MAPPING AND MAP MAINTENANCE
SIMPLE METHODS THAT WORK

Paul D. Brooks
Project Engineer

U.A. Cablesystems of Michigan / U.A.C.C. Midwest, Inc.
Grand Rapids, Michigan

ABSTRACT

An introduction to maps and map maintenance for the technical and non-technical C.A.T.V. professional is presented based on experiences gained in the development of methods currently in use in a medium size cable system.

User groupings are presented and catagories of maps are described. The production of one catagory, general purpose design maps, is expanded upon. Reproduction and distribution of these maps is discussed.

Map maintenance is an important and often overlooked aspect of a mapping system. A method is presented for ongoing information gathering and reporting, with techniques for maintaining the accuracy and currency of the maps. One follows a map through the stages from the need for a change in physical plant to the point at which an updated copy is distributed. Revision procedures are discussed, and an easy to use filing system is described.

PURPOSES OF MAPS

Why do we need maps? Who uses them? What for? C.A.T.V. maps can be grouped into five basic user catagories. Accurate maps are a requirement of field technicians for use in troubleshooting, preventative maintenance, and quality control. Customer service operations and installation departments need maps to answer questions of serviceability and provision of adequate signal to subscribers. Engineering uses maps for plant design and costing, analysis of performance, and examination of system upgrade options. Construction uses maps for permit applications, initial plant build, continuing maintenance, and for efficient locating and marking of underground facilities in response to staking requests. Maps aid management in determination of property taxes, pole ownership and attachment fees, and general record keeping.

TYPES OF MAPS

Several types of maps are necessary to satisfy the above requirements. Here is a list of commonly used types:

Trunk block diagrams: field & office sizes.
Key maps: maps used to find other maps.
System powering maps.
Property line maps: for permit applications.
Intertie & interceptor (supertrunk) maps.
Project maps: to show detail in dense areas such as apartments and mobile home parks.
Trunk and distribution maps.

The trunk and distribution maps are used every day in the field and office. These general purpose design maps will be the main topic of this discussion.

CHARACTERISTICS OF GOOD MAPS

General purpose design maps must satisfy the needs of the five user catagories previously mentioned. The information shown must be reliable and up to date. The maps must be easy to use, convienient, and readable. They should be cost effective in the long term. Map sets need to be accessible to all users. These desirable characteristics can be provided by use of durable originals in conjunction with an inexpensive duplication process. The trunk and distribution mapping method presented here has these qualities, and fulfills the needs of all user groups.

MATERIALS AND TECHNIQUES

The basis of a good mapping system is a set of durable originals. These are produced on heavy (five mil) drafting film, single or dual matte finish. Pre-cut sheets are used rather than roll stock, to facilitate easy reproduction and storage. Permanent notes and line work are drafted in ink, using "rapidograph" pens and the appropriate templates. Lettering must be clearly readable and carefully placed. Hand lettering will suffice, provided the necessary care is taken if reduction is planned.

The sheets, if connected, would form a grid. A four digit numbering system is used, with sheet number 5050 near the geographic center of the service area. The rectangular sheets are long in the east - west direction. The first two digits indicate row, and the second two column. When the maps are in order, two consecutive pages in the book share the longer of the two match lines.

PRODUCTION OF FIRST ORIGINALS

A. Preparation

The first step in producing a map set is to obtain the source maps for background work. The best source maps are "tax atlas" maps, of which copies can usually be purchased or leased. If these are not availiable, bluelines can sometimes be obtained from local utility companies, governments, or civil engineering firms. These may not be to scale, or may have a scale larger than 100 feet to the inch, requiring reduction to that scale before production of the first originals. Previous C.A.T.V. system maps can be used if they were drawn to scale, and if background information (streets,etc.) is still valid. Aerial photographs can also be used, but scaling inaccuracies and lack of property line information make them less desireable. The source maps will determine the working scale. It can be 100 feet to the inch with later reduction, or at the final scale of 200 feet to the inch.

Before background drafting begins, a master sheet of film is produced. On this sheet are drafted the border line, match lines, north arrow, and legend with places for map number and revision dates. Copies of this master are printed on sheets of drafting film to form the blanks of the first originals.

