of the proposed project area is wooded. This mapping is provided in **Appendix C** (**Figure 3 – Historical Land Use/Land Cover Mapping**).

The focus area and the proposed project area were also evaluated using Land Use/Land cover data. Existing, and past land uses, in and around the proposed project area are essentially limited to logging, gas, agricultural, and mining activities. Because of these types of land uses, much of the project area consists of unmanaged forest (second or third growth) with a mixture of pasture and residential areas. Most of the proposed project area is located at higher elevations (along a ridge top) that exhibit many of these characteristics. Prior to mining of the area, the area consisted of forestland and some areas of pasture/hayland. The pasture and hayland has been used for some residents to plant a garden and for the landowners to cut hay. Other than this, the land's capability to support a variety of uses is very limited. Land use information for the proposed project area may be found on **Figure 2** in **Appendix C**. These values are also listed in **Table 3-d**. A discussion of how this information was generated is provided below.

Land use information has been generated using land cover data that was collected as part of the West Virginia Gap Analysis Project. Because some of this information may be dated, the watersheds' major land uses were verified using more recent imagery. Within areas that have Pre-SMCRA impacts and have been permitted by the WVDEP, shapefiles were merged and used to clip the WVGAP polygons. Land cover/land use in these areas were specifically reviewed for post mining land use changes and edited to more closely resemble the current land use meaning that if a mining site had become pasture or woodland, it was identified as such. Areas impacted by mining and areas not historically impacted by mining were tallied separately. Please note that the data analyzed for land use has the following stipulations:

- Road data were taken from the WV Roads shapefile and Street Map 2006 Data. These files were merged to prevent overlap.
- Railroad data were taken from the ***Rahall*** Transportation Institute data (2005). The rail network was digitized from SAMB 2003 imagery using the Bureau of Transportation Statistics railroad file as base map.
- Topographic mapping was used to determine Pre-SMCRA acreages. These areas are not counted in the mining impacts unless they were visible on aerial mapping. In those cases, it was merged with current impacts.
- Road linear footage and acreages were not merged into land use for the Dents Run watershed cumulative impacts. They are only noted in the tables provided below.
- Railroads linear footage and acreages were not merged into land use for the Dents Run watershed cumulative impacts. They are only noted in the tables provided below.
- Gas well data were obtained by using shapefile data from the Office of Oil & Gas. Only active gas wells were merged into cumulative land use for the Scotts Run watershed.
- High-resolution aerial imagery for the United States (April, 2007) was used to review PMLU areas.

As **Table 3-e** depicts, the Scotts Run, Wades Run, and Guston Run watersheds (Focus Watershed) are primarily forested (oak dominant and diverse/mesophytic hardwood forest) and pasture/grassland. Oak dominant forests occur throughout much of West Virginia. These areas generally occur on poorer/well-drained soils, ridges, or south and west facing slopes. Dominant species include white oak, black oak, chestnut oak, and red oak mixed with red maple, yellow poplar, beech, and sugar maple, which are found in the Ridge and Valley section to the east and more extensively in the hills west of the Allegheny Mountains. Diverse/mesophytic hardwood forest is the predominant forest cover throughout most of the Allegheny Plateau region of West Virginia characterized by high species diversity or species dominance patterns that are localized in small areas. This forest type is characterized by a diverse understory of trees that never attain canopy status and wildflowers are common. Typical species in the diverse/mesophytic hardwood forest include basswood, buckeye, beech, yellow poplar, black cherry, sugar maple, red maple, red oak, white oak, and Eastern hemlock. Due to the abundance and variety of fruits, seeds, and nuts, the diverse/mesophytic forest type provides excellent habitat for wildlife and game species. Pastureland/grassland land cover type also includes, hay fields, old fields, abandoned farms, grassland PMLU's and other herbaceous land cover areas (excluding wetlands).

TABLE 3-d
Percentages of Land Use Types in the New Hill West Surface Mine Project Area

Land Use Type	Acres	Percentage of Watershed
Barren land - mining, construction	68.77	0.73
Diverse/mesophytic hardwood forest	37.68	0.40
Moderate intensity urban	0.94	0.01
Oak dominant forest	58.41	0.62
Pasture/grassland	49.93	0.53
Row crop agriculture	3.77	0.04
Shrubland	6.59	0.07

**Pre-SMCRA mining estimates not merged with land use estimates.*

TABLE 3-e
Percentages of Land Use Types in the Focus Watershed

Land Use Type	Acres	Percentage of Watershed
Barren land - mining, construction	396.59	4.21
Diverse/mesophytic hardwood forest	1,547.64	16.43
Floodplain forest	0.94	0.01
Hardwood/conifer forest	49.93	0.53
Herbaceous wetland	0.94	0.01
Intensive urban	21.67	0.23
Light intensity urban	109.27	1.16
Major power lines	74.42	0.79
Major roads	73.48	0.78
Moderate intensity urban	520.00	5.52
Mountain hardwood forest	113.04	1.20
Oak dominant forest	3,003.91	31.89
Pasture/grassland	2,665.82	28.30

Land Use Type	Acres	Percentage of Watershed
Populated areas	28.26	0.30
Row crop agriculture	15.07	0.16
Shrubland	751.73	7.98
Surface water	42.39	0.45
Woodland	4.71	0.05
Active Gas Wells (8)	0.40	< 0.01
Pre-SMCRA Mining*	234.50*	2.49*
Roads	63.64 Miles	
Railroad	5.75 Miles	

**Pre-SMCRA mining estimates not merged with land use estimates.*

In addition to this examination, an effort was made to examine mining areas in the focus area and determine if the permits had achieved some PMLU other than barren lands.

In addition to this examination, an effort was made to examine mining areas in the focus area and determine if the permits had achieved some PMLU other than barren lands. This breakdown found that much of the PMLU areas that were reviewed had become a use other than mining. Examining the permit details for the permits listed in **Table 3-f**, most premining land uses were listed as forestland; hayland or pasture; previously mined and not reclaimed; combined uses; public service; and fish and wildlife habitat/recreation. PMLU included commercial/industrial; pasture or hayland; forestland; public service; and water impoundment. Most areas that were pasture or hayland prior to mining were returned to this land use. Areas that were forestland were often listed as returning to forestland and/or pasture and hayland. Specific numbers for these were not available because many of the older mining permits do not contain the needed level of detail; however, **Table 3-f** contains estimates of PMLU current conditions. Based on these analyses, roads accounted for 63.64 miles, railroads accounted for 5.75 miles, and pre-SMCRA area was 234.50 acres.

TABLE 3-f
Post-Mining Land Use/Land Cover in the Focus Watershed

Cover Type	Unaltered Areas	Pre-SMCRA Areas	PMLU Reviewed Areas	PMLU Review Areas	Future Mining	Overall
	Acreage					
Shrubland	521.88	16.96	223.26	206.3	6.59	751.73
Woodland	4.71					4.71
Surface water	2.83					2.83
Major roads	73.48					73.48
Major power lines	65	1.88	9.42	7.54		74.42
Populated areas	28.26					28.26
Light intensity urban	108.33		0.94	0.94		109.27
Moderate intensity urban	475.72	6.59	43.33	36.74	0.94	520
Intensive urban	16.96	0.94	4.71	3.77		21.67
Row crop agriculture	5.65		5.65	5.65	3.77	15.07
Pasture/grassland	1,873.58	14.13	742.31	728.18	49.93	2,665.82
Barren land - mining, construction	9.42		318.4	318.4	68.77	396.59
Floodplain forest	0.94					0.94
Herbaceous wetland	0.94					0.94
Surface water	8.48	21.67	31.09	9.42		39.56
Diverse/mesophytic hardwood forest	1,370.54	6.59	139.42	132.82	37.68	1,547.64
Hardwood/conifer forest	49.93					49.93
Oak dominant forest	2,840.94	20.72	104.56	83.84	58.41	3,003.91
Mountain hardwood forest	111.16		1.88	1.88		113.04
Active Gas Wells (8)	<0.01%					0.4
Totals	**7,569.14**	**89.49**	**1,624.99**	**1,535.49**	**226.09**	
	GRAND TOTAL: 9,420.21					

3.7 Geology

The proposed project area is located within the Appalachian Plateau physiographic province and is characterized by gradual topographic relief. The bedrock exposures at site are stratigraphically characterized as the Upper Pennsylvanian Age, Monongahela Group; and the Permian-Pennsylvanian Age, Dunkard Group. Within the proposed permit boundaries, the Monongahela Group lies below the top of the Waynesburg coal. The Dunkard Group extends upward from the top of the Waynesburg coal and also contains the Waynesburg "A" coal seam. Local streams have deeply dissected the plateau into narrow sided valleys separated by hills and ridges. Geological strata within the permit area include primarily sandstones, shales and sandy shales with lesser amounts of coal. The predominant rock lithology (as illustrated on the geologic cross sections) is sandstone with lesser amounts of lenticular sandy shales some of which are carbonaceous. Many of the sandstones present in the area occur as lenses or grade into sandy shales within relatively short horizontal distances. The sandstones range from fine to medium grained. Their composition includes feldspars and quartz. Siltstones and claystones are less frequent with gradations ranging from fine sands to silty shales. This material is mostly of durable nature and of a non-toxic variety.

The sediments of the Pennsylvanian Period were deposited approximately 320 million years ago. The warm climate of this period caused extensive forests and great coastal swamps to grow at the edges of water bodies. Marine waters advanced and receded many times, which produced many layers of sandstone, shale, and coal. Vegetation of all sorts fell into the water and was buried under blankets of sediments, which over long geologic time periods were compressed into coal. The non-vegetative sediments such as sand, clay, and silt were compressed into sandstone and shale.

Coal seams in the Scotts Run watershed were first identified by pioneer geologist William Barton Rogers in the mid-1830s (Ross, 1994). Rogers' team found "several fine beds of coal" in the Scotts Run watershed. Scotts Run is part of the Fairmont Coal Field historically included the Pittsburgh seam, which has been an economically important seam, outcropping in this drainage. Rogers report described the coal seams in Scotts Run as follows:

"One of these….. is known by the name of the "Main Coal" of northern Virginia…. The greatest thickness of workable coal is stated to be nine and a half feet, at the mouth of Scotts Run. The second coal seam in importance, is about five feet THICK. A third is from there to four feet. A fourth, geologically the highest known coal of any value in Virginia, Pennsylvania, and Ohio, is five feet in thickness."

The "main coal" in this excerpt is the Pittsburgh seam, which out-crops in Scotts Run. The Redstone seam lies 35 feet above the Pittsburgh, and the Sewickley seam falls another 40 to 55 feet above the Redstone seam. The Waynesburg seam was the fourth seam with falls approximately 250 feet above the Sewickly seam. Mapping is provided in **Appendix C** (**Figure 4 – Geology – Formations and Groups**).

3.8 Soils

Soil within the NHWSM proposed project area is comprised of ten soil types (**Table 3-g**). However, unlike the focus watershed the two predominant soil types were the Dormont and Guernsey silt loams, 3 to 8 percent slopes (DgB – 22.21%) and the Dormont and Guernsey silt loams, 8 to 15 percent slopes (DgC – 23.80%).

The Dormont soils (3 to 8 percent slopes) and Guernsey soils (3 to 8 percent slopes) make up the DgB map unit are located on ridge tops and are formed in place from loamy residuum weathered from limestone and limy shale. These soils are moderately well drained with a depth to a seasonal zone of water saturation is at 32 inches generally from January to April. The depth to soft bedrock is greater than 40 inches. The slowest soil permeability within a depth of 60 inches is slow. Available water capacity to a depth of 40 inches is moderate, and shrink swell potential is moderate. These soils are slightly to strongly acidic and moderately to highly fertile throughout. Both soils are suited to crops, hay and pasture. Dormont soil comprises 45 percent of this soil unit as the Guernsey soil makes up the remaining 40 percent.

The Dormont soils (8 to 15 percent slopes) and Guernsey soils (8 to 15 percent slopes) make up the DgC map unit are located on backslopes and summits and are formed in place from limestone and shale. These soils are moderately well drained with a depth to a seasonal high water table from 20 to 40 inches. The depth to soft bedrock is greater than 40 inches. The slowest soil permeability within a depth of 60 inches is slow. Available water capacity to a depth of 40 inches is moderate, and shrink swell potential is moderate. These soils are slightly to strongly acidic and moderately to highly fertile throughout. Both soils are suited to crops, hay and pasture. Dormont soil comprises 45 percent of this soil unit as the Guernsey soil makes up the remaining 40 percent. Depth to a root restrictive layer is greater than 60 inches for both the DgB and DgC map soil units.

TABLE 3-g
New Hill West Surface Mine Project Area Soil Type Descriptions

ID	DESCRIPTION	Acres	Percent
CkC	Clarksburg silt loam, 8 to 15 percent slopes	5.64	2.49%
CwB	Culleoka-Westmoreland silt loams, 3 to 8 percent slopes	4.07	1.80%
CwD	Culleoka-Westmoreland silt loams, 15 to 25 percent slopes	26.59	11.75%
CwE	Culleoka-Westmoreland silt loams, 25 to 35 percent slopes	21.48	9.50%
CwF	Culleoka-Westmoreland silt loams, 35 to 65 percent slopes	22.2	9.81%
DgB	Dormont and Guernsey silt loams, 3 to 8 percent slopes	50.24	22.21%
DgC	Dormont and Guernsey silt loams, 8 to 15 percent slopes	53.84	23.80%
DgD	Dormont and Guernsey silt loams, 15 to 25 percent slopes	16.87	7.46%

ID	DESCRIPTION	Acres	Percent
Lh	Lobdell-Holly silt loams	2.73	1.21%
U3	Udorthents, dumps, very low base	22.55	9.97%

There are 35 types found in the focus watershed. According to soil mapping, the predominant soil types are Culleoka-Westmoreland silt loams, 35 to 65 percent slopes (CwF - 11.90%) and Culleoka-Westmoreland silt loams, 25 to 35 percent slopes (CwE - 11.79%) (**Table 3-h**).

The Culleoka soils (30 to 50 percent slopes) and Westmoreland soils (35 to 65 percent slopes) make up the CwF map unit are located on hillsides and narrow ridge tops and are formed in place from limy sandstone and shale and limestone. This soil is well drained with a depth to a seasonal high water table that is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderate. Available water capacity to a depth of 40 inches is moderate, and shrink swell potential is low. These soils are medium to strongly acid throughout and moderately fertile which is not suited to pasture. Culleoka soil comprises 55 percent of this soil unit as the Westmoreland soils makes up the remaining 25 percent. The Culleoka soils (25 to 30 percent slopes) and Westmoreland soils (25 to 35 percent slopes) make up the CwE map unit are located on hillsides, benches and narrow ridge tops and formed in place from limy sandstone and shale and limestone. This soil is well drained with a depth to a seasonal high water table that is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderate. Available water capacity to a depth of 40 inches is moderate, and shrink swell potential is low. These soils are medium to strongly acid throughout and are moderately to highly fertile which is suited to pasture, unlike the CwF soils. Culleoka soil comprises 50 percent of this soil unit as the Westmoreland soils makes up the remaining 30 percent. Depth to a root restrictive layer, bedrock, paralithic, is 20 to 40 inches for both the CwF and CwE map soil units. Mapping is provided in **Appendix C** (**Figure 5 – Soil Mapping**).

TABLE 3-h

Soil Type Descriptions for the Focus Area

ID	Soil Type	Acres	Percent
CkB	Clarksburg silt loam, 3 to 8 percent slopes	92.61	0.98
CkC	Clarksburg silt loam, 8 to 15 percent slopes	791.88	8.41
CkD	Clarksburg silt loam, 15 to 25 percent slopes	50.25	0.53
CwB	Culleoka-Westmoreland silt loams, 3 to 8 percent slopes	82.09	0.87
CwC	Culleoka-Westmoreland silt loams, 8 to 15 percent slopes	177.54	1.88
CwD	Culleoka-Westmoreland silt loams, 15 to 25 percent slopes	656.46	6.97
CwE	Culleoka-Westmoreland silt loams, 25 to 35 percent slopes	1110.18	11.79
CwF	Culleoka-Westmoreland silt loams, 35 to 65 percent slopes	1120.82	11.90

ID	Soil Type	Acres	Percent
DdE	Dekalb very stony loam, 15 to 35 percent slopes	14.74	0.16
DdF	Dekalb very stony loam, 35 to 65 percent slopes	305.31	3.24
DgB	Dormont and Guernsey silt loams, 3 to 8 percent slopes	207.78	2.21
DgC	Dormont and Guernsey silt loams, 8 to 15 percent slopes	874.06	9.28
DgD	Dormont and Guernsey silt loams, 15 to 25 percent slopes	736.06	7.81
GuD	Gilpin-Culleoka-Upshur silt loams, 15 to 25 percent slopes	37.70	0.40
GuE	Gilpin-Culleoka-Upshur silt loams, 25 to 35 percent slopes	0.04	0.02
GuF	Gilpin-Culleoka-Upshur silt loams, 35 to 65 percent slopes	25.73	0.27
GwE3	Gilpin-Culleoka-Upshur complex, 25 to 35 percent slopes, severely eroded	106.21	1.13
LaB	Lily loam, 3 to 8 percent slopes	7.58	0.08
Lb	Lobdell silt loam	24.57	0.26
Lh	Lobdell-Holly silt loams	233.92	2.48
MgC	Monongahela silt loam, 8 to 15 percent slopes	2.98	0.03
TlB	Tilsit silt loam, 3 to 8 percent slopes	71.43	0.76
U1	Udorthents, cut and fill	343.05	3.64
U2	Udorthents, dumps, low base	247.18	2.62
U3	Udorthents, dumps, very low base	78.53	0.83
U4	Udorthents, mudstone and sandstone, high base	594.34	6.31
U5	Udorthents, mudstone and sandstone, low base	83.80	0.89
U6	Udorthents, sandstone, low base	24.01	0.25
W	Water	16.48	0.17
WeB	Westmoreland silt loam, 3 to 8 percent slopes	23.21	0.25
WeC	Westmoreland silt loam, 8 to 15 percent slopes	160.23	1.70
WeD	Westmoreland silt loam, 15 to 25 percent slopes	302.59	3.21
WeD3	Westmoreland silt loam, 15 to 25 percent slopes, severely eroded	36.49	0.39
WeE	Westmoreland silt loam, 25 to 35 percent slopes	576.02	6.11
WeF	Westmoreland silt loam, 35 to 65 percent slopes	204.34	2.17

3.9 Aquatic Habitat

Habitat evaluations were completed in Scotts Run in 2009 and early 2010 using USEPA Rapid Bioassesment Protocol (USEPA 1999) Physical Characterization/Water Quality Field Data Sheets for high gradient streams. The sampling locations are summarized in on mapping in

Appendix C – Figure 5. - Habitat Survey Sites. **Table 3-i** contains descriptions of each sampling location.

The results of the visual-based habitat assessment were used to determine the quality of habitat at each sampling location. This assessment was intended to support the mitigation calculations and provide additional information regarding instream conditions. Therefore, habitat assessment data (as well as substrate type and size data) were entered into spreadsheets which scored as follows:

- *Optimal* (total score of 200-166)
- *Suboptimal* (165-113)
- *Marginal* (112-61)
- *Poor* (<61)

Total habitat scores at the 24 sampling locations were established at various locations for monitoring and mitigation purposes (**Table 3-i**). Flow conditions at these sites often made habitat assessment difficult; at times best professional judgment had to be used to determine values. Habitat values ranged from 85 to 126 (**Tables 3-j** and **3-k**). All of these scores fall in the suboptimal or marginal range. The watershed has a history of mining and has what can be described as light residential development (and a road) near many of the sites in the Scott Run.

A summary of each sampling location is provided below. Please note that these values are based on site visits in 2009 and 2010.

TABLE 3-i
Sampling Locations in the Scotts Run Watershed

Sampling Location	Description
Site 1	Located within an unnamed tributary of Scotts Run upstream of the confluence with Tributary 1.
Site 2	Located within Tributary 1.
Site 3	Located within Restoration Reach 4.
Site 4	Located within Restoration Reach 6.
Site 5	Located within an unnamed tributary of Scotts Run downstream of the confluence with Restoration Reach 6.
Site 6	Located within Scotts Run upstream of proposed permit area.
Site 7	Located within Tributary 4.
Site 8	Located within Scotts Run between the confluences with Tributaries 4 and 5.
Site 9	Located within Scotts Run upstream of the confluence with Tributary 4.

Sampling Location	Description
Site 9A	Located within Scotts Run between the confluence with Tributary 4 and Site 9.
Site 9B	Located within Scotts Run upstream of Site 9.
Site 10	Located within Tributary 7 downstream of the confluence with Tributary 6.
Site 11	Located within Tributary 7 upstream of the confluence with Tributary 7-3.
Site 12	Located within Scotts Run upstream of Site 13.
Site 13	Located within Scotts Run downstream of the proposed permit area.
Site 14	Located within Scotts Run downstream of the confluence with Tributary 10.
Site 15	Located within Tributary 5.
Site 17	Located within Scotts Run upstream of Site 16.
Site 18	Located within Scotts Run upstream of Site 17.
Site 19	Located within Scotts Run upstream of Site 12.
Site 20	Located within an unnamed tributary of Scotts Run upstream of Site 19.
Site 22	Located within an unnamed tributary of Scotts Run upstream of the confluence with Restoration Reach 6.
Site 23	Located within an unnamed tributary of Scotts Run upstream of the confluence with Restoration Reach 4.
Site 24	Located within an unnamed tributary of Scotts Run downstream of the confluence with Tributary 1.

Site 1 - Site 1 was located within the thirteenth left descending unnamed tributary of Scotts Run upstream of Tributary 1. The canopy was comprised of a mix of large and smaller deciduous trees dominated by maple, beech, and oak species. The total habitat score at this station was 118 out of 200, which puts it in the low sub-optimal range. This station had a marginal epifaunal substrate which would indicate that there was limited opportunity for benthic colonization. However, there was little embeddedness and sediment deposition noted within the reach. Three of the four flow regimes were present at this sampling location with water filling 25 to 75 percent of the base of the channel. There was no evidence of channel alteration in or adjacent to the stream channel with the channel displaying an appropriate morphology and pattern. Riffles were relatively infrequent in the channel with long runs dominating the reach. The stream banks were moderately unstable with 30 to 60 percent of the banks exhibiting areas of erosion. Between 50 to 70 percent of the stream banks were vegetated with some obvious disruption noted. The riparian vegetation zone was between 12 to 18 meters wide with minimal human impact noted.

Site 2 - Site 2 was located within the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run (Tributary 1). Much like the canopy at Site 1, *Acer* sp., *Fagus grandifolia*, and *Quercus* sp. were the dominant species at Site 2. The total habitat score was 117 out of 200, which was in the low sub-optimal range. The sampling station had little embeddedness and sediment deposition. There was less than 20 percent suitable epifaunal substrate which is limiting for the colonization of benthic macroinvertebrates. The reach was dominated by riffle which is typical of a channel with a steep slope. Approximately 25 percent of the substrate was exposed due to limited flow within the reach. Only two of the four traditional flow regimes are present, likely due to the limited flow within the channel. There is no evidence of channel alteration within the sampling reach. The stream banks were moderately stable with 30 to 60 percent of the banks having erosion which is further compounded by the limited vegetative protection present on the stream banks. The riparian vegetative zone is relative undisturbed and extends to a width greater than 18 meters.

Site 3 - Site 3 was located within the proposed Restoration Reach 4. The canopy was dominated by a mix of large and small deciduous tree and shrub species. *Acer* sp., *Fagus grandifolia*, and *Quercus* sp. were the dominant species located within the reach. The total habitat score of the sampling site was 100 out of 200, which is in the high marginal range. The sampling location was noted with marginal epifaunal cover for aquatic habitat and colonization. Despite the lack of epifaunal substrate/available cover, the reach had less than 25 percent embeddedness and less than 5 percent of the substrate was affected by sediment deposition. Only 25 to 75 percent of the channel was filled with water and only two of the four traditional flow regimes were present during the sampling event. The channel appeared to have been historically altered through channelization. The reach was dominated by plunging runs and pools with riffles occurring occasionally and limited to a distance of approximately 7 to 15 stream widths apart. The stream banks were generally raw with heavy erosion noted and very limited vegetation present. The riparian zone was adequate with an overall width of approximately 12 to 18 meters.

Site 4 - Site 4 was located within the proposed Restoration Reach 6. *Acer* sp., *Fagus grandifolia*, and *Quercus* sp. were the dominant species located within the reach. The total habitat score for the sampling site was 101 out of 200, which falls in the high marginal range. The sampling location had very limited epifaunal substrate. There was moderate embeddedness noted with some new formations of bars and slight sediment deposition, primarily noted in pools, observed within the reach. Channel flow status at this station was moderate, indicating that less than 75 percent of the channel contained flow. The limited flow also resulted in only two of the four flow regimes present within the reach. The frequency of riffle occurrence was occasional; generally occurring every 7 to 15 stream widths in distance. The stream banks were noted with areas of high erosion and little vegetative protection. The channel appeared to have been historically altered. There was no evidence of human activities within 12 to 18 meters of the station.

Site 5 - Site 5 was located within the thirteenth left descending unnamed tributary of Scotts Run downstream of Restoration Reach 6. The riparian vegetation was dominated by a mix of large and smaller deciduous tree and shrub species including *Acer* sp., *Fagus grandifolia*, and *Quercus* sp, *Ligustrum* sp., and *Alnus* sp. The epifaunal substrate was marginal with 20 to 40 percent mixed habitat. The reach was noted with the formation of some new bars and sediment deposition within the pools. Additionally, the cobble and gravel embedded up to 25 to 50 percent by fine material such as sand and silt. The channel was nearly full of water from bank to bank. Despite the channel flow status, only two of the four flow regimes were present in the reach. Riffles were occasionally present occurring approximately 7 times the stream's width. The channel appeared to have been historically altered. Despite the historic influence, the riparian zone was well established with no human influence noted within 18 meters of the channel. The stream banks were marginally stable with many raw areas of erosion noted. This was further compounded by the lack of vegetation present on the stream banks through much of the reach. The total habitat score for the station was 115 out of 200, which is in the low sub-optimal range.

Site 6 - Site 6 was located within the proposed Restoration Reach 3 (Scotts Run). The riparian buffer was dominated by various herbaceous species typically found within a residential lawn setting. The epifaunal substrate scored in the marginal range with only 20 to 40 percent mix of stable habitat present. The reach has less than 25 percent embeddedness and slight sediment deposition (5 to 30 percent). Only two of the four flow regimes were present. Channel flow status was recorded as greater than 75 percent of the channel fill with water with some riffle substrate exposed. Riffles were occurrence was infrequent within the reach. Some historic channel alteration was noted within the reach. The stream banks were moderately stable with small areas of erosion noted. In addition, 70 to 90 percent of the stream banks were protected by vegetation. The riparian zone was very limited with human activity observed within less than 6 meters of the channel.

Site 7 - Site 7 was located in the twelfth left descending unnamed tributary of Scotts Run. The riparian vegetation consisted of primarily *Acer* sp. and *Fagus grandifolia* in the canopy while *Alnus* sp. and various grass species dominated the understory vegetation and ground cover. Epifaunal substrate or available cover was very limited and only one of the four flow regimes present (slow-shallow). Channel flow status was also limited within the reach with water nearly confined to standing pools with shallow riffles noted between the pools. Despite low flow conditions, the substrate had little embeddedness and slight levels of sediment deposition noted. The channel has been altered and is relatively straight within the sampling reach. The reach had moderately stable banks with some erosion noted. Over 70 percent of the stream banks were vegetated which limited the amount of erosion in the reach. Despite historic influence within the reach, the riparian vegetative zone was adequate scoring in the sub-optimal range. Overall, the site had a total habitat score of 105 out of 200, which is in the high marginal range.

Site 8 - Site 8 was located in the proposed Restoration Reach 2 (Scotts Run). The riparian vegetation consisted of a mix of deciduous trees species and grasses typically found within a residential lawn setting. Epifaunal substrate was less than desirable with 20 to 40 percent mix of stable habitat. Little embeddedness and sediment deposition was observed within the reach. Channel flow status was optimal indicating that water reached the base of both banks; however, only two of the four flow regimes were present in the sampling reach. Additionally, riffles were infrequently occurring. Channel alteration noted within the reach resulted in a decrease in the natural sinuosity pattern. Sparse vegetation was observed on the stream banks, which contributed to severe bank erosion in the reach. Human influences were noticeable and limited the riparian vegetative zone width to a marginal rating. The total habitat score for the reach was 105 out of 200, which falls in the high marginal range.

