Sewerage Mapping and Information System

Facility Data Management Sub-section

Sewer Maintenance Section

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1. Introduction

Sewage works first began in Tokyo's 23 municipalities with the installation of the Kanda Sewer in the late 19th century. Implementation of a full-scale sewage system began in the mid-1950s, and 100 percent municipal coverage was achieved by the end of March 2005. By the end of March 2008, more than 15,700km of distributed pipes were in place in the 23 municipalities, supporting urban living from below. Tokyo had been managing its sewer information using hand drawings on Kent paper since 1931, but creating drawings this way for the growing sewage system required a great deal of labor and time and made frequents updates difficult. In 1985, the Tokyo Bureau of Sewerage pioneered the use of information technologies for sewage management in Japan when it introduced SEMIS (Sewerage Mapping and Information System) to administer the massive numbers of drawings accumulating from its growing sewage infrastructure. In 2000, SEMIS was restructured to take advantages of developments in personal computer technologies, making it possible for each bureau office to have its own dedicated computer for accessing SEMIS. In April 2009, the bureau introduced TAIMS (Tokyo Advanced Information Management System), a SEMIS-based system that allows required personnel to access all sewage pipe information.

Example of a public sewer drawing on Kent paper

Fig. 1

2. Background of the Sewerage Mapping and Information System (SEMIS)

SEMIS is a geographic information system (GIS) that brings information from sewage facilities into a unified database for management purposes. The database consists of configuration, attribute and image information. Configuration information consists of facilities data and topographic data, attribute information consists of more than 90 data categories such as pipe diameter, material, year of installation and land manager name, and image information consists of finished drawings and structural drawings for specialized manholes.

A variety of output functions are available to manipulate this information, including configuration search, filing, construction records, standard drawing release, aggregation and SXF data output (a CAD data exchange standard). The configuration search function includes conditional display, upflow/downflow tracking, flow rate measurement, vertical/horizontal view creation and extended area calculation, which has contributed to more efficient planning and design. It is therefore a GIS that can aggregate and consolidate all kinds of information.

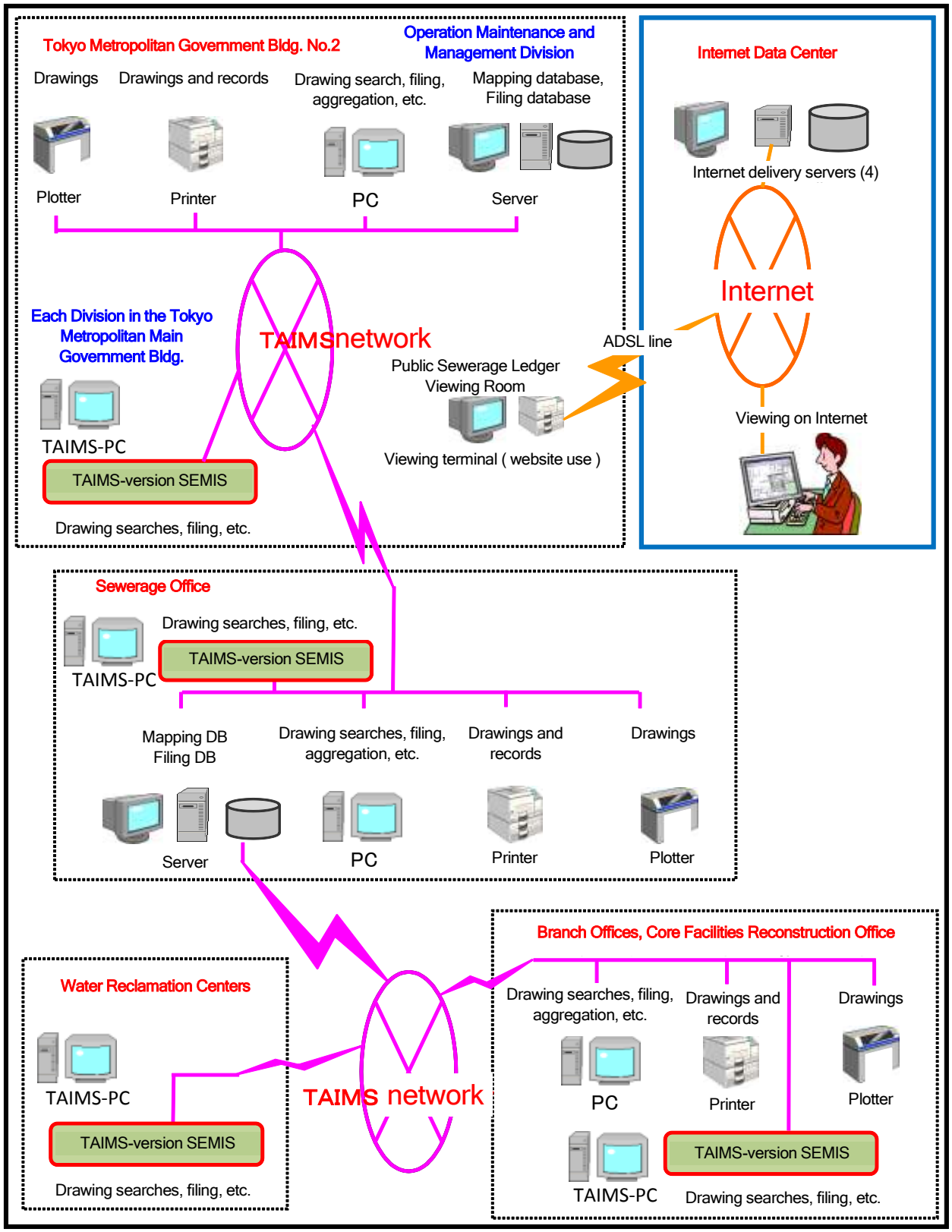
2.1 Development history

The following is the development timeline for SEMIS.

1980: Begin process of digitizing sewer, manhole and construction information data
1982: Begin development of Sewerage Mapping and Information System (SEMIS)
1985: SEMIS completed for midrange computer platform
1986: Full-scale implementation of SEMIS
2000: Implementation of new SEMIS platform for personal computers
2005: Implementation of Internet access for SEMIS
2006: Start of SEMIS SXF data capabilities for construction-site work.
2009: Start of Tokyo Advanced Information Management System (TAIMS) using SEMIS

2.2 Structure of the Sewerage Mapping and Information System (SEMIS)

SEMIS consists of the TAIMS specialized information network for employees called and an Internet-based sewage drawing perusal system.



* Mappong : Sewerage mapping and Information (facility configurations and other facility details)

Filing : Final drawings, information on structural drawings for specialized manholes.

TAIMS : Tokyo Advanced Information Management System

Fig. 2

3. SEMIS Functions

The following examples show screen shots of typical SEMIS functions.

3.1 Drawing Search

This function can be used to search for objects with parameters such as address, sewerage mapping number, affiliated sewerage facility and manhole number.

