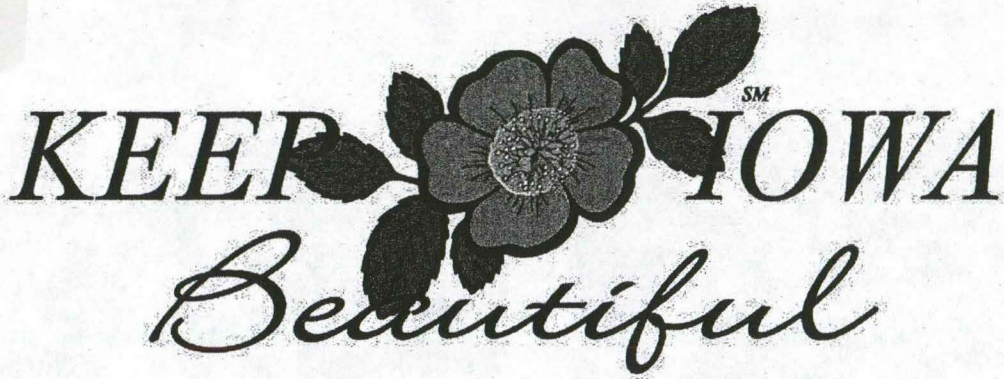


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2001 ROADSIDE LITTER CHARACTERIZATION STUDY

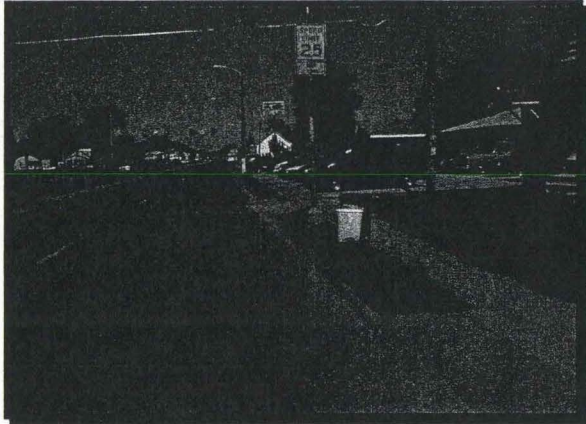
TECHNICAL SUMMARY

**BARKER LEMAR**

ENGINEERING CONSULTANTS

## TECHNICAL SUMMARY

### 2001 ROADSIDE LITTER CHARACTERIZATION STUDY



Keep Iowa Beautiful (KIB) developed a statewide comprehensive program for litter assessment in 2001. Components of this program included the determination of "benchmark information" including the 2001 Roadside Litter Characterization Study. During the spring of 2001, **BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR)** was selected to perform the 2001 Roadside Litter Characterization Study at 150 sites and develop an Internet based Geographic Information System (GIS) for KIB. The total budget was \$120,700.

**BARKER LEMAR'S** Internet based GIS website site and related statistical software programming is located at [www.internetgis.org/kib](http://www.internetgis.org/kib) or via a link at [keepiowabeautiful.com](http://keepiowabeautiful.com).

#### **Roadside Site Selection, GIS Development, and Litter Collection Methodology**

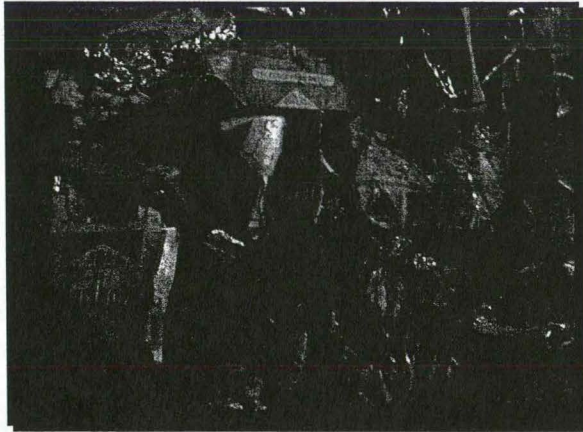
**BARKER LEMAR** met with KIB stakeholders to define the roadside site selection criteria. After discussing several options, a strategy was developed to stratify and weigh the roadside sites according to the population of urban and rural areas, further dividing urban roadside sites according to average daily vehicle count (traffic volume).

An Internet based GIS site was developed during the planning stages to assist staff select sites, store data, and graphically display litter characterization information.