Site 9 - Site 9 was located within the proposed Restoration Reach 3 (Scotts Run). The riparian vegetation was dominated by various grass species found in a residential lawn as well as a few deciduous tree species. Epifaunal substrate was well suited for the colonization of aquatic life in the reach. The station had very little embeddedness and sediment deposition. Deposition was limited to pool areas and an occasional side channel point bar. Water nearly reached the base of both banks, with 75 percent of the channel filled. Riffles were infrequently occurring in the reach. Again, two of the four flow regimes were present in the reach. Similar to Site 8, the channel has been altered and resulted in a very limited riparian vegetative zone width. The stream banks had moderate vegetative protection with between 50 and 70 percent coverage. This contributed to the stream banks being moderately unstable. The total habitat score for the reach was 109 out of 200, which falls in the high marginal range.

Site 10 - Site 10 was located within the tenth left descending unnamed tributary of Scotts Run. The riparian vegetation was dominated by various grass species. The epifaunal substrate had less than 20 percent stable habitat. The channel was marginally embedded with 50 to 75 percent of the gravel, cobble, and boulders surrounded by fine sediments. There was some new increase in bar formation noted in the reach with slight sediment deposition observed in the pools. Water filled greater than 75 percent of the channel, but did not completely reach the base of both stream banks. Only one of the four flow regimes was present during the sampling event. As a result, the riffle frequency was occasional, occurring approximately 15 to 25 stream widths apart. The channel has been altered greatly through the placement of rip-rap. The banks were generally stable with more than 90 percent vegetative coverage. The riparian zone was completely lacking with no native vegetative buffer observed on either side of the channel. The total habitat score for the reach was 85 out of 200, which falls in the marginal range.

Site 11 - Site 11 was located within the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run. The riparian vegetation was dominated by *Fagus grandifolia*, *Acer* sp., *Alnus* sp and *Quercus* species. As with Site 10, the epifaunal substrate was very limited resulting in a poor habitat for aquatic habitat. Very little embeddedness and sediment deposition was observed within the reach. Flow was limited during the sampling event with water filling approximately 25 to 75 percent of the channel. This limited the reach to only two of the four flow regimes and riffle occurrence to be occasional. The channel did not appear to have any current or historic alterations with a normal geomorphologic pattern present. The stream banks were unstable with many raw areas of erosion and less than 50 percent vegetative coverage. No human activity was noted in the riparian vegetative zone. The total habitat score for the reach was 93 out of 200, which falls in the marginal range.

Site 12 - Site 12 was located within Scotts Run immediately upstream of the ninth left descending unnamed tributary of Scotts Run. The riparian vegetation was dominated by fescue and other various grass species typically found in a residential lawn setting. The epifaunal substrate was marginal with a 20 to 40 percent mix of stable habitat. The substrate was slightly embedded with approximately 25 to 50 percent of the gravel, cobble, and boulder surrounded by fine sediment. In addition, sediment deposition was low with only an occasional bar formation noted in the channel. Two of the four flow regimes were noted within the reach. Water filled the channel to at least the base of both stream banks. The occurrence of riffles within the reach was infrequent with the distance between riffles approximately 7 to 15 stream widths apart. The channel has been straightened due to the proximity of the road and houses. The houses have heavily influenced the riparian buffer resulting in no native vegetative protection noted along the channel. The stream banks were moderately unstable with approximately 50 to 70 percent of the banks protected by native vegetation. The total habitat score for the reach was 107 out of 200, which falls in the high marginal range.

Site 13- Site 13 was located within Scotts Run immediately downstream of the ninth left descending unnamed tributary of Scotts Run. The riparian vegetation was dominated by fescue and other various grass species typically found in a residential lawn setting. Site 13 was very similar to Site 12 in terms of habitat. The epifaunal substrate was marginal with a 20 to 40 percent mix of stable habitat. The substrate was slightly embedded with approximately 25 to 50 percent of the gravel, cobble, and boulder surrounded by fine sediment. In addition, sediment deposition was low with only an occasional bar formation noted in the channel. Two of the four flow regimes were noted within the reach. Water filled the channel to at least the base of both stream banks. The occurrence of riffles within the reach was infrequent with the distance between riffles approximately 7 to 15 stream widths apart. The channel has been straightened due to the proximity of the road and houses. The residential setting has heavily influenced the riparian buffer resulting in no native vegetative protection noted along the channel. The stream banks were moderately unstable with approximately 50 to 70 percent of the banks protected by native vegetation. The total habitat score for the reach was 107 out of 200, which falls in the high marginal range.

Site 9A - Site 9A was located within the proposed Restoration Reach 3 (Scotts Run). The riparian vegetation was dominated by various grass species found in a residential lawn as well as a few deciduous tree species. Epifaunal substrate was less than desirable with approximately a 20 to 40 percent mix of stable habitat. The station had little embeddedness with approximately 25 to 50 percent of the gravel, cobble, and boulder surrounded by fine material. Deposition was limited to pool areas and an occasional side channel point bar. Water nearly reached the base of both banks, with approximately less than 25 percent of the substrate exposed. Three of the four flow regimes were present in the reach. Riffles were relatively occur frequently throughout the reach. The channel has been altered and resulted in a very limited riparian vegetative zone width. The stream banks had sparse vegetative protection with less than 50 percent coverage. This contributed to the stream banks being highly unstable. The total habitat score for the reach was 95 out of 200, which falls in the marginal range.

Site 9B - Site 9B was located within the proposed Restoration Reach 3 (Scotts Run). The riparian vegetation was dominated by various grass species found in a residential lawn as well as a few deciduous tree species. The epifaunal substrate within the sampling station contained a 40 to 70 percent mix of stable habitat and is well-suited for the full colonization of aquatic life. The inorganic substrate was partially embedded with moderate levels of sediment deposition noted in the sampling reach. Flow was somewhat low with approximately 25 percent of the substrate exposed. Three of the four flow regimes were present. Riffles were frequently occurring within the reach, often found spaced approximately seven stream widths apart or less. Some channelization was observed within the sampling reach. The banks were highly unstable with less than 50 percent of the banks protected by vegetative cover. The riparian buffer was limited with virtually no native vegetation noted due to human activities. The total habitat score for the reach was 94 out of 200, which falls in the marginal range.

Site 14 - Site 14 was located within Scotts Run downstream of the tenth left descending unnamed tributary of Scotts Run (Tributary 10). The epifaunal substrate had approximately 40 to 70 percent mix of stable habitat and was considered well-suited for full colonization of aquatic life. The reach was somewhat limited with moderate sediment deposition noted. Additionally, the gravel, cobble and boulder substrate was approximately 25 to 50 percent surrounded by fine sediment. Flow within the reach was suboptimal with water filling greater than 75 percent of channel, but not reaching the base of the stream banks. Two of the four flow regimes were present during the sampling event. Riffles were frequently occurring within the reach. The channel appeared to be slightly channelized; however, this activity appears to have occurred historically. The stream banks were moderately unstable with erosion noted on approximately 30 to 60 percent of the reach. This was compounded by limited vegetative cover on the banks, with just over half of the stream banks vegetated. There was no riparian buffer noted within the reach due to the close proximity of the road and residential structures. The total habitat score of the reach was 105 out of 200, which falls in the marginal range.

Site 15 - Site 15 was located in the eleventh left descending unnamed tributary of Scotts Run. Epifaunal substrate at this location was moderate, with 20 to 40 percent of the reach noted as stable habitat for aquatic colonization. This location had moderate levels of embeddedness and little sediment deposition. The channel had two of the four flow regimes which is not uncommon in a stream this size. Channel flow status at this location was *marginal* with 25 to 75 percent of the available channel being filled with water or riffle substrate mostly exposed. Frequency of riffles was common which is expected since the sampling station was in the lower gradient portion of the reach. The station had moderately stable banks but lacked well-established vegetation on the stream banks. The riparian zone was somewhat limited with human activity noted within 12 meters of the channel. The total habitat score of the reach was 113 out of 200, which falls in the sub-optimal range.

Site 17 - Site 17 was located in Scotts Run upstream of the proposed project area. The sampling station had approximately 40 to 70 percent stable substrate which was favorable for epifaunal colonization. The channel had some embeddedness; however, it did not appear to impact the potential for aquatic colonization. Some new sediment deposition was noted in the reach and was comprised primarily of gravel and sand. The reach had three of the four flow regime present which is not uncommon in a stream of this size. Stream flow within the channel was moderate with less than 25 percent of the substrate exposed. The site had a relatively normal frequency of riffles noted which was approximately seven times the streams width in distance. The channel has been historically altered in its normal flow pattern due to the proximity of the road. The stream banks appear to be moderately unstable with limited vegetative protection observed. The riparian buffer zone was also limited due to the proximity of the road. Overall, the total habitat score for the sampling site was 123 out of 200, which is in the sub-optimal range.

Site 18 - Site 18 was located in Scotts Run upstream of the project area and each sampling station. This sampling station was similar to the one located downstream (Site 17), with the exception of the epifaunal substrate, which was limited to approximately 20 to 40 percent mix of stable habitat. Embeddedness and sediment deposition were acceptable for the colonization of aquatic life. Additionally, the channel flow status was sub-optimal with approximately 25 percent of the substrate exposed. Three of the four flow regimes were present within the reach. Riffles were frequently occurring with an overall spacing of less than seven stream lengths separating most riffles. The channel appears to have altered by the close proximity of the residential dwellings and associated yards. This limited the riparian buffer within the reach. It also put pressure on the native vegetation found along the stream banks, which ultimately reduced the overall bank stability to moderately unstable. The total habitat score for this sampling site was 118 out of 200, which is in the sub-optimal range.

Site 19 - Site 19 was located in Scotts Run downstream Site 14. The canopy was dominated by a mix of large and small deciduous tree and shrub species. *Quercus* sp., *Acer* sp., and *Fagus grandifolia* were the dominant species located within the reach. The total habitat score of the sampling site was 93 out of 200, which is in the marginal range. The sampling location was noted with marginal epifaunal cover for aquatic habitat and colonization. In addition to the lack of epifaunal substrate or available cover, the reach had between 50 to 75 percent embeddedness and 5 to 30 percent of the bottom of the channel affected by sediment deposition. Approximately 75 percent of the channel was filled with water and two of the four traditional flow regimes were present during the sampling event. The channel appeared to have been historically altered through channelization. The reach was dominated by riffles that were generally found at a distance of approximately 7 stream widths apart. The stream banks were generally raw with heavy erosion noted and very limited vegetation present. Little riparian vegetation was present along the banks due to the proximity of human activities such as buildings and road.

Site 20 - Site 20 was located in an unnamed tributary of Scotts Run upstream of Site 19. This sampling station was very similar to the downstream sampling station, Site 19. The total habitat score of the sampling site was 81 out of 200, which is in the *marginal* range. Again, the sampling location was noted with *marginal* epifaunal cover for aquatic habitat and colonization. The reach was noted with between 50 to 75 percent embeddedness and 30 to 50 percent of the bottom of the channel affected by sediment deposition. Water flow within the channel was adequate with approximately 75 percent of the channel was filled with water and two of the four traditional flow regimes were present during the sampling event. The channel appeared to have been historically altered through channelization. The reach was dominated by riffles that were generally found at a distance of approximately 7 stream widths apart. The stream banks were generally raw with heavy erosion noted and very limited vegetation present. No riparian buffer was noted within the sampling reach due to the close proximity of residential structures and road to the channel.

Site 22 - Site 22 was located in the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run just upstream of the proposed confluence with Restoration Reach 6. The canopy was comprised of a mix of large and smaller deciduous trees dominated by maple, beech, and oak species. The total habitat score at this station was 118 out of 200, which puts it in the low sub-optimal range. This station had a sub-optimal epifaunal substrate, which would indicate that the site was well-suited for colonization potential. Little embeddedness and sediment deposition noted within the reach with only minimal newly deposited gravel and sand noted. Two of the four flow regimes were present at this sampling location with water filling between 25 to 75 percent of the base of the channel. There was little evidence of channel alteration in or adjacent to the stream channel with the channel retaining an appropriate morphology and pattern. Riffles were relatively frequent in the channel dominating the reach. The stream banks were moderately unstable with 30 to 60 percent of the banks exhibiting areas of erosion. Between 50 to 70 percent of the stream banks were vegetated with some obvious disruption noted. The riparian vegetation zone was between 12 to 18 meters wide with minimal human impact noted.

Site 23 - Site 23 was located in the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run just upstream of the proposed confluence with Restoration Reach 4. Similar to the downstream sampling site, the canopy was comprised of a mix of large and smaller deciduous trees dominated by *Acer* sp., *Fagus grandifolia*, and *Quercus* species. The total habitat score at this station was 122 out of 200, which puts it in the low sub-optimal range. This station had moderate epifaunal substrate which was comprised of approximately 40 to 70 percent mix of stable habitat. Approximately 25 to 50 percent of the substrate was surrounded by fine material. While sediment deposition within the reach was minimal with some newly deposited gravel and sand were noted. Three of the four flow regimes were present at this sampling location with water filling between greater than 75 percent of the base of the channel. There was little evidence of channel alteration in or adjacent to the stream channel with the channel retaining an appropriate morphology and pattern. Riffles were relatively frequent in the channel dominating the reach. The stream banks were moderately unstable with 30 to 60 percent of the banks exhibiting areas of erosion. Between 50 to 70 percent of the stream banks were vegetated with some obvious disruption noted. No human activity was noted within the sampling reach.

Site 24 - Site 24 was located in the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run just downstream of Site 2. Just as the downstream sampling stations, the canopy was comprised of a mix of large and smaller deciduous trees dominated by *Acer* sp., *Fagus grandifolia*, and *Quercus* species. The total habitat score at this station was 126 out of 200 which puts it in the sub-optimal range. This station had a sub-optimal epifaunal substrate, which would indicate that the site was well-suited for colonization potential. Some embeddedness was observed with boulder, cobble and gravel 25 to 50 percent surrounded by fine material. Sediment deposition was not a hindrance to the reach with only 5 to 30 percent of the bottom of the channel affected. Three of the four flow regimes were present at this sampling location with only 25 percent of the substrate exposed due to limited flow. There was little evidence of channel alteration in or adjacent to the stream channel with the channel retaining an appropriate morphology and pattern. Riffles were relatively frequent in the channel dominating the reach. The stream banks were moderately unstable with 30 to 60 percent of the banks exhibiting areas of erosion. Between 50 to 70 percent of the stream banks were vegetated with some obvious disruption noted. Human activity was not noted within 12 to 18 meters of the channel.

TABLE 3-j
Habitat Scores at Sampling Stations in the Scotts Run Watershed in 2009

Habitat Category/Parameter	Possible Score	Stations												
		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
1. Epifaunal Substrate/Available Cover	20	8	2	6	4	9	9	3	6	11	2	3	10	10
2. Embeddedness	20	17	16	16	8	11	16	15	14	15	10	15	15	15
3. Velocity/Depth Regime	20	9	7	8	10	9	10	3	10	10	3	6	10	10
4. Sediment Deposition	20	16	16	17	14	12	15	13	13	15	14	16	14	14
5. Channel Flow Status	20	14	12	8	14	15	14	6	16	15	14	7	16	16
6. Channel Alteration	20	16	16	10	12	15	13	13	10	11	4	16	13	13
7. Frequency of Riffles (or bends)	20	9	16	11	12	14	11	12	14	14	6	6	13	13
8. Bank Stability	20	8	10	4	6	8	12	12	6	9	16	4	8	8
9. Vegetative Protection	20	8	4	6	8	6	12	14	6	8	16	2	8	8
10. Riparian Vegetative Zone Width	20	13	18	14	13	16	2	14	10	1	0	18	0	0
Total:	**200**	118	117	100	101	115	114	105	105	109	85	93	107	107

TABLE 3-k

Habitat Scores at Sampling Stations in the Scotts Run Watershed in 2009

Habitat Category/Parameter	Possible Score	Stations														
		Site 5	Site 6	Site 9A	Site 9B	Site 12	Site 13	Site 14	Site 15	Site 17	Site 18	Site 19	Site 20	Site 22	Site 23	Site 24
1. Epifaunal Substrate/Available Cover	20	14	8	9	14	13	13	14	10	15	9	9	8	14	12	12
2. Embeddedness	20	15	14	12	12	15	15	13	13	14	14	10	10	15	13	14
3. Velocity/Depth Regime	20	10	10	13	13	10	10	10	10	12	11	10	10	10	12	14
4. Sediment Deposition	20	15	13	11	7	12	12	10	16	14	15	12	7	15	15	15
5. Channel Flow Status	20	10	14	14	11	15	16	12	10	14	14	13	12	10	12	13
6. Channel Alteration	20	15	14	13	12	13	13	14	12	14	12	12	14	14	14	13
7. Frequency of Riffles (or bends)	20	15	16	16	16	17	17	18	16	15	16	16	16	16	16	16
8. Bank Stability	20	8	11	4	3	4	4	6	11	10	10	5	2	5	6	8
9. Vegetative Protection	20	6	12	2	2	8	10	8	4	6	8	4	2	4	6	6
10. Riparian Vegetative Zone Width	20	15	0	1	4	0	0	0	11	9	9	2	0	15	16	15
Total:	**200**	123	112	95	94	107	110	105	113	123	118	93	81	118	122	126

3.10 Native Riparian Species

Select sites in the project area were evaluated using visual riparian estimates. These estimates, as well as the site locations are included in **Table 3-l**. The supporting data sheets are provided in **Appendix D**. Parameter values used in obtaining the scores include values for the amount of canopy cover, understory cover, and ground cover in the area adjacent to the channel. They also take into account human influences, such as roads and mining adjacent to the stream and in the riparian zone. The highest total score possible is 122. In general, the sites had a limited upper canopy with moderate to heavy understory and ground cover. The predominate human influences can be attributed to past mining and residential impacts, such as roads and lawns.

Tributary No. 1 is the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. This stream segment was intermittent in nature. The canopy contained a mix of large and smaller deciduous trees and heavy understory. The ground cover was moderate with less than 10 percent barren, bare dirt or duff. Residential lawn influenced the downstream portion of the reach with a residential building noted off the LDB of the channel. Additionally, a small culvert was observed within the channel extending from approximately Station 2+10 to Station 2+22.

Tributary No. 1-1 is an unnamed tributary of the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run. The reach is located within the permit boundary area. This stream segment was intermittent in nature. The canopy contained a mix of large and smaller deciduous trees and moderate to heavy understory. The ground cover in the riparian zone was moderate with less than 10 to 40 percent barren, bare dirt or duff. Human influence was not noted within the reach.

Tributary No. 4 is the twelfth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was ephemeral in nature within the permit area. The canopy contained a mix of large and smaller deciduous trees and moderate understory. The ground cover was moderate with approximately 40 to 75 percent barren, bare dirt or duff. Rip-rap was noted within the channel in the upper portion of the reach. No other human influences were noted within the reach within the permit boundary.

Tributary No. 5 is the eleventh left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was intermittent in nature. The canopy contained a mix of large and smaller deciduous trees and heavy understory. The ground cover was moderate to heavy with approximately 10 to 40 percent barren, bare dirt or duff. Rip-rap was noted within the channel at the end of the Ordinary High Water Mark (OHWM). No other human influences were noted within the reach within the permit boundary.

Tributary No. 6 is the first right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was intermittent and ephemeral in nature. The canopy contained a mix of large and smaller deciduous trees and moderate understory. The ground cover was moderate to heavy with approximately 40 to 75 percent barren, bare dirt or duff. Rip-rap was noted within the channel through the first 100 linear feet. No other human influences were noted within the reach.

Tributary No. 7 is the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run and the ninth left descending unnamed tributary of Scotts Run. The reach is located within the permit boundary. The stream segment was intermittent and ephemeral in nature. The canopy contained a mix of large and smaller deciduous trees and heavy understory. The ground cover was heavy to very heavy with approximately less than 10 percent barren, bare dirt or duff. Rip-rap was present within the downstream portion of the channel. Additionally, a culvert was located within the channel extending from Station 5+00 to Station 5+29. The channel flows through a pasture from approximately station 5+29 through Station 8+82. No other human influences were noted within the reach.

Tributary No. 7-1 is the second left unnamed tributary of the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was ephemeral in nature. The canopy contained a mix of large and smaller deciduous trees and heavy understory. The ground cover was heavy to very heavy with approximately 10 to 40 percent barren, bare dirt or duff. No human influences were noted within the reach.

Tributary No. 7-3 is the first left unnamed tributary of the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was ephemeral in nature. The canopy contained a mix of large and smaller deciduous trees and heavy understory. The ground cover was heavy to very heavy with approximately less than 10 percent barren, bare dirt or duff. No human influences were noted within the reach.

Tributary No. 8 is the first left unnamed tributary of the ninth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was intermittent in nature. The canopy contained a mix of large and smaller deciduous trees and moderate to heavy understory. The ground cover was heavy to very heavy with approximately 10 to 40 percent barren, bare dirt or duff. A gravel road was noted off of the right descending bank (RDB). No additional human influences were noted within the reach.

Tributary No. 9 is the ninth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was intermittent in nature. The canopy contained small deciduous trees and sparse to moderate understory. The ground cover was moderate to heavy with approximately 10 to 40 percent barren, bare dirt or duff. A residential lawn was noted off of the RDB. Additionally, a culvert extended from Station 0+30 to Station 0+54. No additional human influences were noted within the reach.

Tributary No. 10 is the tenth left descending unnamed tributary of Scotts Run. The reach is located within the boundary of the permit area. The stream segment was ephemeral in nature. The canopy contained small deciduous trees and moderate understory. The ground cover was moderate with approximately 10 to 40 percent barren, bare dirt or duff. Rip-rap was noted within the channel. No additional human influences were noted within the reach.

TABLE 3-l
Riparian Vegetative Structure in the New Hill West Surface Mine Project Area

Tributary	Canopy	Understory	Ground Cover
Tributary No. 1	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.*	*Alnus serrulata* *Cornus sp.* *Lindera bezoin* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Euonymus americanus* *Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Vitis sp.*
Tributary No. 1-1	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.*	*Alnus serrulata* *Cornus sp.* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Vitis sp.*
Tributary No. 4	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.*	*Alnus serrulata* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Urtica dioica* *Vitis sp.*
Tributary No. 5	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.* *Ulmus rubra*	*Alnus serrulata* *Lindera bezoin* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Urtica dioica* *Vitis sp.*
Tributary No. 6	*Acer sp.* *Fagus grandifolia* *Quercus sp.*	*Lindera bezoin* *Rhus sp.* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Vitis sp.*
Tributary No. 7	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.* *Ulmus rubra*	*Alnus serrulata* *Cornus sp.* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Solidago sp.* *Urtica dioica* *Vitis sp.*
Tributary No. 7-1	*Acer sp.* *Fagus grandifolia* *Quercus sp.*	*Alnus serrulata* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Urtica dioica* *Vitis sp.*

Tributary	Canopy	Understory	Ground Cover
Tributary No. 7-3	*Acer sp.* *Fagus grandifolia* *Quercus sp.*	*Alnus serrulata* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Solidago sp.* *Urtica dioica* *Vitis sp.*
Tributary No. 8	*Acer sp.* *Fagus grandifolia* *Quercus sp.*	*Alnus serrulata* *Hamamelis virginiana* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Rhubus sp.* *Smilax sp.* *Urtica dioica* *Vitis sp.*
Tributary No. 9	*Acer sp.* *Fagus grandifolia* *Quercus sp.*	*Lindera bezoin* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Fescue sp.* *Smilax sp.* *Vitis sp.*
Tributary No. 10	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.*	*Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Urtica dioica* *Vitis sp.*

Further Environmental Monitoring and Assessment Program (EMAP) characterization of riparian vegetative structure was conducted along the restoration reaches associated with New Hill West Surface Mine. Data sheets are included in **Appendix D**. Riparian vegetation for each stream segment is summarized in **Table 3-m**.

Restoration Reach 1 is located in Scotts Run (Tributary 11). This reach was perennial. The canopy contained a mix of large and smaller evergreen and deciduous trees and moderate understory (**Table 3-m**). The ground cover in the riparian zone was moderate to heavy with 10 to 40 percent barren, bare dirt or duff. The riparian vegetation was dominated by residential lawn through most of the reach. A gabion structure was located on the RDB near Station 3+20. In addition, several outlet pipes were located along the left descending bank (LDB).

Restoration Reach 2 is located in Scotts Run (Tributary 11). This reach was perennial. The canopy contained a mix of large and smaller evergreen and deciduous trees and sparse to moderate understory. The ground cover in the riparian zone was sparse to very heavy with 10 to 75 percent barren, bare dirt or duff. The riparian vegetation was dominated by residential lawn through much of the reach. Pasture was also located along the riparian zone. Residential structures were located in close proximity of the reach along the LDB. In addition, outlet pipes were located along the LDB.

Restoration Reach 3 is located in Scotts Run (Tributary 11). This reach was perennial. The canopy contained a mix of large and smaller evergreen and deciduous trees and moderate to heavy understory. The ground cover in the riparian zone was heavy with 10 to 40 percent barren, bare dirt or duff. A portion of the riparian zone was dominated by residential lawn. Large gabion baskets lined the LDB near Station 21+20. A paved road located off the LDB had an influenced on much of the reach.

Restoration Reach 4 is located off of the thirteenth left descending unnamed tributary of Scotts Run on the LDB. This reach was intermittent. The canopy contained a mix of large and smaller deciduous trees and moderate understory. The ground cover in the riparian zone was moderate to heavy with 10 to 40 percent barren, bare dirt or duff. Trash was noted within the reach, near the gravel county road at the end of the reach. Additionally, there was a culvert located within the reach associated with drainage control up gradient of the gravel county road. Finally, a residential dwelling was located within the vicinity of the upper portion of the reach.

Restoration Reach 5 is located off of the thirteenth left descending unnamed tributary of Scotts Run on the LDB, up gradient of restoration reach 4. This reach was ephemeral. The canopy contained a mix of large and smaller deciduous trees and moderate to heavy understory. The ground cover in the riparian zone was heavy with 10 to 40 percent barren, bare dirt or duff. No human influences were noted within the reach.

Restoration Reach 6 is located off of the thirteenth left descending unnamed tributary of Scotts Run on the LDB, downstream of restoration reach 4. This reach was intermittent. The canopy contained a mix of large and smaller deciduous trees and moderate understory. The ground cover in the riparian zone was moderate with 10 to 40 percent barren, bare dirt or duff. A gravel county road was located at the end of the reach. Additionally, there was a culvert located within the reach associated with drainage control up gradient of the gravel county road.

Restoration Reach 7 is located off of the thirteenth left descending unnamed tributary of Scotts Run on the LDB, up gradient of restoration Reach 6. This reach was ephemeral. The canopy contained a mix of large and smaller evergreen and deciduous trees and moderate to heavy understory. The ground cover in the riparian zone was moderate to very heavy with 40 to 75 percent barren, bare dirt or duff. The riparian vegetation was dominated by reclaimed mining vegetation with a punch out hole noted at the top of the reach.

TABLE 3-m
Riparian Vegetative Structure in the New Hill West Surface Mine Project Area Restoration Reaches

Tributary	Canopy	Understory	Ground Cover
Restoration Reach 2	*Acer sp.* *Fagus grandifolia* *Platanus occidentalis* *Quercus sp.*	*Alnus sp.* *Rhus sp.* *Sassafras albidum*	*Fescue sp.* *Rhubus sp.* *Smilax sp.* *Vitis sp.*

Tributary	Canopy	Understory	Ground Cover
Restoration Reach 3	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Pinus sp.* *Quercus sp.*	*Alnus sp.* *Lindera bezoin* *Rhus sp.* *Sassafras albidum* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Urtica dioica* *Vitis sp.*
Restoration Reach 4	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.*	*Lindera bezoin* *Rhus sp.* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Vitis sp.*
Restoration Reach 5	*Acer sp.* *Fagus grandifolia* *Quercus sp.*	*Alnus sp.* *Lindera bezoin* *Rhus sp.* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Vitis sp.*
Restoration Reach 6	*Acer sp.* *Fagus grandifolia* *Liriodendron tulipifera* *Quercus sp.*	*Alnus sp.* *Ligustrum sp.* *Rhus sp.* *Viburnun sp.*	*Polystichum acrostichoides* *Rhubus sp.* *Smilax sp.* *Vitis sp.*
Restoration Reach 7	*Acer sp.* *Quercus sp.* *Tsuga canadensis*	*Rhus sp.* *Viburnun sp.*	*Rhubus sp.* *Smilax sp.* *Vitis sp.*

3.11 Water Quality

Water Quality was collected by Patriot on various dates in 2008 and 2009. Samples were collected at seven surface water sampling stations in and adjacent to the proposed permit area. The intent of this sampling was to establish baseline water quality data for Section J of Patriot's SMCRA permit. **Table 3-n** contains a description of each station. Sampling locations may also be found on mapping provided in **Appendix C**. Raw data may be found in **Appendix E**.