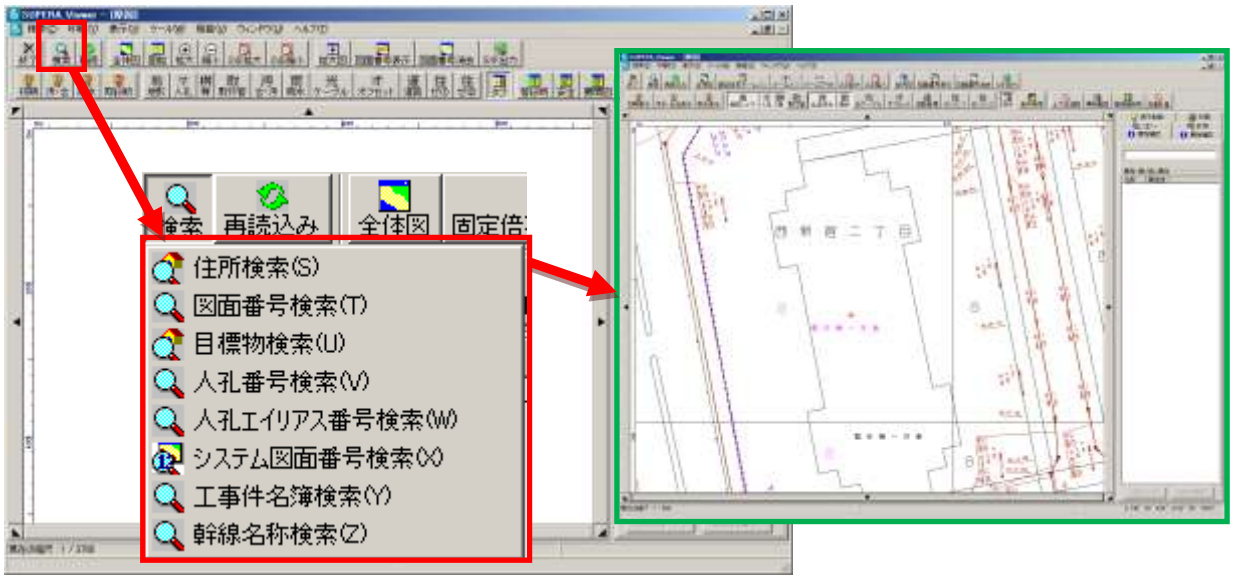


Fig. 3

3.2 Display

Switching between configurations and lead line views is easily done with the Display Control function, accessed through the Switch View button on the toolbar.

3.2.1 Display control

An example of how displays can be manipulated using the example of " Grid / installed pipe data. "

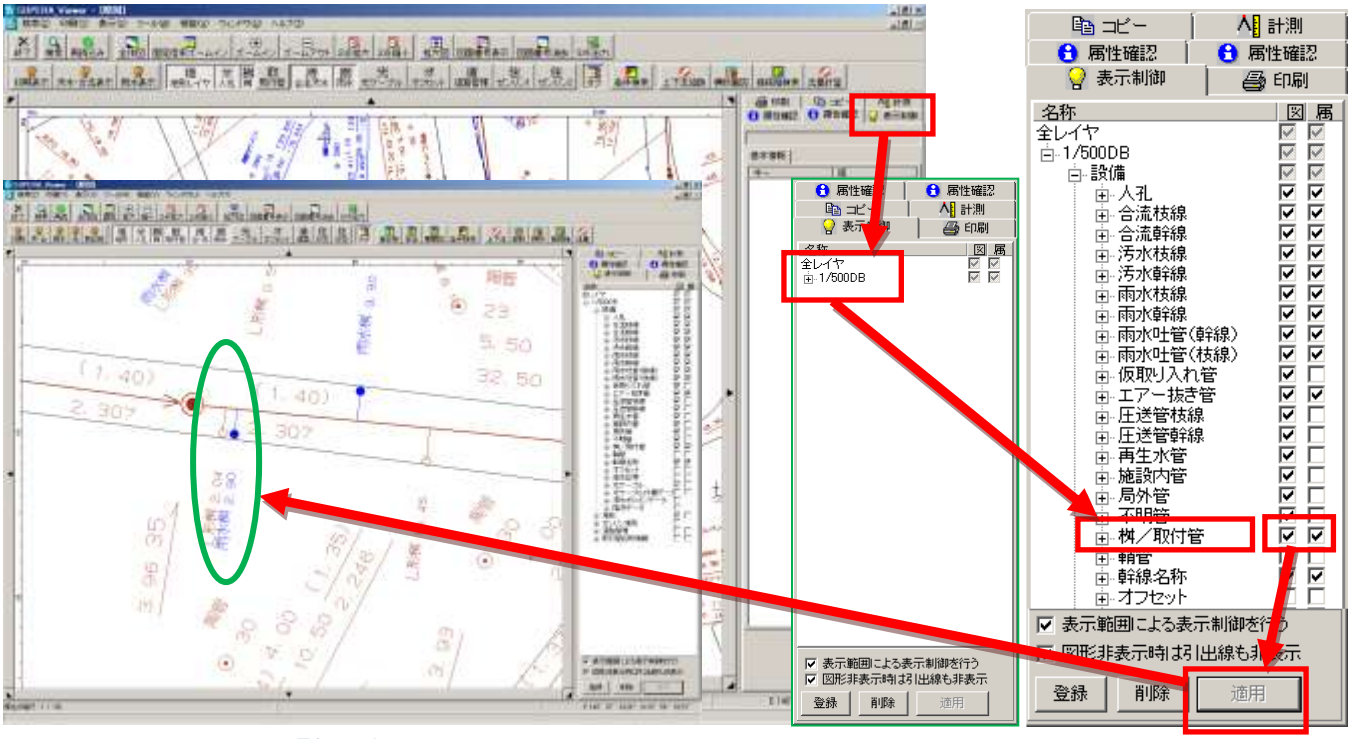


Fig. 4

3.2.2 View switching

An example of view switching for Road Management Center drawings using the Switch View button on the toolbar.