B. Background

To begin background work, start with sheet 5050. Letter in the sheet number and matching sheet numbers on the film blank. Place the film over the source map(s). Partial or multiple source maps are used to cover the approximate 1800' X 3000' area of each sheet. Trace the right-of-way (R.O.W.) lines, or scale them in using centerlines. Here are some typical street widths:

Residential streets	60' or 66'
4 or 5 lane feeder streets	80' to 120'
Divided highways	120' to 200'
Expressways	200' and up

The scale can be stretched or compressed slightly so that plant information does not have to be drawn directly on top of match lines. Street names are then drafted in bold ink far enough away from R.O.W. lines to allow for strand and underground routing and footages.

Franchise boundaries need to be shown precisely. Both sides of the boundary are labeled. R.O.W. lines and franchise boundaries overlap match lines only to border lines -- not into margins or duplication allowance. Show lakes, rivers, and other natural features. Show locations and names of schools, apartments, etc.

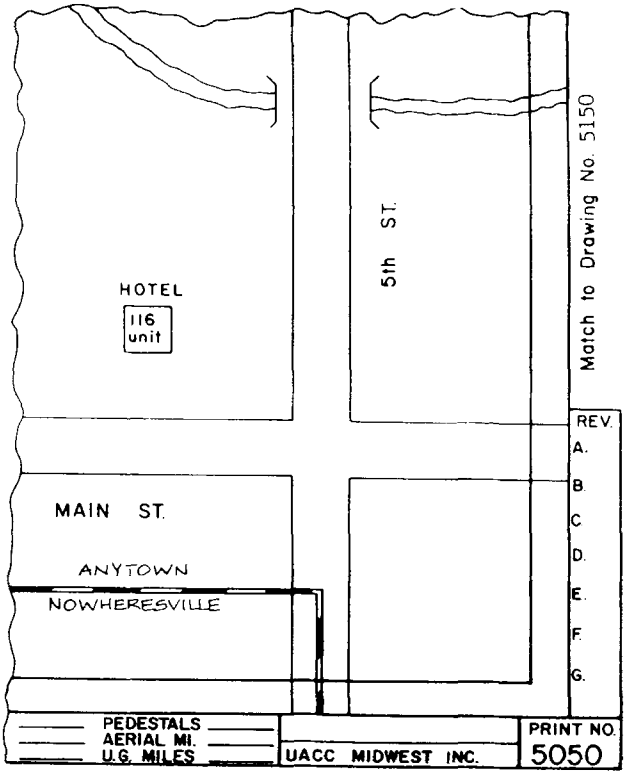


Figure 1. - Background

This drafting process is repeated for each sheet until the entire area is covered, corresponding to the grid. Bluelines can now be run so that field work can be accomplished, and/or information from old maps can be transferred.

C. Strand

The following process assumes all needed field information has been gathered. Draw in poles, pedestals, manholes, etc. on the background originals in their approximate scale locations. These items must be shown outside of the R.O.W. lines. The scale is stretched or compressed slightly to accomodate curves and intersections. Be careful not to draw on top of match lines -- choose one side. Complete all strand information beyond match lines to border lines. Connect poles with solid lines for strand, and use dashed lines for underground routes. Draw in anchors, span guys, and street and driveway bores. Letter in footages large enough for clear duplication and reduction, but small enough to avoid clutter. Show footages on the "field" side of strand or routing. Again, do not letter on top of match lines -- choose one side. Note riser pole locations. Do not include up and down in footage measurements.