TABLE 3-n
Water Quality Sampling Locations in the Upper Scotts Run Watershed

Sampling Location	Description	Latitude	Longitude	Elevation
BWQ B (NH-7) (UTSR-7)	Unnamed Tributary of Scotts Run draining western portion of Proposed Operation	39° 40' 28"	80°04'00"	1044
BWQ C	Unnamed Tributary of Scotts Run draining eastern portion of Proposed Operation	39° 39' 59"	80°03’12"	976
BWQ D (NH-6) (UTSR-6)	Scotts Run above Proposed Operation	39° 40' 28"	80°04'02"	1043

Sampling Location	Description	Latitude	Longitude	Elevation
BWQ E	Scotts Run at Cassville	39° 39' 59"	80°03'48"	997
NH-4/USR	Unnamed Tributary of Scotts Run entering from West at Cassville	39° 39' 57"	80°03'50"	1004
NH-3/DSR	Scotts Run below Old Refuse Hollow - Article 3 Point for S-2010-01	39° 39' 58"	80°03'12"	975
USR-5	Scotts Run Downstream near Jere	39° 39' 59"	80°02'53"	963

Samples collected in the Scotts Run watershed had wide ranges and were likely influenced in some locations by historic mining operations. The most upstream sampling location was BWQ-B (NH-7). This monitoring point was sampled twice a month from August 2008 to May 2009. Two additional samples were collected in January 2010. This data is summarized in **Table 3-o** and datasheets may be found in **Appendix E**. Data was also collected from this monitoring point in 2000-2001. This data is discussed in more detail in Section 4.13 of Patriot's EID (and Part IV of Patriot's 401 application). The pH fell in the normal range at this sampling location. Iron values were all below 1.0 mg/L and selenium was reported well below the State's WQS of 5.0 ug/L. Flow at this location was highly variable

BWQ-D was located in Scotts Run upstream of the proposed operation and upstream of the unnamed tributary in which BWQ-B was located. It was evaluated twice a month from August 2008 to May 2009. Two additional samples were collected in January 2010. This site was previously identified as NH-6). The pH fell in the normal range at this sampling location. Iron values were all below 1.0 mg/L and manganese values were also very low. Selenium was below the detection limit in many samples and the highest reported value fell well below the State's WQS.

BWQ-C was located in a tributary of Scotts Run which would receive drainage from the proposed operation as well as other operations in the watershed. This sampling location is highly influenced by an abandoned refuse dump (referred to as a gob pile in this document) that was partially reprocessed before the reprocessing facility's permit was revoked. Additionally, a pre-existing acidic seep discharges from the bond forfeiture area. While the presence of these pre-existing conditions does not appear to strongly influence pH, they are likely the source of higher iron, manganese, and pH values. Patriot has been collecting water quality data from NH-2 for several years. This data, and a more detailed discussion of its potential impacts are provided in Section 4.13 of Patriot's EID (and Part IV of Patriot's 401 application).

BWQ-E is a monitoring location in Scotts Run downstream of BWQ-B and BWQ-D. This sampling location was sampled twice monthly from August 2008 to January 2010 has similar ranges for the measured water quality parameters. The pH fell in the normal range and iron, aluminum, and manganese were below the WQS. Selenium was not detected in 12 of the 17 samples from this location.

USR (NH-4) is located in a tributary of Scotts Run. Data were collected from January 2008 to March 2009 with an additional event in January 2010. This sampling location is upstream of DSR (NH-3), but downstream of historic mining activities. While the pH at this location is in the normal range, higher iron and aluminum values have been recorded.

DSR (NH-3) is located on Scotts Run and sampled during the same time period as USR. The pH at this location was in the normal range and iron values were usually below 0.5mg/L (exceed 1.0 mg/L in three samples). Total dissolved solids and specific conductance had broad ranges at this location.

USR-5 was the most downstream station located approximately 2,000 feet below DSR. Samples were collected twice a month during 2008 with an additional sample collected in January 2010. High iron values at this location correlate with flow and only three samples contained values greater than 1.0 mg/L. The pH at this location fell within the normal range.

As noted, a more detailed description of the water quality analysis for this project may be found Section 4.13 of Patriot's EID (and Part IV of Patriot's 401 applications).

Field water quality data was also collected at the sampling locations listed in **Table 3-p**. This data is provided in **Table 3-p**. Some of the field water quality data do not reflect the specific conductance values found in laboratory data.

TABLE 3-o

Surface Water Quality Data Collected At Select Sampling Locations in the Scotts Run Watershed in 2008, 2009, and 2010

Site	pH	Flow (gpm)	Total Hot Acidity (ppm $CaCO_3$)	Total Alkalinity (ppm $CaCO_3$)	Total Fe (ppm)	Total Mn (ppm)	TSS (ppm)	TDS (ppm)	Spec. Cond. mhos	Dissolved AL Mg/l	Total Al (ppm)	Selenium Ug/L
BWQ- B	7.80-8.40	<1-250	<2-3	57-117	<0.014-0.251	<0.002-0.029	<3-9	140-336	210-400	<0.008-0.164	<0.065-0.231	<0.80-52.32
BWQ-C	7.00	<1-76	<2—3	24-59	0.797-66.83	0.334-7.642	7-23	672-1,820	1,011-2,360	<0.065-0.228	<0.065-1.037	<0.80-7.57
BWQ-E	7.80-8.50	9-250	<2-3	73-156	<0.014-0.250	<0.003-0.028	<3-7	196-344	263-471	<0.065-0.194	<0.065-0.207	<0.80-3.71
BWQ-D	8.00-8.40	5-150	<2-3	63-188	<0.014-0.385	<0.003-0.044	<3-12	12-316	232-362	<0.008-0.180	<0.065-0.269	<0.8-2.62
DSR (NH-3)	7.30-7.80	25-5,000	<2-3	63-188	<0.014-1.45	<0.003-0.327	<3-15	256-736	367-1,088	<0.065-0.250	<0.065-0.294	211
USR (NH-4)	7.00-7.60	10-2,500	<2	30-47	0.019-4.094	<0.003-0.413	10-17	272-296	431-499		<0.065-2.201	
USR-5	7.50-8.00	20-8,000	<2	105	0.016-2.886	<0.003-2.375	<3	352	512	<0.065-0.216	<0.065-1.484	

[1] *Measured only once*

BDL – Below Detectable Limits

** No value can be reported because all measures BDL*

TABLE 3-p

Field Water Quality Data Collected At Select Sampling Locations in the Upper Scotts Run Watershed

April 2009													
Parameters	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13
pH	6.66	7.41	7.12	7.06	7.43	8.15	5.3	8.07	7.16	7.24	7.35	7.73	7.66
Conductivity	277	342	319	303	289	260	356	275	290	207	142.9	410	493
Turbidity	3.89	18.5	9.78	6.44	8.67	3.57	0.27	1.89	2.77	4.2	58.6	15.1	99.9
Temperature	9.6	8.5	10.2	10.8	10.8	11	10	11.6	9.5	9.1	8.5	9.7	9.9

March 2010																
Parameters	Site 14	Site 8	Site 15	Site 9A	Site 9B	Site 13	Site 12	Site 19	Site 20	Site 6	Site 17	Site 18	Site 5	Site 22	Site 23	Site 24
pH	7.52	7.58	7.57	7.76	7.67	7.31	7.45	7.55	7.21	7.04	7.25	7.16	7.33	7.44	7.43	7.34
Conductivity	248	210	314	192.6	176.5	250	206	191.1	190	171.3	164	150.8	194	189.6	177.2	171
Turbidity	750	350	110	130	210	300	230	160	386	153	123	86.9	286	50	100	150
Temperature	6.8	7.3	10.8	8.3	8.5	8.7	8.3	7.5	7	4.6	4.8	4.6	5.4	5.3	6.7	8

3.12 Aquatic Habitat/Benthic Macroinvertebrates

The WVDEP – Division of Water and Waste Management (DWWM) completed watershed assessments in the Monongahela River watershed in 1998 and 2003 using biological, water quality and habitat evaluation techniques. The sampling techniques and assessment methods were based on the Rapid Bioassessment Protocols (RBP) developed by the USEPA. Benthic macroinvertebrates were collected using a modified RBP II method and the biological condition was then determined through the use of six community based metrics which have been combined into a single index referred to as the West Virginia Stream Condition Index (WVSCI). Habitat was also assessed using RBP methods. Please see the **Habitat Assessment** section below for a more detailed discussion regarding Habitat Assessment using the RBP.

Generally, the sites sampled by the WVDEP in the Scotts Run watershed and in the Focus Area were in fair condition. Although the conductivity values reported by the WVDEP are slightly lower than those reported in the field by POTESTA, the data collected by the agency is by and large consistent with the data submitted by Patriot to the WVDEP in the proposed surface mine permit application. Mapping of the sampling locations may be found in **Appendix C – Figure 8**.

Date	Stream Name	ANCode	Mile Point	WVSCI	RBP	pH	Spec. Cond (umhos/cm)	Sulfate (mg/l)	TSS (mg/l)	Total Al (mg/l)	Total Fe (mg/l)	Fecal (col/100ml)
09/15/99	Scotts Run	WVM-6		31.80	117	7.30	1,282	940		0.137	0.0992	275
06/10/03	Scotts Run	WVM-6	5.4	54.26	134	7.84	283	42.2	< 3	0.10	0.24	88
09/16/99	Wades Run	WVM-6-A	0.2	53.97	121	7.70	1,111	550	< 5	< 0.10	0.256	2,500
05/18/04	Guston Run	WVM-6-B	0.4	53.16	142	7.88	975	346	16	0.98	0.89	4,100
09/15/99	Guston Run	WVM-6-B	0.8	58.16	120	7.40	853	260		< 0.10	0.0954	525

3.13 Functional Assessment Information

In an effort to better quantify a project's impacts to aquatic and terrestrial resources, the USACE has developed a system or method, for use in southern West Virginia, to quantify riparian and landscape conditions in the watershed that would be impacted (as well as those to be mitigated). The approach is often referred to as the USACE's Functional Assessment Approach for High Gradient Streams (WVHSA) (USACE, 2007) or as the Interim Functional Assessment Approach or IFAA. The reported IFAA data was collected by POTESTA in March 2010. **Table 3-q** contains a description of the reaches where data was collected and assigns these reaches a code which is used in corresponding IFAA tables.

TABLE 3-q
Reach Descriptions

Stream Channel	Description
Tributary No. 1	Mine-Through
Tributary No. 1-1	Mine-Through
Tributary No. 4	Mine-Through
Tributary No. 5	Mine-Through
Tributary No. 6	Mine-Through
Tributary No. 7a (3+61 to 5+00)	Mine-Through
Tributary No. 7b (5+30 to 19+13)	Mine-Through
Tributary No. 7-1	Mine-Through
Tributary No. 7-3	Mine-Through
Tributary No. 8	Mine-Through
Tributary No. 9	Mine-Through
Tributary No. 10	Mine-Through

This WVHSA model was developed to help determine the condition of headwater streams and riparian areas in the mountainous regions of West Virginia. The model has eleven indicators which are used to make determinations regarding four broad assessment categories. The four broad assessment categories are: hydrology, biogeochemical cycling, plant community functions, and wildlife habitat. The 11 indicators that are used in the model to derive values for each assessment category are as follows:

- The **Stream Channel Alteration** variable reflects alterations to the natural hydrology of the stream due to activities within the channel itself. This variable quantifies types of structures or alterations to the natural channel using six sub-variables or conditions. These include the following: unaltered; restored; incised, or excess sediment in the channel; dammed; channelized/straightened; and channels greater than 50 percent filled. **This indicator is the primary field for score determination.**

- The **Average Percent Slope of the Watershed** variable reflects anthropogenic alterations to the natural slope of the headwater watershed. In general, natural headwater channels in West Virginia have relatively high gradients. The variable value is based on slope or the channel's existing condition (if undisturbed).

- The **In-stream Sediment Size** variable is the predominant particle size of materials comprising the surface of the streambed. Particle size influences habitat and energy dissipation in the stream channel. The variable's value is based on cobble and boulder-size rock being the most favorable which would be typical of a high gradient headwater stream in West Virginia. The smallest particle sizes (sand, silt, and clay) as well as bedrock which is habitat limiting, have lower values.

- The **Land Cover within the Watershed** variable is defined as the surface water run-off potential from the watershed into the stream. The variable is a visual estimate of one of five basic land cover types (forest, shrub, orchards, pasture, and urban) with forest land cover being the most favorable.

- The **Average Percent Cover of Trees variable** is the average percent of cover of trees in the watershed surrounding the headwater stream. The tree cover is presumed to be a measure of dominance and biomass of trees in the forest stand adjacent to the channel.

- The **Shrub Cover** variable is the average percent cover of woody vegetation greater than 39 inches in height and less than 3 inches in diameter at breast height (dbh). Shrubs can dominate the vegetative community in headwater reaches, influencing run-off, as well as the quality of large woody debris (LWD).

- The **Average Percent Cover of Herbaceous Vegetation** variable is the average percent cover of ground vegetation. This is all herbaceous vegetation that is less than 39 inches. This variable is only applied when the tree or shrub cover is not well developed.

- The **Vegetation Composition and Diversity** variable reflects the quality of the woody plant community in the riparian zone. Is based on the premise that undisturbed high gradient headwater streams in West Virginia would have an abundance of native trees of various species. Value is generated based on number of species in the riparian zone with five being the highest possible value.

- The **Soil Detritus** variable is a visual estimate of the percentage of the ground surface that is covered by organic material such as leaves, sticks (less than three inches in diameter), needles, flowers, fruits, dead moss, or lichens. This variable is an indication of the amount of organic material that may be available for export to downstream reaches.

- The **Large Woody Debris** variable is the total number of logs (whole or partial) found in the stream channel (per 1,000 feet). The log must be at least 39 inches long, or if the channel is narrower than 39 inches, the debris must span the entire channel and be at least 3 inches in diameter. Large woody debris is often an important channel forming element in high gradient, headwater channels. It also may provide habitat and a limited amount of nutrients and organic matter to downstream reaches. Researchers at Virginia Tech also found a relationship between uptake of dissolved inorganic phosphate (a limiting nutrient in

Appalachian streams), and debris dam frequency, LWD volume and the proportion of fine-grained sediments present in the stream bed (Valett et al. 2002).

- The **Stream Channel Geomorphology** variable reflects direct alterations to the channel's natural geomorphology. This variable reveals changes in slope within the stream channel. This variable is different than **Average Slope of the Watershed** because it is an in-stream measure. Unaltered channels or channels with slopes greater than four percent are given the highest value.

Interim Functional Assessment Approach values are provided in **Table 3-r**. The total IFAA values in the impact areas ranged from 0.28 to 0.67. IFAA assessment forms may be found in **Appendix F**. A summary of each site is provided below.

Tributary No. 1 – Tributary No. 1 is the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (465 linear feet (0.029 acres) of intermittent stream channel). The first 100 feet of this channel was characterized by a highly eroding channel that was dominated by a boulder substrate; however, the particle sizes ratio in this tributary has a larger component of gravel (52 percent) than boulder and cobble (23 percent), with a 25 percent fraction of smaller particle sizes. Land cover within the watershed is primarily forest with some pasture. The tree cover is composed of a minimum of three species of trees. The riparian vegetation immediately surrounding the channel was densely populated with shrub species. The slope in this small tributary remained consistent at approximately 6 percent to the end of the ordinary high water mark. Fifty percent of this tributary was classified as incised or with excessive sediment within the channel and thirty percent classified as channelized/straightened. The remaining portion was noted as unaltered. Moderate amounts of detrital material were observed in the watershed with 45 percent of the reach having more than 50 percent coverage. Very little large woody debris was noted within the reach. The habitat functions, hydrologic functions, and biogeochemical functions at these locations are intact. The WVHSA averages for Tributary 1 was 0.53 (**Table 3-r**).

Tributary No. 1-1 – Tributary No. 1-1 is the unnamed tributary of the first left unnamed tributary of the thirteenth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (325 linear feet (0.007 acres) of intermittent stream channel). The channel was characterized by excess sediment in the channel. The inorganic substrate was predominantly silt, gravel, and sand (93 percent). Land cover within the watershed is primarily forest with some pasture. The tree cover is composed of a minimum of two species of trees and the riparian vegetation immediately surrounding the channel was densely populated with shrub species. Initially the channel had a slope of approximately 3 percent but increased to 15 percent at the end of the ordinary high water mark. Moderate amounts of detrital material were observed in the watershed with 45 percent of the reach having more than 50 percent coverage. Very little large woody debris was noted within the reach. The habitat functions, hydrologic functions, and biogeochemical functions at these locations are intact. The WVHSA averages for Tributary 1-1 was 0.54 (**Table 3-r**).

Tributary No. 4 – Tributary No. 4 is the twelfth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (422 linear feet (0.012 acres) of ephemeral stream channel). The channel was channelized or straightened and is lined with rip-rap throughout most of the reach (70 percent). This tributary was identified in the field as historic anthropogenic activity within the watershed was mining related. The particle sizes ratio in this tributary has a larger component of boulder/cobble (46 percent) than gravel or silt (26 percent and 20 percent, respectively). Sand comprised a much smaller fraction of the substrate (8 percent). The watershed land cover is forest and pasture, both comprising 50 percent (each). The tree cover is composed of a minimum of four species of trees. Little vegetation was noted along the stream banks; however, a moderate amount of large woody debris was noted within the channel in despite marginal riparian vegetation. The slope of this upper portion of the reach was approximately 25 percent. The WVHSA averages for Tributary 4 was 0.47 (**Table 3-r**).

Tributary No. 5 – Tributary No. 5 is the eleventh left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (86 linear feet (0.002 acres) of intermittent stream channel). The channel was channelized or straightened and is lined with rip-rap throughout the reach. This tributary was identified in the field as historic anthropogenic activity within the watershed, either residential or mining related. The particle sizes ratio in this tributary has a larger component of boulder/cobble (67 percent) than gravel (28 percent). Sand comprised a much smaller fraction of the substrate (5 percent). The watershed land cover is forest and pasture, both comprising 50 percent (each). The tree cover is composed of a minimum of three species of trees. Fifty percent of the reach was noted with a greater than 70 percent vegetative cover. Additionally, no woody debris was noted. The slope of this upper portion of the reach was approximately 25 to 30 percent. The WVHSA averages for Tributary 5 was 0.28 (**Table 3-r**).

Tributary No. 6 – Tributary No. 6 is the first right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through and Pond No. 1a (100 linear feet (0.007 acres) of intermittent stream channel and 469 linear feet (0.026 acres) of ephemeral stream channel). The first 100 linear feet of the tributary has been channelized as it extends through an existing spoil storage area where the channel was lined with rip-rap. Forty percent of this tributary was classified as incised or with excessive sediment within the channel while the remaining portion was classified as unaltered (45 percent) or channelized/straightened (15 percent). The inorganic substrate was predominantly silt, gravel, and sand (84 percent). The watershed land cover is predominantly pasture with, forest and reclaimed mine comprising the remaining 30 percent. Seventy percent of the watershed had greater than 70 percent herbaceous cover. The tree cover is composed of a minimum of four species of trees. Moderate amounts of detrital material were observed in the watershed with 45 percent of the reach having more than 50 percent coverage. Moderate amounts of large woody debris were noted. The average slope of this the reach was approximately 7 percent. The WVHSA averages for Tributary 6 was 0.58 (**Table 3-r**).

Tributary No. 7 – Tributary 7 was evaluated in two locations. Tributary No. 7a extends 139 linear feet along the ninth left descending unnamed tributary of Scotts Run while the remaining

1,383 linear feet of proposed impacts are located along the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run and is identified as Tributary 7b.

Tributary 7a will be impacted as a result of a mine-through (139 linear feet (0.023 acres) of intermittent stream channel). The first 361 linear feet of the tributary has been channelized as it extends through an existing spoil storage area where the channel was lined with rip-rap (70 percent). The remaining portion of this reach was classified as unaltered. The inorganic substrate was predominantly boulder/cobble (75 percent). The remaining 25 percent is comprised of a mixture of gravel, sand, silt and bedrock. The watershed land cover is predominantly forested with, pasture, reclaimed mine, and urban roads comprising the remaining 30 percent. The tree cover is composed of a minimum of five species of trees. Moderate amounts of detrital material were observed in the watershed with 45 percent of the reach having more than 50 percent coverage. Large woody debris was limited. The average slope of this the reach was approximately 3 percent. The WVHSA averages for Tributary 7a was 0.45 (**Table 3-r**).

Tributary 7b will be impacted as a result of a mine-through (731 linear feet (0.055 acres) or intermittent stream channel and 652 linear feet (0.037 acres) of ephemeral stream channel). Fifty percent of this tributary was classified as incised or with excessive sediment within the channel while the remaining portion was classified as unaltered. While the predominant land cover was forest (45 percent), approximately 25 percent of the watershed has been timbered. The inorganic substrate throughout this portion of the channel consisted of mostly sand, gravel, and silt (93 percent) with minor boulder/cobble and silt gravel components. The tree cover is composed of a minimum of five species of trees. Reduced amounts of detrital material were observed in the watershed. Detritus was scattered through much of the reach with over half of the watershed having less than 50 percent coverage. More woody debris was noted in the upstream portion of the Tributary 7 and would be attributed to recent logging activities. The average slope of this the reach was approximately 4 percent. The WVHSA averages for Tributary 7b was 0.67 (**Table 3-r**).

Tributary No. 7-1 – Tributary No. 7-1 is the second left unnamed tributary of the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (37 linear feet (0.001 acres) of ephemeral stream channel). The channel was noted as being incised or with excessive sediment within the channel with equal amount of gravel, sand, silt, and clay substrate. Larger particle sizes were not observed. Tree and shrub cover in this area is less than 70 percent primarily due to more recent logging activity which is also the dominant land use. The tree cover is composed of a minimum of two species of trees. The riparian vegetation immediately surrounding the channel was densely populated with shrub species. The average slope of this channel was approximately 11 percent and extends 37 linear feet to the end of the OHWM. Detritus was scattered through much of the reach with over half of the watershed having less than 50 percent coverage. Despite recent logging activities, no large woody debris was noted within the reach. The WVHSA averages for Tributary 7-1 was 0.53 (**Table 3-r**).

Tributary No. 7-3 – Tributary No. 7-3 is the first left unnamed tributary of the second right unnamed tributary of the ninth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (209 linear feet (0.006 acres) of ephemeral stream channel). The channel was noted as being predominantly incised or with excessive sediment (60 percent) within the channel with clay substrate (100 percent). The remaining portion was noted as unaltered. Larger particle sizes were not observed. Land cover within the watershed is primarily reclaimed mine (logging) with some forest. The tree cover is composed of a minimum of three species of trees. The riparian vegetation immediately surrounding the downstream portion of the channel was densely populated with shrub species. The channel increases to a slope of approximately 7 percent through the end of the reach to the end of the OHWM. Limited detrital material was observed in the watershed with 75 percent of the reach having less than 50 percent coverage. Very little large woody debris was noted within the reach despite recent logging activities. The WVHSA averages for Tributary 7-3 was 0.61 (**Table 3-r**).

Tributary No. 8 – Tributary No. 8 is the first left unnamed tributary of the ninth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (139 linear feet (0.017 acres) of intermittent stream channel). Land cover within the watershed is primarily forest with some pasture. The tree cover is composed of a minimum of four species of trees. The riparian vegetation on the LDB was densely populated with mixed tree species and limited ground cover. Riparian vegetation on the RDB was limited due to an existing gravel road. The channel was moderately incised in several areas and the stream banks were eroding and being undercut by high flow events. Forty percent of this tributary was classified as incised or with excessive sediment within the channel and 10 percent classified as channelized/straightened. The remaining portion was noted as unaltered. Bedrock was the predominant inorganic substrate (70 percent) with boulder/cobble, gravel, and sand making up the remaining 30 percent. The slope in this portion of the tributary was approximately 9 percent. Limited amounts of detrital material were observed in the watershed with 70 percent of the reach having less than 50 percent coverage. Very little large woody debris was noted within the reach. The habitat functions, hydrologic functions, and biogeochemical functions at these locations are intact. The WVHSA averages for Tributary 8 was 0.64 (**Table 3-r**).

Tributary No. 9 – Tributary No. 9 is the ninth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (127 linear feet (0.009 acres) of intermittent stream channel). Land cover within the watershed is primarily forest with some pasture. The average particle sizes ratio in this tributary has a larger component of gravel (35 percent) than boulder and cobble (25 percent), with a 40 percent fraction of smaller particle sizes. The tree cover is composed of a minimum of four species of trees. The riparian vegetation immediately surrounding the channel on the RDB was densely populated with groundcover commonly found in a residential setting. The LDB was also dominated by grass groundcover however more tree species and shrubs were noted. The slope in this portion of the tributary was approximately 3 to 4 percent. Sixty-five percent of this tributary was classified as incised or with excessive sediment within the channel and thirty-five percent classified as channelized/straightened. Moderate amounts of detrital material were observed in the watershed with 45 percent of the reach having move than 50 percent coverage. The habitat functions, hydrologic functions, and biogeochemical functions at these locations are intact. The WVHSA averages for Tributary 9 was 0.49 (**Table 3-r**).

Tributary No. 10 – Tributary No. 10 is the tenth left descending unnamed tributary of Scotts Run and will be impacted as a result of a mine-through (217 linear feet (0.009 acres) of ephemeral stream channel). Ninety-five percent of the channel was channelized or straightened. The average particle size ratio in this tributary has a large component of boulder or cobble (95 percent), with a 5 percent fraction of smaller particle sizes (gravel and sand). Land cover within the watershed is primarily reclaimed mine with some forest and pasture or hay. The tree cover is composed of a minimum of two species of trees. Early successional species and various grass species were the dominant species in the riparian corridor. Seventy percent of the watershed had greater than 70 percent herbaceous cover. The average slope in this portion of the tributary was approximately 25 to 27 percent. Moderate amounts of detrital material were observed in the watershed with 45 percent of the reach having more than 50 percent coverage. The habitat functions, hydrologic functions, and biogeochemical functions at these locations are intact. The WVHSA averages for Tributary 10 was 0.33 (**Table 3-r**).

TABLE 3-r
IFAA Values for the New Hill West Surface Mine

Stream Code	Hydrology Functions	Biogeochemical Functions	Plant Community Functions	Habitat Function	WVHSA Reach Average
Impact Areas					
Tributary No. 1	0.59	0.59	0.39	0.54	0.53
Tributary No. 1-1	0.62	0.61	0.36	0.58	0.54
Tributary No. 4	0.55	0.55	0.32	0.44	0.47
Tributary No. 5	0.36	0.36	0.16	0.24	0.28
Tributary No. 6	0.61	0.62	0.47	0.60	0.58
Tributary No. 7a	0.48	0.46	0.43	0.44	0.45
Tributary No. 7b	0.70	0.68	0.64	0.65	0.67
Tributary No. 7-1	0.61	0.61	0.45	0.47	0.53
Tributary No. 7-3	0.69	0.66	0.51	0.57	0.61
Tributary No. 8	0.70	0.68	0.55	0.63	0.64
Tributary No. 9	0.58	0.51	0.38	0.47	0.49
Tributary No. 10	0.43	0.44	0.15	0.33	0.34

4.0 GOALS AND OBJECTIVES OF COMPENSATORY MITIGATION PLAN

The primary purpose of the proposed mitigation project is to off-set the permanent and/or temporary loss of unavoidably impacted aquatic resources through the proposed mitigation. The goals of this project are as follows:

- Mitigate for the temporary loss of intermittent, and ephemeral channels.
- Mitigate for the permanent loss of wetlands.
- Mitigate for the temporal loss to aquatic resources associated with the proposed activity.