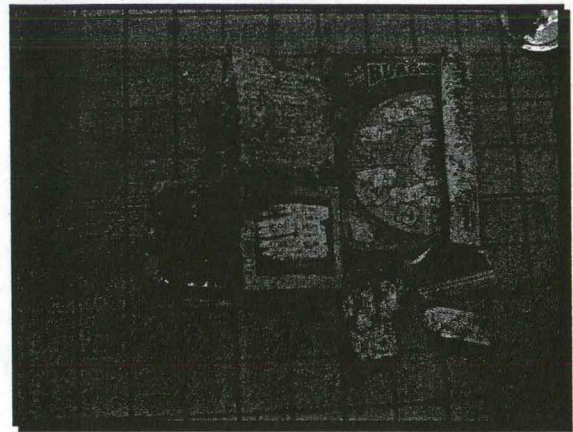
During the fieldwork, staff attempted to collect every piece of visible litter greater than 1/2-inch square including cigarette filters and butts. Sites were generally 200 feet long and did not exceed 40 feet wide.

#### **Data Analysis: Classifying Litter, Identifying Name Brands, and Performing Statistical Analysis**

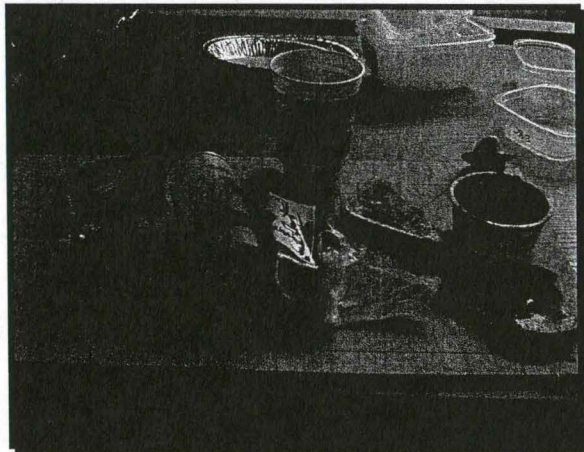
Litter was sorted into several pre-approved classifications with a special emphasis on beverage containers and the deposit designation of the containers. Weight (in grams), area (in square inches), and number of pieces were recorded for each subcategory. 22,585 pieces of litter were collected over a total of 627,998 square feet (or 1 piece of litter every 28 square feet).



