

5 Programming manual

5.1 GIS Database Application Manual for Ayutthaya Province (for GIS Database Manager)

In the technological world, a digital system is becoming as the supporting tool for decision making system and mapping. At present, the Geographic Information System (GIS) is an effective tool for production, rectification, improvement, gathering, exploration, analysis, and demonstration. It has been applied to various projects because its convenience and fast-and-easy to develop or manage complicated spatial data. The natural resources and environmental problems, in particular, can identify the impact to quality of life both direct and indirect. Consequently, it is properly to use a GIS system for an effective environmental quality management in provincial level.

a. Introduction to ArcGIS

ArcGIS, one of GIS programs developed by ESRI, is high capability to demonstrate, analyze, and manage geographic information. It can apply to a variety of field works and manage a large file with attractive Graphic User Interface (GUI).

ArcGIS 9.2 is latest version which operating under Windows (98/NT2000/XP2002) or higher. ArcGIS's components are ArcView, ArcEditor, and ArcInfo. In case of using any software operation is depended on propose and requirement of each organization. ArcView can view any data running by ArcSDE. In contrast, ArcEditor and ArcInfo can rectify data running under ArcSDE which is Client/Server software for spatial data management in term of DBMS (Database Management Systems). The above three components of ArcGIS are comprises of;

ArcView has ArcCatalog, ArcMap, and ArcToolbox programs which can explore, manage, analyze, and rectify data and create a map.

ArcEditor has all ArcView's functions. It also has additional tool for rectify data as Coverage and Geodatabase.

ArcInfo has all ArcEditor's functions. It also has Geoprocessing and ArcWorkstation (ARC, ArcEdit, ArcPlot, INFO, ARC Macro Language or AML) as an additional tool.

Details of each component are described below.

a.1 ArcView

ArcView has a capability of Data Visualization, Query, Analysis, and Map Creation under Windows operation with a tool for Exploring, Selecting, Displaying, Editing, Analyzing, Symbolizing, Classifying Data, and Metadata.

ArcView's structure is composed of ArcCatalog, ArcMap, and ArcToolbox. It can view data directly to a file or network and web-enabled. ArcView was created from COM (Component Object Model) technology; therefore, the customization and Macros program (Visual Basic for Applications (VBA) or Visual Basic, C++, and Delphi extensions can be applied. Main capabilities of ArcView are;

- Explore, Display, and Query spatial data
- Access and edit Shapefile and Personal geodatabase

- Spatial analysis with Geoprocessing
- Mapping with various tools and Wizards program
- 2D and 3D reporting and graph
- Co-ordinates system projection
- Data annotation
- Map display with the Internet system
- Import/ Export compatible with various data file types

Furthermore, it also have Extensions Program to increase capability of ArcView comprises of Spatial Analyst, ArcView 3D Analyst, ArcPress, Geostatistical Analyst, and StreetMap for instance.

a.2 ArcEditor

ArcEditor is a medium size of ArcGIS composed of all ArcView's function components. It is designed for Enterprise GIS Organization as their name with a capability for data edition in Enterprise GIS. For example, under the core system of ArcInfo and ArcSDE with a Relational Database Management System (RDBMS), one of user can editing data by use ArcEditor and another user can viewing or searching data by use ArcView in the same time.

ArcEditor is comprises of all ArcView's function components and additional component of data editing tools for Shapefile, Coverage, Personal geodatabase, and Enterprise geodatabase.

a.3 ArcInfo

ArcInfo is the most capability of ArcGIS with all function components of Arcview and ArcEditor. It also has completed ArcToolbox and ArcInfo Workstation (ARC, ArcEdit, ArcPlot, AML and all extensions). Hence, ArcInfo is a completed GIS program with various functions such as data creating, editing, querying, mapping, and analyzing.