The following objectives would be used to achieve these goals:

- Restoration of channels in tributaries located in mine-through areas as close as practicable, to stable conditions and restoration, creation, and/or enhancement of riparian habitat in these impacted channel segments.
- Restoration of channels in historical drainages as close as practicable, to stable conditions, and restoration, creation, and /or enhancement of riparian habitat in these segment.
- Restoration of channel in Scotts Run.
- Payment of in-lieu fees for wetland impacts

This CMP proposes to improve the habitat and restore channels in various locations in the Scotts Run watershed. Treatments (restoration) as designed by Patriot, POTESTA, and others would be utilized by Patriot to off-set the unavoidable loss of aquatic resources associated with the proposed NHWSM.

Temporary impacts would be mitigated by the restoration, as close as practicable to pre-disturbance conditions of the channels during reclamation. Temporary impacts associated with mine-through areas would be mitigated post mining by the restoration of these channels, as close as practical, to pre-mining conditions. This equates to approximately 4,118 linear feet of channel restoration in temporarily impacted areas. Additionally, these impacts would be mitigated through the restoration of 2,495 linear feet of channel in areas that likely contained channels prior to disturbance associated with the land use change of forested to agricultural use (pasture) and through restoration activities in 2,750 linear feet of Scotts Run. Please note that restoration of 100 linear feet of rip-rap channel in Tributary No. 6 is included in the industrial drainage calculations.

Permanent impacts (to wetlands) associated with the proposed project would be offset by the use of the State of West Virginia's and the USACE in-lieu fee program.

The minimum mitigation ratio is 1:1 for both permanent and temporary impacts. Temporal losses will be mitigated at a minimum of 3 years, maximum of 5 years as calculated using the

USACE's West Virginia Stream and Wetland Valuation Metric Worksheet (the Worksheet). Mitigation, as proposed, would result in approximately two (2) feet of restoration for every one (1) foot of temporary impacts. Wetlands would be mitigated using in-lieu fees. Section 7.0 of this report contains performance standards for the proposed project. This discussion is based on the values calculated in each mitigation sites Worksheet and there are habitat based.

4.1 Temporary Impacts

The temporarily impacted channels (mine-throughs) would be restored to their pre--mining configuration (as close as practicable) when mining and reclamation activities are completed. Restoration of these areas would also include the creation/restoration/development of adjacent riparian zones. The inclusion of riparian restoration is important for several reasons (aside from the obvious – source of allothonouse organic material including: (i) restoration of the riparian zone would also buffer the stream from excess nutrients, which in large quantities may impair aquatic communities, as well as other inputs such as pesticides or herbicides; (ii) the plant material contained in the riparian zone would provide habitat for a number of species; (iii) terrestrial animals would seek food and shelter within a vegetative stand (riparian zone) along a stream segment; (iv) use of the riparian zone by various bird species and research also indicates that migratory birds find refuge in an established canopy along their route; and (v) dense canopies block out the sun's intensity and reduce temperatures which also reduces the amount of aquatic vegetation (i.e., algae) growing in pools, especially in slow flowing streams. This reduction in algae would result in increased oxygen levels for aquatic life. All of these conditions may also influence which benthic macroinvertebrate species are present as well as other types of aquatic organisms.

Existing aquatic communities in the permit area would be altered as a result of the proposed activity. The extent of or nature of the effects is directly related to the type of impact proposed for the channel reach. Aquatic organisms residing in the footprint of the mine-through areas would be lost due to migration to downstream reaches which may have developed in the minimally to highly impacted headwater drainage. When these reaches are restored and the riparian zone is re-established, there is no reason to suspect that similar aquatic species would have difficulty re-colonizing these areas because these channels would be restored to their pre-mining condition, as close as practicable, which would include appropriate habitat for the establishment of instream communities. Further supporting the concept of re-colonization of these reaches is the noted presence of considerable watershed area adjacent to the proposed project area. Stream reaches outside of the proposed permit area would contain communities which would help to re-establish the indigenous species to the temporarily impacted reaches. Additionally, many aquatic organisms "drift" or move in a downstream direction as habitat or other conditions warrant.

As noted, much of the unavoidable impacts, associated with the proposed New Hill West Surface Mine, to the aquatic resources are temporary in nature. In order to off-set these losses, Patriot is proposing on-site and off-site restoration including the restoration of the proposed temporarily impacted reaches. The existing substrate of the stream bed in the disposal areas consists of sedimentary particles (sandstone and some shale) that have eroded from the higher mountain upland areas (ridges) and transported (by flow) and deposited within the stream bed. Substrate within the receiving watershed is characterized as native sandstone and shale, with varying size components, depending upon stream reach. It is assumed that the substrate in these reaches is native to the reach and is composed of organic and inorganic solid material (including water). While disposal sites are composed of material similar to that which would be discharged, the substrate in these reaches will no longer be available for colonization by aquatic species in the short-term. Short-term is three to five years depending on the location of the restored tributary.

The proposed mitigation would restore streams with similar substrate to that lost by the proposed activities. Initially, restored channels may have smaller LD_{50}s; however, it is expected that the optimal particle size for each of these reaches (would be based on slope as well as other instream factors) would be achieved over time. More specifically, with the normal movement of bed material in these reaches, the channel bottoms substrate will become more diverse and more appropriate for the streams pattern, dimension, and profile. Restoring and/or promoting similar substrate type in the newly restored channels would encourage colonization of these reaches by organisms adapted to the existing headwater environment. Similar effects are anticipated in historical drainages that would be restored on-site and adjacent to the proposed project area. In these reaches, the substrate may initially be composed of a lower or smaller LD_{50}; however, flow through these reaches would result in a gradual flushing of the finer grain sediments until an optimum particle size distribution is achieved. Because the flushing is anticipated to be gradual over time, impacts to downstream reaches are not anticipated.

Areas of Scotts Runhave eroded banks and very little channel heterogeneity in some reaches. This is likely the result of on-going disturbance associated with adjacent lawns and roads. Restoration efforts would likely focus on riparian restoration as well as instream activities which would encourage sediment transport through these reaches (see Section 6.0).

Suspended particulates/turbidity is not expected to be impacted as a result of mitigation activities with the exception of a brief period of time during construction activities. These impacts would be minimized by the placement and use of BMPs. After construction, particulates in the channel are expected to be similar to the baseline conditions in the watershed. Normally particulates may enter from the run-off, seasonal flooding, and vegetative breakdown. These types of materials are part of the normal cycling in streams, and it is anticipated that these activities will be ongoing after construction (or restoration) in the mitigation reaches.

Water is the part of the aquatic ecosystem in which organic and inorganic constituents are dissolved and suspended. It constitutes part of the liquid phase and is contained by the substrate. Water forms part of a dynamic aquatic life-supporting system. Waters within the proposed New Hill West Surface Mine permit area have not been defined as High Quality or High Value aquatic systems by the State of West Virginia, nor are they listed as or proposed to be listed as National Wild and Scenic Rivers. However, it is noted that, at a minimum, all waters of the State are designated for the Propagation and Maintenance of Fish and Other Aquatic Life (Category B) and for Water Contact Recreation (Category C) consistent with CWA goals.

Water quality in the proposed project can be described as fair and the receiving stream downstream (Scotts Run) has undergone Total Maximum Daily Load (TMDL) development for iron, manganese, and aluminum. As previously noted, past and current mining activities as well as other types of land disturbances have occurred within the Scotts Run watershed. Historic mining activities which resulted in the generation of higher conductivity, low pH, and metals are known to occur in areas adjacent to the proposed project area. This project, as proposed, would result in Patriot removing historical, toxic material (an old gob pile) in the area where Pond No. 1 would be relocated. Removal of this material for the relocation of Pond No. 1 is expected to improve water quality downstream of the proposed project area. Additionally, a historical seep exists in the vicinity of the existing Pond No. 1. Post mining, it is Patriot's intention to release the pond area to WVDEP's Special Reclamation Program to help to reduce the impacts of this seep to the aquatic community downstream of the proposed project area.

It is expected that the placement of dredged and fill material in the proposed permit area would have minimal impact on waters at the site. While on-site increases in sedimentation may initially be noted, the implementation of the drainage and sediment control systems required by the mining regulations should minimize impacts to areas off the project area. These structures would also reduce impacts associated with increases in run-off which may occur in areas that have been temporarily de-vegetated. Patriot would use a Materials Handling Plan (MHP) to handle any toxic/acid producing material encountered to minimize the potential for the formation of acid mine drainage , further minimizing any potential adverse effects of water in the aquatic ecosystem. Additionally, while water temperature may be altered during initial construction due to lack of available cover, when channels are restored and riparian zones are established, downstream temperatures would be expected to stabilize. Additionally, many of the impact areas are not forested and may already have higher temperatures. Due to historical mining, existing water quality is greater than 300 μS/cm in some locations. There are no valley fills proposed as a part of this project. Water discharging from this proposed projects new National Pollutant Discharge Elimination System (NPDES) outlets would not flow through rock fill material. Water discharging from the relocated Pond No. 1 would come from the existing side-hill fill. Because the material discharge into this fill is similar in nature to the material in the existing fill, the addition would not be expected to alter water quality. In general, activities associated with the proposed project should not result in the violation of water quality standards or effluent limits assigned to the project's discharge outlets.

Current patterns, water circulation, and normal water fluctuations in the upper reaches of the restored channels may be primarily dependent on precipitation; however, post mining reclamation would result in a configuration of not only similar to pre-mining conditions, but that would encourage the movement of surface waters to newly restored channels. Waters are expected to flow in a downstream direction from these newly restored channels to existing drains in each watershed. These drains have been previously verified by the USACE and are known "waters of the United States."

As discussed, water flow and presence in the restored channels is expected to fluctuate with rainfall, with these fluctuations being similar to those found in existing ephemeral segments in the watershed as well other sources of water in the drainage (overland flow, groundwater, seeps, etc.). It is anticipated that these restored channels would be capable of transporting materials to downstream reaches in Scotts Run. The amounts and kinds of materials transported to downstream reaches would depend on a number of factors including rainfall amounts, age of riparian zone, vegetation used to populate riparian zone, channel slope, channel roughness as well as other factors that are important components of channel geomorphology.

Current patterns, water circulation, and normal water fluctuations in the restored areas in and adjacent to the permit area are expected to be similar to the existing conditions in the impacted stream reaches; considering that current patterns and water circulation are dependent on the topography of the stream channel and its surrounding area, channel size, and stream flow. The newly restored streams would be constructed, as close as practicable, to those that currently exist or, in the case of the historical drainages, from adjacent watersheds that should contains streams of similar pattern, dimension, and profile. The flows in these reaches would be expected to fluctuate based on precipitation and, in some areas, would continue to fluctuate daily, seasonally, and annually based on the ground water contribution to these areas combining with the discharge from the proposed permit area. Therefore, replacing the temporarily impacted stream reaches with the newly restored channel in the footprint of the existing drain is expected to minimize such losses in the watershed.

4.2 Impact Debits and Credits for Temporarily Impacted Areas

In an effort to better quantify the project's impacts to aquatic resources, Patriot utilized the USACE's Worksheet to determine the loss of aquatic resources for this project and the amount of off-set that could be generated by the proposed mitigation. Using this method, baseline values for each reach have been determined. For proposed mitigation areas, a predicted post mining value has also been determined. Values for temporarily impacted areas and restoration areas are provided in **Table 4-a**. The Worksheets for each site are provided in **Appendix G**.

Mitigation values determined by the Worksheet are based on RBP habitat sheets, and where available, water quality data. In some instances, water from downstream reaches was used to assess or determine future condition. Temporal loss in the calculator was based on 3 or 5 years depending on the impact location and its place in Patriot's mine plan. Debits were also determined on a 15-year maturity rate. Because the material in the post mining channel will not be moving through fill, large fluctuations are not anticipated; however, post mining specific conductance values were set at 300 µS/cm if the pre-mining value was less than 300 µS/cm and near the current value for segments with specific conductance values of greater than 300 µS/cm.

TABLE 4-a
Impacts Debits and Credits

Site	Raw Unit Score	Impact Unit Yield (Debit)	Mitigation Unit Yield (Credit)	Sub-Totals	Running Balance (Debit or Credit)
Restoration of Temporarily Impacted Areas					
Tributary No. 1	**345.2625**	**618.0199**	**174.375**	-443.645	-443.645
Tributary No. 1-1	**241.3125**	**407.8181**	**271.375**	-136.443	-580.088
Tributary No. 4	**279.575**	**489.2563**	**349.205**	-140.051	-720.139
Tributary No. 5	**62.995**	**110.2413**	**72.24**	-38.0013	-758.141
Tributary No. 6 (Ephemeral)	**246.225**	**469**	**815.3775**	346.3775	-411.763
Tributary No. 6 (Intermittent)	**72.75**	**127.3125**	**164.5**	37.1875	-374.5755
Tributary No. 7 (Ephemeral)	**384.68**	**673.19**	**454.77**	-218.42	-592.9955
Tributary No. 7 (Intermittent)	**626.4**	**1096.2**	**719.925**	-376.275	-969.2705
Tributary No. 7-1	**20.72**	**37**	**25.8075**	-11.1925	-900.463
Tributary No. 7-3	**109.725**	**209**	**145.7775**	-63.2225	-1043.6855
Tributary No. 8	**89.3075**	**150.9297**	**108.42**	-42.5097	-1086.195175
Tributary No. 9	**81.5975**	**137.8998**	**99.06**	-38.8398	-1125.03495
Tributary No. 10	**125.86**	**217**	**477.7**	260.7	864.33495
Restoration of Scotts Run and Historical Drainage					
Restoration Reach No. 2			**12.0375**	12.0375	852.29745
Restoration Reach No. 3			**171.125**	171.125	681.17245
Restoration Reach No. 4			**15.4125**	15.4125	665.75995
Restoration Reach No. 5			**430.625**	430.625	235013495
Restoration Reach No. 6			**9.975**	9.975	225.15995
Restoration Reach No. 7			**403.75**	403.75	178.59005

4.3 Mitigation Strategy

It is believed, that the mitigation submitted in this document is both reasonable and practical, and would provide the level of watershed improvement necessary to off-set the loss of aquatic resources identified in this CMP. **Table 4-b** contains the lengths of stream, including acres, impacted by the proposed project. The cumulative permanent impacts associated with the New Hill West Surface Mine would be approximately 0.064 acre of wetland and the temporary impacts would be approximately 4,118 linear feet of intermittent and ephemeral channel. As discussed.

Patriot proposes to off-set the unavoidable impacts to the aquatic resources in the temporarily impacted areas through the use of stream restoration techniques (plus additional mitigation for temporal losses as determined by the Worksheet) after mining and during reclamation activities (**Table 4-c**). This would include restoration of 2,952 linear feet off-site, in Scotts Run and unnamed tributaries of Scotts Run. On-site restoration activities would include the restoration of 4,118 linear feet of channel as well as 2,193 linear feet of channel in historic drainages (does not include Restoration Reaches 4 and 6). To off-set permanent impacts associated with mining activities Patriot proposes to pay in-lieu fees (**Table 4-c**). **Table 4-d** depicts the debits and credits derived from each of the proposed activities.

TABLE 4-b

Impacts Associated with the New Hill West Surface Mine

Impacts	Permanent Impacts							Temporary Impacts					
	Perennial		Intermittent		Ephemeral		Wetlands	Perennial		Intermittent		Ephemeral	
	Length (ft)	Acres	Length (ft)	Acres	Length (ft)	Acres	Acres	Length (ft)	Acres	Length (ft)	Acres	Length (ft)	Acres
Mine-Through Areas	---	---	---	---	---	---	---	---	---	2,112	0.149	2,006	0.091
Mine Areas	---	---	---	---	---	---	0.064	---	---	---	---	---	---
Cumulative Impacts	**---**	**---**	**---**	**---**	**---**	**---**	**0.064**	**---**	**---**	**2,112**	**0.149**	**2,006**	**0.091**

[1] An additional 145 linear feet (0.03 acres) will be temporarily impacted due to sediment.

TABLE 4-c

Impacts Associated with the New Hill West Surface Mine and Proposed Mitigation

Location	Permanent and Temporary Impacts				
	Intermittent		Ephemeral		Wetland
	Length (ft)	Acres	Length (ft)	Acres	Acres
New Hill West Surface Mine	2,112	0.149	2,006	0.091	0.064
Off-Site Restoration					
	Length (ft)				
Scotts Run	2,750				
Unnamed Tributaries of Scotts Run	202				
Cumulative Off-site - Restoration	**2,952**				
On-Site Creation					
	Length (ft)				
Mine-Through Areas	4,118				
Historical Drainage Areas	2,193				
Cumulative On-site - Restoration	**6,411**				
Wetland Impacts					
Wetlands	**In-lieu fee**				

TABLE 4-d

Mitigation Allocation Table Associated with the New Hill West Surface Mine

Associated Impacts	Mitigation Measures
Temporarily Impacted Areas	
4,742.867	3,878.533*
Historical Drainage restoration	
0	859.7625
Restoration in Scotts Run	
0	183.1625
Totals	
4,742.867	**4,921.458**

value includes 1,163 linear feet of historical drainage restoration, and 100 linear feet of rip-rap channel

5.0 SITE SELECTION

The applicant is proposing to mitigate for the loss of aquatic resources associated with the New Hill West Surface Mine in the Scotts Run watershed using on-site and off-site mitigation in the same drainage for temporary stream impacts and in-lie fees for permanent wetland impacts. This mitigation would in-kind.

5.1 Stream Restoration/(Enhancement)

The stream restoration sites, as identified in this CMP are located in the Scotts Run watershed and downstream of the proposed project.

Stream restoration in the mine-through areas have been selected as appropriate because they are required as per Patriot's SMA and would be located in the footprint of the existing channel. Mitigation efforts in the historical drains are appropriate based on their proximity to the impact area and the ability to create channels that would have connectivity with known jurisdictional channels in the watershed. This form of mitigation would off-set the loss to existing aquatic resources in these areas by restoring channels that are similar to those that likely existed prior to historical disturbance in the watershed. It is projected that restoration in the mine-through areas and restoration in the historical drainages, would, over time, mimic as close as practicable, the channels that are present in these reaches and would be constructed to develop pattern, dimension and profile which would be appropriate for their position in the geomorphic continuum. Also, the location of the sites were selected based on their potential for success (final reclamation configuration directs the surface runoff to these areas) as per the proposed project areas original topography and their immediacy to connectivity with the OHWM of reaches that were delineated then verified by the USACE as "waters of the US." It should be noted that channel restoration in the historic drainage locations would provide input of organic material and nutrients and provide habitat, resources that have been lost due to agrarian practices for several decades. These historic areas, once impacted, contain what can be described as swales, which don't have appropriate slope maintained for a long enough distance to have resulted in natural channel formations. Instead, many of these areas contain wet areas, which in the proposed locations, have not developed into emergent wetlands, but contain sufficient dampness that post mining, careful contouring would likely result in channels that contain flow during portions of the year. Restoration is expected to provide the watershed with resources that would have not been realized had Patriot not proposed these areas as candidates for restoration.

Mitigation areas in Scotts Run would benefit from such restoration activities through: (i) improvements in bank stability; (ii) restoration of riparian areas; (iii) enhancement the stream bed to promote a more heterogenous channel; and, (iv) creation of cover and riffles in portions of the channel. In addition to improving these channels through mitigation, these sites were identified as appropriate mitigation areas because they are located in the same direct drainage as the proposed impacts. By keeping the mitigation efforts in the same watershed and close to the proposed impacts satisfies the watershed mitigation approach by off-setting unavoidable impacts in the same watershed where the proposed impacts would occur.

5.2 Wetlands

Patriot has proposed to pay the in-lieu fee for 0.064 acre of wetland impacts. In-lieu fee payment is allowed under current mitigation rules and based on the level of impact associated with this project, is preferable. The proposed wetlands are emergent to pre-emergent in nature and are the result of land use impacts in the watershed. Because wetlands would typically not be found in the topography as described in the proposed permit area PMLU, in-lieu fee or a mitigation bank is the preferable option; however, there are not mitigation banks in this watershed.

6.0 MITIGATION WORK PLAN

The following section provides a description of the applicant's Mitigation Work Plan (MWP), which was developed based upon current site conditions. Modifications to this plan may occur during project construction. Patriot would notify the USACE in writing if any major modifications occur in the proposed project's mitigation scope.

6.1 Project Boundaries

The proposed mitigation areas are limited to the areas of temporary impacts within the project area (mining permit's boundaries identified in S-2009-09) and areas of Scotts Run located adjacent to the proposed project area. These areas are depicted on project mapping which is included in **Appendix A**.

Patriot is proposing three types of mitigation. These types are as follows:

- Restoration on-site of unnamed tributaries that would be mine-through as part of the proposed permit.
- Restoration on-site/off-site of historic drainage patterns in areas that currently contain ditches or swales.
- Restoration off-site of several hundred feet of Scotts Run located upstream most of the proposed NPDES outlets for this project as well as discharge from the sediment control structure to be used for the existing side-hill fill (Pond No. 1).

6.2 Construction Methods, Timing and Sequencing

As discussed, the MWP is based on current site conditions at the project area and the MWP, created by Patriot and its consultants may change due to unforeseen field conditions or other pertinent information. Changes, if considered major, would be reported to the USACE for concurrence or evaluation. Implementation of the restoration of streams on-site would be completed after mining and reclamation (back grading) activities are completed. Restoration activities (off-site in Scotts Run) would be initiated and completed as soon practicable (considerations for time of year, weather, and appropriate authorizations) to commencement of mining activities and the issuance of required permits. Site preparation and construction activities for these areas would be conducted during dry periods, preferably from late spring through early fall, but would be completed (unless unforeseen conditions are encountered) in any case prior to mid-November. Based on minimal impacts to the restoration reaches, the sequence of construction activities should progress downstream when possible, although it may be necessary to proceed upstream during the construction of some steeper sections of channel. Additionally, the restoration plan calls for construction beginning with the proposed stream sections located at the highest elevations in the drainage basin first and ending with the sections located at the lowest elevations in the basin. Sediment control structures should be decommissioned only after the completion of any upstream construction.

As noted, the proposed mitigation activities for the NHWSM have been sub-divided into three types to simplify the proposed MWP, with two types falling essentially on-site and the third off-site. Section 6.2.1 addresses on-site restoration. Section 6.2.1.1 addresses the restoration and enhancement of historic drainage patterns that are located within and adjacent to the permit area, which would be restored to mimic, as close as practicable, channels found in those reaches pre-disturbance (agricultural impacts). These channels would be constructed using data collected from tributaries in small adjacent watersheds (Tributary Nos. 1 and 4) and would contain stream channel in areas which likely contained stream, but currently contain only swales or ditches. Section 6.2.1.2 addresses stream restoration efforts associated with on-site mine-through areas. Section 6.2.1.3 addresses on-site mitigation measures (such as riparian plantings) that may be used at the stream locations discussed in Sections 6.2.1.1 and 6.2.1.2. Finally, Section 6.2.2 would address restoration and enhancement areas off-site in Scotts Run.

6.2.1 On-site Restoration Areas

6.2.1.1 Restoration and Enhancement of Historic Drainage Patterns Located within and Adjacent to the Permit Area

Restoration and enhancement efforts for the historic drainage patterns located within and adjacent to the permit area would be initiated after mining and regrading, during the reclamation phase. These areas are identified as Reach Nos. 4, 5, 6, and 7 on mapping found in **Appendix H**. The restoration efforts as well as channel enhancement efforts would concentrate on restoring the appropriate pattern, dimension, and profile of these reaches; taking in the final configuration of the surrounding reclaimed areas. For the restoration areas, mitigation efforts would primarily focus on reconnecting the drainage area to the proper drainage outlet (channel) which is appropriately sized based on total drainage area. The channel would be configured with the properly sized inorganic substrate, and restoration would include stabilizing stream banks, restoring the riparian zone, and enhancing the stream bed by installing in-stream and bank-placed structures which would provide cover and riffle (or step) areas.

The restoration of the channels would be initiated through excavation using equipment with a small-bucket size which would aid in the creation of proper channel dimensions. Loose, organic, native fill from the site (where and when available) would be utilized to backfill along the channel to aid in the creation of the appropriately sized channel. Such work would be performed during low flow conditions and would, as discussed, proceed in a downstream manner (to avoid sediment transport into newly restored channels) when practicable and after BMPs to reduce erosion and sedimentation have been implemented. The completed streambed would be lined with appropriately sized non-toxic, non-acid forming rock ranging from gravel to small boulders. Channel designs for these structures would mimic as close as practical the pre-mining pattern dimension and profile of the mine-through channels. The proposed restoration and enhancement of historic drainage areas within and adjacent to the New Hill West Surface Mine would account for approximately 1,232 linear feet of channel. This does not include an additional 463 linear feet of channel in the headwaters of Tributary No. 10 and 700 linear feet in the headwaters of Tributary 6 that would also be restored in an area that historically had channel which was destroyed by agricultural/residential use as well as 100 linear feet of rip-rap channel in Triburary No. 6. These restoration efforts are included in Section 6.2.2 with restoring the mine-through area on Tributary No. 6 and Tributary No. 10. Mapping and figures may be found in **Appendix H**. Restoration measures are discussed below.

Restoration and Enhancement Measures –Reach 4

Reach 4 is part of what was historically an unnamed tributary of Scotts Run. This area, while disturbed, did contain a few stream features in areas that were not highly altered. Stream measurements were obtained in those small segments and used as current condition descriptions which would provide a measureable baseline and goal for restoration activities. Reach 4 is actually outside of the project area but directly downstream/adjacent to these activities.

Current Conditions

Reach 4 began at the confluence of what historically was an unnamed tributary in the Scotts Run watershed downstream of what has been identified as Tributary No. 1. This falls below Fleming roads and is separated from Reach 5 by a 33-foot culvert. For restoration purposes, this reach extends upgradient approximately 137 linear feet to what is being identified as Station 01+37. Initially, the slope within this reach was approximately 47 percent. By Station 00+46, the slope decrease to approximately 30 percent. As the reach approaches the road (approximately Station 01+07) the slope greatly reduced to approximately 6 percent. A cross-section located at Station 00+84 had an A_{bkf} of 4.5 square feet and a D_{bkf} of 1.3 feet. The riparian is well developed on either side of the reach with a mixture of deciduous tree and shrub species.

Restoration Measures

Restoration within Reach 4 would focus on creating a stable channel including stabilizing the eroding stream banks throughout the reach (**Figure 1 – Appendix H**). This shall be accomplished with the placement of large rock material and live stakes which would be keyed into the banks along much of the channel. Live Stakes as a bank stabilization technique are discussed in Section 6.2.1.3. In addition, existing steps would be enhanced with the placement of rock material and logs. The enhancement of existing drop structures and addition of new ones would allow the channel to naturally divert the stream's energy toward the thalweg rather than the stream bank. Finally, a diverse herbaceous seed mixture should be applied to portions of the stream bank that has limited vegetative coverage.

Restoration and Enhancement Measures –Reach 5

Like Reach 4, Reach 5 is part of what was historically an unnamed tributary of Scotts Run. This area was disturbed, and was often difficult to identify - periodically appearing more like a swale than a ditch (**Photo No. 3**). While not a jurisdictional channel, some areas of the reach did contain a few stream features in areas that were not highly altered. Stream measurements were obtained in those small segments and used as current condition descriptions which would provide a measureable baseline and goal for restoration activities. Reach 5 is inside of the project area and would be restored during reclamation activities.

Current Conditions

Reach 5 was located immediately upstream of Fleming Road. Station 01+70 was located at the edge of the road (**Photo Nos. 1** and **2**) and extended upstream to Station 07+00. The initial slope of this reach was initially approximately 16 percent and decreased to approximately 10 percent. Two cross-sections were established within the reach. The first cross-section was located at Station 02+60. The station had an A_{bkf} of 0.5 square feet and a D_{bkf} of 0.2 feet. A second cross-section located at Station 04+13 had an A_{bkf} of 0.1 square feet and a D_{bkf} of 0.1 feet. Cross-sectional diagrams may be found in **Appendix I**. The particle size distribution in Reach 5 was surveyed at Stations 02+60, 04+50, and 05+83. This data may also be found in **Appendix I**.

A well-established riparian buffer was present on both sides of the reach (**Photos 4** and **5**) and no flow was present during the field survey. Reach 5 **Photo Nos. 1** through **5** may be found in **Appendix J**.

