



# APPLIED ECOLOGICAL SERVICES, INC.

SPECIALISTS IN ENVIRONMENTAL MANAGEMENT AND RESEARCH

## MEMORANDUM

**TO:** Jana Murphy, Flambeau Mining Company

**FROM:** Bill Stoll and Steve Apfelbaum, AES

**DATE:** November 4, 2005

**RE:** Aerial photography correlation with vegetation monitoring data on the reclaimed Flambeau Mine site (98-450).

This memorandum is submitted to Flambeau Mining Company to satisfy the monitoring requirement found in Section 4.6 of the Surface Reclamation Ecological Monitoring Program, Flambeau Mine (Hunt and Apfelbaum, 1998) that states "aerial photography will be qualitatively evaluated to gauge the vegetation cover and representative plant communities over the entire site."

The attached images (Figures 1 & 2) were created by scanning the minimum number of aerial photographs required to cover the entire mine site. These scanned images were combined to create one composite color photo (Figure 1) and one composite infrared photo (Figure 2). Color intensity differs between scanned images, and therefore composite photos show shade differences between the different images used to create the photo. These differences observed in the composite photos are an artifact of the process used to create them and are not a reflection of the condition of the vegetation.

Color and infrared aerial photographs of the reclaimed mine site were taken August 8, 2005. These photographs confirm that the entire reclaimed mine site is very well covered with highly productive vegetation. They also indicate that the vegetation cover and productivity on site is much greater than in adjacent areas to the northwest once used as gravel quarries, and approximately the same as similar offsite areas (e.g., grassland/pasture), not impacted by mining operations.

The average total plant percent cover of the entire reclaimed mine site is 94% (see Analysis of Revegetation Success for Reclamation of the Flambeau Mine, 2005). The three general plant communities created on site, Woodland, Upland Grassland, and Wetland have total plant cover of 98%, 98%, and 83%, respectively. These numbers are consistent with the aerial photographs, which show complete cover and high productivity in all three communities. Lower cover in the wetland this year compared to last year (2004) is due to much drier conditions this year due to an extreme drought.

Each of the three plant communities is easily identified on the photographs. Open water areas (black) and highly productive wetland vegetation (deep red) in the mitigation wetland and biofilter ponds are evident in the infrared photograph and reveals an appropriate hemi-marsh structure. These communities and

features are also easily seen in the color aerial photograph. The dark green color of the vegetation within these wetlands also indicates their high productivity. All biofilter swales, including live-stake planting areas (e.g., willows), are also evident on both aerial photographs. The location of the woodlands on the site is also easily identified by the presence of the numerous surviving conifers trees. Some of the planted deciduous trees are also visible in these woodlands, but most are still too small to be located on these photographs. The photographs also indicate that the remainder of the site, upland grassland is very well covered with highly productive vegetation. In addition, greener and redder areas of the grasslands in the color and infrared photographs, respectively, appear to correspond to areas of greater native cover, whereas, browner or grayer areas appear to correspond to areas with lower native cover relative to non-natives.

Some areas of the grasslands on the site are grayer in the infrared photograph and browner in the color photograph than last year. This may be due to lower productivity of the vegetation and lower native cover on the site as indicated by the field data. Data collected in 2005 showed a decrease from last year in the total native cover. Although total plant cover increased slightly in the grasslands, native cover decreased from 70% to 60%. In addition, this data shows that total plant cover increased slightly in the other communities on the site, with the exception of the wetlands, while native cover is about the same or slightly lower than last year in these communities. 2005 was an extreme drought year and decreases in native cover over the past year may be due to dramatically decreased precipitation during the 2005 growing season. Although these conditions may have lead to a slight reduction in native cover, site data documents that vegetation is well established and abundant throughout the site and is still dominated by native species.

In summary, the entire mine site is very well vegetated, and the three plant communities, woodland, upland grassland, and wetland, are easily found in appropriate locations according to the reclamation plan. A high degree of woody plant survivorship is also evident in the woodlands and wetland swales in these photographs. Also, there is no indication of erosion or sedimentation on the site, and little to no evidence of vegetation stress.