ArcInfo is usable for data analysis function completely and comply with other application program. Because ArcInfo was created from COM (Component Object Model) technology, it can distribute Objects by define their principal and behavior. The main capabilities of ArcInfo are;

- Graphical User Interface (GUI) in Windows system
- Client/Server architecture
- High efficiency data processing tools such as creating, managing, querying, overlaying, analyzing, and display.
- Ability to edit one database by various users
- Other high effectiveness tools such as auto change co-ordinates system (On-the-fly projection), data type changing, and data import or export.

a.4 ArcMap, ArcCatalog, and ArcToolbox

All ArcGIS (ArcView, ArcEditor, and ArcInfo) are have 3 mains programs separated by function as ArcCatalog (data management), ArcMap (mapping management), and ArcToolbox (analysis management). Those 3 programs are working simultaneously.

ArcCatalog is usable for source selection, data creation, and metadata.

ArcMap is usable for display, query, edit, and create map document.

ArcToolbox is useable for spatial data analysis, database analysis, and convert and import-export data.

a.5 ArcMap

ArcMap is usable for display, edit spatial data, and create map, graph, and report. ArcMap can provide data viewing as "appear on the map like what seeing on screen" and able to drag-and-drop data from ArcCatalog by open map documents in ArcMap then drag data from ArcCatalog to display area of ArcMap directly.

GIS database that show on the map in ArcMap is called as Layer. Each layer separated each data type and source with Table of Content (TOC) display of ArcMap. The TOC default position at left side but it is able to move to other position.

Layer order in TOC means data showing order in map section. The top order will show on top, thus the background should be located lowest layer in order to not cover an important data.

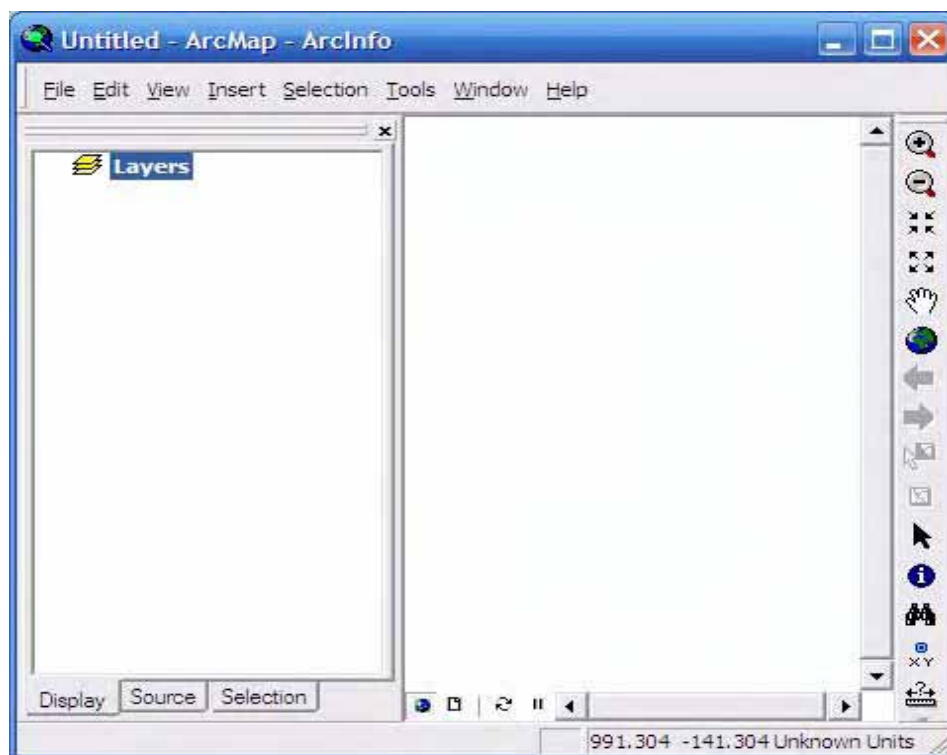


Figure 2 : ArcMap Program

While map is showing, user can find other interested data by click at their Feature then access to ArcMap database. There is easy to design the map annotation of electronics document and publishing. For some data which appropriate to present as graph or report, ArcMap is also manageable.

a.6 ArcCatalog

ArcCatalog is application program for database connection. The main effectiveness is an applicable to browse and organize data source, spread map document or data. Graphic

interface of ArcCatalog is look like the Windows Explorer, but different on that it can browse data, map, and metadata.