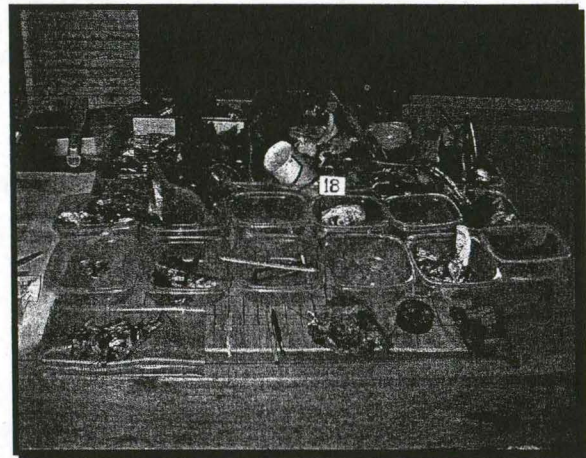
***Cigar/Cigarette Packaging***



***Lottery Related***

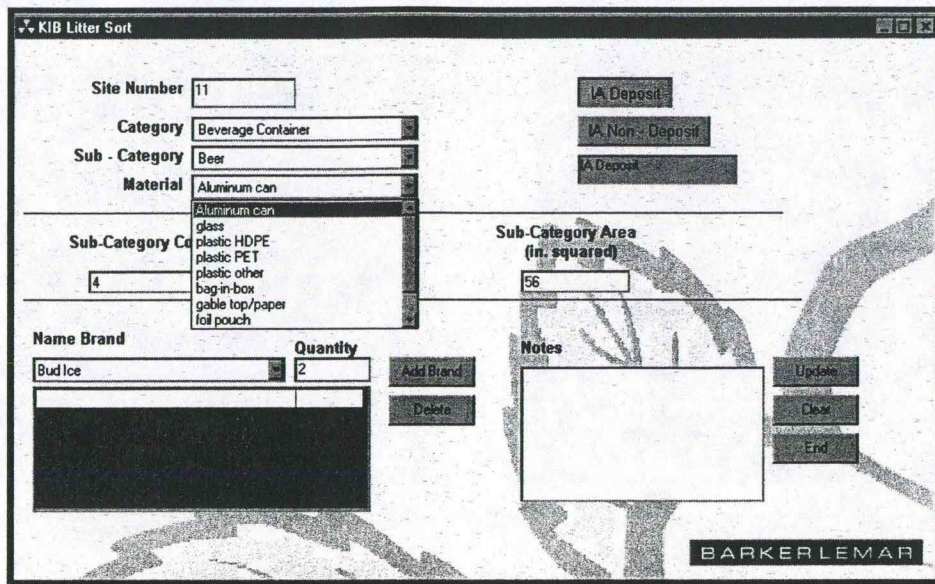


***An Example of Litter from a  
Low Volume Site***



***An Example of Litter from a  
High Volume Site***

During the litter classification procedures, data was directly entered into a database via a program written by **BARKER LEMAR** using drop-down boxes and "pop-up" reminders that warned staff if data was entered incorrectly or fields were incomplete. This programming provided reduced data entry mistakes and dramatically decreased data entry time allowing staff to perform the name brand identification phase, area estimation phase, litter count phase, and litter weight phases for the represented subcategories within each of the 150 roadside sites.



**Screen shot of BARKER LEMAR'S data entry page written in Visual Basic for the litter classification and counting phase. Drop-down boxes provided lists of categories, subcategories, material types (shown), as well as lists of previously entered name brands.**

The litter subcategories with the greatest amount of litter were:

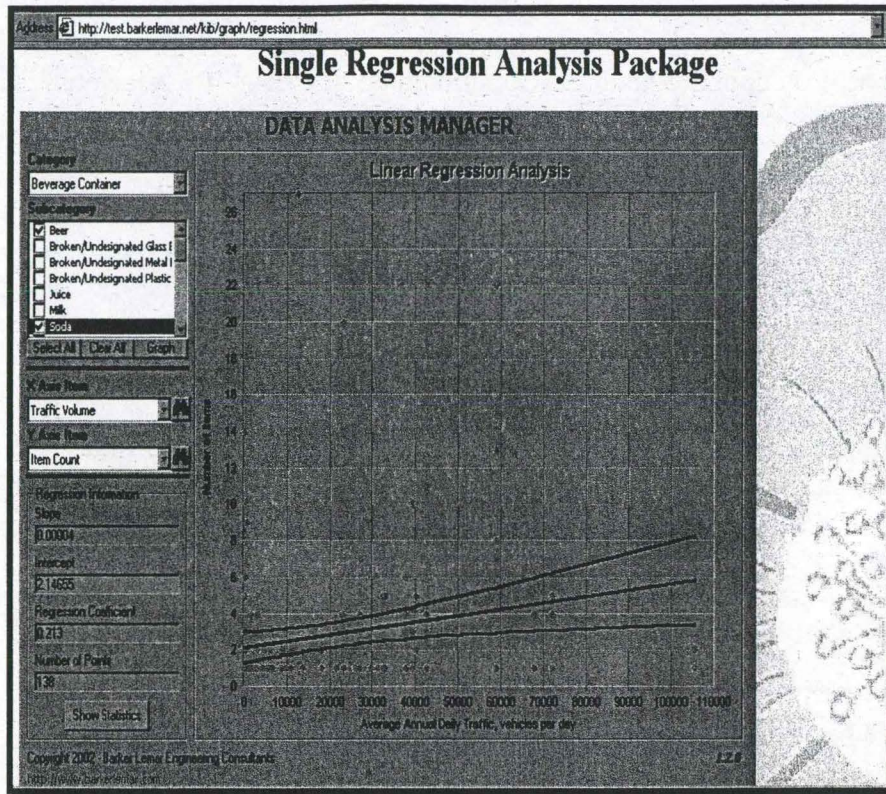
- Cigar/Cigarette Filters and Butts
- Candy and Snack Packaging
- Plastic and Paper Cups
- Beer and Soda Containers

Staff identified every piece of litter by its name brand whenever possible. Leading name brands within key subcategories were:

- Marlboro - Cigar/Cigarette Filters and Butts
- Snickers - Candy & Snack Packaging
- Bud Light - Beer Containers
- Mountain Dew - Soda Containers
- McDonalds - Plastic & Paper Cups



The Single Regression Analysis Package compares one X variable and one Y variable. This package also allows users to select Subcategories, and "Where Clause".