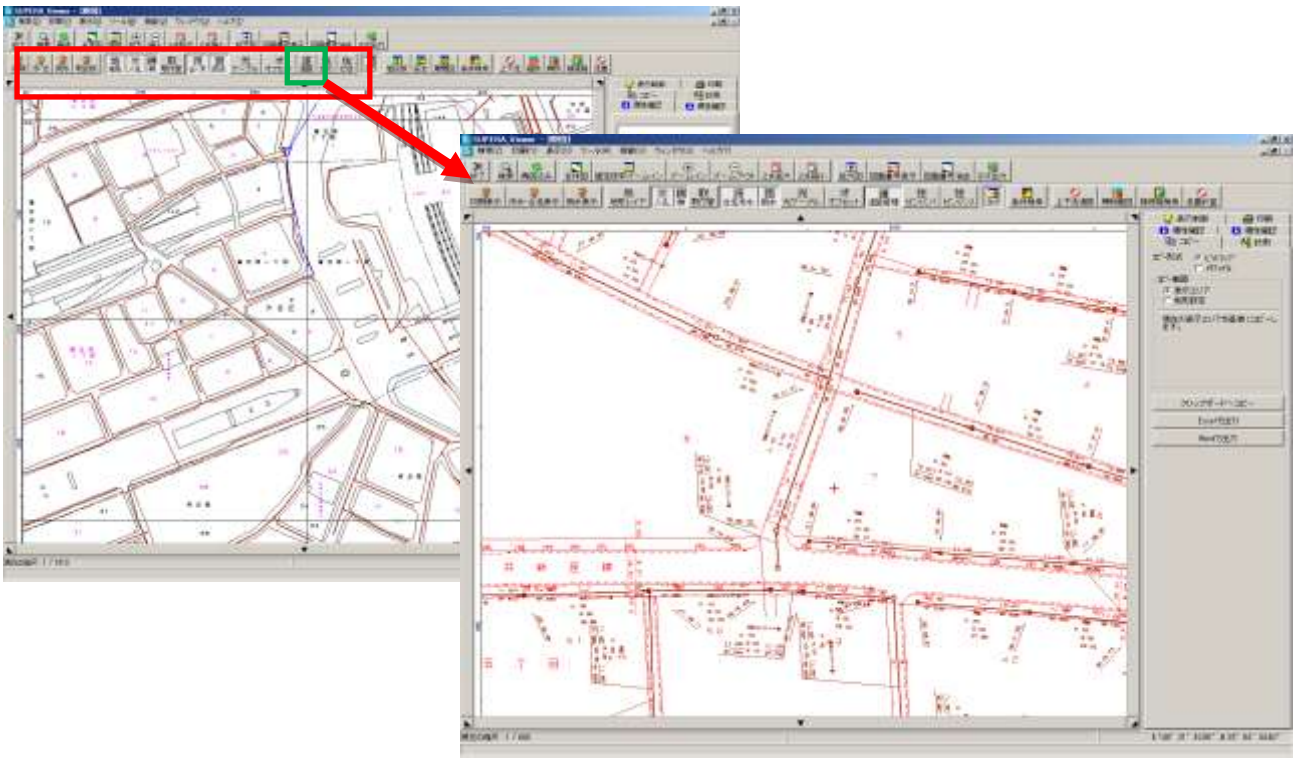


Fig. 5

3.3 Attributes

Clicking on the Confirm Attributes tab allows attribute details to be checked. The example below shows functions associated with selecting a sewer pipe.

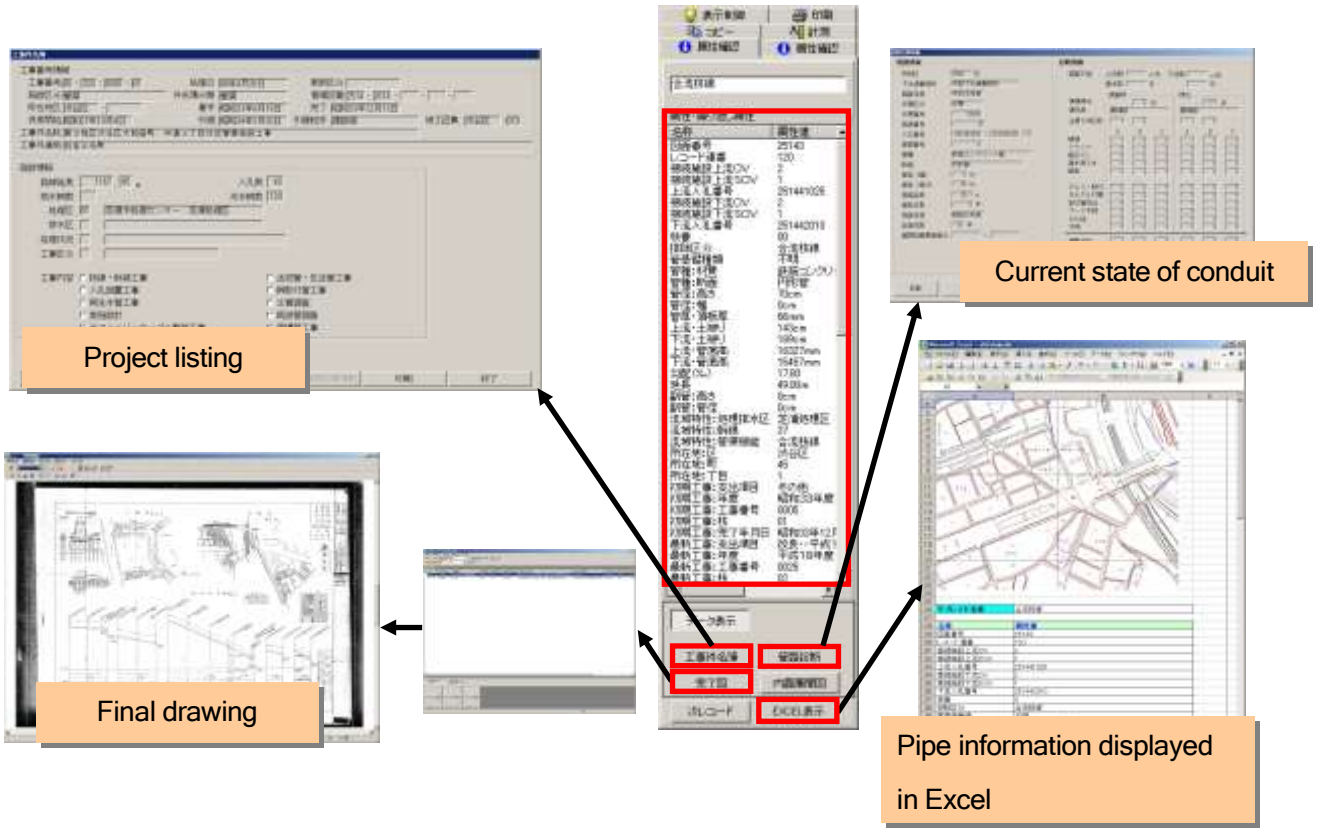


Fig. 6

3.4 Sewage

The Sewage button on the toolbar can be used for upstream / downstream tracking of pipes, flow rate measurements, vertical / horizontal views, etc.