The data on disk drive or network system can access by click the button of “Connect to Folder” and select the pathway of data. ArcCatalog is able to connect with various database includes SDE and OLE DB databases.

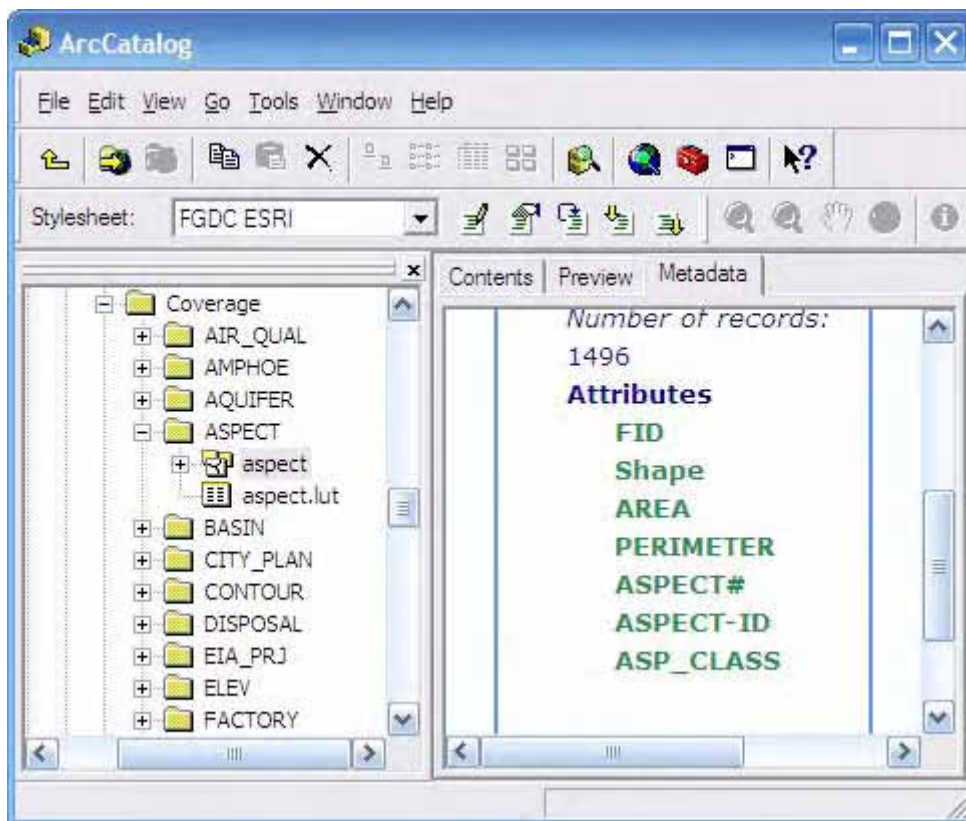


Figure 3 : ArcCatalog Program

The selected group of data is called “Catalog”. The “Catalog Tree” is located on left side, while the right side is “Catalog Contents”. The right side of ArcCatalog program is composed of 3 components; Content (data lists), Preview (figure or table), and Metadata.

a.7 ArcToolbox

ArcToolbox is a tool for advance analysis GIS data such as co-ordinates system conversion or data type conversion (for example, convert Shapefile to Geodatabase). User can import data with “drag-and-drop” working from ArcCatalog to ArcToolbox.