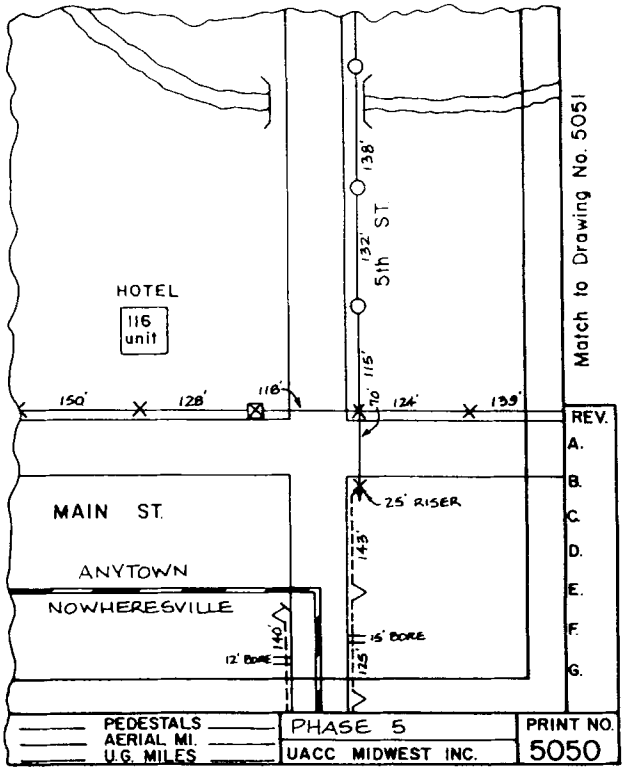


Figure 2. - Strand

D. Subscribers / Notes

Draft the number of potential subscribers next to each possible tap location. Draft a zero if there are no potentials. Letter in notes for feed points to apartments, schools, future developments, etc. Indicate name and file reference number if a separate project map is needed. Letter or use symbols for non-standard signal requirements such as "long drop" or "6 sets" etc. Some or all of the strand map items can be counted and added to the legends of each sheet if desired.

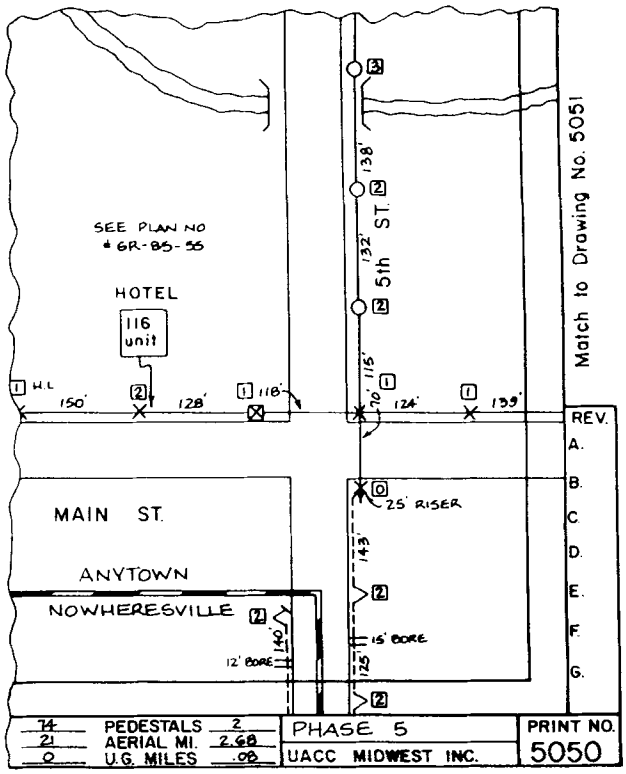


Figure 3. - Subscribers / Notes

The entire process of producing strand originals can be accomplished by a contract mapping company. Many contract mappers will customize their product to the needs of individual operators.

PRODUCTION OF FINAL ORIGINALS

A. Duplication / Reduction

After the strand originals have been completed, a reduction and/or duplication process is performed by a local reproduction house. This step tends to be expensive; but since it only needs to be done once, the professional quality makes it worthwile. Have the jobber prepare sample results before providing him the entire set. The resulting maps will be 11" X 17" on heavy film. The background, strand, and subscriber information is produced on the back side of the film. This will permit erasure of the design information (drawn on the front side) without damage to the strand information.

When the process is complete, obtain all originals (and negatives if photo-reduction is used) and keep them on file for future use. Usually strand and background information will change very little. Have additional film copies made of maps which contain phase or franchise boundaries so that multiple sets of originals can be placed in separate files. Also obtain additional film copies to be used for separate intertie and interceptor trunk sets.