Restoration Measures

Restoration and enhancement measures for Reach 5 shall focus primarily on the establishment of the appropriate dimension, pattern, and profile for an A2 stream type. It is likely that the dominant flow regime would be a step:pool transitioning into a cascade flow regime based on the slope found within the reach and it would represent the most stable stream type given current and post mining conditions proposed for this reach. The channel would be too small for in-stream structures and would focus on the installation of grade control step pools and drop structures as appropriately necessary (**Figure 1 – Appendix H**). In addition, the riparian buffer shall be vegetated with a fast germinating seed mix as well as live woody stems.

Restoration and Enhancement Measures –Reach 6

Reach 6 begins as a highly eroded channel and then disappears as a result of previous disturbance. Like Reach 4, this area falls outside of the permit area but is highly degraded and would benefit from restoration efforts.

Current Conditions

Reach 6 began at the confluence of an unnamed tributary of an unnamed tributary of Scotts Run. Initially the reach's slope is approximately 14 percent. The A_{bkf} for the cross-section established within this reach was 1.9 square feet with a D_{bkf} of 0.7 feet. Cross-sectional diagrams may be found in **Appendix I**.

A pebble count was completed in Reach 6 at Station 0+84. The data indicated that the dominant particle size was gravel (65 percent). There was also a moderate percentage of cobble within the reach (23 percent). Sand particles comprised of 12 percent of the inorganic substrate. No bedrock, boulder, silt, or clay particles were noted in the pebble count samples. The particle size summary, graph, and bar chart may be found in **Appendix I**.

Reach 6 is affected by sparse vegetation along the reach resulting in erosion and undercutting (**Photo Nos. 1** and **2**). Furthermore, the reach has a high entrenchment ratio which further exasperates the rate of erosion during high flow events. Very little sinuosity was noted within the reach. It appears that the reach has been historically altered; however, it does not appear that the reach has been channelized. An elevated floodplain is located off both sides of the reach; however, it is disconnected and does not allow high flow from storm events to reach the floodplain. There is very little grade control in terms of steps and pools within the reach. The current flow regime is dominated by run and riffle. The reach is absent of LWD with only small twigs and branches present. The riparian buffer consists of a mix of deciduous tree and shrub species which is dominated by privet. The upper canopy provides adequate cover during the growing season. Additionally, the reach is influenced by the close proximity of a paved road (Fleming Road). A culvert is located within the reach at approximately Station 00+95 (**Photo No. 3**). Reach 6 **Photo Nos. 1** through **3** may be found in **Appendix J**.

Restoration Measures

Restoration and enhancement measures for Reach 6 would consist of the installation of drop structures to down-cut the channel through the first approximately 25 linear feet (**Figure 1 – Appendix H**). The channel would be down-cut in order to create a B-type stream which is more commonly found in this watershed at this percent grade. In addition, the RDB should be secured with a combination of vegetation and appropriately sized rock material in order to reduce the amount of erosion and sediment loading currently occurring between Stations 00+20 thru 00+40. The reach is entrenched from Stations 00+56 thru 00+75. The stream banks should be sloped back and reconnected to the existing floodplain. A fast germinating seed mix should be applied to the banks upon completion of regarding. The riparian vegetation is well-established within the reach and special care should be taken in order to reduce damage to the existing vegetation. Reach 6 photos may be found in **Appendix J**.

Restoration and Enhancement Measures –Reach 7

Current Conditions

Proposed Reach 7 would began immediately upstream of the existing culvert (approximately Station 01+20) and extends upward to Station 0620+38 (**Photo No. 1**). The slope in this reach was initially approximately 30 percent. Cross-section was not established due to the lack of a definable channel.

The particle size distribution in Reach 7 was not performed due to the lack of a definable channel.

This reach is currently characterized as a swell with no definable bed and bank. However, the natural relief of the hillsides would be supportive of a naturally occurring channel. The riparian vegetation is predominantly a mixture of monocot herbaceous species with some tree and shrub species present off the LDB. Reach 7 photos may be found in **Appendix J**.

Restoration Measures

Restoration and enhancement measures for Reach 7 would focus primarily on the establishment of the appropriate dimension, pattern, and profile for an A2a+ stream type (**Figure 1 – Appendix H**). This is the most stable stream type given the slope. The channel would be too small for in-stream structures and would focus on the installation of grade control step pools and drop structures as appropriately necessary. In addition, the riparian buffer shall be vegetated with a fast germinating seed mix as well as live woody stems.

6.2.1.2 Temporary Mine-Through Restoration on the Permit Area - On-Site

Restoration of the temporary mine-through channels located within the NHWSM would be initiated after mining and regrading activities have been completed, during the reclamation process. Site preparation for these channels would begin with the installation of temporary erosion control with such in-stream erosion controls being limited to material that would degrade and not require removal. Also, stream bank erosion controls may consist of silt fences, staked hay or straw bales, compacted earth, sand bags, or other appropriate materials. Figures with the examples schematics of these types of structures (erosion control) are provided in **Appendix K**.

As discussed, these restoration efforts would be initiated during the reclamation phase unless the area contains an on-bench pond which would remain in-place until Phase II bond release. Reclamation of the reaches that lie outside of the on-bench ponds include: the mine-through of Tributary No. 1 and Tributary No. 1-1 which would impact approximately 790 linear feet of intermittent channel: approximately 246 linear feet of ephemeral channel in Tributary No. 7-1 and Tributary No. 7-3, approximately 139 linear feet of intermittent channel in Tributary No. 8, approximately 151 linear feet (including small culverted reach) of intermittent channel in

Tributary No. 9, and 680 linear feet (includes aforementioned 463 feet) of intermittent channel in Tributary No. 10.

In addition to mitigation measures completed during reclamation activities, mine-through areas on Tributary Nos. 4, 5, 6, and areas of Tributary No. 7 would be restored after Phase II release due to the presence of on-bench sediment control in some of these reaches. While a substantial portion of Tributary No. 7 would be restored during reclamation, these impacts are included in those to be addressed after bond release. Restoration in these location include approximately 422 linear feet of Tributary No. 4; approximately 86 linear feet of Tributary No. 5; approximately 1,369 linear feet of Tributary No. 6; and 1,522 linear feet of Tributary No. 7 would be restored. These areas, like the reaches restored during the reclamation phase, would mimic, as close as practicable, pre-mining conditions and downstream reaches as they existed prior to disturbance and taking into consideration any surround land configuration changes. Diagrams of pre-mining conditions may be found in **Appendix I**. Restoration measures for these reaches are diagramed on **Figure Nos. 2** through **9** in **Appendix H**.

Restoration in these reaches would employ natural stream design techniques in an effort to achieve an appropriate stable hydro-geomorphic configuration for channel setting. Additionally, channel design would be meet the conditions as outlined in Patriot's SMA and may be found in **Appendix L**.

As noted, timing of the proposed mitigation measures is related to construction sequences and bond release. After removal the site would be stabilized by mulching and seeding as soon as regrading has been completed. Restoration of the areas of on-bench ponds are not expected to occur until two years after the last augmented seeding and after Phase 2 bond release is obtained; likely no less than two years before final bond release. As noted, existing condition cross-sections for temporarily are provided in **Appendix I**.

For restored channels, a minimum width of 25 feet of riparian zone would be established on both sides, where practicable. Tree, shrub, and herbaceous plant material would be planted later when environmental conditions are conducive to their survival. These areas may already have been seeded with an initial application of fast germinating, non-invasive seeds species during the reclamation process. If necessary, planting would be completed along the stream banks and newly created riparian zone as quickly as possible. The planting of woody and herbaceous material should follow upon the successful establishment of the seeded plant material. Planting initiatives would focus on the successful establishment of woody plant material.

6.2.1.3 Riparian Plantings

The purpose of this section of the CMP is to describe the plantings for the riparian zones proposed for the mine-through and portions of the historic drainage pattern areas. The information contained in this section, including the information regarding riparian plantings as developed and recommended by the horticulturist at POTESTA. In general, the riparian plantings in each mitigation area are very similar with a few changes in seed mixtures.

Below is a Vegetative Plan (VP) for site preparation, planting, and maintenance. In ideal situations, implementation of the VP section would be initiated with soil augmentation followed by planting; however, in areas in need of immediate erosion control, it would be more practical to initially seed the area with a fast germinating seed mixture in order to reduce the rate of erosion. Application of this seed mixture would be done via hydro-seeding. Composition of the seed mixture would vary depending upon whether or not trees are established in the riparian zone and suggested hydro-seed blend is provided in **Table 6-a.** This seed formulation contains perennial seeds, as well as fast germinating temporary species in order to minimize or reduce the chance of erosion on the stream bank. Also, small plant material should be hand planted in areas that need better vegetation cover and such plantings should take place during conditions which are favorable for the plant's survival; generally in early to late spring and mid to late fall for this region. However, the ground should not be too saturated, in order for the plants to have sufficient air flow in the root zone. Native and ornamental species should be utilized for the cover of the riparian zone along the restored stream. The use of exotic species would not occur in this restoration. This would reduce the level of competition the plants must endure in order to survive.

TABLE 6-a
Suggested Hydro-seed Mixture

Seed Mixture	Rate Flat Areas[a]	Rate Sloped Area[a]	Seeding Time[b]
Orchard Grass	5	12	
Birdsfoot Trefoil[c]	10	10	
Red Clover	10	10	
Bicolor Lespedza	2	5	
Annual Rye Grass	5	5	Before May 15th
Buckwheat	25	25	After May 15th
Foxtail Millet	10	10	
Winter Wheat	40	40	Nov. 15th-Feb. 1st
Mixed Locust	2	3	
Winter Rye	5	5	
Spring Oats	6	6	

Mixed locust would only be seeded in "sloped" areas.
[a]*Seeding rate is for Pure Live Seed (PLS) in pounds per acre.*
[b]*Fall and winter seeding mixtures should vary as shown.*
[c]*Herbaceous legumes must be treated with appropriate bacterium before seeding.*

Lime requirements – Soils found in the adjacent permit are classified as moderately well drained and moderately to highly fertile throughout, according to the Natural Resources Conservation Service (NRCS) soil survey. The NRCS further states that the soils found at there sites are slightly to strongly acidic. Most plants grow in soil with a pH of 5.5 S.U. or greater with very few surviving below a pH of 4.5 S.U. When the pH is below 5.5 S.U., elements such as aluminum, iron, manganese, copper, nickel, and zinc which are generally present in mine soils may become soluble and more toxic to plant life. For example, an increase in solubility of aluminum would result in the reduction of root development, while an increase in solubility of manganese would reduce shoot development. If these sites are found to have a low pH (~4.5 S.U.), hydrated lime would be applied to the areas of concern. Hydrated lime is a dry powder that is obtained from heated calcium oxide treated with water. This treatment with water converts oxides to soluble hydroxides, thus resulting in a product that can produce immediate alkaline soil conditions. Adding lime to the soil may still be necessary if the pH levels are within the acceptable range, due to the potential acidity which may be associated with the oxidation of pyretic material which is often associated with mining soils. By amending the soil with lime, the exchangeable aluminum within the soil would be inactivated reducing the amount taken up by the plants. The ability of a liming material to neutralize acid is evaluated by comparing it with the neutralizing ability of pure calcium carbonate. The level of calcium carbonate equivalent (CCE) may vary from various limestone quarries. As a result of this variation, it is important to note the neutralizing value of the limestone utilized. Additional limestone may be necessary if the CCE has a neutralizing value less than 100. For example, if a liming recommendation calls for 2,000 pounds per acre of CCE and lime has a neutralizing value of 80 percent, then (2,000/ 80) x 100 = 2,500 pounds, is the actual amount of agricultural lime required. A recommended rate of 1 to 2 tons per acre of hydrated lime is suggested for these sites, where applicable. Where necessary, hydrated lime should be applied to the riparian zone approximately 7 to 10 days before actually applying the seed mixture. This time frame allows the hydrated lime to filter into the subsurface, raising the pH level. Once applied, the hydrated lime should be tracked into the soil by mechanical means. It should be noted that hydrated lime may cause the root zone to burn on plants that are present. Therefore, caution should be taken when applying the lime and should only be applied in areas that require a pH adjustment.

After the hydrated lime has had time to filter into the soil, agricultural lime can then be applied. In the event that precipitation has not fallen during the week, these sites may need to be irrigated in order to activate the hydrated lime. This application can be incorporated into the hydroseed mixture. Agricultural lime is composed of calcium carbonate, which does not instantly change the pH of the soil like hydrated lime. However, agricultural lime is an effective method of raising the pH over a longer period of time. The residual effect of agricultural lime is greater than hydrated lime. A recommended rate of 1 to 2 tons per acre of agricultural lime should be utilized for all areas that require a minor pH adjustment.

Liming Materials – Agricultural lime (ground limestone) is generally the widely used form of lime used on surface mine reclamation projects. It is important that the particle size of the limestone be ground to the standards recommended by the U.S. Department of Agriculture or the

State of West Virginia. The calcium carbonate equivalent standards in the State of West Virginia are as follows:

- Burnt Lime: Not less than 140 percent
- Hydrated Lime: Not less than 110 percent
- Marl: Not less than 80 percent
- Limestone: Not less than 80 percent
- Slag: Not less than 80 percent
- Shells: Not less than 80 percent

The minimum sieve size standards for agricultural liming materials in the State of West Virginia are:

- Pulverized
  - 100 percent passing a US standard 20 mesh sieve
  - 70 percent passing a US standard 100 mesh sieve

- Ground
  - 90 percent passing a US standard 20 mesh sieve
  - 50 percent passing a US standard 60 mesh sieve
  - 35 percent passing a US standard 100 mesh sieve

- Coarse Ground
  - 90 percent passing a US standard 10 mesh sieve
  - 40 percent passing a US standard 60 mesh sieve

It should be noted that finely ground limestone would degrade at a faster rate then coarse ground limestone. It may be necessary to add a mixture of fine and coarse ground lime in order to benefit from the quickly reacting fine material and the residual effect of the coarse material. When the sulfides are high, the rate of application may need to be doubled to quickly react with the active acidity.

Another source to neutralize acidic soils is hydrated lime. Hydrated lime is more expensive than agricultural lime and is generally more difficult to apply to with conventional equipment. However, hydrated lime is highly effective in areas that are difficult to reach by conventional means. The level of CCE is also greater in hydrated lime than found in agricultural lime. Typically the neutralizing value of hydrated lime is 135 percent. In addition, hydrated lime reacts immediately with the soil once applied and down not have a lasting effect as does coarsely ground agricultural lime.

Another less effective form of liming materials is calcium silicate slag. This material may be utilized but is not recommended.

Suggested liming rates are as follows:

pH (Soil-water suspension)	Rate of CCE (tons/acre)
6.1 and higher	None
6.0 to 5.5	1 to 2
5.4 to 4.6	3 to 4
4.5 to 4.0	5 to 6

Application of Lime - Agricultural lime can be spread with conventional lime-spreading trucks on areas that are accessible to vehicles or by blower devices that are mounted to trucks. Hydrated lime can be applied on relatively smooth and level land with a pull-type, gravity flow spreader, and on steep slopes with a hydroseeder.

Lime should be applied before seeding or planting is initiated. Once the lime is applied, it should be tilled in with tractor discs or plows to a depth of approximately 6 inches. Care should be taken when tilling on slopes. The furrows could form into rills or gullies and result in accelerated erosion. However, it is necessary to incorporate the lime into the ground at the recommended depth; otherwise the lime would wash away and be ineffective in amending the soil.

Lime may be applied to the soil at any time of the year. It is recommended that the lime be applied to the soil approximately 2 to 4 weeks before initiating seeding or planting. However, newly mined areas should be seeded as soon as possible after the grading is completed. Additional lime (up to 50 percent) should be added to soils that would be planted before a two-week period to offset the limited reaction time. In addition, soils that are high acidic should have additional lime incorporated into the soil. Large quantities of agricultural lime properly incorporated usually would not inhibit establishment of seeded vegetation.

Fertilization – Patriot mining intends to stockpile topsoil in designated areas. While the NRCS considers soils in this region moderately to highly fertile, the proposed project area has been disturbed and it is likely that the soils in the uplands areas may only be moderately fertile in nature. Fertilizer may be incorporated into the hydroseed mix to aid in the germination and seed establishment process. The formulation of the fertilizer to be utilized should be 10-20-10 and should be applied at a rate of 600 pounds per acre.

Trees and shrubs should receive fertilization at the time of planting, unless they have been pre-fertilized at the nursery. Osmocote (or similar, pre-approved, slow release fertilizer) should be inserted within all tree and shrub planting pits at the rate indicated in **Table 6-b**.

TABLE 6-b
Osmocote Application Rates

Size of Plant	Measure
1 cutting bundle	1 Tablespoon
1 gallon	1 Tablespoon
5 gallon	1 Tablespoon
2" caliper tree	2 Tablespoons
4" caliper tree	4 Tablespoons

Seeding – As noted, seed mixes were formulated to address the site-specific requirements (**Appendix M**). Given the existing condition of these drainages, a combination of native and naturalized grasses and forbs were incorporated. The species within the seed mixes also span a wide range of soil moisture and sunlight conditions. Cool and warm season grasses should be incorporated to promote grass germination in early spring and summer. Three distinct seed mixes were formulated:

1. Standard Stream Bank Seed Mix
2. Disturbed Stream Bank Seed Mix
3. Floodplain Seed Mix

These seed mixes are subject to revision and species replacement based upon specific seed availability at the time of implementation. Seeding may not be applicable to the entire site, due to the existence of well established ground cover in the form of grasses and forbs.

The stream bank seed mixes should be utilized along stream banks, requiring a reseeding application, from the toe of the bank to the top of the bank, with an overlap into the overbank levee. The “Standard Stream Bank Seed Mix” utilizes native and naturalized species and should be utilized on stream banks that are reasonably stable and/or not subject to scour and erosion (e.g., banks that are stabilized by existing vegetation and roots).

The “Disturbed Stream Bank Seed Mix” incorporates introduced (non-native/non-invasive) species along with native and naturalized species. This seed mix incorporates some aggressive naturalized and non-native/non-invasive species to aid in successful establishment and immediate stabilization. This mix should be utilized on stream banks that are unstable, subject to erosion, and/or subject to high scour velocities (e.g., banks that have been destabilized by heavy operating equipment, banks on eroded concave bends).

The “Floodplain Seed Mix” should be utilized from the top of the bank to the inland/upslope extent of the disturbed floodplain. This mix incorporates native and naturalized species of predominantly cool season grasses to aid in germination under the cooler temperatures of the riparian canopy.

Hydroseeding should be utilized to apply all seed material for riparian zone establishment along the channels, where practicable. The process of hydroseeding should be a two-phase process. The first phase, as previously mentioned, should be to apply hydrated lime to the riparian zone along the new channels. This would immediately adjust the pH to levels that are conducive for successful seed germination. The second phase should be the application of a seed, fiber or paper mulch, non-asphalt tackifier, agricultural lime, and fertilizer hydroseed blend. The individual rates of application per acre are listed below:

- Floodplain seed - 126 lbs
- Standard stream bank seed - 115 lbs
- Disturbed stream bank seed - 131 lbs
- Mulch – 1,000 lbs
- Fertilizer - 300 lbs
- Agricultural lime – 1 to 2 tons
- Hydrated lime – 1 to 2 tons

Areas that are not accessible to the hydroseeding truck would be seeded by alternative means (i.e., by hand held broadcasters). The same seeding rates and formulations would apply for these applications.

<u>Vegetation of Regraded Streams</u> **–** The regraded streambanks would be vegetated with, but are not limited to, the following design:

- Bottom seed mixture: 5 lbs. Red Top/ acre
5 lbs. Creeping Bentgrass/acre
5 lbs. Riverbank Wild Rye/acre
5 lbs. Fowl Bluegrass/acre
5 lbs. Alkaligrass/acre
- Slope tree: Black Willow, Button Bush, and Silky Dogwood
5' center - equally mixed
- Top of channel: Lined with Shellbark Hickory at 5' intervals

<u>Soil Stabilizers</u> - Soil stabilizers are organic and inorganic chemical products that are applied in water solutions to the soil surface to temporarily stabilize the soil against wind and water erosion, and to retard evaporation of soil moisture. These stabilizers are generally composed of polymers and gums that form a thin layer of protection on the soil surface. They do not deeply penetrate the soil and therefore may need to be used in conjunction with mulches such as straw, hay, or wood fibers and wood cellulose mulches. Because of the expense, soil stabilizers are generally limited to use in combination with hydroseed mulches which help hold the mulch in place.

Seed Quality – It is important to utilize good-quality seed. The seed quality is clearly identified on the seed tag. Two values that describe the seed quality are pure seed and germination percentage, which are used to determine the pure live seed (PLS). This is used to calculate the true cost of the seed formulation. PLS is the percentage of pure crop seed multiplied by the germination percentage that is located on the seed tag. This gives the true rate of seed that is contained within the seed formulation. In addition, the seed tag would clearly state the percentage of noxious weeds which is important in order to reduce the potential for introduction of invasive species in the Complex area. Finally, the date in which the seed was tested should be noted. It is important the date be recent in order to assure that the information of the tags is accurate to the current condition and the seeds are new and viable.

There are simple tests that can be conducted in order to assure that the seed lot that has been received is viable and ready to plant:

- Documentation sheet by lot completed and signed by seller.
- Appearance: clean, insect free, undamaged, proper color, moist or dry, etc. Acorns may often have 1 insect hole and up to ¼ of the acorn consumed by insects and still be viable.
- Condition: crack or cut at least 10 nuts to determine freshness, color, moisture, viability, etc.

Inoculation of Legume Seed – Seed of herbaceous legumes should be inoculated with the appropriate strain of rhizobia. Inoculants are generally available for most species. In some instances, the inoculum must be prepared by the manufacturer. Inoculum requirements should be readily available from wholesale seed suppliers. Pre-inoculated legume seed may be available from wholesale seed suppliers. If pre-inoculated seeds are unavailable, inoculation may be completed by the vegetation contractor. Inoculating seeds may be done as follows:

- For dry seeding, the inoculants can be mixed with lightly moistened seed just before sowing. The inoculants should be generously applied using even more than that recommended by the manufacturer. Moistening seed with a “sticker” such as sugar mixed with water, molasses, or synthetic gums helps bind the inoculums to the seed and extends longevity of the rhizobia.

- When seeding with a hydroseeder, the inoculants are added to the slurry just before it is spread. When mixed with a slurry that includes fertilizer, the inoculating bacteria may be killed by high acidity (low pH) caused by the fertilizer. To reduce loss of the bacteria the slurry pH should be kept above 5.0 and spread as soon as possible after mixing. Where slurry pH is below 5.0, hydrated lime can be added at 100 pounds for each 1,000 gallons of water to lessen the effect of the acidity. For hydroseeding, inoculants should be added at double the amount recommended for dry seeding.

It is important to use viable inoculants. Generally commercial inoculants are stamped with an expiration date. If the inoculant has expired, it should not be used. Inoculants should be stored in cool dry locations. Heat would compromise the integrity of the inoculants. Finally, inoculants are species specific. It is important to utilize an inoculant for the legume species in which it is intended.

Selection of Plant Material - Plant material should be supplied by a native plant nursery in the size, form, species, and variety specified, but is subject to availability from plant and seed suppliers. The plants should be in healthy condition with normal, well-developed branch and root systems, and conform to the requirements of the current “American Standard for Nursery Stock.” At the time of delivery, plants should be sound, healthy, vigorous, and free from disease. Plants should be hardened, the process that a plant undergoes while preparing for cold temperature, (as applicable) for a minimum of two weeks at the local nursery and/or on-site prior to planting. Patriot reserves the right to make substitutions of certain plant types (i.e., other than those specified) during the construction of the proposed restoration projects.

Herbaceous cover should be planted initially and/or in conjunction with woody vegetation; however, herbaceous cover may impede the establishment of woody vegetation. Therefore, it is necessary to select herbaceous material that is compatible with woody species, such as legumes. Grasses generally compete with woody vegetation and tend to grow in dense clumps that choke out the tree saplings. Low-growing legume species and varieties are preferred.

Salvaging and Transplanting Native Plants - The salvaging and transplanting of on-site native plant species is an alternative to ordering plant material. Plants that are located on-site are better adapted to the local climate and soil conditions. In addition, the costs involved in transplanting the plant material are relatively inexpensive compared to ordering vegetation. There can be a high mortality rate if the plants are not collected properly and planted in a timely manner. Plant material should be collected within a ± 250-foot interval of the mitigation area in order to aid in successful adaptation.

Salvaging existing plant material in the work area begins with the selection of small healthy plants which are isolated from other plant species. An area around the plant should be cleared and limbs extending over 4 feet on shrubs and 6 feet on trees should be pruned back in order to easily handle the plant. Begin digging around the plant, approximately 8 inches out from the trunk of species between 3 to 4 feet in height and 1 foot from the trunk for plants greater than 4 feet high. The root ball of the plant should be placed in a moist burlap sack, preferably lined with wet leaves or mulch. The plant should be placed in a holding area until it can be planted in the new location. It is important that the plant is not exposed to direct exposure to the sun and wind.

When transplanting the plant material, over dig the hole that the plant would fill approximately twice as big as the rootball. Once the rootball is in the hole, the roots should be spread out within the hole so that there are no roots kinked or circling. When backfilling the hole, water should be added to the hole when the plant is half planted in order to assure there are no voids in the dirt. Once the plant is fully planted, be sure to lightly tamp the soil around the base of the plant making sure not to over compact the soil. In order to help the plant conserve energy, approximately half of the shoots should be pruned back. The final step in transplanting is to thoroughly water-in the plant.

A final method of salvaging native plant material located on-site is plant cuttings and seed collection. Some guidelines to follow are as follows:

- Collect 30 to 50 parent plants in good condition.
- Never collect more that 50 percent in given area.
- Collect an equal number of seeds or cuttings from each plant.
- Use ± 250-foot intervals for collection of seeds or cuttings.
- Use young shoots for cuttings (1 to 2 years old).
- Protect cuttings from wind by covering with plastic.
- Cuttings should be planted within two hours of collecting.
- Seeds collected should be ripe, or mature.

Planting Conditions – Planting should not be done in soil that is frozen, excessively moist, or otherwise in a condition deemed not satisfactory for planting in accordance with accepted horticultural practice.

Grading – Grading should not occur when soils are wet or muddy or if the soils are fine particles (i.e., sand and silt). In addition, final grading should not be to a fine or smooth finish. This would reduce the chance of soil compaction. The final grade should include coarse material which would further reduce the chance of soil compaction and allow air gaps that would promote root development for new seeded and transplanted vegetation.

When trucks are delivering the final layer of material, the rooting medium should be placed in tightly packed piles that abut one another across the entire area. Once the material is in place, a bulldozer can be used to grade the tops off the piles and gently level the area with one or two passes. Traffic should be limited once the final grade is complete.

Observations – It is not anticipated that planting would be done in areas where the depth of soil over underground obstructions or rock is insufficient to accommodate the roots, or where pockets in rock or impervious soil would require drainage. If such conditions are encountered in the excavation of planting areas, and if the stone, boulders, or other obstructions cannot be broken and removed by hand methods in the course of digging plant pits, other locations for the planting may be designated.

Preparation of Planting Pits – Planting pits should be circular in outline with roughened, vertical sloped sides. Planting pits should be dug so that the top of the root ball is level with the final grade.

Woody Cuttings – Woody cuttings must meet minimum dimensions of 0.25-inch diameter and 4-foot length.

Binding Removal – Approximately 1/3 of the pit should be backfilled to stabilize a balled and burlapped tree or shrub. Approximately 1/3 to 1/2 of the top of the pit should be backfilled. Approximately 1/3 of the top portion of the burlap should be removed while the remainder should be ripped or scored. Other containers should be removed prior to inserting plant material into the planting pit.

Tree and Shrub Planting – Unless otherwise specified, trees and shrubs should be laid out and planted in groupings of the same species, maintaining the on-center, diagonal spacing designated in the plant schedules and planting details.

Roots on root bound plants should be scored or ripped 1/4- to 1/2-inch deep on the edges of the burlap sack wrapped around the root zone. The tree or shrub should be inserted into the center of the pit and set so that the top of root ball is approximately level to the final grade (i.e., at the same depth at which it was grown). If the pit is too deep, native soil or clean backfill may be utilized to compensate for the proper elevation. The soil shall be carefully worked around and over the plant roots and thoroughly and properly settled by firming, hand tamping, and "watering in."