The highest simple correlation coefficients were identified for traffic volume and county population. These results are consistent with other linear regression correlation studies researching litter. An  $r$ -value of .20 shows that (80% of the variability is not accounted for via traffic count ( $r$ -values closest to 1.0 determine that all variability is accounted for).

Using the Single Regression package,  $r$ -values for Cigar/Cigarette Filter and Butts were calculated using various traffic volume ranges. A traffic range between 1000 and 9,071 generated an  $r$ -value of .695 (30 graphed points) at a 95% confidence level.

The  $r$ -values for Candy and Snack Packaging were also calculated using various traffic volume ranges. However, a strong regression correlation was not identified between this litter subcategory and traffic volume.

Beer containers illustrate a weak negative correlation as traffic volume increase from 20,000 to 115,000 vehicles ( $r$  equals  $-.262$ , 23 graphed points). Soda containers illustrate a slightly stronger positive correlation as traffic volume increase from 20,000 ( $r$  equals  $-.362$ , 33 graphed points). A negative, weak correlation was identified for Candy and Snack Packaging as the median age increases ( $r$  equals  $-.265$ , 102 graphed points).

As age increases Beer, Soda and Candy/Snack packaging all show a weak negative simple correlation coefficient (e.g.  $r$  equals .265 with 102 points for Candy/Snack Packaging). Consequently, age may be having a positive affect on the amount of litter on Iowa's roadways.

### **KIB GIS/Internet Site**

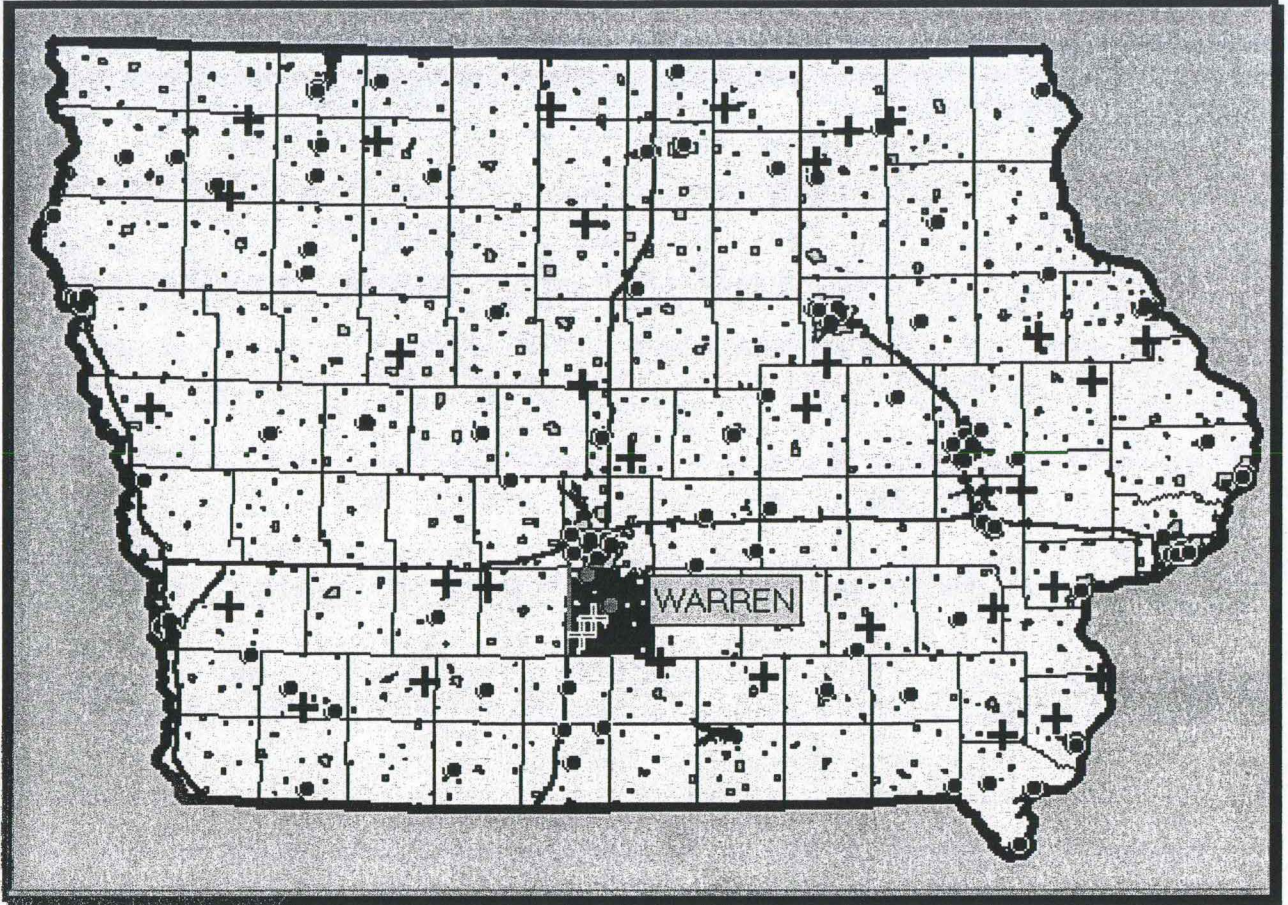
**BARKER LEMAR** developed a GIS based web page for KIB. The GIS/Internet site is available online via [keepiowabeautiful.com](http://keepiowabeautiful.com) or <http://barkerlemar.net/kib/main.asp>.

