

DRAINAGE AREA PLANNING
DATA COLLECTION FROM SQUARE ONE

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SYNOPSIS

The execution of a Drainage Area Plan (DAP) involves the collection of data from many sources, some of which may be unreliable and the data should be subjected to Quality Control (QC) checks to assess its accuracy.

To proceed with the DAP using incorrect data will waste resources and lead to inaccurate assessments of the options for upgrading the sewerage system which could be valued at many thousands of pounds.

This Paper details the data required for the execution of the DAP, the sources of the data and the means of assessing the accuracy of the data. The Paper also discusses Quality Assurance (QA) procedures.

The Paper has been prepared as an "aide memoire". The storing, formatting and use of the data has, and will continue to be, the topic of Papers by other authors.

DATA REQUIRED FOR DRAINAGE AREA PLANNING

Table I uses the four phases defined in *The Sewerage Rehabilitation Manual (SRM)* for the preparation of a DAP, to summarise the principal data required. From Table II it can be seen that the data can be categorised as follows :-

- | | | |
|-----|---------------------------|---|
| (a) | DATA FROM SEWER RECORDS - | Data available from existing Main Drainage records. |
| (b) | DATA FROM OTHER SOURCES - | Data available from other existing records. eg. traffic data |
| (c) | DATA FROM FIELD SURVEYS - | Data collected, and checked, as part of the DAP eg. Flow Survey Data. |

The "Data from Sewer Records" is of varying quality. The standard varies between a line drawn on an Ordnance Survey plan to a fully computerised database. The amount of data required to complete the sewer records is dependent on the quality of existing records. It is important to distinguish between data required for the DAP and data required to bring the sewer records up to the specified standard.

The "Data from other Sources" has generally to be taken as being correct. Should any item prove to be spurious then the source could be asked for a second opinion.

The "Data from the DAP" is of great importance to the engineer responsible for executing the DAP. The accuracy of this data is directly linked to the output from the DAP.

Table II summarises the sources of the principal items of data. The data collected from the Field Surveys can thus be summarised as being from five separate exercises :-

- (a) Manhole Survey
- (b) Condition Survey
- (c) Ancillary Survey
- (d) Flow Survey
- (e) Impermeability Survey

N.B. It is possible that (a) and (c) may be a single exercise.

DETAILS OF SURVEYS

Manhole Survey

Manhole surveys are usually carried out by a specialist contractor if the survey work is in large quantity ie. to collect data for catchments where existing data is insufficient. The specialist contractor would be appointed either by competitive tendering or via a Term Contract. If the work is of a small quantity eg. to carry out a sample check of existing records, then the work could be carried out by a trained "in-house" team from the Agent Authority or Consultant.

The document giving guidelines, specifications and method of measurement for manhole survey work is the Model Contract Document for Manhole Location Surveys and the Production of Record Maps published by the WRc. and promoted by the Water Authorities Association (WAA).

Safety is of prime importance for all work in connection with sewer surveys and should be the topic of a separate paper or discussion. Traffic safety and plant safety should be considered in addition to the live-sewer ie. Confined Spaces, safety requirements.

Condition Survey

Survey work to establish the internal condition of existing sewers can be by either remote control (CCTV) or man entry surveys and is usually carried out by a specialist contractor. The specialist contractor would be appointed either by competitive tendering or via a Term Contract.

The document giving guidelines, specifications and method of measurement for CCTV survey work is the Model Contract Document for Non Man-Entry Sewer Inspection published by the WRc. and promoted by the Water Authorities Association (WAA). There is a similar document for Man-Entry Inspections.

In addition to the collection of data required for manual Sewer Classification many sewer inspection contractors now use computer software for formatting the data and also for carrying out computerised classification and creating databases for model building etc.

Ancillary Survey

The survey of sewer ancillaries is an important part of the data collection process for a DAP as it is the simulation of ancillaries which causes the most concern during model verification. Records may be available for ancillaries such as pump stations, overflows, tanks etc. but additional survey work may be required.

If the data collection is relatively uncomplicated eg. level survey of an overflow, then the work could be part of the manhole survey. However, a specialist input may be required eg. a drawdown test for a pump station.

Flow Survey

The measurement of in-sewer flows and associated rainfall data is required for verifying the "predictions" of the computer model. The collection of Flow Survey data is carried out by a specialist contractor appointed by competitive tendering or via a Term Contract.

The document giving guidelines, specifications and method of measurement for Flow Surveys is the Model Contract Document for Short Term Flow Surveys published by the WRc. and promoted by the Water Authorities Association (WAA).

The term "short term" is normally five weeks for data collection. However, this is weather dependent and hence the time scale could be extended. It is prudent to avoid the drier months from December to February when planning a Flow Survey. It is also prudent to plan the survey once the model building is well underway.

Impermeability Survey

The measurement of impermeable areas is usually carried out as a desk exercise. 50% of the areas are measured off a 1:1250 scale Ordnance Survey Plan and this sample is then applied to the remainder of the catchment. It is often necessary to check the areas on-site to trace illegal/irregular connections to separate or partially separate sewerage systems. The Impermeability Survey contractor will do this by lifting manholes and inspection chambers and checking with householders etc. to locate such connections.

The work would be carried out by a specialist contractor/consultant who will provide data for direct input into the SSD File.