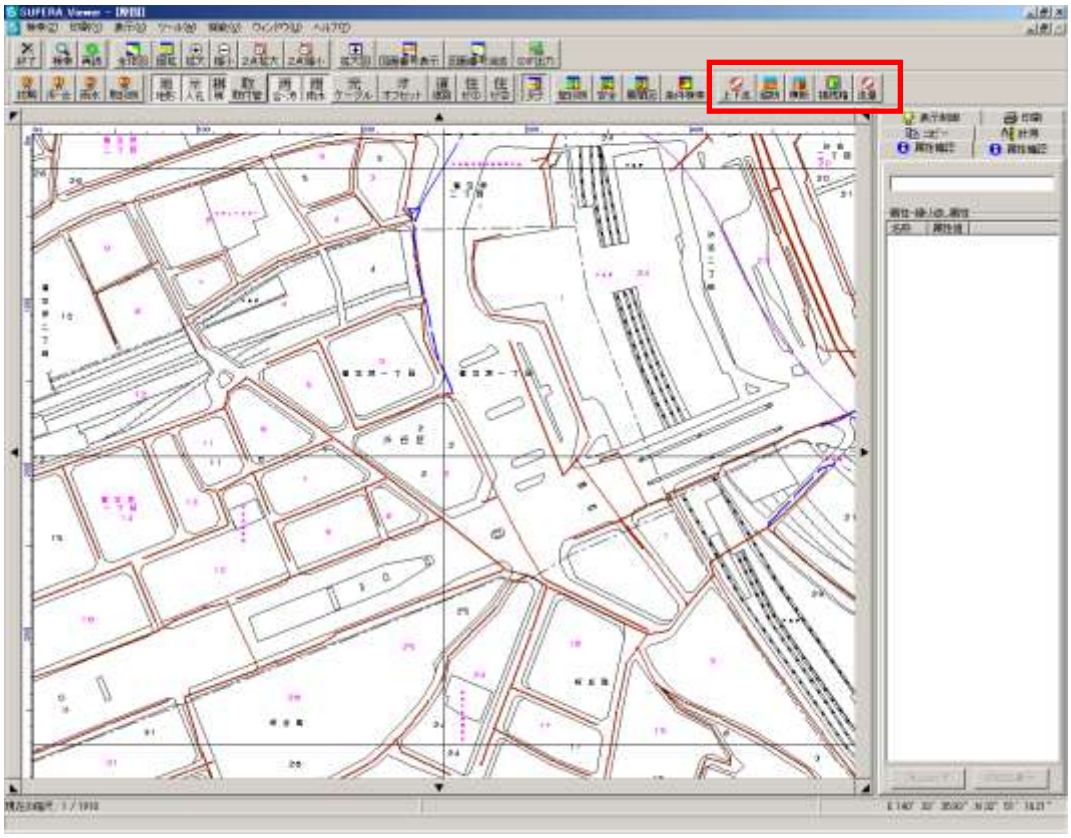


Fig. 7

3.4.1 Upstream / downstream tracking

An example of how the Upstream/Downstream, Tracking button on the toolbar can generate an upstream tracking drawing.

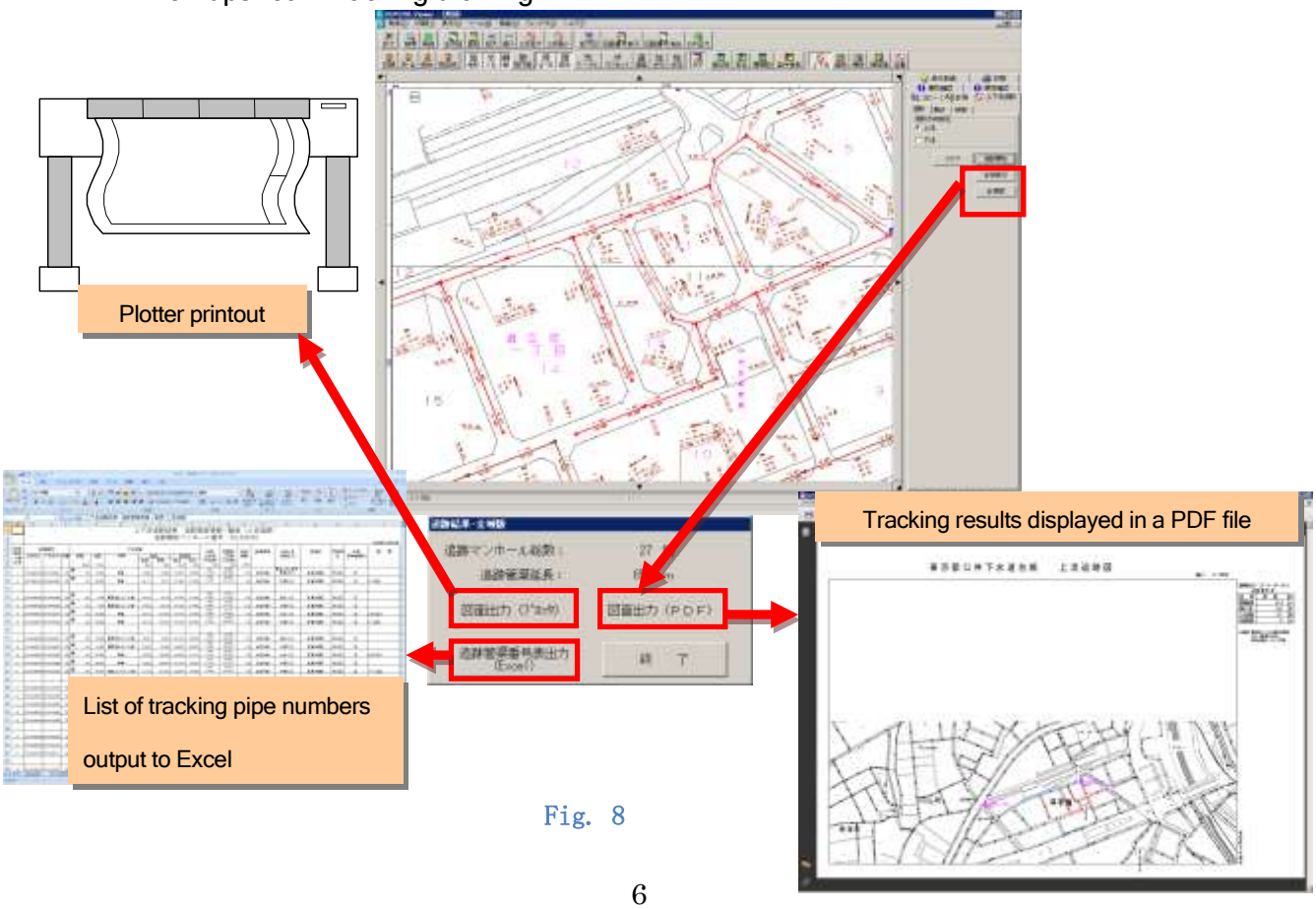


Fig. 8

3.5 Conditional Search

By using the Search by Condition button on the toolbar and applying pre-registered information, the system can separate out results by color.