This unique tool allows litter researchers and the general public to see and perform a variety of customized views and reports, the following list provides only a sample of the features of this tool:

- Identify the location of roadside litter characterization test sites;
- View roadside site characteristics, such as - site length and width, the distance to a stoplight or park, and the distance to a fast food restaurant or convenience store (visual distance);
- Print specific reports for roadside sites, litter categories, and traffic volume categories;
- View pictures of the roadside sites and view the litter collected from those roadside sites;
- Perform statistical analysis on multiple independent variables;
- See the X and Y coordinates for the site;
- Identify key geographic and demographic features (landfills, rivers, IDNR lands, schools, US Census Bureau Data), and;
- View IDOT road data for road segments.

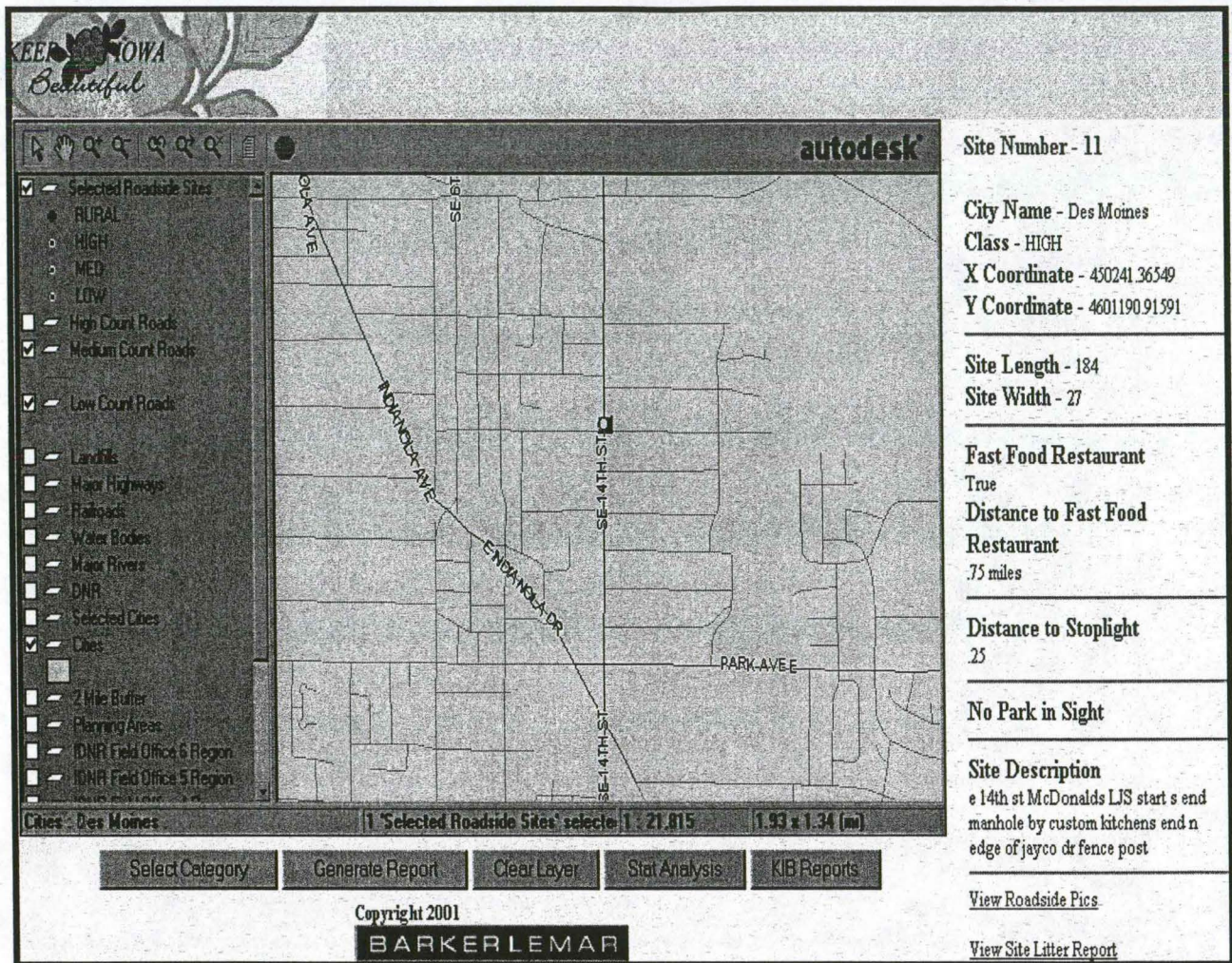
The power to quickly overlay maps, store, sort, and display roadside litter data, census data, Iowa Department of Transportation road data, geographic features, etc., over the Internet is the strength of this tool. Additionally, the data can be quickly updated with new data from follow up studies performed by local state affiliates or KIB.

