

## SECTION 2: DESCRIPTION OF DATA

Charlotte-Mecklenburg County is located in the Piedmont region of North Carolina. Low-lying rounded hills and gentle rolling ridges characterize the landscape. The local climate is both moderate and seasonal. Rainfall during the summer months can be characterized as high intensity and short duration, while during the winter months it is of lower intensity and longer duration.

As of July 1, 1998, Mecklenburg County had a population of 613,310 (Estimated by U.S. Bureau of the Census). This represents an approximately 20% increase during the last 8 years. From 1980 to 1990, the population in Mecklenburg County had a 26.5% increase.

The Charlotte-Mecklenburg Utility Department (CMU) has a wastewater collection system consisting of approximately 2,659 miles of separate sanitary sewers, 5 wastewater treatment plants and 55 pump stations and lift stations.

CMU's computerized Complaint History And Maintenance Processing System (CHAMPS) was designed and implemented in 1979 in order to effectively plan and control the activities associated with managing the sewer system. The system was designed to capture historical data relative to the installation, maintenance, inspection, and repair of sewer lines. This data provides the core information for the current study.

In particular, CHAMPS provides the following useful information for this study.

1. SSO records: time and location of each reported SSO (SSO Data).
2. Work records: repair and maintenance activities (Activity Data).

In addition to the above-mentioned key data, there are available the following supporting data:

1. Rainfall data (1983 - 1997) acquired from National Climatic Data Center for the Mecklenburg County area.
2. Groundwater elevation data (1984 - 1997) acquired from the

United States Geological Survey.

3. The data on the age of the systems.
4. Daily flow to the treatment plants (1984 - 1997).
5. Length of sewer (in miles) maintained by CMU over the years.

## **2.01 SSO Data.**

The CHAMPS database contains 47 fields. These fields can be found in a copy of the CHAMPS manual attached in Appendix A. Each observation in the CHAMPS data is a reported SSO with its reporting time and SSO location. There are three main variables generated from this database. They are **TIME** (when an SSO occurred) **TOPO** (where an SSO occurred) and **SSO** (SSO frequency aggregated by **TIME** and **TOPO**) respectively.

## **2.02 Repair and Maintenance Activity Data.**

The repair and maintenance data were provided in the tabular form by CMU as shown in Appendix B. There are 25 attributes in this database, that is, fiscal year and other 24 operations codes, with the measures of activity aggregated by fiscal year from 1980 to 1998.

The 24 operations codes are defined in the CHAMPS manual attached in Appendix A. Among the 24 codes, the following are considered as pro-active maintenance activities, and relevant to the current study.

1. CHAMPS Code 08 - Rapid Response (coded as X08 for analysis purpose). The unit of this measure is one location.
2. CHAMPS Code 09 - Jets & Combination Machines, or Combination Machines (coded as X09). The unit of this measure is one linear foot.
3. CHAMPS Code 10 - Rodder (coded as X10). The unit of this measure is one linear foot.
4. CHAMPS Code 11 - Off Street Cleaning (coded as X11). The unit of this measure is one linear foot.
5. CHAMPS Code 12 - Right-of-Way Mowing (coded as X13). The unit of this measure is one linear foot.
6. CHAMPS Code 14 - T.V. Inspection (coded as X14). The unit of this measure is one linear foot.

7. CHAMPS Code 15 - Herbicide (coded as X15). The unit of this measure is one linear foot.
8. CHAMPS Code 16 - Cleaning/Inspection of Manhole (coded as X16). The unit of this measure is one location.
9. CHAMPS Code 17 - Inspections (coded as X17). The unit of this measure is one location.

### **2.03 Rainfall Data**

Daily total rainfall from a location in the Charlotte-Douglass International Airport (**RAIN**) from Jan. 1983 to Nov. 30, 1997.

### **2.04 Groundwater Level**

Groundwater elevations were acquired from the United States Geological Survey. Monitoring data was obtained from three wells around the Charlotte-Mecklenburg area. One of the wells is in the Hornets Nest Park, one is by Highway 521 near South Carolina and one is on Ridge Road in the northern part of the county. For the purpose of the analysis, the groundwater level (GW) is the mean number of feet below surface. A higher value of GW implies a lower groundwater level.

### **2.05 System Age**

Sections of the sewer system under CMU's jurisdiction were coded with their dates of installation. Therefore, each reported SSO is associated with an age of the sewer section. For analysis purpose, the system age (**AGE**) is coded A (Past-1960), B (1961-1971), C (1972-1984) and D (1985-Present).

This information was supplied by CDM (CDM, 1994, pp.1-6 through 1-8). It is based on as-built drawings, the recorded date of construction, and the corresponding county topographical map (Figure1).

### **2.06 Daily flow to Treatment Plants**

The daily flow data, in million gallons, were obtained from all the regional treatment plants and aggregated into monthly data. The

total monthly flow data are coded as **FLOW**.

## 2.07 Sewer System Length

Total sewer system length (SSL) in miles maintained by CMU over the years is as follows.

Year	SSL
1971	946
1972	1045
1973	1100
1974	1207
1975	1283
1976	1390
1977	1447
1978	1475
1979	1530
1980	1585
1981	1640
1982	1670
1983	1700
1984	1730
1985	1767
1986	1882
1987	1913
1988	1992
1989	2123
1990	2205
1991	2271
1992	2303
1993	2362
1994	2426
1995	2482
1996	2565
1997	2659
1998	2764

The above database forms the basic information background for the current study.