B. Design Information

After the 11" X 17" strand originals have been prepared and duplicated, design information is drafted on the front side of the film. Cables, amplifiers, passives, and taps are drafted between R.O.W. lines as much as possible. These items are shown only up to the match lines. If trunk and distribution cables are both present, draw trunk cable closest to strand or routing if possible. Power supplies and amplifier set-up information are drawn between streets to avoid clutter and improve readability.

Show local trunk and distribution only. Thru trunks, institutional cables, interties, and interceptor trunks should be drawn on separate original sets. Since small lettering items such as tap values will not have to undergo reduction, the readability of this information on the final prints is assured.

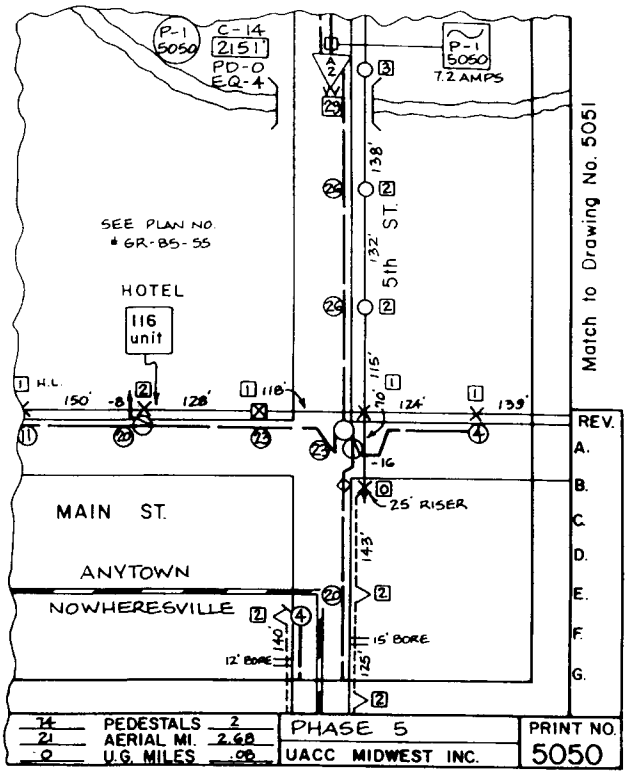


Figure 4. - Design Information

MAP SETS

Once drafting of the plant design is complete, phase boundaries can be added. If the maps are to be divided into separate sets by trunk phase, film copies of the strand originals are used for all sheets showing phase boundaries. The plant design is drafted on these copies to allow the phase sets to be filed separately. Paper print sets can now be made on an inexpensive blueprint machine or xerographic-type copier capable of the 11" X 17" size. Print sets are made for each field tech and the staker, and a set is provided for shared office use by other departments and staff. The map sets are bound into books which are small enough to handle and store easily in the front seat of a vehicle.

MAP MAINTENANCE

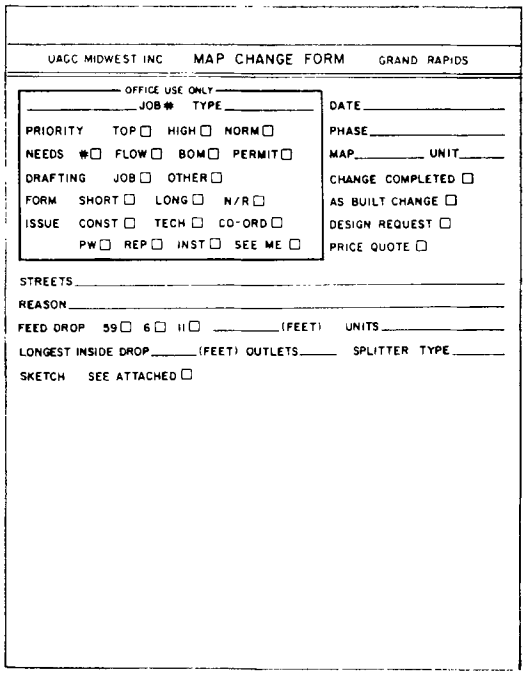
Much effort and expense goes into producing good system maps. If these maps are not properly maintained, this expense may have to be repeated after only a few years. The succession of neglect and re-mapping produces unreliable maps and high life cycle costs. Fortunatly, this circle can be broken by use of continuing revision and distribution coupled with a means of capturing data on plant changes.