Woody Cutting (Live Stakes) or Bundle Planting – Patriot's contractor should use augers, stingers, hand held dibble bars, or a similar method to prepare planting pits for the placement of cuttings or bundles. Cuttings should be inserted in the ground with the bud scars or tip pointing upward and to a sufficient depth such that the butt end of the cutting penetrates the design water elevation. Following planting, the earth around the cuttings or bundles should be tamped to insure proper soil contact. Cuttings or bundles shall be held to the watering and care instructions as specified herein.

Herbaceous Planting – Unless otherwise specified, herbaceous plant material should be laid out and planted in groupings of the same species, maintaining the on-center, diagonal spacing designated in the plant schedules and planting details. To help replicate naturalized stands of herbaceous vegetation and to aid in project monitoring, plant groupings should be equivalent to the number of plants per nursery flat as follows:

Size of Plant	Plants in Grouping
2.5-inch pot	17 or 34
10-cubic-inch cone	32, 49 or 98

Herbaceous plants shall be set approximately level to the final grade (i.e., at the same depth at which they were grown) utilizing sand or clean backfill to compensate for the proper elevation. Backfill for planting should be native soil, if available. The soil shall be carefully worked around and over the plant roots and thoroughly and properly settled by firming, tamping, and "watering-in."

The planting density specifications are as follows:

Plant Types/Heights (ft):	On-Center Spacing (ft)
Shrubs ≤ 10	3
Shrubs and trees 10 ≤ 25	20
Trees ≥ 25	40

Gross quantification of plant material needed would be calculated assuming a general "on-center" plant spacing of 40 feet for trees, 20 feet for shrubs, and 3 feet for herbaceous plants. A generic schematic of this type of plant spacing is provided in **Appendix N**. This quantification does not take into account the size/form of available plant material nor does it include the additional material required for stream bank stabilization. It is being utilized for planning level quantification and is subject to adjustment. A healthy reforested area allows for liberal airflow, which would decrease the chance for disease to develop and spread between stands of trees. This principle should be applied in the planting design. This vegetative design should be implemented in areas that the riparian vegetation is lacking. Reseeding of the riparian zone should only be done if deemed necessary. A general vegetation list has been formulated to initiate selection of plant material, as well as wholesale prices (**Appendix N**).

<u>Seeding</u> – Where practical, seeds may be substituted for herbaceous plant plugs. Seeds should be applied at a rate of approximately ¼ lb. per planting mass. The ground surface should be graded in the most practicable manner. The seeds should be broadcasted by hand in an area of approximately 40 square feet. The soil shall be carefully firmed, tamped, and "watered-in." Seed mixtures are discussed earlier in this section.

<u>Deer Control</u> – Where practical, tubing or netting may be required in order to limit damage to the newly planted seedlings caused by deer. Tubes may be placed around the trunk of the trees in order to prevent damage from bucks scraping the velvet from their antlers. The tubes may also provide added support to the newly planted trees. Netting may be placed over the saplings in order to prevent deer from grazing on the new tender growth located on the growing terminals of the tree. This netting typically degrades within 3 to 5 years due to sunlight. If deer continue to remain a threat to the livelihood of the newly planted vegetation, fencing, where practical, may be required to be placed around the plant material. Fencing, if used, must be at least 8 feet high and should be made of woven wire.

<u>Watering</u> – Thorough watering or puddling shall accompany backfilling/planting. Directly after backfilling/planting, it is recommended that Patriot's contractor provide initial watering of each plant at a rate of 15 gallons per square yard of plant basin.

Mulch – Mulches are utilized to retain moisture particularly newly planted seeds and seedlings, reduce run-off in recently plated areas, and provide a layer of insulation reducing the effects of temperature extremes. Mulches come in a variety of forms including agricultural and wood residues, mats, and netting made from wood fibers and other assorted organic and synthetic materials. Mulches may be utilized in areas of well-established vegetation; however, it is particularly beneficial in areas that have been recently vegetated.

The most commonly utilized mulches within the region are agricultural and wood residues. Agricultural residues include straw which is generally from cereal grains such as wheat and oat, and hay which is primarily from grasses. Hay is generally preferred because it contains various native grass, weed, and legume seeds which are able to establish in the newly vegetated area. Special care must be taken when selecting a supplier of hay due to the possible composition of seed material that may be contained within the hay. Although straw does not contain the level of seed material as hay, it is sometimes preferred because it does not decay as rapidly as hay.

Rates of application for straw and hay mulches should be 1-1/2 to 2 tons per acre. In order to improve the resistance to wind and water movement, the hay and straw should be tacked down with non-asphalt emulsion or other tacks. The mulch may also be pressed into the soil with tractor discs.

Wood residues common to the region include hardwood chips, bark, processed wood fibers, reprocessed waste paper, and sawdust. Processed wood fibers and waste paper are generally preferred due to its relative abundance and while providing a relatively inexpensive ground cover. This mulch is typically sold in bales, which is easily handled and stored. Hardwood mulch is plentiful within the region which makes it a commonly used mulch material. Hardwood mulch interlocks with itself and weighs more than agricultural residues, such as straw and hay making it a commonly used mulch material. Hardwood mulch's natural weight allows the mulch to remain in place with little if any need to secure the mulch in place. Sawdust is the least desired wood residue due to the relatively light weight. The lack of bulk associated with sawdust often leads to the material becoming entrained with run-off during storm events.

The recommended application rate for bark and wood chips is 45 to 60 cubic yards per acre (at a depth of 3/8 to ½ inch). If the soil is highly acidic, a rate of 60 to 100 cubic yards per acre (at a depth of ½ to ¾ inch) is recommended. In areas where there is a greater concern for moisture conservation (i.e., southwestern slopes) the recommended rate is greater than 100 cubic yards per acre. Caution should be taken when applying higher rates, particularly in recently seeded areas. Depths greater than ¾ inch may inhibit the germination of some vegetative species. However, depths of 3 to 4 inches (400 to 500 cubic yards per acre) are recommended in areas where the goal is to suppress herbaceous germination and only establish woody stem species.

The recommended rate of application for wood fiber "hydromulches" is approximately 1,500 pounds per acre. However, higher rates may be necessary in areas that require more erosion control. In general, the wood fiber is mixed into a slurry compound that may also contain fertilizer and seeds. However, the seed may become suspended in the mulch and fertilizer compound and not have the ability to reach the ground and may be exposed to extreme temperatures and the potential of drying. It is recommended that the seed and fertilizer be applied first, followed by the mulch in order to reduce the mortality rate of the seeds.

Mulching materials such as mats and netting which are made form wood fibers and other organic and synthetic materials are generally expensive in comparison to agricultural and wood residues. However, in areas that are highly visible to the public, these alternative materials may be implemented due to the need for erosion control that is both effective and aesthetically pleasing. These mulches should be implemented under controlled of engineered standards.

Tree Staking – Trees less than 2 inches in caliper should be tied to two vertical post stakes by means of strong wire. The wire should run through rubber hosepipe, or other material to prevent the wire from gouging the surface of the tree's trunk, where the wire comes in contact with the tree. The posts should be driven to a minimum depth of 2 feet, at a 45-degree angle, into the ground with one stake on the side of the prevailing wind and the other on the opposite side. Trees greater than 2 inches in caliper should be staked to 3 wooden, 3-foot long stakes equally spaced and driven flush into the ground. Posts or stakes should be inserted 1 foot outside of root area into the surrounding soil. It is POTESTA's recommendation that the stakes be removed after 1 year in order to promote the overall strength of the tree.

Noxious Weeds - According to West Virginia regulations (61 CSR 9.61) the following noxious weed seeds are prohibited:

1. Wild Onion (*Allium vineale*)
2. Hawk Weed (*Hieracum spp*.)
3. Buckhorn (*Plantago lanceolata*)
4. English charlock or wild mustard (*Brassica arvensis*)
5. Corn cockle (*Agrostemma gilthago*)
6. Oxeye daisy (*Chrysanthemum leucanthemum*)
7. Indian mustard (*Brassica juncea*)
8. Star Thistle (*Centurea solstitialis*)
9. Wild Carrot (*Daucus carota*)
10. Horse Nettle (*Solanum catolinas*)
11. Field Pepper Grass (*Lepidium compedtre*)
12. Wild Morning Glory (*Lpomea purpurea*)
13. Bindweed (*Convolvulus arvensis*)
14. Dodder (*Cruscuta spp*.)

Restricted noxious weeds include:

1. Bentgrass (*Argostis spp.*)
2. Bermuda Grass, Giant Bermuda Grass (*Cynodon dactylon*)
3. Annual Bluegreass (*Poa annua*)
4. Rough Bluegrass (*Poa trivialis*)

5. Meadow Fescue (*Fesuca pratensis*)
6. Tall Fescue (*Festuca arundinacea*)
7. Orchard Grass (*Dactylis glomerata*)
8. Redtop (*Agrostis gigantean*)
9. Timothy (*Phleum pretense*)
10. Velvet Grass (*Holcus lanatus*)

If noxious weeds are encountered, the following methods provide ways to remove the weeds and would be used:

1. Mechanical
2. Chemical
3. Manual
4. Biological
5. Prescribed Fires

<u>Mechanical</u> - Generally utilizes tractors and other machinery that is equipped with blades or tilling discs. The soil is scalped, contoured, or scarified in order to remove existing vegetation. This method is relatively inexpensive and would generally remove the entire plant including the root structure. In addition to removing the existing vegetation, mechanical methods would till the soil and provide a good seed bed for desirable plant species that may be planted at a later time. This method is non-selective and may result in the removal of desirable vegetation.

Heavy equipment which is generally associated with mechanical removal of vegetation may result in compaction of soil. As a result, this process must be implemented during relatively dry conditions. Additionally, the machines may promote erosion and create depressions in which may collect water. In order to reduce the potential for compaction, rubber-tired and treaded tractors should not be utilized where there is a risk for compaction or erosion. In addition, these machines should not be used on slopes in excess of 35 percent, for safety purposes.

<u>Chemical</u> – Herbicides are the primary means of eradicating unwanted vegetation chemically. Herbicides may be found in granular form; however, liquid form is the most common state. Herbicides utilized in the project area must be registered by the USEPA. Herbicides contain an active ingredient which kills the plant. Inert ingredients which are found in the herbicide formulation are utilized for their ability to reduce drift or increase the solubility or stickiness. Herbicides may be applied by aerial application (i.e., helicopter or fixed wing aircraft), mechanical equipment (i.e., truck-mounted broom sprayers), backpack equipment (i.e., pressurized containers with an agitation device), or hand application (i.e., injection or application of granular formulations).

The use of herbicides is beneficial (if necessary) due to the wide range of vegetation in which it can control. Additionally, some formulations are species specific. By and large, herbicides are contact or systemic in nature. They tend to affect only the vegetation in which they are applied and do not have an effect on the soil. **Special care must be taken in order to reduce the potential of drift or water contamination when applying herbicides.**

Herbicides are either pre-emergent, applied before weed seeds germinate, or post emergent, applied after weed-seed germination. Pre-emergent herbicides are soil-applied and control weeds by inhibiting seed germination and seedling development. Post emergent herbicides are generally applied to the foliage of established weeds. Some herbicides persist in the soil and control all stages of plant growth. These chemicals may be nonselective and should not be used near trees or shrubs.

The choice of herbicide depends on four major factors: 1) the kind of tree or shrub to be treated, 2) the kind of weeds to be controlled, 3) application methods, and 4) the site. Select an herbicide compatible with the kinds of trees or shrubs in the planting area. An herbicide recommended for one kind of plant may not be safe for another.

The choice between pre-emergent and post emergent herbicides depends on the presence or absence of vegetation. Often pre-emergent and post emergent herbicides are mixed to control both existing vegetation and new germination seeds. Most herbicides used in tree and shrub plantings are effective against a particular group of weed species. Select an herbicide that would control the primary kinds of weeds present. When selecting an herbicide, consider the various formulations available and your ability to make the application.

Precautions:

1. Follow instructions for precautions and application rates.
2. Do not spray the foliage of desirable trees with post emergence herbicides.
3. Herbicide drift is a serious problem. Spray herbicides with low pressure (25 to 330 pounds per square inch maximum) on calm days only. Use special care when applying 2,4-D or other phenoxy-type chemicals. Use the amine salt formulations when possible. If the ester formulation must be used, be sure it is the low-volatile form and that the air temperature would stay below 85 degrees Fahrenheit (°F) for several hours.
4. Allow herbicide treatments to dry for at least three hours at an air temperature above 60°F.
5. Application equipment should be in proper working condition, calibrated, and free of contamination. Clean equipment immediately after use.
6. Wetable powder formulations require constant agitation for uniform application.
7. When mixing two different chemicals, be sure to determine their compatibility by checking the labels or consulting you local extension office.

8. Most pre-emergent herbicides require sufficient moisture for activation. Failure to water or incorporate according to label instructions would usually result in reduced weed control.

9. Use lower rates of herbicide on coarse, sandy soil.

It is necessary to calibrate the application equipment. If too much herbicide is applied, then there is the potential for death of unintended plant species and added expense in herbicide material. If too little herbicide is applied, then the weed control would be ineffective. Nozzles and gaskets should be checked every time before application in order to reduce potential leaks and injury. Measures for preventing effects on human health are provided in **Appendix O**.

<u>Manual</u> – This method generally involves axes, hoes, chain saws, brush cutters and pruners. While this is the preferred method, timing is absolutely critical when using this method. The vegetation must be cut back or removed before the plant goes to seed. A single plant has the ability to produce thousands of seeds. If the plant is not removed in time, then the seeds would have the opportunity to spread and proliferate. This method is likely the most expensive of the five due to the labor intensive effort that is involved.

<u>Biological</u> - This method includes grazing, competition with use of desirable vegetation, insects, and pathogens that control or eliminate noxious or unwanted vegetation. The most widely method of biological control is the planting of desired vegetative species to compete with the noxious weeds. Often biological control would incorporate other methods such as chemical or mechanical control. These methods would be incorporated before planting the desired species in order to achieve a high level of success in eliminating the noxious weeds.

When targeting a specific noxious plant, it is necessary to have enough specimens to support the introduced insect, pathogen, or livestock. This method is target specific and therefore reduces to potential for harm to desired vegetation. This method can be very cost effective. However, it is a very complex interaction between living organisms and the results may be slow and require intense monitoring. **This method is not recommended by POTESTA.**

<u>Prescribed Fire</u> - The most common prescribed burning techniques are broadcast burning, pile burning, and underburning. Broadcast burning involves burning material that is scattered over an open area. The material is ignited with handheld drip torches. Generally the material is already cut and a fire perimeter is maintained. Pile burning is carried out once an area has been cleared with vegetation place in a pile. Piling the vegetation is done with tread or rubber-tired tractors or dozers. Again, the piles are typically ignited with handheld dip torches. Finally underburning is a technique in which the ground cover and woody debris is ignited. This promotes natural regeneration beneath the forest canopy. This must be conducted when air temperatures are relatively cool and there is sufficient wind to dissipate convective heat that would otherwise damage the forest canopy.

6.2.1.4 In-stream Structures

Due to channel size in the on-site restoration areas, the in-stream structures would be limited to gradient control features such as steps. These structures are low-elevation structures that span the entire channel width and create an immediate drop in channel bed and water surface elevation. These structures are often used to stabilize channel grades, improve fish passage, and to reduce erosion. Steps may do the following: redistribute or dissipate energy; stabilize the channel bed; restore a step:pool morphology; limit channel incision; limit bank erosion by directing flow away from an eroding bank; modify the channel bed profile and form by promoting collection, sorting and deposition of sediment; create structural and hydraulic diversity in uniform channels; scour the channel bed, creating holding pools for aquatic life; and raise the bed on an incised stream. In these channel reaches, structures would primarily be used to create step:pool morphology and to control slope. These structures would only be utilized in channel reaches where channel slope made them practicable.

Steps can alter the velocity, flow hydraulics, and sediment transport characteristics upstream and immediately downstream of the placed structure. Step structures can also create a drop in the channel bed, which under appropriate flow conditions would create a backwater effect upstream and a plunge pool immediately below the structure. The low velocity backwater conditions are created by raising the effective bed elevation which reduces channel slope. Backwatering commonly induces sediment deposition and increases water surface elevation (upstream) during low and moderate flows. The amount of backwatering is associated with the scale of the structure (how much the channel cross-section is reduced) and the slope of the stream. Large scale backwatering is not anticipated in the restored channels in the sediment control structure areas at the New Hill West Surface Mine.

Patriot has proposed the construction of steps in the reconstructed (restored) stream channels (as grade requires). Water would flow over the steps perpendicular to the structure's alignment. During normal (moderate) flow conditions, flow would be dispersed across the structure. These structures would only be located in straight segments. Their final placement would be determined during the construction process; however, these structures would be used to control grade so multiple structures are anticipated. Large rock (greater than 12 inches) would be used as bank protection at and around the excavated area and would be used to hold the toe on the inside (toe of bank) on the downstream face (braces also used). Example schematics (plan view, elevation, and cross-section) of these structures are provided in **Appendix P**. Please note that these schematics are not for construction purposes.

If any failure in the step structures is observed during the monitoring period, maintenance may include, but is not limited to; clearing of accumulated debris, installation of additional drop structures, or replacement of an approved fabric, logs, boulders, riprap, ballast, or other structural elements.

6.2.1.5 Large Woody Debris

In addition to the drop structures, placement of large woody debris within the channel would be appropriate due to the size of the channels. Large woody debris (LWD) consists of naturally occurring woody debris (i.e. logs, stumps, rootwads, and branches) that is generally greater than 10 centimeters in diameter and at least 2 meters in length. LWD is generally introduced into the stream channel as whole trees, logs, or root wads. Whole trees are placed in the channel with the stump cut off and trenched into the stream bank. Generally, the all of the limbs remain intact allowing the structure to increase surface area and flow resistance. Logs are typically cut sections of the trunk that have had the limbs removed. Root wads are the root portion of the tree with a section of the trunk remaining attached. The trunk is buried into the stream bank with the root portion exposed in the stream channel.

The LWD unit and descriptions should be clearly defined in the construction plans. This definition should include a minimum crown width and/or a minimum number of limbs that have not been trimmed in any way. Also, the most durable tree species available should be utilized. However, these species are generally valued for its lumber, so compromise would often be necessary.

If correctly implemented into the stream, LWD would influence the morphology of the stream by increasing sediment capacity, increasing sinuosity, stream bank stability, dissipating flow energy through resistance, promote bar formation through induced sediment deposition, armor stream banks, and the formation of scour and drop pools (Fischenich and Marrow, 2000). Furthermore, LWD provides an area for the attachment and growth of aquatic vegetation, which in turn provides nourishment for aquatic benthic macroinvertebrates and ultimately the fish population. Additionally, LWD can increase uptake rates and tighten nutrient spiraling within the system, which is an important aspect of energy in the stream. Finally, LWD may provide a roughness element to the channel when utilized as a small drop structure, thus serving as an important component in the stream's hydraulics (Chin, 2003). LWD structures are temporary and may last from 5 to 15 years, barring failure. Factors that influence the life span of LWD structures of the type of trees utilized, climate, position relative to water surface, and soil contact. When selecting tree species to utilize, oak generally last the longest. If the site is cool and dry, the LWD structures tend to have a longer life span than if the climate is hot and wet. It is important to keep the structures submerged as mush as possible, frequent wetting and drying of the structures tend to promote decay. Finally, microbial digestion in the soils would reduce the life span of the structure. If possible, bury the structure in anaerobic soils in order to prolong the life span of the structure.

Where utilized, LWD would be placed in portions of the channel as a series of logs that bisect the stream channel. If necessary, the logs would be anchored in order to withstand high flow events. Instances where anchoring the woody debris may become necessary is when there are concerns of increased flooding, severe erosion as the result of structural failure of the log structures, the potential for the LWD to drift and accumulate on the upstream side of bridges and other structures that may be located within the active stream channel. The LWD should be large enough to develop a logjam without significant movement downstream.

It is necessary to have a riparian buffer that is able to recharge woody debris that is lost due to decay or is transported downstream. If a riparian buffer is not well-established, mobile wood may be loosely added to the floodplain or along potentially eroding stream banks. It is important to evenly distribute the LWD throughout the reach.

Placement of the LWD is critical to the success of the structure. LWD should be anchored to the stream bank rather than the mid-channel. It is recommended that a minimum of two separate anchors be placed on a LWD structure. The anchors should be as close as possible to the LWD in order to reduce the chance of debris breaking the cable, rope, or chain. It is important that LWD be anchored down is the channel if possible in order to keep the structure submerged and reduce deteriorations caused by alternate wetting and drying.

LWD structures may be anchored with cable, chain, rope, or reinforcing rod. Cables are the most widely utilized method of securing LWD structures. Stainless steel cables are widely used due to their corrosion resistance. Cables may be secured with cable links or wire rope clips. In order to reduce the potential of slipping, two clamps are recommended. Note that cables should not be secured by knotting.

Chains are more flexible than cables; however, they are generally heavier and are more costly. Chains are generally secured with bolts that are fit through the links. The biggest size able to fit through the link should be utilized. Washers should be placed at the head and the nut end. Lock nuts or washers are suggested.

Rope may be especially desirable where attachments are visible and thus aesthetics are important. Rope is generally secured with the use of knots. In some instances, mechanical devices, such as turnbuckles may assist in securing the structure. It is important that the rope does not have any slack or play between the anchor and the structure.

Reinforcing rod, or rebar, can be utilized to anchor the LWD to other LWD or to the existing substrate. It is recommended using reinforcing rod that is approximately 3/4 inch in diameter. This method of anchoring is generally preferred due to the relatively low cost of material and ease of driving the rod through the substrate of other LWD (Fischenich and Marrow, 2000).
Rootwads, another form of LWD, may also be used in the sediment control structure areas (as applicable). A rootwad is the lower trunk and root fan of a large tree. Individual rootwads are placed in series and utilized to protect stream banks along meander bends. A revetment can consist of just one or two rootwads or up to 20 or more on larger streams and rivers. Due to the anticipated size of the post mining channel restoration, the use of very few rootwads is anticipated.

Rootwad structures are constructed by grading the stream bank back and establishing a desired meander radius. A trench is excavated parallel with the stream bank along the radius. Starting at the downstream end of the meander, a footer log (18-24" diameter, 8-10' long) is placed in this trench. A second trench is cut perpendicular to the first back into the stream bank angling downstream. The rootwad is placed in this trench so the trunk side of the root fan rests against the footer log and the bottom of the root fan faces into the flow of water. Large boulders are then placed on the top and sides of the footer and rootwad to hold them in place. Moving upstream, the next footer log is placed in the trench with its downstream end extending behind the first footer log and the next root wad is put in place. This process continues until all rootwads have been installed. Some installation methods utilize a cut-off log on top of each rootwad to hold it in place, rather than boulders.

Once the structure is in place, the area between and behind the rootwads is backfilled with rock/fill. The top of the stream bank is graded to transition into the rootwads and this area and the area between the rootwads is stabilized with vegetation.

Rootwad structures have the potential to greatly enhance in-stream habitat. Rootwad promote the formation of pool habitat along the outside of meander bends and the root fan portion of the rootwads provides overhead cover for the pools. An example schematic is provided in **Appendix P**.

6.2.1.6 Stream Bank Stabilization Measures

Some areas of the channels that are being restored may benefit from additional stream bank stabilization measures. The representative treatments may be used in any number of combinations to meet specific stream bank stabilization requirements and therefore may be adjusted during the construction phase of this project. The applicable as well as additional potential measures are listed below:

LS – Live Stakes: Woody cuttings are placed in the ground, eventually taking root. When properly utilized, the binding root mass of the mature shrubs or trees would stabilize and reinforce the bank.

Live stakes should be cut from fresh, green, healthy, dormant plant material which is adapted to regional conditions. Live stakes should have a diameter between 0.75 and 1.5 inches and should be long enough to reach moist soil and have at least one foot exposed to sunlight. Commonly used woody plants include willow, poplar, and alder. These species have high growth rates with shrubby habitats, fibrous root systems, and high transpiration rates. Live branch cuttings should be covered and kept moist. If it is necessary to store the cutting for more than a few hours, then should be place in cold storage.

When installing live stakes, the following guidelines may be used:

- Live stake rooting areas should be soaked in barrels of water for 24 to 48 hours just prior to installation.
- The live stakes should have side branches removed (keep bark of the live stakes intact), the basal ends angled, and the tops cut square.

- The cuttings should be implanted with the angled basal end downs and buds oriented up at a minimum of 10 degrees to the horizontal. Stakes should be positioned above the normal baseflow level.
    - In soft soils, the stakes can be inserted perpendicularly into the slope using a dead blow hammer; in hard soils, a steel rod should be used to create a pilot hole before the stakes are planted.
    - Twenty percent of the live stake and a minimum of two lateral buds should be exposed above the soil so that shoots would grow.
    - Split or damaged stakes should not be used.
- Once stakes have been inserted, soil should be tamped firmly into place around the base.
- Successive stakes should be arranged in a triangular configuration and spaced 2 to 3 feet apart, allowing for a density of 2 to 4 cuttings per square yard. If willow is used, additional room for growth is necessary and cutting should be planted at 3 to 5 foot intervals. When inserted in an array, the stakes should be 12 to 18 inches apart to form chevron-like rows that point downstream.
- If necessary, the toe of the embankment can be reinforced against undercutting (under mattresses) with use of a rock toe or other vegetative measure.

A schematic of the described guidelines is provided in **Appendix Q**. Please note that these schematics are not for construction purposes.

<u>BSP – Bank Shaping and Planting</u>: The bank is graded to a stable slope with soil and other material placed on the bank to aid in growth of appropriate plant material. This is most effective on stream banks where moderate erosion and channel migration are anticipated. This technique is primarily used as one of the least intensive approaches to restoration and may be used as a preparatory step for other bank stabilization techniques.

Select native plant materials that are suited to the channel velocity regime and other site conditions should be selected. These species may be determined using a local reference channel. Lower slope segments can be planted with more flood tolerant species, while upland species may be more suited for the upper slopes. At dry locations, plant species should be selected based on their ability to root to groundwater.

Bank shaping should be scheduled to end during the planting window for the vegetation that has been selected and during lower flow conditions. Topsoil should be salvaged to apply to the slope surface as a planting medium. Water supplementing may be necessary.

When completing bank shaping and planting, the following guidelines may be used:

- Divert flow away from the stream bank and install silt fences or other devices to keep construction generated sediment from entering the stream.
- Grade the existing bank to achieve a stable angle of slope.
- Install a biodegradable or synthetic fabric to hold soil in place (a minimum of 12 inches into the side slope to hold loose sediments in place).
- Plant slope with vegetation. Plants can be installed by cutting openings in the fabric and planting in bank substrate.

DPP – Dormant Post Plantings: The stream bank is planted with tree material that is embedded vertically. The trees would create channel roughness, causing a reduction of stream flow and capture sediment.

These plantings should be installed in a manner that is similar to Live Stakes (see text above). Native species that root well should be utilized. The post should be 7 to 9 feet long and 3 to 5 inches in diameter. The bottom of the post should be tapered for easy instillation.

When installing live stakes, the following guidelines may be used:

- Install the posts at or above the normal waterline pointing upwards with one-half to two –thirds of the length of the post driven into the ground.
- The bottom 12 inches of the post should be in saturated soil to enable adequate moisture for growth.
- The post should be placed in rows in a square or triangular pattern.
- It may be necessary to plant other species above the post to prevent top-of-bank erosion.

6.2.2 Restoration of Unnamed Tributaries of Scotts Run

Mitigation restoration efforts would be preformed along several reaches located within the Scotts Run watershed. The restoration efforts concentrate on stabilizing stream banks, restoring the riparian zone, and enhancing the stream bed by installing in-stream and bank-placed structures which provide cover and riffle areas. Because mitigation for these areas are not dependent on the mining and reclamation activities, restoration efforts would be conducted simultaneously with mining operations in order to minimize temporal loss.

Three reaches have been identified for restoration within the Scotts Run watershed:

- Reach 2
- Reach 3
- Reach 4

Mitigation within these channels would result in approximately 2,750 linear feet of restoration. Suggested mitigation measures are provided below. Please note that these are only suggested changes and the restoration areas should be re-evaluated prior to the start of any construction activities to determine existing watershed condition. This is of particular importance in this watershed due to the on-going construction activity of a sewer line and power transmission line which have the potential to substantially alter stream configuration prior to the commencement of mitigation activities. Cross-sections, and pebble counts from these areas are provided in **Appendix I**. Photos are provided in **Appendix J**.