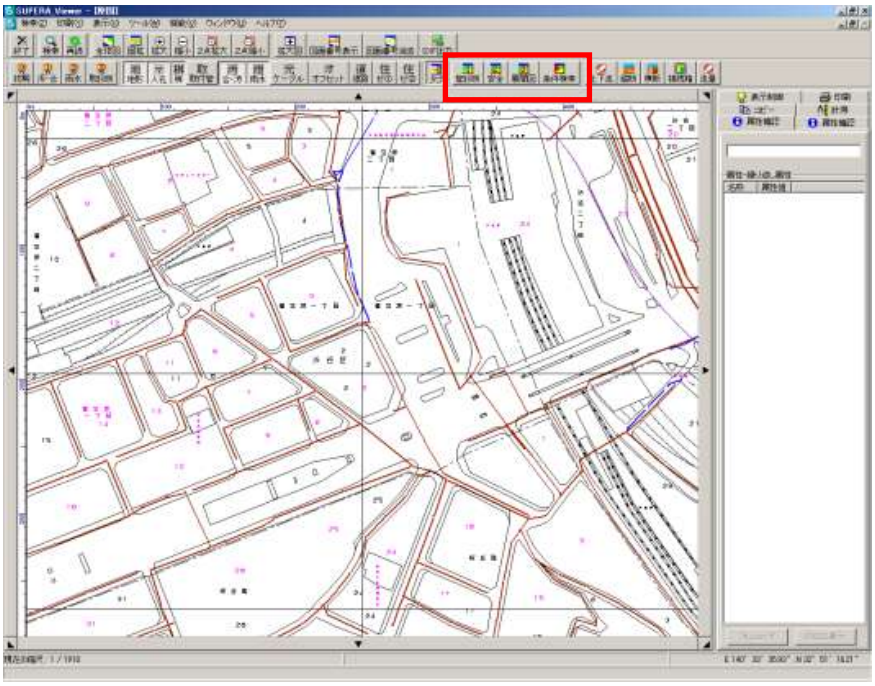


Fig. 9

(1) Separate conditional search results by color

The following example shows use of the Conditional Search function on the toolbar to carry out a specified search and obtain color-coded results. After clicking on the Conditional Search button, the conditional search function is activated via the appropriate tab. Conditions are set in the dialog box and the display generates color-coded results according to the selected specifications.

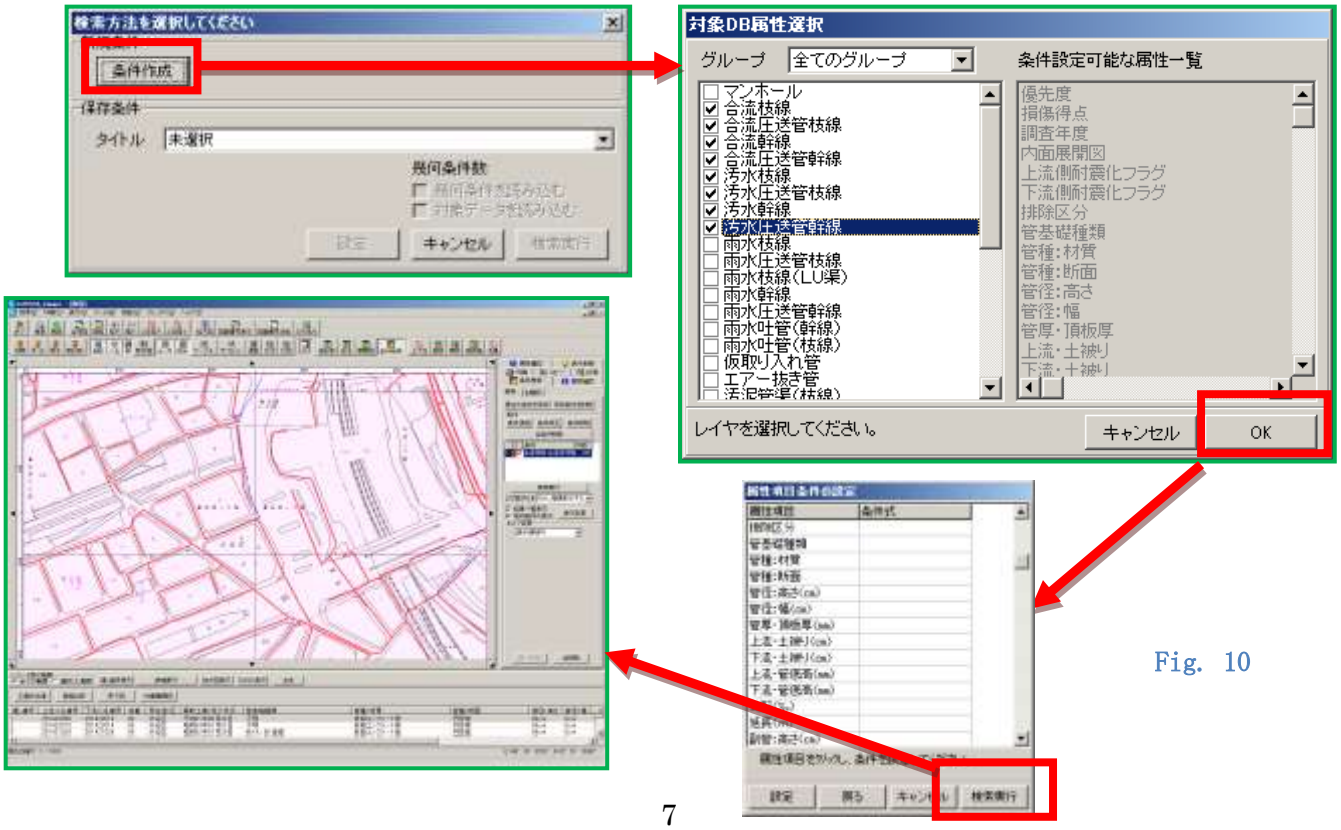
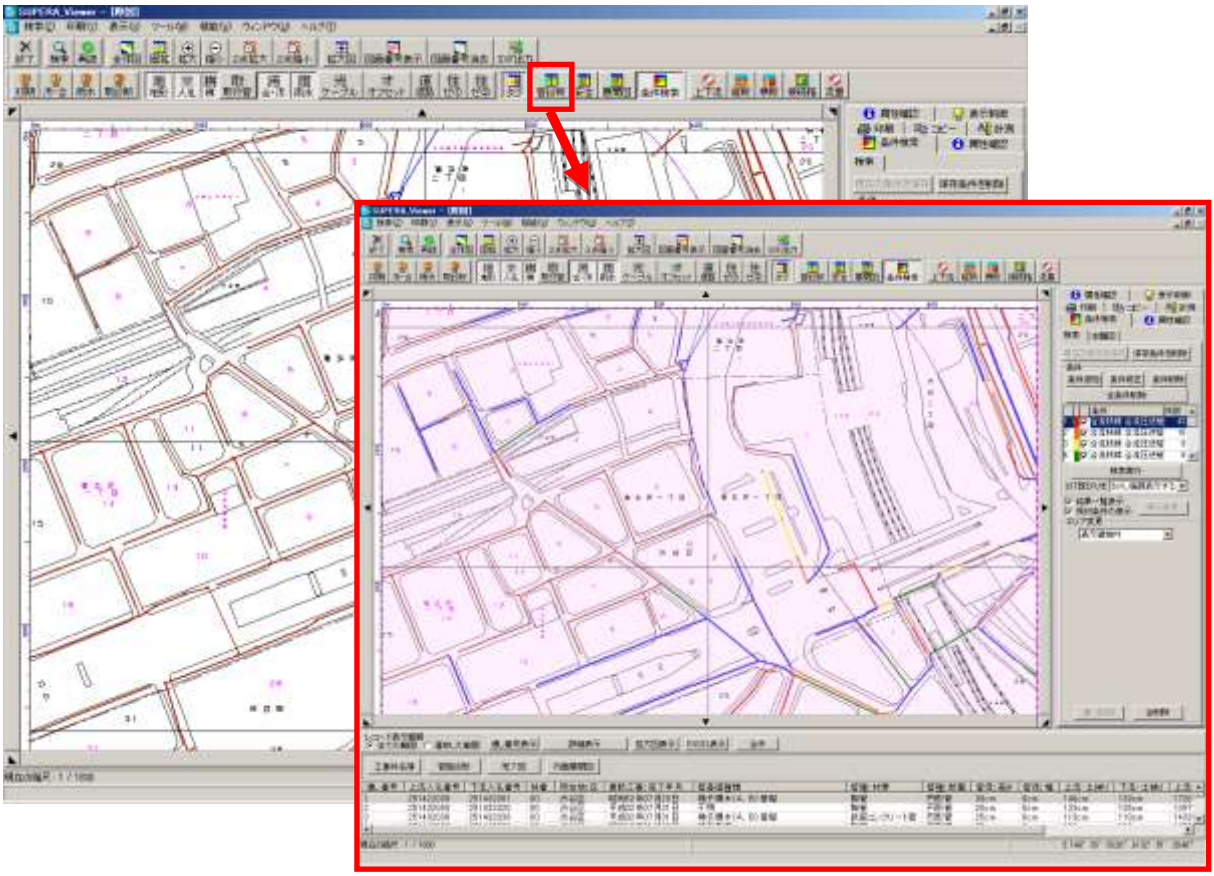