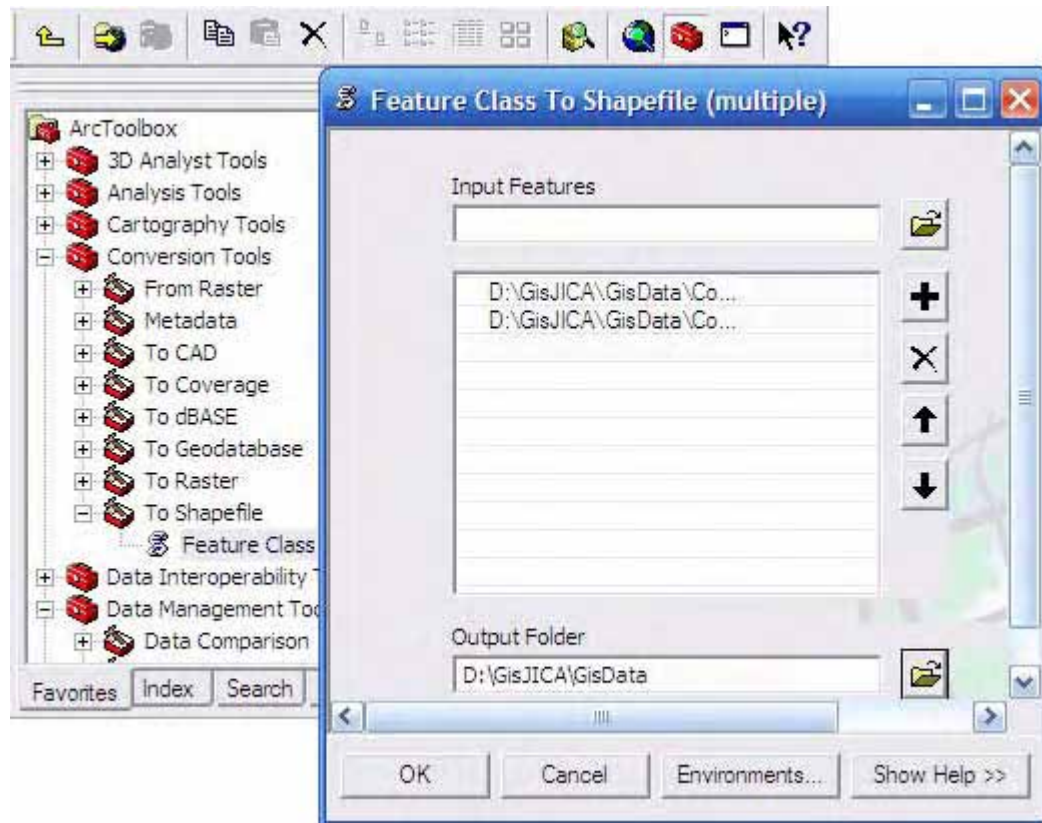


Figure 4 : Arc Toolbox Program

In addition, user can create own tool as “.exe” or “.dll” file types.

There are more than 140 tools of ArcToolbox in ArcInfo such as Conversion Tools, Map Analysis Tools (Union, Clip, Split, Buffer etc.).

ArcToolbox in ArcInfo also has linkage to ArcInfo Workstation by Open Development Environment (ODE) which allow ArcInfo user to use AML and DLL.

b. Data Handling

b.1 Data Composition and Import

Layer can create by use ArcCatalog program. Normally, when installed ArcGIS program, it will located on Start/All Programs/ArcGIS/ArcCatalog