Restoration and Enhancement Measures – Reach 2

Current Conditions

Reach 2, located within Tributary 11, began at Station 07+00 and extends upstream to Station 16+00. The slope in this reach was approximately 1.1 percent. Riffle cross-section data was collected at Station 10+00. This station had an A_{bkf} of 29.9 square feet and a D_{bkf} of 1.5 feet. A pool cross-section was located at Station 10+40 and the station had an A_{bkf} of 35.3 square feet and a D_{bkf} of 1.9 feet. A run cross-section was located at Station 10+90 and the station had an A_{bkf} of 14.5 square feet and a D_{bkf} of 0.8 feet. Cross-sectional diagrams may be found in **Appendix I**.

Particle size distribution data collected in Reach 2 indicated that the reach was predominately a mix of gravel and cobble at the riffle and run sampling locations with combined percentages of 85 and 92. The remaining inorganic substrate at Station 10+00 consisted of sand (6 percent) and boulder (2 percent), while Station 10+90 were comprised up 11 percent sand and 4 percent boulder. The particle distribution survey conducted at Station 10+40 (Pool) was dominated by sand (44 percent). There was also a high percentage of gravel (39 percent) at the sampling location. Combined, cobble and silt/clay made up 17 percent of the inorganic substrate within the pool sample. The LD_{50} of this reach ranged from 1.8 mm to 65.2 mm, while the LD_{84} ranged from 19.3 mm to 134.5 mm. No bedrock was noted in the pebble count samples; however, the downstream portion of this reach is comprised of bedrock. A particle size summary, graph of the particle size distribution, and a bar chart of the particle size distribution may be found in **Appendix I**.

Reach 2 was heavily influenced by the close proximity of a step wooded hillside on the RDB (**Photo Nos. 1, 10** and **11**). Little meandering was noted within the reach due to the heavy influence of the hillside (**Photo Nos. 3** and **4**). The channel is somewhat entrenched with very little floodplain present through the first 700 linear feet of the reach. The RDB is noted with an eroded bedrock wall with some grade relief noted on the LDB. The channel had a moderate width/depth ratio through the lower portions of the reach. The riparian vegetation was limited on the LDB due to the close proximity of residential and storage structures. Much of this reach is dominated by bedrock with some deposition noted in portions of the reach (**Photo Nos. 7** thru **9**). It appears that the channel is cleared of gravel and cobble deposition through the use of a tractor from approximately Station 07+25 to 10+00 (**Photo No. 6**). Tracks appear on the LDB which originate from a barn located nearby. The channel is approximately the width of a front end blade of a tractor. Despite a deep pool located at Station 10+37, pools are nearly absent from the reach (**Photo No. 5**). Large woody debris was nearly absent from the reach with the exception of a log jam noted at Station 13+50 (**Photo Nos. 13** and **14**). The stream banks appear to be fairly stable within the reach despite the limited vegetative protection. Some undercutting was noted between Stations 13+00 and 14+00. A cattle crossing was noted between Stations 14+00 to 15+50 (**Photo Nos. 17** and **15**). Moderate erosion was observed within this portion of the reach (**Photo No. 16**).

Restoration Measures

Reach 2 begins with the need to stabilize the LDB through the planting of herbaceous and woody stems. In addition, it is recommended that a small floodplain be constructed along the LDB to provide relief during high flow events. As previously mentioned, the reach is currently limited by a steep hillside located on the RDB from approximately Station 07+00 through approximately Station 14+00. Although the RDB appears to be fairly stable, it is recommended that herbaceous ground cover along with some live stakes should be planted along this portion of the RDB in order to reduce the sediment loading as well as provide cover for the channel. Most restoration efforts in terms of floodplain creation, plantings, and meander alteration should occur on the LDB due to the limitations that the hillside posses on construction. A cattle crossing is currently located near Station 15+10. This portion of the channel should be tiled with cobble sized material in order to reduce the bank erosion and sedimentation often associated with livestock crossings. Due to the influence of bedrock within the reach, in-stream structures shall be limited to drop structures constructed primarily of woody material. The drop structures would provide the potential for forced pools to form. Additionally, it would provide habitat for small aquatic life such as benthic macroinvertebrates, which is limited within this reach. These structures should be installed near Stations 12+00 and 13+80. **Photo Nos. 1** through **18** are in reference to this reach. Those photos may be found in **Appendix J**.

Restoration and Enhancement Measures – Reach 3

Current Conditions

Reach 3, located within Tributary 11, began at Station 16+00 and extends upstream to Station 34+50. The slope in this reach was approximately 1.6 percent. A run cross-section was located at Station 24+04. This cross-section had an A_{bkf} of 12.3 square feet and a D_{bkf} of 1.0 feet. The riffle cross-section for Reach 3 was located at Station 24+43. This cross-section had an A_{bkf} of 18.4 square feet and a D_{bkf} of 0.8 feet. A second run cross-section was located at Station 32+74. This cross-section had an A_{bkf} of 16.7 square feet and a D_{bkf} of 1.0 feet. Further upstream at Station 33+03, an additional riffle cross-section was established. This station had an A_{bkf} of 16.2 square feet. and a D_{bkf} of 0.7 feet. Cross-sectional diagrams may be found in **Appendix I**.

The pebble count data collected in Reach 3 indicated that the particle sizes in this reach were predominately gravel (38-63 percent) and cobble (23-43 percent). Combined, boulder and sand made between 13 to 19 percent of the inorganic substrate within the reach. The LD_{50} of this reach ranged from 30.1 mm at Station 24+04 to 62.8 mm at Station 32+74 while the LD_{84} ranged from 93.8 mm at Station 24+04 to 155.5 mm at Station 32+74. Silt/clay made up 2 percent of the inorganic substrate at Station 24+43 and was not present at the remaining sampling locations. No bedrock was noted in each of the four pebble count samples. Particle size summaries, graphs, and bar charts may be found in **Appendix I**.

In general, the reach was heavily influenced by the paved road located on the LDB (**Photo Nos. 5, 14, 16, 17, 19,** and **34**). The close proximity altered the natural sinuosity of the channel resulting in a channelized stream. Very little vegetation was observed on the stream banks particularly in the middle to upper portions of the reach. A thin strip of native riparian vegetation was present on the LDB from Station 16+00 through Station 19+50 (**Photo Nos. 1, 4,** and **6**). By and large the limited riparian buffer consisted of fescue and other monocot species typically present in a residential lawn setting. A plastic gas transmission line is located within the channel near Station 18+00 (**Photo Nos. 2** and **3**). The gas line extends approximately 60 linear feet along the RDB. Gabion baskets were present on the LDB from Station 20+50 through Station 30+10 (**Photo Nos. 7, 8, 9,** and **11**). The downstream portion appeared to have settled with on-going erosion issues associated with the slope of the bank and close proximity of the paved road. Heavy erosion was noted on the RDB of the channel from Station 20+50 through Station 24+00 (**Photo Nos. 10** and **13**). By Station 24+00, there was an elevated floodplain which extended on the RDB towards residential dwellings and on the LDB to the paved road which was just located above the high water mark (**Photo Nos. 18, 20,** and **21**). Despite the elevated floodplain located on the RDB, the channel had highly eroded stream banks and was disconnected from the floodplain (**Photo 23**). Several residential bridges span the channel through this reach (**Photo Nos. 12, 15,** and **22**). Moderate erosion was associated immediately upstream of the crossing located at Station 27+00 (**Photo Nos. 34** and **36**). Very little native riparian vegetation was observed on both sides of the channel near Station 29+00 (**Photo 28**). As the channel approaches Station 29+00, a few well established deciduous and evergreen trees are located on the RDB (**Photo Nos. 25, 27, 29,** and **30**). The stream is lined with a sparse layer of deciduous trees and shrubs from Station 31+00 through Station 32+20 (**Photo Nos. 31** and **32**). The stream is channelized near Station 31+70 due to the close proximity of the paved road (**Photo Nos. 33** and **34**). A more natural flow pattern appears upstream near Station 32+50. The RDB can best be described as raw and eroding (**Photo Nos. 35** and **28**). No LWD was noted in the downstream portion of the reach, with very little present in the upper portions (**Photo No. 37**). The reach is dominated by a run/riffle flow regime with few pools sporadically present in the entire reach. The reach was dominated by gravel, cobble, and boulder. Bedrock was not as prevalent through the reach as those located downstream. The inorganic substrate was coated with filamentous algae through many portions of the reach, particularly where tree and shrub species were absent from the riparian buffer.

Restoration Measures

Reach 3 begins with the need to slope back the RDB from approximately Station 16+00 through Station 18+00. This would require excavating the channel back to an approximately 2:1 slope and seeding with a fast germinating seed blend. It should be noted that an exposed gas line was noted near Station 18+20 and extends upstream to approximately Station 18+72 on the RDB. The LDB should be hardened with the installation of a combination of rock structures and live joint plantings in order to reduce the potential for erosion and damage to the paved road that parallels the reach. This should be initiated from approximately Station 16+00 through approximately Station 21+20. A log drop structure shall be placed within the channel at the base of the riffles near Station 19+00 in order to force the creation of a pool. Existing gabions structures located on the LDB are currently eroding. They currently extend from approximately Station 20+00 to 21+20. These structures should be reinforced and secured to the stream bank. The RDB should be sloped back and vegetated with a mix of herbaceous and woody stems initiated at approximately Station 20+00 and extend upstream to approximately Station 23+00. It may be necessary to incorporate a combination of rock structures and joint plantings along this portion of the reach on the RDB, particularly on outside bends of meanders. The channel should be down-cut from approximately Station 21+55 to 23+50 by installing drop structures within this portion of the reach. The sinuosity should be increased through the placement of the drop structures. Additionally, a pool shall be created near Station 21+55 and extend to approximately 21+40. The LDB should be vegetated with low growing woody plant material from approximately Station 23+00 through approximately Station 30+00. Limitations would be imposed by the proximity of the road as well as by overhead utility lines. Currently the vegetation is limited to a mixture of herbaceous plant material commonly found in a residential lawn setting. The installation of woody plant material would provide cover, woody debris for habitat, and detritus for benthic macroinvertebrates within the reach. Again, the RDB should be sloped back just upstream of the bridge located near Station 23+00 and extend upstream to approximately Station 26+00. Vegetative planting should incorporate a combination of fast germinating herbaceous seed mix and live woody stems. A pool should be established within the bend located near Station 25+00. This would absorb much of the stream's energy during a high flow event. A drop structure should be placed at the head of the pool in order to assist the hydraulics of the stream in down-cutting the thalweg in maintaining the integrity of the pool. The point bar located at approximately Station 26+00 should be pulled back several feet in order to redirect the thalweg away from the LDB. In addition, a pool should be incorporated in this bend to absorb the stream's energy from the LDB. This pool would also absorb the energy from the unnamed tributary flowing into the reach. The RDB should be pulled back, redirecting the thalweg toward the RDB, just upstream of the bridge located near Station 27+00 through approximately 28+00. A pool should be constructed in this area as well. This would redirect the energy of the channel from the LDB and absorb some of the stream's energy as it passes under the bridge. Again, a drop structure should be placed immediately upstream of the constructed pool in order to maintain the depth. Woody stem and native herbaceous plantings should continue upstream along both the RDB and LDB in this portion of the reach. Care should be taken not to remove or damage any existing native woody vegetation along this portion of the reach when installing new vegetation. Again, the RDB should be sloped back near Station 30+00 for approximately 100 linear feet in order to create a small floodplain within this portion of the reach. The LDB should be back filled near Station 31+20, in order to promote the redirection of the thalweg toward the RDB. Once the LDB has been back filled, it should be hardened with a combination of rock structures and joint plantings. The LDB should be back filled near Station 31+90 as the thalweg is pulled toward the RDB by pulling back the stream bank. A compound pool should be constructed just upstream from Station 32+20 through 33+40. In addition to constructing a pool, the RDB should be further stabilized by sloping back the stream bank and installing rock structures along with joint plantings. Finally, the LDB should be sloped back from approximately Station 34+00 through the end of the reach Station 34+50 (**Photo Nos. 39** and **40**). The bank should be stabilized with a fast germinating seed mix along with live woody stakes. Reach 3 **Photo Nos. 1** through **40** are in reference to this reach. Those photos may be found in **Appendix J**.

6.2.2.1 Riparian Plantings

Riparian planting information for off-site restoration would be similar to that described for on-site restoration efforts. **Riparian planting information for this CMP may be found in Section 6.2.1.3.**

6.2.2.2 Instream Structures

Instream structures in the off-site restoration area consists primarily of cross vanes and drop structures. A discussion of cross vanes is found below. **Drop structures are discussed in Section 6.2.1.4.**

Cross Vanes

Cross vanes are another instream structure that provides grade control and may be appropriate for the stream size located within the proposed mitigation/restoration areas. In addition to grade control, cross vanes also provide stream bank protection, keep the thalweg in the center of the channel and provide pool habitat through the process of scouring located immediately downstream of the structures. In small streams, cross vanes are typically located at the head of a riffle flow regime. Within larger streams, the structures are typically located within the glide.

Cross vanes are generally constructed of large rock material. They may also be constructed of woody material in order to add habitat enhancement to the reach. Rock size for the construction of these structures varies due to stream size. Generally speaking, if the channel is dominated by particle size of gravel or larger, the rock material should be approximately 1 to 2 tons in size apiece. Flat rocks are preferred material. The rock material is then oriented upstream at a 20 to 30 degree angle off the bank on both sides of the channel. The structure is generally highest against the stream bank (slightly below or at the bankfull elevation). The rock material is then placed in an upside down "U" pattern with the slope of the structure pointing downward, upstream. There should be small gaps located between the rock materials to allow for base-flow to pass through the structure with little resistance. Geotextile material is often used in the construction of cross vanes. The material is used to prevent a compromise of the structure if the gaps between the rock materials are too large. The geotextile material is buried tot the depths of the footers, which are utilized to help prevent the movement of the structure. An example schematic is provided in **Appendix P**.

6.2.2.3 Bank Stabilization

BM – Brush Mattresses: Brush mattresses are typically a combination of live stakes, live fascines, and branch cuttings that are wired together and installed to cover and protect stream banks. The mat may be secured to the bank by live and/or dead stakes and partially covered with soil to initiate the growth of the plant material.

Live material should be cut from fresh, green, healthy, dormant plant material which is adapted to regional conditions. Woody branches should be up to 2.5 inches in diameter and 5 to 10 feet long. Commonly used woody plants include: willow, poplar, and alder. These species have high growth rates with shrubby habitats, fibrous root systems, and high transpiration rates. Live branch cuttings should be covered and kept moist. If it is necessary to store the cutting for more than a few hours, then should be place in cold storage.

When installing brush mattresses, the following guidelines may be used:

- Live branches should be oriented in criss-cross layers perpendicular to the flow of water in slight depressions along the bank. The butt ends should alternate to provide a uniform mat thickness of at least 12 inches and very few air voids.
    - Approximately 20 to 50 branches should be used per running meter provided their lengths are the same as the slope length.
    - If the branches are not long enough to cover the bank slope, multiple layers should be used with the branches in the lower layers overlapping those in the upper layers by at least one foot.
- Once the branches are in position, the mattresses may be bound with wire and secured with three foot wooden stakes placed at two to three foot intervals. The wire should be tied to notches in the stakes before they are driven into the ground to allow tension to develop in the wire which should pull the mattresses to the ground.
- When in place, the mattresses should be covered with alternating layers of soil and water until only a portion of the top layer of branches are exposed i.e., everything but the butt ends should be covered.
- If necessary, the toe of the embankment can be reinforced against undercutting (under mattresses) with use of a rock toe or other vegetative measure.

A schematic of the described guidelines is provided in **Appendix Q**. Please note that these schematics are not for construction purposes.

BP – Branch Packing or Brush Layering: Branch packing or brush layering is layers of live branches and compacted backfill in the face of a cut or fill slope which are typically used to provide stability and act as horizontal slope drains. They can also be used in conjunction with wooden stakes to repair slumps and holes in the stream bank.

Like brush mattresses, live branches should be cut from fresh, green, healthy, dormant plant material which is adapted to regional conditions. The live branches should be 0.5 to 2.5 inches in diameter and should be long enough so that 1/2 to 2/3 of the branch is in contact with the soil at the back of the terrace, bench, or gully while projecting slightly from the slope face. Commonly used woody plants include: willow, poplar, and alder. If the stakes are used for live gully repair, they should be long enough to extend 3 feet into competent soil and the base of the slump or hole and they should be soaked for 24 to 48 hours prior to installation.

Brush packing should be done during low flow, beginning at the edge of the streambed. When installing brush packing, the following guidelines may be used:

- Live cutting should be placed on the prepared earth lifts from fill brush layering, or excavated terraces from cut brush layering.
    - Fill brush layers should be positioned on earth lifts 7 to 17 feet in width, and cut brush layers should be arranged on trenches with a minimum width of 3 to 7 feet.
    - Brush rows should be angled away from the contour on excessively wet sites. The angle of the branches should range from 10 to 20 degrees from the horizontal with higher values for wetter soils.
    - Branches should be arranged in a criss-cross fashion in 4 to 6 inch thick layers with their cut ends touching the back of the slope. Wooden stakes should be placed 1 to 1.5 feet apart and driven a minimum of 2 to 3 feet into competent ground. A maximum of 25 percent of the brush layer should protrude from the slope face.
- Moist backfill should be lightly compacted on each layer of branches. This is done to eliminate air voids and provide an adequate soil/branch interface which should initiate growth. Each layer of backfill should have a thickness of 6 to 12 inches.
- Rows of brush layers should be spaced as follows:
    - Slope of 1.5:1 to 2:1 – Contour Spacing of 4-5 feet;
    - Slope of 2:1 to 2.5:1 – Contour Spacing of 5-6 feet;
    - Slope of 2.5:1 to 3:1 – Contour Spacing of 6-8 feet;
    - Slope of 3:1 to 4:1 – Contour Spacing of 7-10 feet.

  Frequently wet and unstable slopes may require closer spacing.
- Long straw or mulching material should be used between brush layer rows of slopes of 3:1 or flatter to impede surface erosion until native vegetation is established. On steeper slopes, fabric may be used.

A schematic of the described guidelines is provided in **Appendix Q**. Please note that these schematics are not for construction purposes.

Additional bank stabilization measures may be found in Section 6.2.1.6.

6.3 Source Water Supply and Connectivity

Water sources for the restored channels in the temporarily impacted areas (mine-through areas) would include: waters flowing off the surface of the regarded landscape; groundwater if the water table is above or at the level of the streambed; precipitation events; and waters flowing from upstream (upland) reaches in areas where the mine-through area were once located.

Water sources for the historic drainage areas within and adjacent to the permit area are anticipated to be from waters flowing of the surface of upland areas, precipitation events in the drainage, and potential groundwater if the water table is above or at the level of the streambed.

Water sources for the restored channels in the Scotts Run (Reach 1, 2, and 3) would include: waters flowing off the surface of the regarded landscape; groundwater if the water table is above or at the level of the streambed; precipitation; and waters flowing from upstream reaches of Scotts Run.

6.4 Native Vegetation, Natural Regeneration, and Control of Exotic Invasive Species

As noted in Section 6.2, several plant species have been selected as part of the vegetative recomendations for this CMP. The species selected are non-invasive species that may occur in this region. At no time would the applicant use exotic, invasive species to vegetate the riparian areas. The some on-site and off-site restoration areas are adjacent to existing forest. This location promotes natural regeneration along the riparian parameter. Over time, species that populate these forested reaches should migrate and mix with the species selected for planting in the riparian areas. With regard to exotic species control, the applicant must meet performance standards with regard to the total number of stems in the riparian areas. During these inspections exotic invasive species would be identified and addressed accordingly.

While this surface mining project does not contain mountaintop mining or valley fills, it should be noted that the spread of invasive species was evaluated in the Mountaintop Mining/Valley Fill Environmental Impact Statement (EIS). Initially there was some concern that exotic and invasive species pose some threat to the natural ecosystem and may out-compete and displace native species at surface mining sites. This would reduce available food and habitat for wildlife and would change natural areas in terms of composition, structure and general ecosystem processes. The study, *Terrestrial Plant (Spring Herbs, Woody Plants) Populations of Forested and Reclaimed Sites,* included a review of the use and occurrence of introduced invasive species on reclaimed mountaintop mining sites. The study indicated that species that may be considered exotic may be introduced during reclamation but their spread to other areas may be limited by surrounding forests and remoteness from the other disturbed lands, and the remoteness of mountaintop mining/valley fill sites typically limits the spread of invasive species to these sites.

Additionally, on February 3, 1999, an Executive Order (EO) was issued to discourage the introduction of invasive species and provided for their control to minimize the damage that they may cause. This EO (EO 13112) requires that Federal agency not authorize, fund or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless the benefits of the actions clearly outweigh the potential harm caused by the invasive species. For these reasons, it is not expected that exotic invasive species would be a potential issue at these reclamation sites.

6.5 Elevation and Slope

Slope and elevation of restored channels on the permit area would be based on the reclaimed areas post-mining configuration and existing conditions down-gradient of these sites. Restored channels in the proposed permit would have slopes that are similar to pre-mining conditions. Due to excavation and material regrading activities in these reaches as well as the modeled AOC for this project, post mining elevations may be slightly altered (greater). Minimal to no slope or elevation changes are anticipated in the off-site restoration areas located within Scotts Run.

6.6 Erosion Control

Temporary erosion control measures or BMPs would be used by Patriot to minimize impacts from soil disturbances in the areas that have been selected for restoration (rehabilitation/enhancement). Also, temporary sediment control structures would be maintained in and around channels until vegetation growth and cover is sufficient to minimize erosion and provide sediment control.

In-stream erosion control structures would be limited to material that would degrade and not require removal. Stream bank erosion control may consist of silt fences, staked hay or straw bales, compacted earth, sand bags, or other appropriate materials. Schematics of these types of structures are provided in **Appendix K**.

6.7 Stream Geomorphology

Stream geomorphology of the restored channels in the mine-through and sediment control structure areas is expected to be similar to pre-mining conditions. A summary of this information may be found in **Table 6-c. Table 6-c** also contains some morphological information from the restoration areas. No major changes to stream geomorphology are anticipated in the restoration areas. A discussion of restoration strategies has been provided in Section 6.2.

TABLE 6-c

Summary of Stream Geomorphology in Mine-Through and Other Restoration Areas

Site	Entrenchment Ratio	Width To Depth Ratio	Slope (%)	Sinuosity	Dominant Bed Material (D50 In mm)	Stream Type
Tributary 1	1.34-1.71	8.67-49.00	6	Moderate	0.41-24.95	A, B
Tributary 1-1	3.42-3.75	19.00	13	Low-Moderate	0.30	A, B
Tributary 4	1.27-3.57	10.17-26.00	25	Low	5.13-85.67	A
Tributary 5	2.31	5.78	20	Low	90	A
Tributary 6	1.19-3.13	4.00-210.00	7	Moderate	1.25	B, C, F
Tributary 7	1.96	6.25	4	Moderate	0.63-6.47	B, C, F
Tributary 7-1	2.36	5.50	11	Low	16	A
Tributary 7-3	5.00	22.00	7	Low-Moderate	25.73	A, B
Tributary 8	1.14	19.00	9	Moderate	19	B
Tributary 9	1.27-3.69	8.75-22.50	4	Moderate	60.83	B
Tributary 10	1.24-1.77	5.57-11.33	27	Low	1326-110.68	A

6.8 Site Management and Maintenance

Within six weeks of completion of mitigation activities associated with this CMP, the applicant would forward a report to the USACE regarding the created and/or restored channels. The mitigation sites would then be evaluated on an annual basis or until released by the USACE. Monitoring reports would include the following information:

- Details sufficient for an inspector to determine compliance with performance standards and to identify any required remedial actions.
- A report and photographs with fixed locations or stations depicted on plan views.
- A restatement of the compensation site plan goals, objectives, and performance standards. Identify any structural failures or external disturbances on the site, and describe any management activities and/or corrective measures that were implemented during the previous year.
- A site map showing the location of data collections, an assessment of the presence and level of occurrence of invasive species, an assessment of the degree to which performance standards are being met, proposed corrective actions to improve attainment of performance standards, and a narrative summary of the results and conclusions of the monitoring.
- A description of monitoring methods which may include sampling methods, sample size, statistical justification for sampling regime and data analyses performed.
- A description of differences between the approved mitigation plan and the as-build mitigation site and rationale for variance from the approved mitigation plan.
- Remedial actions taken during the monitoring period. Such actions may include, but are not limited to, removing debris, replanting, controlling invasive species, regarding the site, applying additional topsoil or soil amendments, adjusting site hydrology, etc. The permittee is reminded that remedial measures are necessary to achieve or maintain achievement of the success criteria and otherwise improve the extent to which the mitigation site(s) replace the functions and values lost due to project impacts.
- A description of the status of erosion control measures on the compensation sites(s) and a discussion of their functioning status and details on the need for their continued use.

Construction, monitoring, and maintenance shall be the responsibility of the applicant.

7.0 PERFORMANCE STANDARDS

Performance standards, as defined in 33 CFR 332.2, are observable or measurable physical, chemical and/or biological attributes that are used to determined if a compensatory mitigation project meets its objective. The performance standards suggested as part of this CMP reflect the overall objectives of the mitigation plan as stated in Section 4.0. The measurements used herein are variables which may be used successfully to monitor change overtime at the mitigation sites.

A monitoring plan (presented in Section 11.0) has been developed to determine the success of the stream restoration. The monitoring would be directed towards the evaluation of primary activities accomplished throughout the project. The success of this project would be determined based upon the achievement of the following criteria:

- Restoration of mine-through areas.
- Restoration of historic drainage.
- Restoration/enhancement of Scotts Run.
- Erosion control and bank stability.
- Establishment of riparian vegetation.

Performance standards are listed below. These standards would be monitored as per the Monitoring Plan in Section 11.0. The performance standards outlined below would measure the suggested success criteria.

Restoration of Mine-Through Areas and Historic Drainages

- Restored streams would develop and maintain a definable bed and bank with an ordinary high water mark in order to meet the definition of jurisdictional waters.

- A total of 6,411 linear feet of on-site stream restoration would be present and be functioning as the intended type of jurisdictional waters.

Restoration/Enhancement of Scotts Run

- Restoration/enhancement of Scotts Run would include the stabilization of stream banks, installation of appropriate in-stream structures, and establish/improve the existing riparian corridor.

- A total of 2,750 linear feet of proposed stream restoration/enhancement would occur within the mainstem of Scotts Run.

Erosion Control and Bank Stability

- For the intermittent stream reaches, two bankfull flow events must be documented within the 5-year monitoring period to demonstrate that out-of-bank flows and an active floodplain have been restored as part of the mitigation work.

- Original cross-section of the restored streams, as well as an as-built survey, would be used to determine if the restored channels is exhibiting stability. Changes that occur would be evaluated to determine if the channel is moving towards an unstable condition or the movement is part of natural channel meander.

- A longitudinal profile would be used to determine the stability of the bedform features. An as-built survey would be completed and used to determine changes in features overtime. Bedforms observed would be similar with those observed upstream and downstream of the proposed impacts and would be consistent with pre-impact conditions.

- Particle size distribution and pebble count data would be collected and utilized to determine change in substrate overtime. The goal for the restoration reaches would be consistent with the pre-impact condition, as well as material present in upstream and downstream reaches (as applicable).

- Channel stability, in terms of pattern, profile, and dimensions of the restored channel would be used to determine success and would be monitored using the Bank Erosion Hazard Index (BEHI).

Establishment of Riparian Vegetation

- Transect surveys of vegetation would be performed to determine survival of native vegetation and avoidance of exotic or invasive species. Goals would be to establish a high rate of germination in ground cover without inhibiting shrub and tree species; achieve prescribed stems per acre; and minimize the presence of aggressive and invasive species.

Although restoration of the proposed mine-through (and historical) areas would be sequential in nature, achieving the proposed performance standards would be based on a restoration in a three year timeframe. Additionally, while water quality improvements are anticipated as part of the proposed project, restoration efforts are not geared towards water quality improvement so these efforts are not included in the performance standards.