The following pages provide screen shots of the KIB GIS/Internet site.

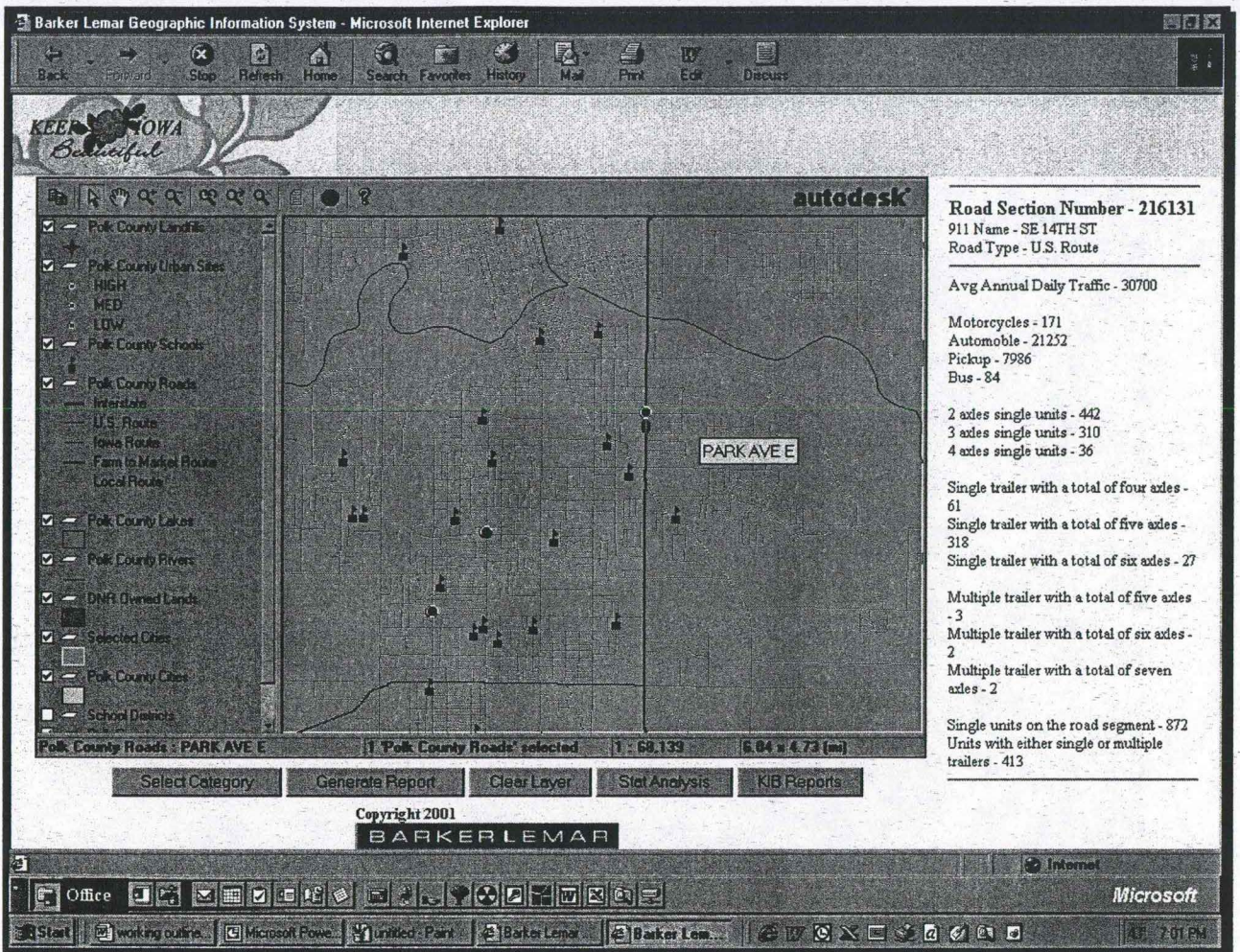


***A view of the primary State map as seen when the KIB GIS/Internet site is opened (using a password and user name). This map shows high volume (blue dots), medium volume (red dots), low volume (purple dots), and rural roadside litter characterization sites (maroon plus signs).***





**Screen shot of KIB's GIS/Internet site showing key site features of Roadside Site 11. Site 11 was 184 feet long by 27 feet wide. It was 0.75 miles from one or more fast food restaurants/convenience store. NOTE: as a user Zooms in, using the "+" magnifying tool icon, road names are added to the screen.**



Screen shot showing IDOT road segment data and the ability to "mouse-over" and identify geographic features, including roads, railroads, rivers, bodies of water, landfills, schools and universities, and public lands.

In this example, the average annual daily traffic count is 30,700 vehicles of which 21,252 are automobiles and 7,986 are pick-up trucks.

http://test.barkerlemar.net/kib/files/reports/KIB\_namebrand.rpt?user0=kibread&password0=kibread&init=act&prompt0=Packaging

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PACKAGING

**Namebrand Breakdown  
by Category,  
Sub-Category and  
Individual Item**

Candy wrappers/Snacks (paper or plastic)

NONE	466
Snickers	59
Tootsie Rolls	37
brachs star brites	18
Reeses	18
Twix	18