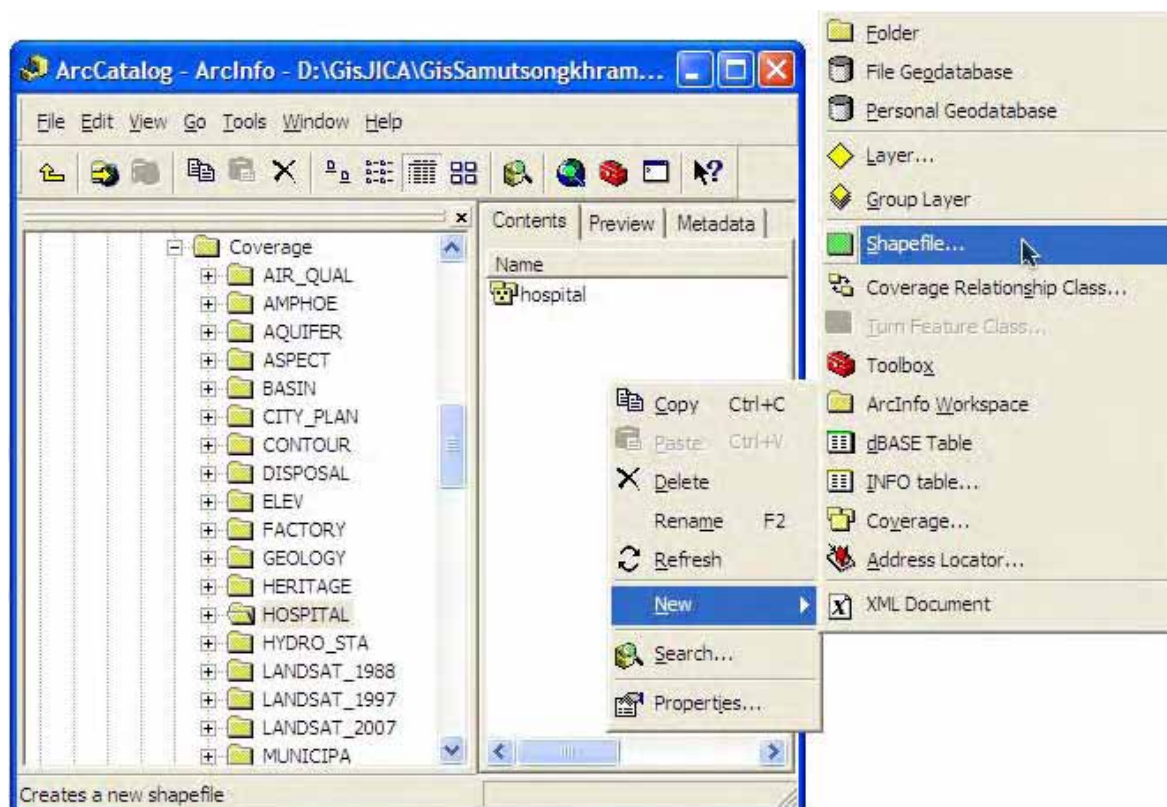


Figure 5 : Arc Catalog Program

Starting by right click at the “Directory” which need to keep layer and select “New” to create layer such as Shapefile, Coverage, Personal Geodatabase etc. Then the box will appear to fill in the name, type (such as Point, Polyline, and Polygon, (and spatial reference edition) click “Edit” button).

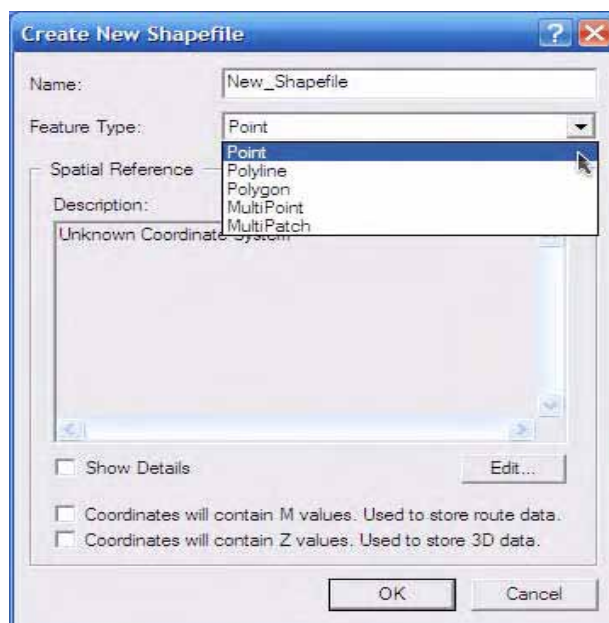


Figure 6 : Layer Creation

Right click and select Properties to create Field as Attribute of layer by type the name in “Field Name” and select data type in “Data Type” (display as Dropdown Menu).