A. The Map Change Form

To capture this data, a "map change form" is used. This multi-purpose form is made availiable to all field personnel. To use this form, the field person fills out the blanks provided for date, trunk phase, map number, and his unit (radio) number. If he has made a change in the plant, the change completed box is checked off. If the existing plant was found to be different from the map, the as built change box is checked. If design work is required to provide more signal or solve other problems, the box marked design request is used. If a customer has requested service and a plant extension is needed, the price quote box applies.

The address, street, and cross streets can be written on the line marked streets. If an explanation is required, a note such as "splitters at pole" is written on the line marked reason. A line is provided for the field person to describe drop cable types and lengths with blanks for the number of dwelling units and outlets per unit. This is particularly useful for prewire situations. The bottom half of the form has a space for a sketch, with a check box see attached if a copy of a system map is provided instead of a sketch. If signal level readings were made, they can be written on the sketch or map copy, near the device measured. A section marked office use only is provided to aid communications between the designer and draftsperson, if the department consists of more than one employee. This section allows the form to function as a cover sheet for the paperwork related to this particular job.

Since the main purpose of this form is to capture field data, accuracy and frequent use are stressed. Neatness and completeness are encouraged, but are of secondary importance.


UAGC MIDWEST INC MAP CHANGE FORM GRAND RAPIDS

OFFICE USE ONLY
_____ JOB# TYPE _____

PRIORITY TOP☐ HIGH☐ NORM☐
NEEDS #☐ FLOW☐ BOM☐ PERMIT☐
DRAFTING JOB☐ OTHER☐
FORM SHORT☐ LONG☐ N/R☐
ISSUE CONST☐ TECH☐ CO-ORD☐
PW☐ REP☐ INST☐ SEE ME☐

DATE _____
PHASE _____
MAP _____ UNIT _____
CHANGE COMPLETED ☐
AS BUILT CHANGE ☐
DESIGN REQUEST ☐
PRICE QUOTE ☐

STREETS _____
REASON _____
FEED DROP 59☐ 6☐ 11☐ _____(FEET) UNITS _____
LONGEST INSIDE DROP _____(FEET) OUTLETS _____ SPLITTER TYPE _____
SKETCH SEE ATTACHED ☐

Figure 5. - Map Change Form

8 1/2" X 11" Actual Size

B. Workflow

It is important to delegate the responsibility for mapping and map maintenance to an individual or department. Map work is too easily forgotten about if it does not receive prompt attention. The workflow method described herein provides for good map maintenance.

When the design and mapping department receives a map change form, several steps are followed. Here is an example of what typically happens. When a map change form comes in from the field, it is examined to determine if design work is needed. In this example more signal is needed at a pole to provide more tap ports. The system designer calculates an appropriate plant change, and sketches this change on a copy of the system map.