7.1 Adaptive Management Plan

Aquatic ecosystems are complex and dynamic entities which will often respond to natural and anthropogenic disturbances in unique, watershed specific manner. Adaptive management, which is often referred to as "learning by doing," is a problem-solving environmental management approach for learning through deliberately designing and applying management actions as experiments. Adaptive management is a very useful tool when there is a high degree of uncertainty and it strongly emphasizes the critical role of on-going monitoring and evaluation (which is used as a learning tool to inform subsequent actions). Under adaptive management, learning becomes ongoing, interactive, and self-correcting (Stankey et al. 2005; Williams et al. 2007). Adaptive management typically involves the following:

- Treats management practices as experiments from which learning occurs.
- Mimics the scientific method.
- Highlights uncertainties.
- Specifies hypotheses or questions.
- Structures actions to test the hypotheses.
- Evaluates results.
- Adjusts subsequent actions accordingly.

Adaptive management is a cyclic process where one assesses, designs, implements, monitors, evaluates and adjusts as projects progress.

7.1.1 Basis for Adaptive Management Plan

After initial restoration activities associated with both on-site and off-site areas proposed for this project are complete, adaptive management (and associated monitoring) is warranted due to the uncertainties associated with the project. Success criteria are based on the hypothesis that have been developed and are found below. Monitoring activities are designed to determine whether the project is meeting these success criteria and adaptive management actions are designed to help meet project goals which are based on the success criteria.

Project Hypotheses

1. Restoration of on-site and off-site areas proposed for this project would not lead to in channel instability throughout these reaches.

2. Restoration of on-site and off-site areas proposed for this project would not result in additional erosion throughout these reaches.

3. Restoration of on-site and off-site areas proposed for this project would result in stable channels with flowing water (when appropriate).

Project Uncertainties

While general statements can be made regarding water quality below mining operations, each operation has specific conditions which may or may not be similar to operations at other locations. Aside from construction techniques, there are multiple factors such as geology, existing land use, and existing water quality, as well as the extent to which waters would be impacted which may influence changes to aquatic communities downstream of mining operations. While there has been historic mining in the Scotts Run watershed, these operations did not implement avoidance and minimization to the extent Patriot has proposed for the NHWSM. The proposed project would utilize and existing side-hill fill. This fill has a sediment control structure that would be relocated for the purpose of this project. Pond relocation is expected to result in the removal of material which currently may be posing a threat to aquatic resources in downstream reaches (old gob). With the use of an existing side-hill fill for the placement of excess overburden; the removal of old mining waste; the addition of only three NPDES outlet; the mining of similar strata; and no valley fills, it has been reasonably concluded that the proposed project should not result in permanent degradation in water quality in Scotts Run. Therefore, water quality issues are not perceived as an adaptive management issue. Instead the proposed project would require restoration of the proposed mine-through and historical areas once mining operations are completed. Project uncertainties are related to these activities and how well restoration activities would succeed the mainstem of Scotts Run in areas identified as Reach 1, 2, and 3 in Section 6.2.2.

Success Criteria

This project would be considered successful if the following occur:

1. The proposed restoration areas exhibit ordinary high water marks.
2. The proposed restoration exhibits out-of-bank flows and is capable of utilizing the adjacent floodplain.
3. The proposed restoration areas are stable, exhibiting minimal erosion and loss of banks.
4. The proposed restoration areas have established riparian vegetation.

7.1.2 Monitoring Activities

Baseline Monitoring

Baseline monitoring would establish in the proposed restoration areas. These sampling locations would replicate those established prior to mining activities. Pre-mining points have been established in the following locations:

- In the footprint of each of the proposed mine-through areas;
- In the footprint of each historical area or downstream of these reaches (as applicable); and
- In Scotts Run in the proposed off-site restoration area as well as upstream and downstream of these locations.

TABLE 7-A
Proposed Sites

Locations		
	x-sections	**Pebble Count**
Tributary No. 1	Station No. 01+50	Station No. 03+00
	Station No. 03+25	Station No. 05+00
Tributary No. 1-1	Station No. 01+25	Station No. 02+00
	Station No. 02+73	
Tributary No. 4	Station No. 00+00	Station No. 00+00
	Station No. 05+04	Station No. 05+04
Tributary No. 5	Station No. 00+56	Station No. 04+00
Tributary No. 6	Station No. 02+41	Station No. 04+00
	Station No. 04+20	
Tributary No. 7	Station No. 06+47	Station No. 06+30
	Station No. 15+00	Station No. 15+00
Tributary No. 7-1	Station No. 00+00	Station No. 00+00
Tributary No. 7-3	Station No. 01+73	Station No. 01+73
Tributary No. 8	Station No. 01+58	Station No. 03+00
Tributary No. 9	Station No. 06+60	Station No. 09+00
	Station No. 07+12	
Tributary No. 10	Station No. 00+00	Station No. 00+00
	Station No. 01+15	Station No. 01+15
Reach 2	Station No. 10+40	Station No. 10+40
	Station No. 10+00	Station No. 10+00
	Station No. 10+90	Station No. 10+90
Reach 3	Station No. 24+04	Station No. 24+04
	Station No. 24+43	Station No. 24+43
	Station No. 32+74	Station No. 32+74
	Station No. 33+03	Station No. 33+03

Cross-sections would be established at each of these sampling locations. Pebble counts would also be completed and a long profile would be established so that it encompassed each sampling locations for proposed restoration areas. Additionally, sampling methods such as visual observations, RBP, and BEHI would be used to monitor project success.

Reporting

Patriot would submit an as-built survey which would include this information within six weeks of construction (restoration) activities. Following the initial report, Patriot would submit an annual mitigation monitoring report to the USACE and WVDEP including the inspector's report, performance standards enforced, photographs, and plan views of the monitoring stations, and notes on deficiencies observed or corrective measures taken to maintain successful function.

These reports would be submitted no later than December 31st of the year following completion of restoration measures. Corrective measures deemed necessary by the USACE, (or WVDEP) based on evaluation of these reports, would be performed.

7.1.3 Adaptive Management Strategy

In order to address the acquisition of new information regarding the project, unforeseen circumstances, and possibly changing field conditions, an adaptive management plan has been developed for the proposed NHWSM. The plan would provide a process for addressing how such new information may be incorporated into the monitoring and maintenance strategy in order to achieve the project's overall goals. As discussed, meeting and maintaining conditions consistent with the goals outlined above would require long-term monitoring, maintenance (although efforts would be to keep this to a minimum), and modifications that may be necessary as a result of potentially changing watershed conditions. As previously noted, annual monitoring reports would be prepared which would include the data, results, recommendations for any remedial actions, and proposed modification to project features or monitoring procedures and these reports would be submitted to the USACE and WVDEP. Recommendations for change would be supported by documentation which may include site data, photo documentation, and any other relevant information supporting the need for remedial measures or other types of changes to the monitoring program.

The main areas of maintenance concern or focus are as follows:

- Restoration of Mine-Through and Historical Areas
  - Restore and maintain channel with definable bed and bank.

- Erosion Control and Bank Stability (in on-site and off-site restoration areas)
  - Hydraulic performance (maintaining appropriate geomorphology), i.e., monitored stream parameters would include flow events, stream dimension (cross-section), pattern (longitudinal survey), bed material, and photo documentation).
  - Maintaining a stable channel.
  - Minimize bank erosion.
  - Maintaining appropriate bedforms and particulates.

- Establishment of Riparian Vegetation (in on-site and off-site restoration areas)
  - Establishment of early successional vegetation particularly along newly restored stream banks associated with restoration areas, i.e., obtain high percentages of germination of ground cover to quickly offset potential erosion issues without inhibiting the establishment of tree and shrub species.
  - Maintaining appropriate bank cover.

To meet plan objectives the monitoring plan includes:

- Baseline assessment of channel features.
- Assessing hydraulic performance of restored channels.
- Monitoring sediment deposition in restored channels.
- Monitoring streambank stability in restored channels.
- Monitoring the vegetative community newly created riparian areas.
- On-going monitoring at each site prior to and after active mining.
- Annual monitoring as per Section 11 after active mining.
- Monitoring of channel alterations through flow measurements, stream surveys and visual observations.

Like most stream restoration projects in West Virginia, Patriot would be restoring stream channels with variable physical features including minimal changes in slope and multiple channel types. Changes in the physical features of any natural channel, as well as restored channels, do change periodically and such changes do not always require maintenance; however, when these changes adversely affect hydraulic performance or the stability, structural integrity and habitat quality within the channels, actions should be taken. Hydraulic performance is measured through monitoring of physical features, e.g., an example would be step:pool configuration. Stream bank stability would be assessed using repeated cross-section surveys, vegetative cover, and pebble counts. Establishment of the riparian habitat would be assessed through visual inspection and best professional judgment.

As previously stated, in order to carry out a performance-based maintenance program, various physical features that affect performance would also be monitored to identify changes. Such features include hydrology, channel geometry, vegetation, and bank stability. Note, as discussed, not all changes are considered detrimental (such changes occur in natural stream channels as well). For example, considerable reconfiguration of physical features may be allowed as long as they do not adversely affect conveyance, bank stability, structural integrity or habitat quality. In fact, significant evolution of the physical features of a channel is often expected to occur following construction. Performance monitoring in this CMP can be divided into the following categories:

- Hydrology/Hydraulic Performance
- Channel and Overbank Geometry
- Vegetation

Each of these categories can be further subdivided in to specific areas based on the previously identified concerns outlined above. The following sections provide: (i) a description of design features in the CMP; (ii) monitoring methods to analyze feature performance; and (iii) adaptive management measures to address potential concerns.

1. Hydrology/Hydraulic Performance

Hydrology/hydraulic performance measures are directed to the design and maintenance requirements of the restored channels in on-site and off-site restoration areas for the NHWSM. On-site restoration areas must be restored, as close as practicable, to pre-mining conditions as per Patriot's SMCRA permit.

Goals

One of the indicators of success for such mitigation areas is the visual observation of flowing water (where appropriate) and the establishment of an ordinary high water mark. Another indicator is the restooration of a channel that maintains the appropriate dimension, pattern, and profile for its position in the hydrogeomorphic continuum and connection to the existing floodplain. Therefore, a goal of this adaptive management plan is to collect stream data that indicates restoration success.

Monitoring Method

Monitoring of the hydrology/hydraulic performance of such channels would be by the visual observation of flow in restored channels (in the footprint of proposed mine-through areas and in the historical drainages) with such monitoring being performed in accordance with Sections 7.0 and 10.0 of this CMP. Monitoring in both on-site and off-site restoration areas would include the establishment of permanent cross-sections, as-built channel surveys, and evaluations at these sites to identify significant deviation from the baseline or as-built data. Monitoring would also include at least two observations during the monitoring period following the occurrence of a bankfull event to establish stability of restoration measures and identify proper movement into the floodplain. This analysis would assist in identifying potential areas of concern that can lead to preventive maintenance measures.

Adaptive Management Measures

The proposed restoration measures should be self-maintaining after an initial vegetation establishment period, and should require little, if any, maintenance; however, concerns would arise if the flood capacity of the channel is reduced (some type of infringement on the channel or in the floodplain) or if the geomorphic stability of the restored channel is compromised. These problems could occur due to excess sediment deposition, erosion, topographic changes, higher than expected channel roughness, or differences in the predicted channel dimensions and associated flow regime versus pre-mining data.

An evaluation of alternatives would be undertaken in the unlikely event of such a channel failure or compromise. Changes that may be necessary if such events were to occur may include, but aren't limited to the following:

- Removal of sediments
- Removal of vegetation
- Modification of channel dimensions
- Addition of more structure
- Regrade of vegetative areas

The range of alternative may also include a no-action alternative which may prescribe a "wait and see" solution. Other measures may be undertaken if anticipated benefits do not come to fruition. This may include increases or decreases in vegetative plantings, modification of instream habitat, or introduction of LWD. These types of measures would not be undertaken without notification of the USACE as per obligations outlined in Section 9.0 of this CMP. Additionally, this CMP contains a monitoring plan that requires annual reporting to the USACE (and the WVDEP). This monitoring plan would include any minor deviations or changes in channel structure which may require additional monitoring to help establish project success.

2. Channel and Overbank Geometry

The successful establishment of restored channels in the mine-through and historical drainage areas is contingent on the placement of the channels as close as practicable to its original topographical location (with an acceptable range of elevation) so as to achieve adequate stream flow and geomorphic stability. Geomorphic stability is also a success measure in the off-site restoration area. Bedload transport though the channel is an important function that helps determine the quality of aquatic habitat. Excessive erosion may reduce the channels ability to transport these sediments.

Goals

To establish and maintain a channels in on-site and off-site restoration areas in an appropriate configuration which would result in minimal erosion on the banks at or below the two-year channel.

Monitoring Method

As noted in the previous section, monitoring of these channels would take place at cross-section sites established after construction of the channels is complete. Monitoring methods would include visual observations of flowing water, the integrity of streambanks, and the successful establishment of riparian zones in the restored channels with such monitoring being performed in accordance with Sections 7.0 and 11.0 of this CMP. In addition to this information, a Bank Erosion Hazard Index (BEHI) form would be completed during monitoring events. If the values generated using BEHI fall into the high range, this is an indication that adaptive management measures many need to be undertaken. Restoration areas would also be monitored using RBP forms (as applicable).

Adaptive Management Measures

The topographic cross-sections and maps would be compared with previous surveys and assessed by a professional hydrologist or a geomorphologist responsible for mitigation monitoring to determine changes or make recommendations, as necessary, regarding the configuration of the re-established channel. The key areas of concern are: erosion of stream banks; aggradation of channel which could impair flood capacity or change channel stability; and aggradation of the overbank channel or damage to the floodplain. The process for addressing erosion problems would be highly proactive with the monitoring plan revealing potential problems early so that low-tech, vegetative methods can be employed to slow down or eliminate erosion. If the problems become severe enough to warrant structural treatment, then a design process would be initiated (after contacting the appropriate resource agencies).

3. Vegetation

Riparian plantings are a key component of channel restoration. Vegetation is expected to provide soil and channel stability, as well as habitat values. The specific objective in this CMP is to achieve the vegetation cover suggested in the performance standards. It may become necessary to modify the riparian plantings during the final design and construction phase or during post construction if conditions are not as expected when the proposed CMP was created. Examples of potential vegetation issues could include shortages of species at local nurserys, unanticipated soil conditions, or other site specific modifications. The following adaptive management plan is designed to collect the data necessary to determine if success is being achieved and if adjustments are necessary.

During initial establishment, there would be an intense effort to establish native plantings and to have native plantings out-compete undesirable invasive non-natives. Carrying out the vegetative planting would be part of the channel restoration process.

Goals

To effectively establish vegetation along restored channels and in the riparian zone which meets the criteria established in the Performance Standards, provides bank stability, and provides suitable habitat for terrestrial species.

Monitoring Method

After construction and during the establishment of vegetation, monitoring transects would be established. Annual surveys of plant communities would be completed to document plant development, species composition, and diversity. The plant cover would be mapped so that species coverage can be determined. If necessary, a biannual maintenance plan would be developed to replace failed plantings, to tag areas for removing exotic vegetation, or other actions. These surveys would be preformed annually or as often as deemed necessary (or appropriate) to properly monitor plantings.

Adaptive Management Measures

Based upon the monitoring results, the restoration projects vegetation specialist may determine that modifications to the original vegetation plan are necessary due to different or changing conditions. For example, a native plant may colonize the project area which is not found in the list provided in **Appendix N** or an area may be too wet or too dry for a prescribed species for that area. In both instances the vegetation specialist would propose a modification to vegetative cover that complies with the projects objectives and the goal set by Patriot and resource agencies (USACE and WVDEP).

8.0 PROJECT SUCCESS

The proposed mitigation project is the responsibility of Patriot. Certification in writing from Patriot and concurrence from the USACE when Patriot has satisfied the requirements of the CMP would end the monitoring period for this project. The land owners would be responsible for protecting the mitigation areas upon completion of the mitigation requirements.

9.0 CONTINGENCY PLAN

Mitigation for Patriot has three primary components: (1) the successful restoration of channel in the mine-through areas; (2) the successful restoration of channel in historic drainages; and (3) restoration of areas in Scotts Run. As discussed, initiation of mitigation would occur as soon as practically possible, in a phased approach. As discussed, initiation of restoration activities in Scotts Run would occur early in the life of the proposed permit (within one year from the start date). Should an unforeseen problem arise, pertinent agencies would be notified immediately.

Appropriate remedial actions would be taken immediately to rectify the problem (i.e. adjust the plan). It is anticipated that that restoration work in Scotts Run would be completed within six months (to a year) of placement and prior to cessation of Patriots mining and reclamation activities. Restoration of mine-through and historical drainage areas would occur during the reclamation phase in different areas of the proposed project. This work would be completed post mining, but during reclamation (prior to final bond release). Being completed in this manner would allow for monitoring and release of this portion of the mitigation plan before final bond release of the entire the permit. Because these areas are bonded to ensure reclamation activities are completed, and since part of the proposed reclamation plan configuration would include restoration of these channels as a part of the mining and reclamation plan, adequate reclamation bond is in place to act as both a contingency plan and financial assurance that the proposed mitigation would be completed.

Success is based on the endpoints outlined in Section 4.0 of the CMP. These evaluations would occur, according to the monitoring schedule outlined in Sections 11.0, continuing for five years following the completion of the mitigation activities. If an issue arises significantly impacting the project success during the monitoring period:

- The USACE and the WVDEP would be notified.
- If applicable, field work would commence immediately to rectify the problem.
- If necessary, a qualified individual would be consulted to perform tasks to correct the problem.
- A revised mitigation plan may be submitted to appropriate agencies for review.
- As needed, the frequency of field inspections would be adjusted to ensure the problem has been corrected.

At the end of the monitoring period (as described above), the project would be evaluated to determine if mitigation goals were achieved. If a mitigation goal was not achieved, qualified personnel would be retained to analyze, re-design, re-permit, or complete other tasks as necessary to meet applicable project goals. A revised mitigation plan may be completed, and the field inspection schedule would be adjusted to ensure the designated goals are obtained. If the compensatory mitigation does not meet the project goals within the monitoring period, proper adjustments would be completed, and evaluation would continue until project goals have been met.

If the performance standards outlined in this CMP cannot be achieved, Patriot reserves the right to pursue the following contingencies:

- Re-design the mitigation plan
- Submittal of in-lieu fees
- Mitigation Banking
- Preservation

However; due to the nature of this project and the likelihood of success, Patriot is confident that the proposed measure would not be necessary.

10.0 SITE PROTECTION

The mitigation sites within the permit area would be physically protected, to the extent practical, from activity that could harm the success of this mitigation project during the monitoring period. These sites are private property and post monitoring would be subject to the same projections present in this area of the upper Scotts Run watershed prior to mining activities. Further, these sites, as waters of the United States, benefit from all of the statutory and regulatory protections of such waters. Future disturbances in the form of pollutant discharges, channel alterations, or filling would be limited in accordance with those laws.

11.0 MONITORING AND LONG-TERM MANAGEMENT

A monitoring plan has been developed to determine the success of this compensatory mitigation. The monitoring would be directed towards the evaluation of primary activities accomplished throughout the project. The success of this project would be determined based upon the achievement of the following criteria:

- In mine-through and historical drainage areas
  - Channel Restoration and the development of an OHWM
  - Erosion Control and Bank Stability
  - Establishment of Riparian Vegetation

- In the Off-Site Mitigation Areas (in Scotts Run)
  - Channel Restoration
  - Erosion Control and Bank Stability
  - Establishment of Riparian Vegetation

Visual observations would be made at all project sites. Recording methods used to determine success would include the following:

Item	Recording Method
Channel restoration	Cross-sectional and longitudinal surveys; habitat assessments ; visual observations
Erosion control and bank stability	Longitudinal and lateral photographs; BEHI
Riparian vegetation	Photograph plots; vegetation assessment

Data gathering points would be field selected to provide a representative evaluation of each project site. These points would be marked and referenced in the field to allow for comparable results between inspections.

Monitoring records would be preserved and would be promptly reviewed after each field inspection. If it is determined that significant regression has occurred, the cause of the regression would be confirmed and appropriate action(s) would be taken to alleviate the problem. If necessary, the monitoring period and the number of data collection points would be adjusted accordingly.

Using these same performance standards as guidance provided the basis for the development of the following monitoring plan time period which addresses both USACE and WVDEP requirements:

1. Within six weeks of restoration activities, Patriot would submit and as-built survey to the USACE and WVDEP.

2. Patriot would submit annual mitigation monitoring reports to the USACE and WVDEP including the inspector's report, performance standards enforced, photographs, and plan views of the monitoring stations, and notes on deficiencies observed or corrective measures taken to maintain successful function. These reports would be submitted no later than December 31st of the year following completion of restoration measures. Corrective measures deemed necessary by the USACE (or WVDEP), based on evaluation of these reports, would be performed.

3. After mitigation phases are completed and not less than two years after the last augmented seeding and/or maintenance, Patriot would submit documentation, certifying that it has satisfied the requirements of its restoration plan to the USACE and WVDEP. In no case would the monitoring time period be less than five years.

4. The USACE and WVDEP would provide Patriot with its concurrence, in writing, that the approved restoration plan has been successful (concurrence would not be unreasonably withheld if all performance measures have been met).

5. Receipt of the USACE's and WVDEP's concurrence, in writing, ends the monitoring period and Patriot's responsibility for the restoration areas, but not any potential legal restrictions placed on the land owner.

The success of stream restoration would be based on visual observations of flowing water, the integrity of stream banks, and upon the successful establishment of riparian vegetation assessed according to the monitoring plan. At least two observations during the monitoring period would be made following the occurrence of a bankfull event. Photographic documentation, at the proposed sampling locations to be established in the field, would be collected in these areas throughout the monitoring period to record the effectiveness of the restoration activities.

In restoration areas, channel stability, in terms of pattern, profile, and dimensions of the restored channel would be compared to the baseline (goal of creating a channel that is as close as practicable to the original channel) to determine success and would be monitored using the BEHI and other habitat assessments. If, during the monitoring period, the BEHI values fall into the High range or the restored channel measures differs substantially from the pre-disturbance channel, Patriot would take corrective action to stabilize eroded areas of the channel banks and correct problems with the restored channel.

Upon completion of instream activities, as-built channel surveys would be conducted to document the dimension, pattern, and profile of the restored channels. Permanent cross-sections would be established during this survey for use during future monitoring surveys. These proposed sites are discussed in Section 7.1 and provided in **Table 7-a**. Permanent cross-sections would be established during this survey for use during future monitoring surveys. The locations would be selected to represent approximately 50 percent of the riffle habitat and 50 percent of the pool areas (as available). In some instances it may be necessary to establish a cross-section at a step instead of a riffle or a run instead of a pool. When evaluating a step:pool channel, the inter-step length (the longitudinal distance between the tops of successive steps measured along the centerline of the channel), the step height, and the inter-step gradient (the change in elevation between successive steps divided by the inter-step length) should be measured. Cross-section information should be collected at the top of a step sequence were the distribution in velocity is considered the most uniform. Cross-sections established in the restoration areas may be at the same Stations that were established to collect baseline data, as practicable. The as-built channel (rehabilitated) surveys would include photographic documentation at cross-sections, a plan view diagram, vegetation information, and a pebble count as well as a longitudinal survey documenting each reach. A re-survey of permanent cross-sections would be performed until performance standards have been achieved. This monitoring would be done to ensure that mitigation efforts are successful. If changes occur in the stream segments, which are significant enough to alter the dimension, pattern, and profile so that the restored channel becomes a different stream type (Rosgen Classification), Patriot would take corrective action to restore the stream to its intended re-established condition.

Approximately 4.72 acres of riparian zones would be restored along 4,118 linear feet of impacted channels. There should be minimal change (throughout the monitoring period) in channel stability and increased production in the riparian zone. Riparian vegetation along these restored reaches would be evaluated based on the criteria discussed in Section 7.0. This may include the following standards: vegetation in the identified riparian zone area must achieve 65 percent succession for canopy cover (trees) and understory (brush and shrubs), ground cover (grasses) must fall in the very heavy range (90 percent). Ground cover values must be high to help minimize erosion. Damage to the riparian zone by natural species (such as deer or beaver) may require adjustment to the criteria for successful establishment of the riparian zone. It must be understood that some areas of the riparian zone would not meet these understory and ground cover standards simply due to abnormal conditions, such as extreme weather events; therefore, a reasonable determination would be made as to whether this is a natural occurrence or whether it is an unsuccessful revegetation effort. If during the monitoring period, these values are not successfully achieved, Patriot would take corrective measure to mitigate for the lack of success.

11.1 Erosion Control

The purpose of many of the structures installed in accordance with this restoration plan are intended to prevent erosion in the restored channels, while enhancing the existing stream habitat in areas. A discussion of erosion control measures is provided in Section 6.7 and schematics may be found in **Appendix K**.

11.2 Timetable for Monitoring

Monitoring would begin after completion of mitigation activities and in accordance with the performance timelines established above. Monitoring periods for mitigation activities in the project area would be based on construction initiation and are not expected to be concurrent i.e. Patriot would have to issue separate monitoring reports for each activity or may have mitigation reports that contain multiple phases of mitigation activities.

12.0 IMPLEMENTATION PLAN

The Implementation Plan for Patriot consists of the general work plan and other components of this CMP. Specifically, the Implementation Plan also includes the Financial Assurances (see Section 12.0), the Contingency Plan (see Section 8.0), and the Site Protection Plan (see Section 9.0). This plan provides the necessary information to demonstrate that Patriot possesses sufficient expertise, supervision, and resources to complete the proposed mitigation plan.

13.0 FINANCIAL ASSURANCES

Financial assurances and contingency funds are monies that are set aside for remedial measures so that there is a high level of confidence that the mitigation project would be successful (in accordance with applicable performance standards). This includes identifying parties that are responsible for long-term management of the mitigation sites. Financial assurances are typically based on the size of the project and complexity of the compensatory mitigation, the degree of completion of the project at the time of approval, the likelihood of success, and past performance.

A financial bond is required as part of the WVDEP-SMA permit. Channels which would be temporarily impacted as a result of the construction and operation of the NHWSM permit fall within the bonded area and would have a reclamation bond in place. Because these areas are bonded to ensure reclamation activities are completed, and since part of the proposed reclamation plan configuration would include placement of restored channels in these reaches as a part of the mining and reclamation plan, the bond itself serves as a financial assurance that final reclamation plans, which include these areas would be completed or, in this case, restored as close as practicable to pre-mining conditions. The surety bond for the proposed NHWSM would be valued at $1,320 per acre for a total bond amount of $279,000, which would be adequate to act as both a contingency plan and financial assurance that the proposed mitigation would be completed. This bond would be released in increments following approved completion of reclamation phases, but would not be completely released until mining and reclamation phases are complete. As discussed, it is important to note that the reclamation plan would include the restored channels on-site. Also, as discussed, the mitigation work performed off the bonded area and downstream of the project area would be completed and subject to monitoring prior to when the on-site mitigation would be completed. If problems occur with these mitigation areas, these issues would be addressed while the project is ongoing, further minimizing the need for additional financial assurances.

In summary, much of the mitigation areas are located within the mining permit boundaries (bonded area) and these channels are incorporated into the reclamation plan. Being made a part of the reclamation plan requires that such reclamation be completed prior to bond release; therefore, the value of the bond provides adequate financial assurance that the channels would be created. Also, as noted, the off-site mitigation would be completed before the mining and reclamation activities are completed which leaves Patriot in place to assure that this mitigation is successful as well. Because of these in-place financial assurances and the upfront completion of a portion of the mitigation requirements, no additional financial assurances would be required. Copies of the Bond Calculations may be found in Section D.2 of Patriot's SMA.

14.0 CLOSING

This report was prepared at the client's request using data developed or provided by Patriot, and POTESTA. The scope of this study was mutually devised by POTESTA and the client and is limited to the specific project, location and time period described herein. The work scope and report represent POTESTA's review of the sites proposed for mitigation and POTESTA's understanding of site conditions as provided by others using the methods specified. POTESTA assumes no responsibility for information provided or developed by others or for documenting conditions detectable with methods or techniques not specified in the work scope. POTESTA has reviewed the information provided by others and assumes it is credible for the purposes of this report but it has not been verified by POTESTA or any other consultant. Therefore POTESTA cannot warrant the accuracy, completeness, legality, reliability or efficacy of such information.

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