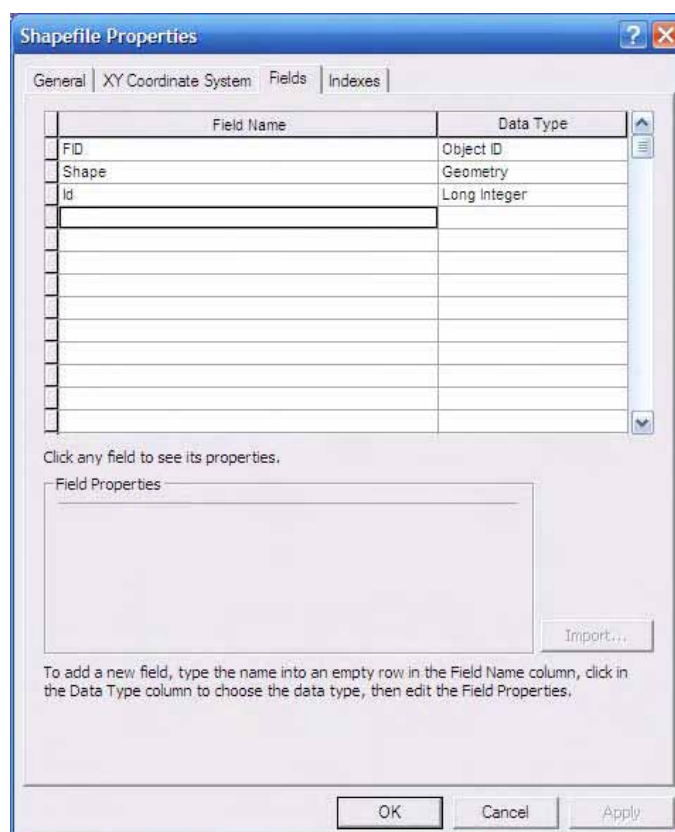



Figure 7 : Define Field to Layer

This layer will use for graphic data composition in section of spatial data editing and attribute data editing of ArcMap.

Data import by click “Add Data” button at File >  Add Data in Main Menu

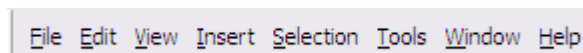


Figure 8 : Main Menu


Otherwise click  at Data button on standard menu or open ArcCatalog Program and ArcCatalog to ArcMap.



Figure 9 : Standard Menu

b.2 Data Editing

Data can be edited with ArcMap, a part of ArcGIS program, by Graphic Data Editing and Attribute Data Editing

b.2.1. Graphic Data Editing

It is necessary to open “Editor Toolbar” in ArcMap before start to data editing. If Editor Tool is not show, when right click at Menu Bars or Toolbars it will be appear hidden function and click Editor.

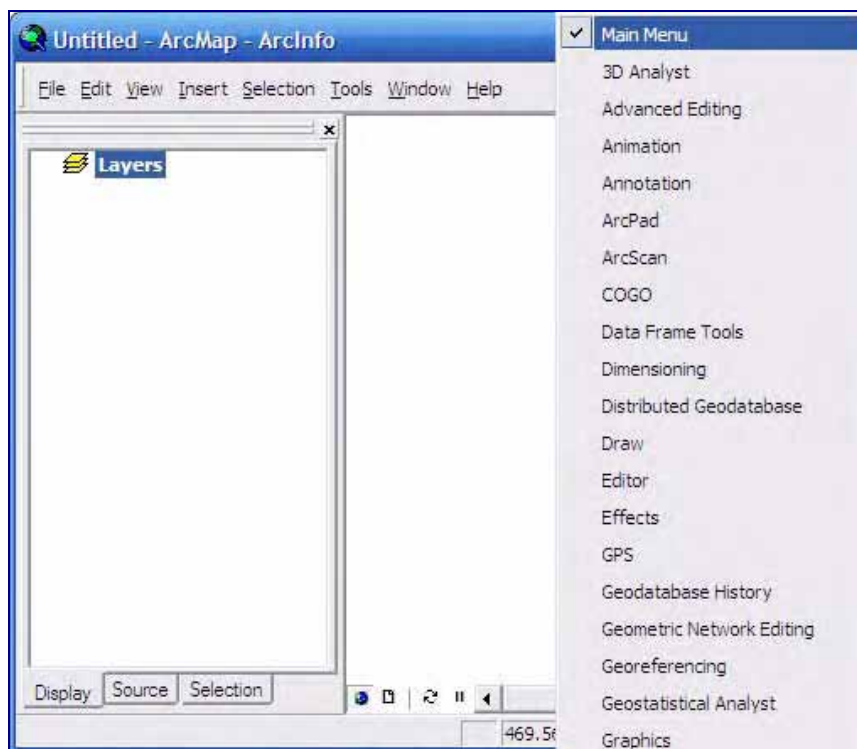



Figure 10 : Open Editor

If currently use Standard Tool, the Editing  button will appear on toolbar and click to add Editor Tool. The position of Editor Tool can move as user defined.