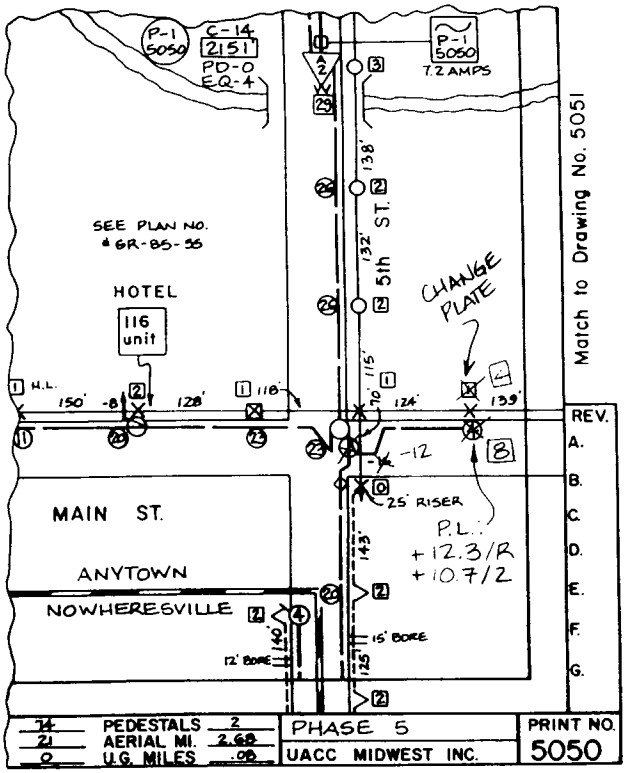


Figure 6. - Design Notes

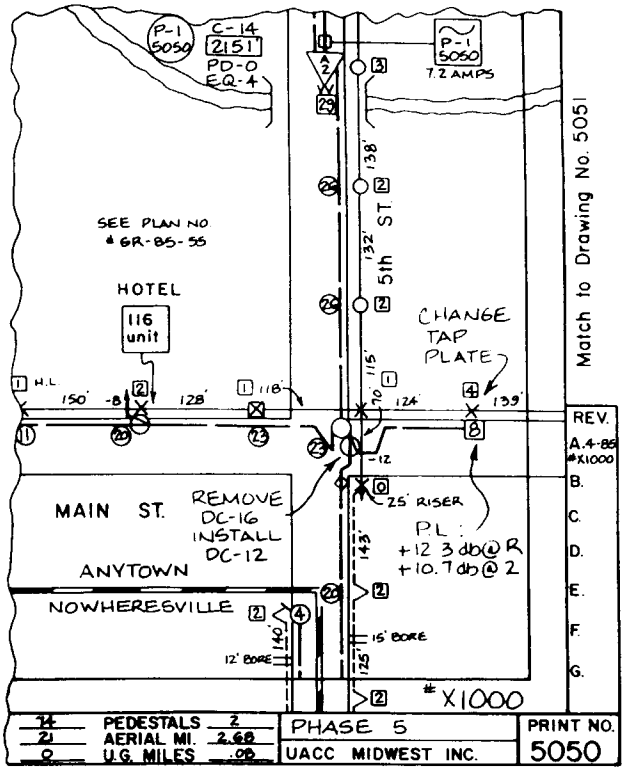


Figure 7. - Construction Notes

This sketch accompanies the map change form to drafting/administration. The 11" X 17" system map original is removed from its normal file and the ink work is altered to represent the eventual plant layout. At this time the revision date is placed on the original in ink. Construction notes are made in pencil to guide field work. A job number is assigned and printed in pencil on the original. It is important to use pencil so that the film will not be damaged later when these notes are removed. When the pencil notes are complete, the original is not returned to its normal file, but instead is placed in a "construction notes" (plans in progress) file. The originals are now ready for duplication prior to issue. (See Figure 7. - Construction Notes.)

Prints of the original with construction notes are made in preparation for issue. The notes that apply to the appropriate department are highlighted on the prints.

Two or more sets of prints are then issued to that department and become scheduled work. The field people who receive these prints have copies of the same sheets in their map books to use for "before and after" comparisions. (See Figure 8. - Issue.)