Fig. 10

(2) Separate conduit diagnosis results by color

Conduit diagnosis results can be separated according to color by using the Conditional Search function on the toolbar.



When an arbitrary configuration is specified

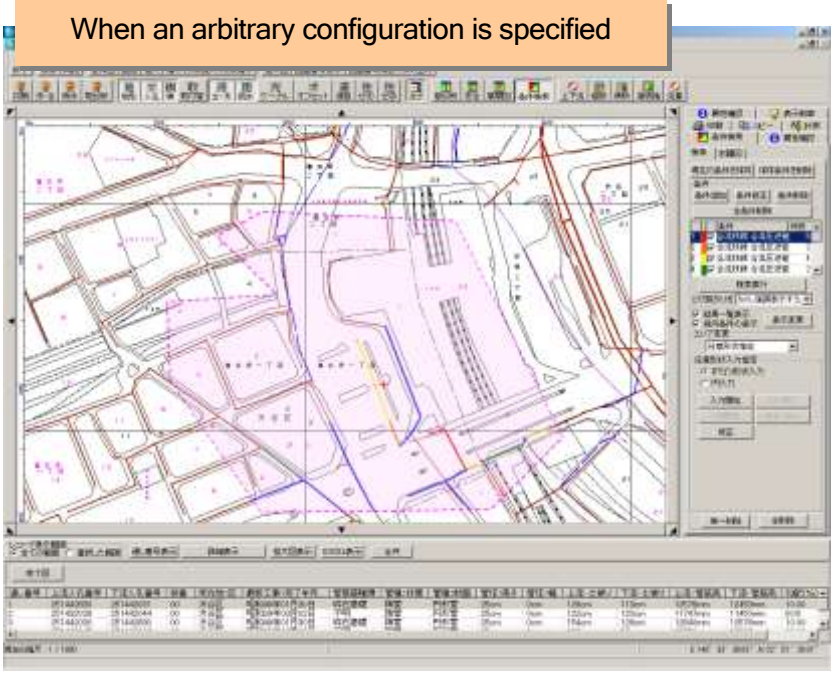


Fig. 11

3.6 Copy to Clipboard

An area selected on a drawing can be copied to the clipboard.

※ Metafile output is also available in addition to bitmap images.