Also select the task of Start Editing ,Save Editing, or Stop Editing on Editor Toolbar.

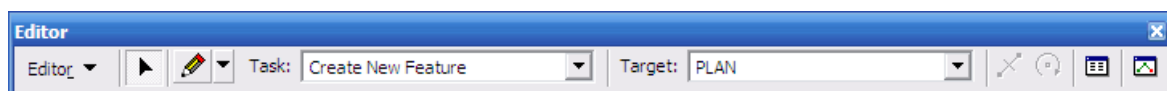


Figure 11 : Editor Toolbar

In case of Coverage data type, it has to convert by right click and select “Export” in ArcCatalog program to Shapefile or Personal Geodatabase before editing.

Data editing in ArcMap will begin on Start editing. The editing data will temporary store in Edit session until finish or save, then record editing data in original file.

The history of editing data in Edit session will show on map display but still not record in original file until save editing data.

A variety of button such as Dropdown Menu on Editor Toolbar is gray, means “Disabled”, because it is still not order to edit. Then click “Start Editing” from Editor Toolbar.

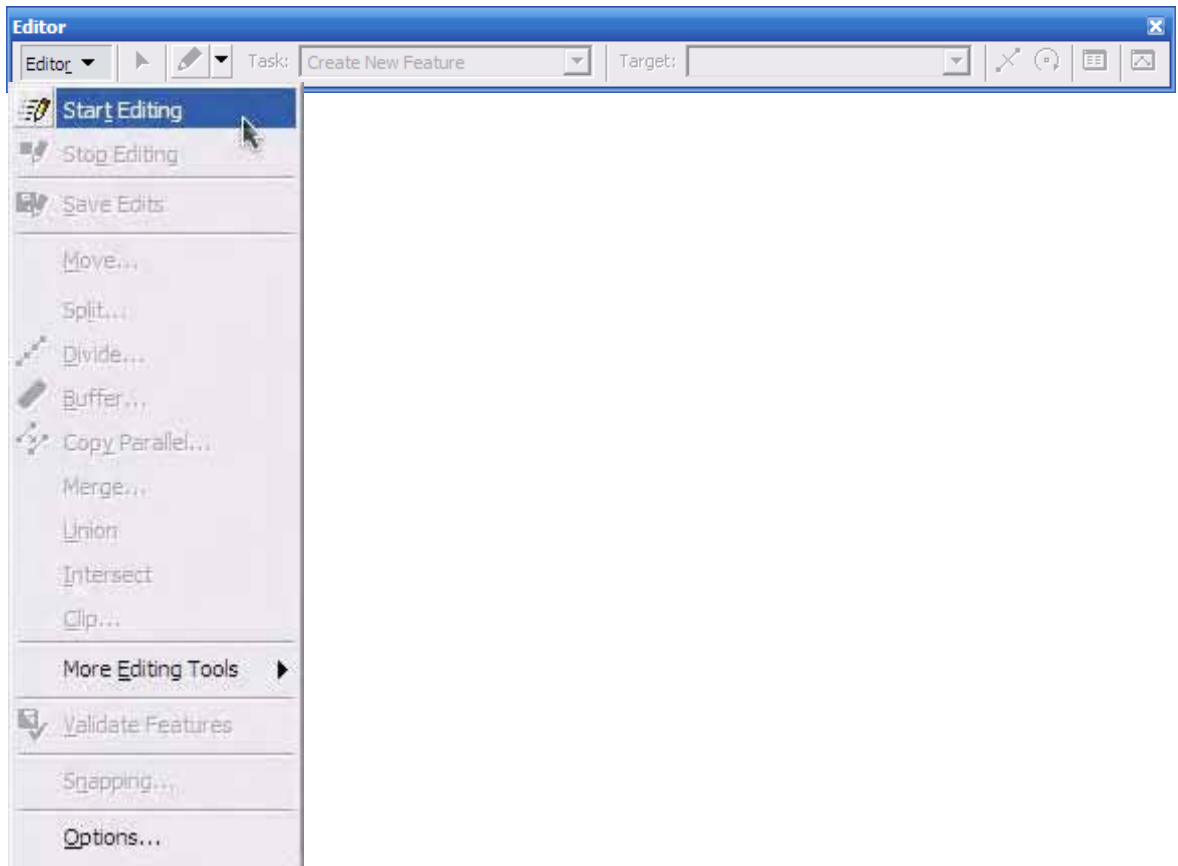



Figure 12 : Start Editing

Object movement; click “Start Editing” buttons will Enabled, the “Edit” is main tool for select and move object. Click at Edit  (this tool may activated (on object, it will be Highlighted).

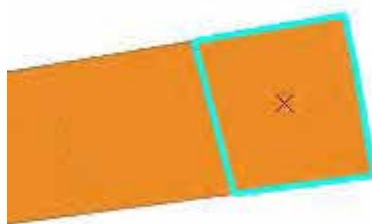


Figure 13 : Object Selection