Lifesaver Creme Saver	17
Starburst	16
Life Savers	15
Nestle	14
Slim Jim	14

**Customized name brand and other reports are available using the "KIB Reports" button. This example shows the name brands identified from all the roadside sites. NONE represents pieces of litter that could not be identified with a particular name brand. Snickers, Tootsie Rolls, and Brachs Star Brites / Reeses / Twix were the top three littered pieces in the subcategory "Candy Wrappers/Snack Wrappers (paper or plastic)".**



## CONCLUDING REMARKS

BARKER LEMAR staff would like to thank the KIB Review Group that assisted with the development of the 2001 Roadside Litter Characterization Study.

- Keep Iowa Beautiful
- The Iowa Dept. of Nat. Resources
- The Iowa Dept. of Transportation
- Carroll Co. Solid Waste Management Commission
- Iowa Recycling Association
- Story County Engineer's Office
- Iowa League of Cities
- Iowa Beverage Systems, Inc.
- Iowa Wholesale Beer Dist. Assoc.
- Iowa Grocery Industry Assoc.
- Casey's General Stores, Inc.
- Iowa Farm Bureau Federation
- Iowa Assoc. of Co. Conservation Boards

The authors would like to personally thank Field Staff for their enthusiasm and professionalism during the collection and classifying phases. The authors would also like to thank the IT staff that listened to ideas and then transformed those ideas into working databases, reports, Internet compatible programs, statistical programs, and various other technical pieces.