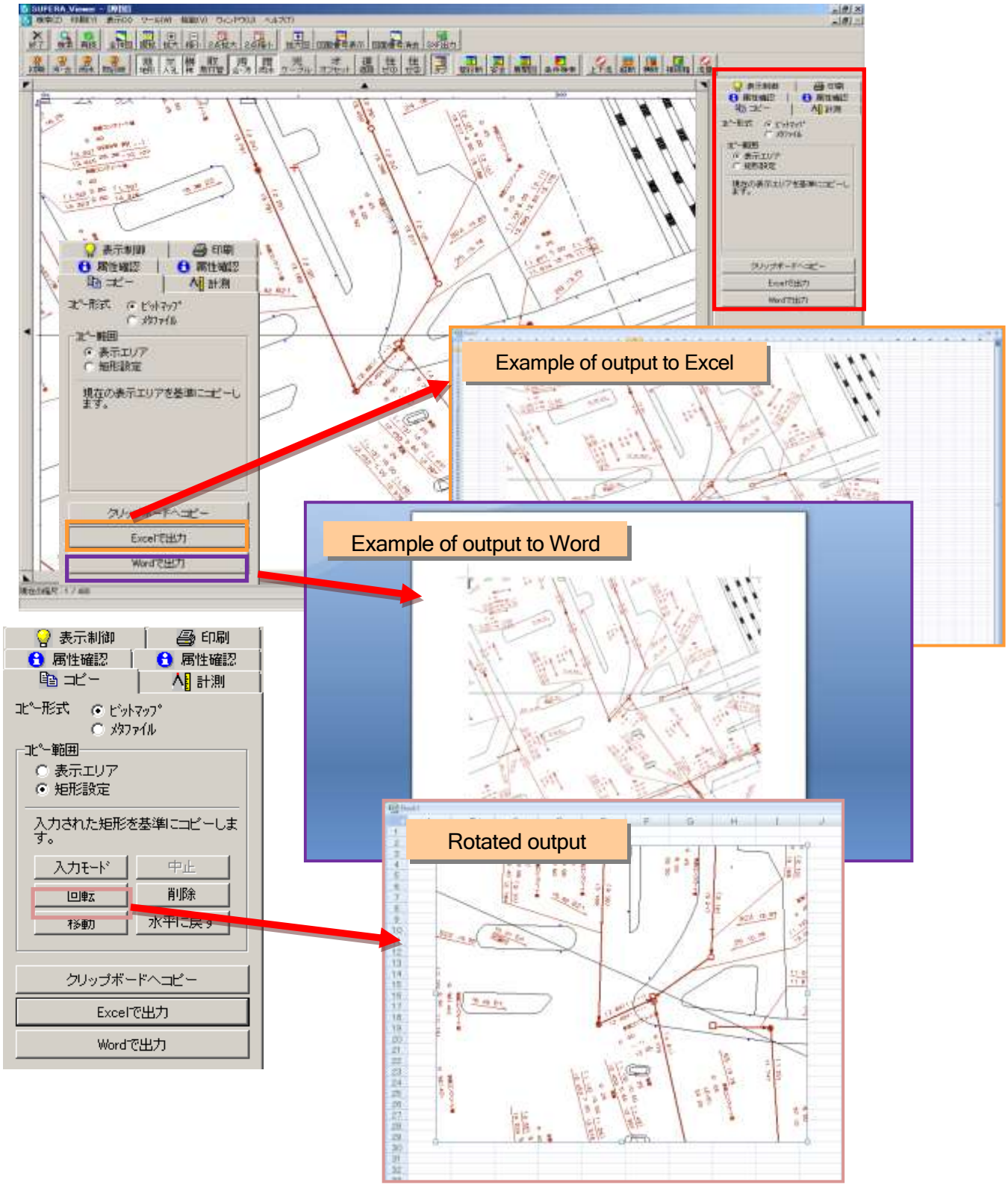


Fig. 12

3.7 Printing and Output

This function supports printing to laser and inkjet printers and plotters, PDF file creation and output of SXF data for CAD use.

3.7.1 Drawing printouts and PDF file creation

Output examples for a drawing printout and a PDF.

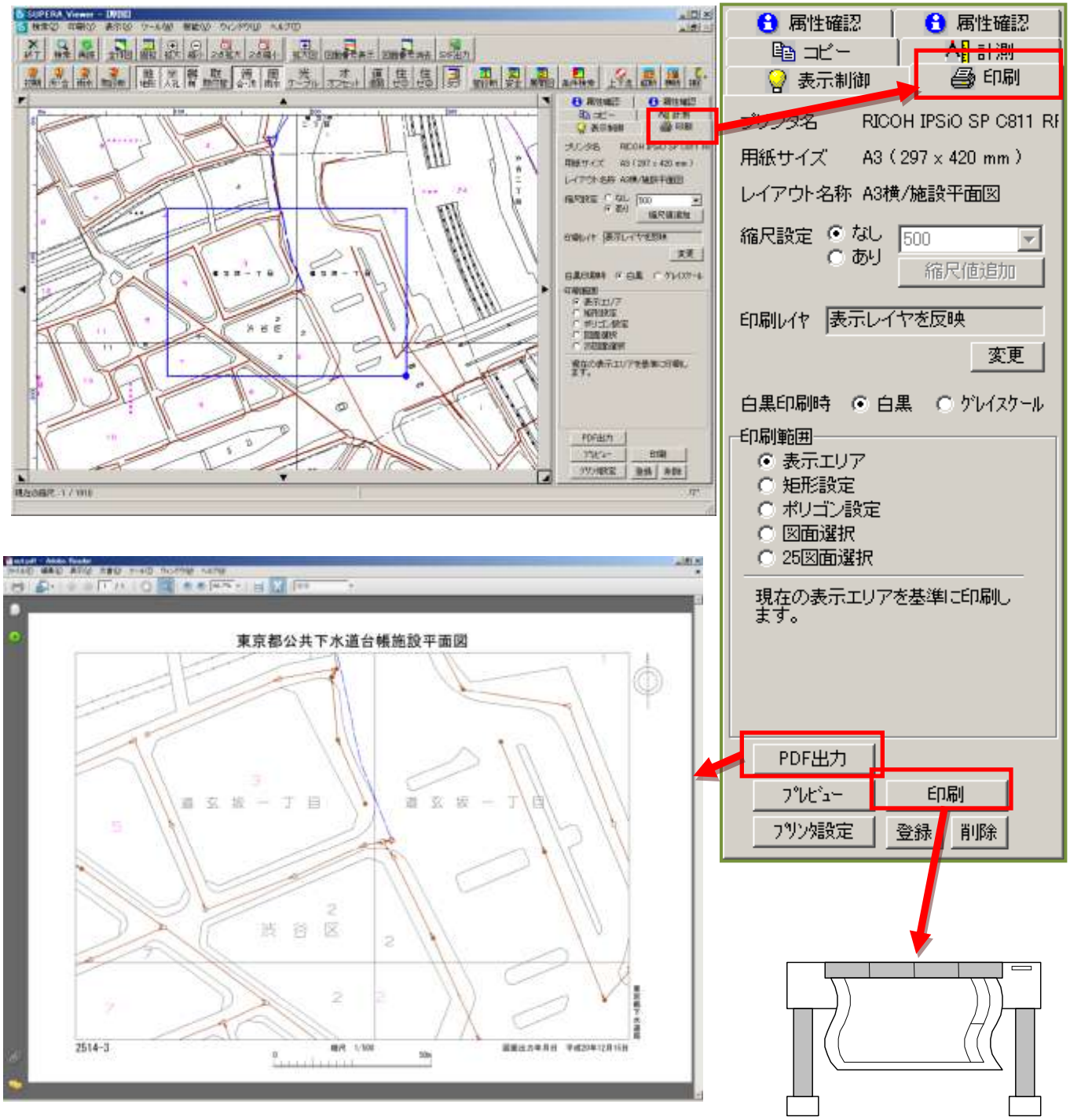


Fig. 13

3.7.2 SXF data output

An example of SXF data output for CAD.

