

## **Executive Summary**

### **Comparing Nutrient Losses via Runoff from a New Golf Course and the Golf Course Site's Previous Native Condition**

**Principal Investigator:  
Dr. Steve Starrett, Civil Engineering Department  
Kansas State University**

**Project Start Date: February 1998**

The objective of this research is to compare the nutrient loading, by way of surface water runoff from a new golf course (Colbert Hills Golf Course), and the site's previous native prairie condition. The nutrient loading from the golf course site into the main surface water stream (Little Kitten Creek) will be determined during construction and during operation. Surface water samples are being collected during runoff events from at three locations on Little Kitten Creek. Currently, automated samplers are installed where Little Kitten enters the golf course property, where a small tributary enters the property and where Little Kitten Creek exits the property. About 300 water samples have been collected since February. Water samples will be tested for nutrient concentrations and other physical and chemical parameters. Surface water runoff amounts will be determined so those mass amounts of nutrients contained in the runoff can be calculated.

Kansas State University in cooperation with Jim Colbert, PGA TOUR, GCSAA, and various alumni are building Colbert Hills Golf Course, a 27-hole championship course, near Manhattan, Kansas. Colbert Hills is being built on land that has a prairie-woodland mix that is typical of the Flint Hills Region. The only previous land use was occasional grazing for beef cattle. Data on water quality from the nearby Konza Prairie research area (NSF Long-Term Ecological Site and USGS Benchmark site) has been collected for close to 20 years and comparisons in water quality from Colbert Hills and the Konza Prairie will be made.

## **October 1998 USGA Project Progress Report**

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**Principal Investigator:**  
**Dr. Steve Starrett**  
**Civil Engineering Department**  
**Kansas State University**

**Collaborators:**  
**Dr. Steve Thien, Soil Scientist, KSU**  
**Dr. Jack Fry, Turfgrass Scientist, KSU**  
**Dr. John Harrington, GIS Expert, KSU**

#### List of Students Involved

Mr. Yunsheng Su, Ph.D. candidate in CE  
Mr. Todd Armatys, undergraduate student in CE  
Mr. Nathan Ham, undergraduate student in CE  
Mr. Jered Morris, undergraduate student in CE

#### Research Initiated

The objective of this research is to compare the nutrient loading, by way of surface water runoff from a new golf course, and the site's previous native prairie condition. We are investigating the new golf course's impact on surface water quality during construction and during golf course operation.

#### Progress

##### **Major Tasks Performed**

- An excellent graduate student was recruited
- This project initiated February 1998, much preliminary work was performed prior to this project
- Three automated water samplers, three depth measuring devices, and a tipping bucket raingauge were setup to achieve the objective of this project
- Survey of stream cross section at depth measuring locations
- Experimental equipment was calibrated
- Equipment maintenance and operation guidelines were developed
- Sample collection and storage procedures were developed
- About 300 water samples were collected during runoff events
- Survey of disturbed area after each runoff event
- Some water quality parameters were determined using a DO probe, a conductivity meter, a turbidimeter, and a pH meter

- Samples are being stored in freezer until taken to lab to determine nutrient concentrations
- Literature review is underway

About 100 of the 300 samples have already been tests and the remaining will be tested from nutrient concentrations in the next few months. Numerous physical and chemical parameters of the samples such as turbidity, pH,... have already been determined.

### Preliminary Results

The following nitrogen concentrations were determined in water samples taken prior to the start of construction.

- Average of total N from pond, spring and creek samples ranged from 0 to 8 mg L<sup>-1</sup>
- Average of Little Kitten Creek samples were about 1 mg L<sup>-1</sup>
- Average of spring samples were about 2 mg L<sup>-1</sup>
- Average of pond samples were about 3 mg L<sup>-1</sup>
- About 8% of total N was in the inorganic form
- No ortho- or total phosphorus was detected above the detection limit of 1 ppm

### **Immediate Tasks**

- Determine flowrates in streams based on depth
- Review and revise sample collection standards and strategies
- Continue sample collection and analysis
- Continue monitoring construction practices
- Develop data base management strategies