SECTION 13

TOPOGRAPHY

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13.1 Premining Topography

The topography of the Pinabete Mine Plan permit area (permit area) is defined by generally rolling terrain with areas of steep escarpments, badlands, sand dunes, and incised drainages and arroyos. The elevation within the permit area ranges between 5,300 and 5,600 feet. The area is bordered to the west by escarpments that are part of the ancient channel walls of the Chaco River. Along the western edge of the permit area, some terrain drains into the Chaco River. There are two major arroyos that traverse the permit area and adjacent areas, Pinabete Arroyo and Cottonwood Arroyo. The pre-mine watersheds that intersect the permit area are presented in Section 18 (Water Resources). The permit area is divided into two operational areas, Areas 4 North and Area 4 South.

Area 4 North is generally defined to the north by the Cottonwood Arroyo and the southern Navajo Mine permit boundary line to the south. Cottonwood Arroyo enters the ~~BHP Navajo Coal~~ Navajo Transitional Energy Company (NTEC) mining lease boundary from the east as north, middle and south forks which confluence to a main Cottonwood channel near the center of the northern permit area boundary. The western edge of Area 4 North generally follows a bluff which rises 90 to 120 feet above the surrounding terrain which drains to the Chaco River, while the southern portion drains to Pinabete Arroyo.

Area 4 South is generally defined to the north by the Area 4 North resource area boundary line and to the south by No Name Arroyo. The western edge of Area 4 South is generally defined by two bluffs west of the permit boundary, which reach a height of approximately 80 feet above the surrounding terrain. Area 4 South is divided into western and eastern portions by the Pinabete Arroyo. This arroyo has headwaters of about 51.8 square miles off lease to the east. It enters Area 4 South at the southeast corner and exits at the northwest corner. The majority of terrain within Area 4 South drains to Pinabete Arroyo. Some of the terrain along the eastern edge drains east into a tributary of Cottonwood Arroyo.

Maps of the premining topography within and adjacent to the permit boundary are included as Exhibit 13.1-1. A summary of premining slopes is provided in Table 13.1-1. Nearly 58% of Area 4 North and 56% of Area 4 South are within the 0-3% slope class. The premining slope classes, identified in Table 13.1-1, for Area 4 North and Area 4 South presented on Exhibit 13.1-2.

13.2 Premining Topography Information Collection and Analysis

Topographic data were collected through an aerial flight conducted in March 2008. The data were used to develop a digital terrain model (DTM) of the surface. From the DTM, contours were generated at 10-feet intervals.

The slope analysis was performed using the 3D Analyst and Spatial Analyst extensions for ArcGIS. A triangular irregular network (TIN) surface was created using the DTM information developed by Aero-Graphics, Inc. TINs are a commonly accepted method to present three-dimensional surfaces using vector and planar digital geographic data. A TIN surface is constructed by triangulating a set of vertices, or points, within an area. These connected vertices form a network of contiguous, nonoverlapping triangular facets, which can be used to represent elevation, aspect, and slope.

The TIN surface was then converted to a percent slope raster dataset using tools in ArcGIS. A raster dataset is a tool used to divide an analysis area into a discrete grid with a known spacing or cell size. Individual characteristics (e.g., slope, elevation, etc.) can then be assigned to the raster cells. The computer software converts a TIN surface to a raster dataset by converting the three-dimensional TIN surface to a two-dimensional surface and overlaying the user specified raster cell spacing to the now flat surface. The software then analyzes and assigns numerical values based on the TIN surface to centers of the raster cells. This conversion creates a raster dataset with interpreted values (i.e., slope values) at known spacing over the entire analysis area.

The raster dataset was converted into a point shapefile, with each point representing the center of the raster cell and interpreted slope value. Therefore each point in the shapefile represented the slope value for a known area. By classifying the points in 3% slope increments, an approximate area of each of slope class could be determined. The slope class areas were than normalized to the permit area, and the total area of each slope class and percentage of the permit area areas were calculated.

Personnel

Persons or organizations responsible for data collection, analysis, and preparation of this permit application package section:

~~Ron Van Valkenburg~~ ~~Kent Applegate~~ ~~Ray Yazzie~~ ~~Matt Owens~~	BHP Billiton Mine Management Company (disclosed agent) Farmington, NM
~~BHP Navajo Coal~~Navajo Transitional Energy Company	Aero-Graphics, Inc. Salt Lake City, UT