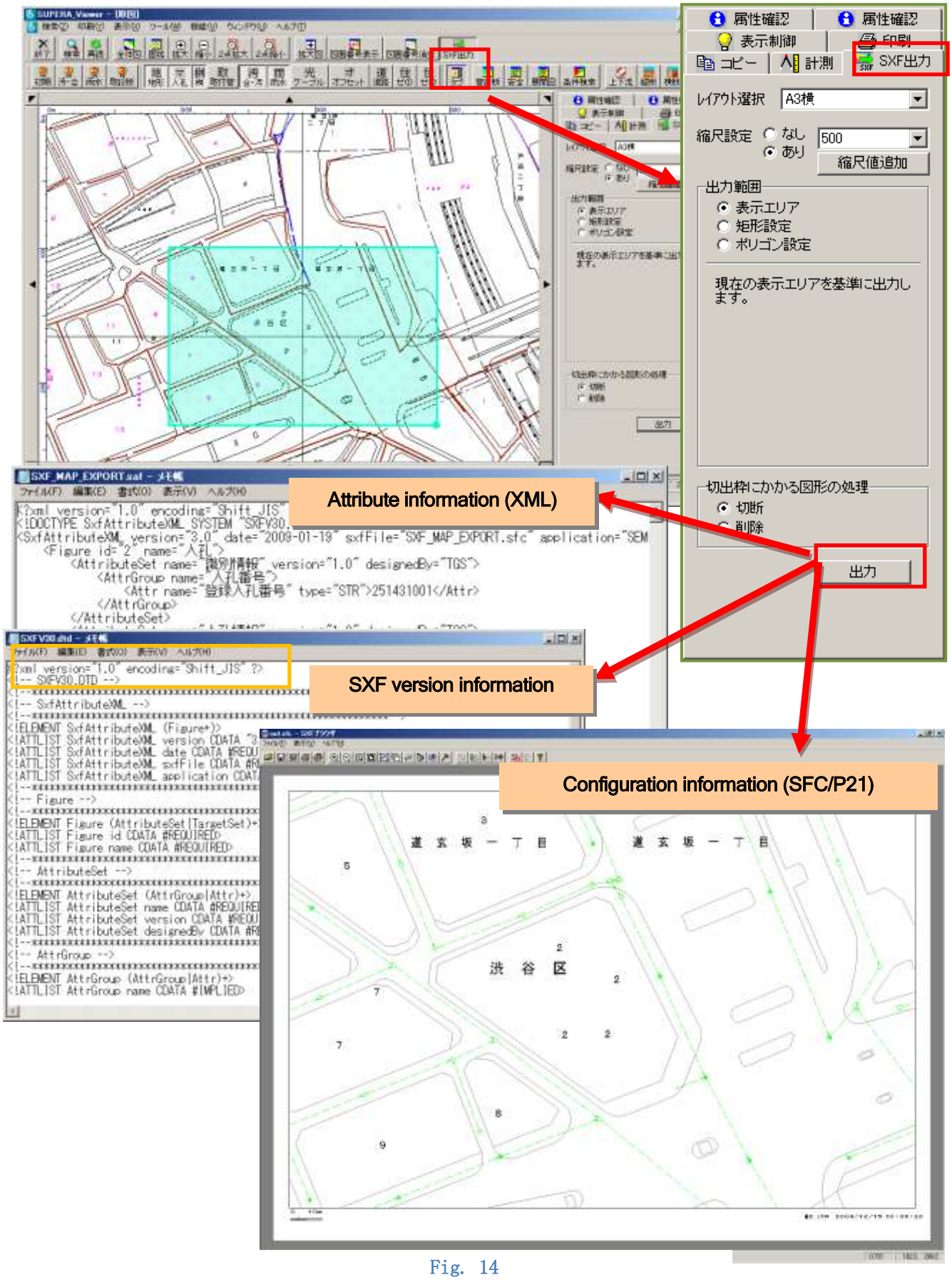


Fig. 14

3.8 Data Recycling of Sewage Mapping Information

In order to make practical use of existing sewage drawings data, the Tokyo Bureau of Sewerage pioneered the use of input/output functions in Japan with SXF Version 3. As of April 2004, sewage facilities information can be output to SXF for use in design and construction, and the finished drawings are returned to the system in a loop that is termed “data recycling.”

(1) Data recycling of CAD-based pipe design system.

An example of existing mapping data being used in a CAD system for pipe design.

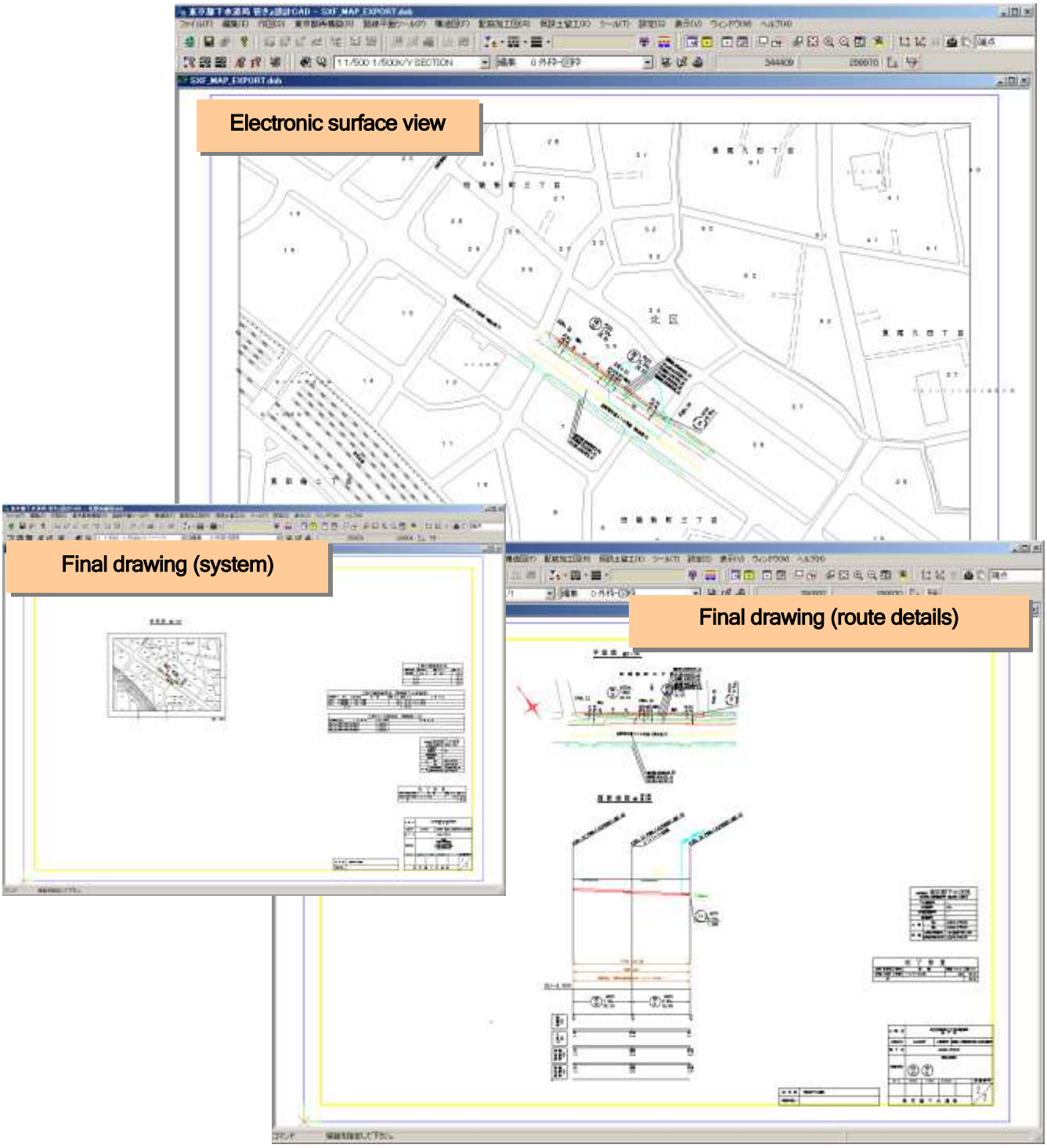


Fig. 15