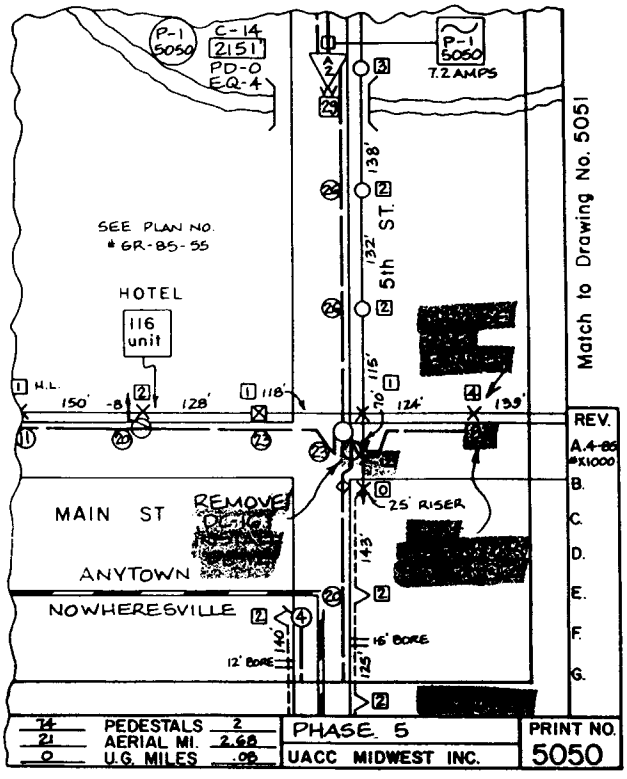


Figure 8. - Issue

When their work is done, they return one set of prints marked "completed", with any field changes noted on the prints. At least one set is retained by that department for use as a reference until revised prints are received. If two departments are involved (for instance construction and technical) the job is re-issued with a different set of notes highlighted on the prints. When all work is completed, one set of prints is returned with signal level measurements noted on them. If these measurements agree with calculated values, the job is considered complete. The mapping person or department then makes a record of job status, and releases the job to subscriber sales if required. If field changes were made in the course of the work, these are checked for correct design, and the original map is changed to represent the actual layout. The original is returned again to the construction notes file.

C. Revisions

Periodically (every three months recommended) all the originals are removed from the construction notes file. Pencil notes and job numbers are removed if work is completed. Prints are then made for all map sets. The originals can finally be returned to their regular files.

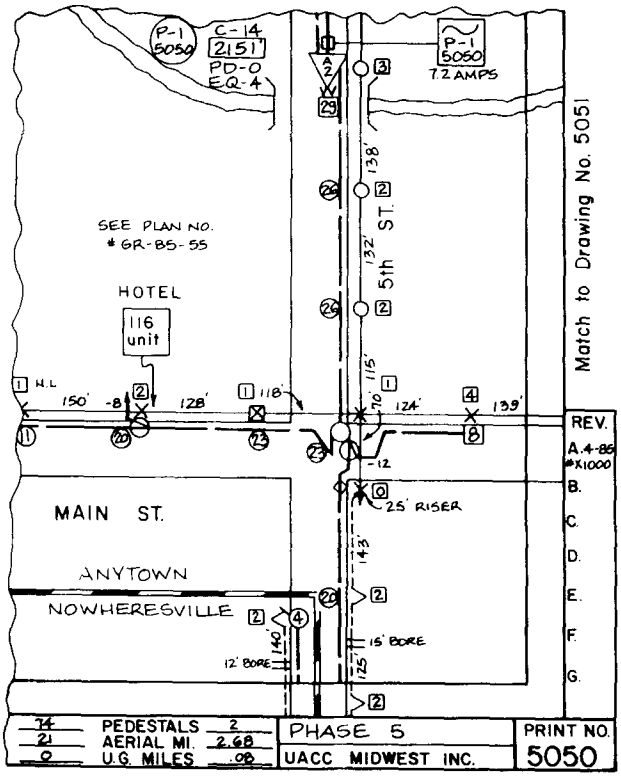


Figure 9. - Revised Map

This filing system requires two sets of storage, but is inherently fail-safe in that no map is ever returned to its regular file without revisions being provided to all users. When a technician or other map set user receives his revised prints, he discards each outdated print and inserts the new one in its place.

A list of map numbers is kept on file showing the most recent revision date of each map. This list is brought up to date each time revisions are run. It is used to check the currency of a map set that is returned, for instance, when an employee is promoted and another is hired as his replacement.

CONCLUSIONS

If these methods are adhered to, the map sets in the field will be accurate enough to be used to re-generate the system map originals in the unlikely event of an office fire or other natural disaster. With proper attention, good maps, like a fine wine, will improve with age.

ACKNOWLEDGEMENT

Thanks are extended to Don Peterson for his encouragement without which this topic would not be presented. Special thanks to Sherie Richardson for her artwork and her assistance in development of these methods.