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To: German Jefferson Lake Association

Subject: Environmental Assessment Overflight of German Jefferson Lake

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Introduction

A.W. Research Laboratory flew an Environmental Assessment Overflight (EAO) over German Jefferson Lake on October 11, 2007.

The purpose of the EAO was to document existing environmental conditions at residences along the shoreline. Visible and hyperspectral images were taken with aircraft mounted and handheld cameras. The images were analyzed at A.W.R.L. for environmental concerns.

User Guide

Image sites are marked on the map located in the front of the report. These numbers correlate with image site numbers.

Some images have ovals, circles or arrows indicating areas of interest. Three tables and a notes section are provided below each set of images for each location recorded. The tables are: *Influence on Lake*, *Ordinance Non-conformity* and *Recommendations*.

The shoreline along German Jefferson Lake provides a scenic environment for its residents and visitors, along with habitat for a broad diversity of wildlife and fish. The landuse types along the shoreline are both residential and forest. The homes along the shoreline provide valued seasonal and year-round lakeside living. As part of an effort to protect this resource, A. W. Research Laboratories (AWRL) was contacted for assistance in identifying observable impacts to the lake. In response to this request, AWRL conducted an EAO using remote sensing equipment.

AWRL has used low altitude remote sensing imagery to identify nutrient and toxic conditions in lakes since 1974. The use of remote sensing (aerial imagery) is valuable for Lake Management because it quickly and economically summarizes complex environmental conditions. These dramatic aerial images demonstrate environmental conditions to lay people in a format that is easily understood, and becomes a tool for lakeshore residents to gain a better awareness of their effect on the environment, and with that awareness an increased willingness to rectify problems.

Additional advantages of the aerial perspective are:

- 1) It allows the user to see things that would be obscured from the ground perspective,
- 2) The visual image record can be reviewed at a remote location, and
- 3) The visual image recorded can be reviewed using standard protocols to detect evidence of conditions that the users are interested in. Because this review can take place in a controlled laboratory situation, it is more consistent than field review.

On a technical level, the EAO provides an image data set of the selected shoreline areas, in the visible through the thermal region of the spectrum. The image data is recorded on three hyperspectral video cameras. The hyperspectral video data provides narrow band images in the visible and near infrared regions of the spectrum.

The analysis protocol combines this information into the EAO. For point and non-point source pollution detection, EAO is a successful methodology providing a comprehensive view of lakes, streams, wetlands, and adjacent upland area.

Ultimately, the purpose of conducting an EAO is to detect point and non-point sources of nutrients destined for the lake. Once these sources are located and investigated, the concerned parties - whether they are governmental entities, industries, or homeowners- can prioritize actions to minimize the adverse impacts of the pollution. Successful efforts will result in attaining the ultimate goal of improved water quality, along with cleaner and healthier environment for everyone to enjoy. Specifically, this report can be used to achieve these goals by presenting the following:

Identification of land use practices, or other conditions, that may affect water quality.

Methodology

During the first phase of the EAO, A.W. Research Laboratories' Remote Sensing System recorded the selected shoreline areas; using multi-spectral video cameras mounted vertically in an aircraft and handheld cameras. The overflight was completed on October 11, 2007. The meteorological conditions at the time of the flight were as follows:

Temperature:	45° F
Sky:	Overcast
Wind:	5 mph

Analysis Criteria

The focus of this study was to evaluate the effect of water pollutants related to land use and related impacts within the near shore area. Such anthropogenic pollution falls into non-point sources of pollution that change the temperature or nutrient load in the near shore or littoral zone and point sources which appear to be actively discharging on the day of the overflight.

Lake classification:	Recreational Development
Setback:	100 Feet from OHW
Lot Width:	200 Feet
Lot Area:	80,000 Square Feet
Percent Impervious:	≤25%

SUMMARY DISCUSSION / RECOMMENDATIONS

The EAO is an integrated database, report, guiding document and interactive planning tool, which is to be used on a daily basis.

The summary section looks at the statistical data generated by the EAO. The data presented in this format is useful in:

1. Prioritizing groundtruthing tasks.
2. Establishing budgets and financial requests for restoration of environmental concerns.
3. Establishing a statistical evaluation for ordinance and policy review.
4. Providing a historic record.

INFLUENCES ON LAKE

The data reveals the instances of non-point runoff that were observed on 42 of the sites analyzed. The implementation of a shoreline buffer campaign is recommended. The installation of these native vegetation systems will lessen or eliminate the influences of stormwater runoff and provide a needed balance of terrestrial habitat needed for a healthy fishery and lake in the near shore area. Installing low berms along the shoreline is an effective way of mitigating non-point runoff. The non-point runoff sources are probably the largest loading contributors. Twenty-two point sources were identified and present an opportunity to do a mass balance on the lake. Twelve areas of non-point septic concerns were identified and should be groundtruthed. Thirty-seven impervious areas were identified. These areas may be mitigated by restoration of vegetative buffers and berms.

ORDINANCE CONFORMITY

















The greatest non-conformity observed was inadequate vegetative buffers. As previously stated, the implementation of a vegetative buffer campaign is recommended.

BEST MANAGEMENT RECOMMENDATIONS

The priority listing of best management practices recommended are as follows:

1. Develop and/or expand vegetative buffers. This can be positively done by publicly recognizing property owners who have kept or restored buffers.
2. Investigate the septic systems servicing the residences. The EAO process identifies areas where nutrients may be entering the lake from septic systems. In some instances this may occur when the system is by definition conforming.
3. Direct storm water away from the lake.
4. Encourage lake homeowners to use lake water for lawn maintenance. Place the intake to the watering system as deep as possible in the lake.
5. Berms are effective at cleaning runoff before it reaches the lake.

Source Map Color Code

Septic Point Source	Brown	
Septic Non-point Source	Orange	
Runoff Point Source	Red	
Runoff Non-point Source	Pink	
Toxic Point Source	Bright Green	
Toxic Non-point Source	Sea Green	
Lake Setback	Gray	
Impervious Surface	Black	
Fill/Dredge in Lakebed	Gold	
Vegetative Buffer <75 feet	Lime	
Other	Tan	
Septic Wastewater Investigation	Blue	
Develop/Expand Vegetative Buffer	Sky Blue	
Berm	Rose	
Redirect Stormwater From Lake	Yellow	
Debris Removal	Blue Gray	

Notes Section

It is the intent that the "Notes" section of the summary tables to be used as the basis for developing groundtruthing plans and priorities. "Groundtruthing" is essentially an on-site validation of concerns identified in the examination of the aerial images. One of the most effective uses of the EAO data is when a trained "groundtruther" presents the slides and analysis to the property owner of each residence. Together these parties can identify whether concerns identified in the slides are significant. In cases where problems are confirmed then the "groundtruther" can instruct the property owner on the need for - and implementation of - Best Management Practices (BMPs). Implementing the Recommendation and "Notes" part of the analysis is CRUCIAL to getting the full value of the EAO study.

AWRL can be retained to provide training for association volunteers, consultants or interns. Training is important to ensure that the groundtruthing results are accurate and complete documentation of the observation is complete. It is important that the groundtruthing experience should be cooperative and educational rather than threatening to the lakeshore owner.