CHECKING OF DATA

It is prudent to check both data which has been collected from the Field Surveys and data which has been supplied by others. As discussed above, the preferred option could be a multi- thousand pound scheme and hence the assessments should use data which is as accurate as possible.

Quality Control (QC) checks fall into two main categories :-

- (a) QC checks which are set-up as an integral part of the Field Surveys eg. manhole surveys, CCTV surveys.
- (b) The cross checking of an item of data available from more than one source eg. a pipe diameter would be recorded both as part of a CCTV Survey and as part of a Flow Survey.
- (c) Checks on the accuracy of critical items of data eg. overflow spill-levels, pump station data

For the surveys using the WRc/WAA Model Contract Documents, the specification, tolerances and QC procedures are defined in the document. For the cross checking of data from different sources, Table III summarises the primary source of the data and possible sources of cross reference. The table is intended for use as an "aide memoire" and is not intended to be exhaustive or applicable to all DAP's.

Quality Assurance (QA) can be confused with QC. when in fact QC is part of QA procedures. In the Synopsis to CIRIA Report 109, QA is defined as "all activities and functions concerned with the attainment of quality". The basic framework for the application of QA in civil engineering is available via BS 5750. It should be noted that BS 5750 is designed with factory production in mind but can be used for civil engineering practice with only minor amendments.

TABLE I

PHASE	DESCRIPTION	USE	SOURCE
1	Pipe Data	Master Plan	Sewer Records: DAP (Manhole Survey)
	Manhole Data	Master Plan	Sewer Records: DAP (Manhole Survey)
	Traffic Data	Critical Sewer Analysis	Highway Authority or Agents.
	Soils Data	Critical Sewer Analysis	Local Authority
2-A	Pipe Condition	Structural Assessment	DAP (CCTV Survey)
	Trade Effluent Data	Pollution Assessment	Local Authority or Water Company
2-B	Pipe & Manhole Data	SSD File	DAP (see Phase 1)
	Ancillary Data	SSD File	DAP (Ancillary Survey)
	Impermeability Data	SSD File	DAP
	Soils Data	PCD File	User Notes
	Sewer Flows & Rainfall Data	Model Verification	DAP (Flow Survey)
	Flooding Data	Historic Verification	Local Authority; House to House Survey
3	Water Quality Data	Develop Options	Water Company or NRA
	Development Data	Future Flows	Local Authority

TABLE II

DESCRIPTION	FROM RECORDS	FROM OTHER SOURCES	FROM FIELD SURVEYS
Pipe Data	*		*
Manhole Data	*		*
Traffic Data		*	
Geotechnical Data		*	
Pipe Condition			*
Trade Effluent Data		*	
Ancillary Data			*
Impermeability Data			*
Soils Data		*	
Sewer Flows & Rainfall Data			*
Flooding Data	*		
Water Quality Data		*	

TABLE III

DATA	MANHOLE SURVEY	CCTV SURVEY	ANCILLARY SURVEY	FLOW SURVEY	IMPERMEABILITY SURVEY
Pipe	*	S		S	S
Manhole	*		S	S	
Condition	S	*		S	
Ancillary	S		*		
Impermeability					*
Sewer Flows		S		*	S
Flooding	S			*	S

LEGEND

* Primary Source of Data
 S Secondary Source of Data for "cross-check"

Paper 3 : DAPs - Data Collection from Square One (P Smith, Babbie Group)

M Osborne (HRL) : Am I right in saying that the (NWWL) MH card you showed only allows levels to 2 decimal places?

Answer: Yes, 2 is adequate. It is virtually impossible to level accurately to 3 decimal places in a confined space such as a manhole.

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K Thomas (NRA) : The WAA organisation as such no longer exists. What provision is there for the future of the WRc/WAA documents you showed?

Answer: I don't know, but the documents I showed are fairly recent.

N Orman (WRc) : Rest assured the Sewerage Working Group is still active in these areas.

.....
J Hind (M Barber & Co) : [Addressing M Osborne] Why are you concerned about the number of decimal places on the manhole card?

M Osborne (HRL) : Large diameter sewers with very flat gradients ought to be levelled to 3 decimal places in my opinion.

A Baldwin (I.H.S.) : How would you check the pipe levels?

Answer: They should be checked against the tolerances within the specification, measuring from cover level to invert level.

P Collinson (Stockport B.C.) : There are huge amounts of paper involved in DAP work (eg 1/1250 plans), which often are passed from one organisation to another, or between individuals within one organisation. Have you developed a system for this?

Answer: It's a case of adequate planning at the start of each project.

D Gordon (Strathclyde Regional Council) : The importance of data collection and its quality has been stressed but contractors are very variable. Should there be a national guide for manhole survey quality?

Answer: Yes, quality control is vital; in general you get what you pay for. Recent prices for manhole surveys have varied from £10 to £47 per cover.

M Edwards (Morgan Collis Group) : Flow surveys are usually on the critical path and tend to be done later, whereas would they not best be done at the beginning of data collection?

Answer: You will have to comply with the programme for the survey. Best to delay flow survey until the core of the model is defined to avoid redundant monitors.

S Ball (Fylde B.C.) : Is it necessary always to carry out field survey. Is it possible to verify a model only from historical data?

Answer: Historical data is usually a very variable quality and quantity, should only be used as precursor to flow survey.