When point the mouse at object, pointer will be change as 4 directions arrow symbol means ability to move object position. It should be noted that buttons on Editor Toolbar are enabled.

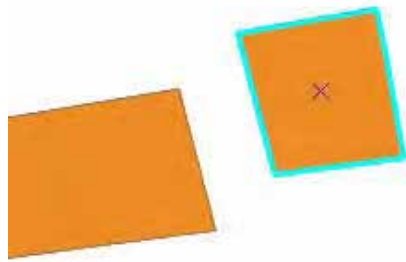



Figure 14 : Object Movement

Object Rotation; click Rotate  button and move object around Selection Anchor. The Anchor moving will be effect to object rotation.

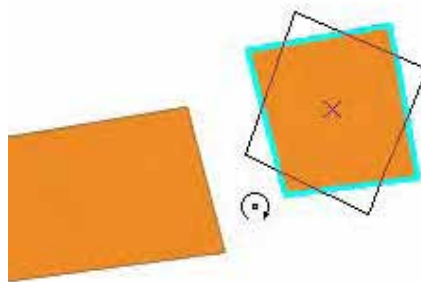




Figure 15 : Object Rotation

It can specify the degree of rotation; positive degree means rotate clockwise and negative degree means anticlockwise.

Sketch  is an outline drawing tool. The sketch is a group of all spots composed to be object (Vertices) and lines (Edge) composed to be object (Segments). The movement of one spot within object called Vertex, Edit tool is usable for move this Vertex position. When click at Edit  and double click at object, their Sketch will be appeared with Vertices and Segments. And when point mouse above the Vertex and drag Vertex in the new position, the figure of Sketch will be changed.

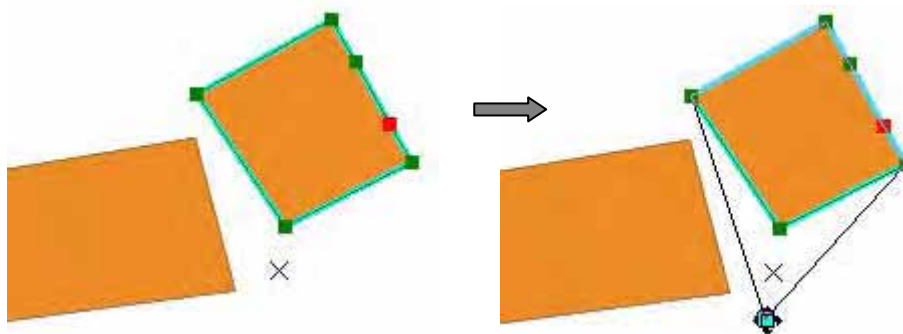


Figure 16 : Vertex Movement

Delete Vertex; use Context menu help to edit object. Right click at Sketch by point mouse above the left below Vertex and right click to show Sketch then select Delete Vertex

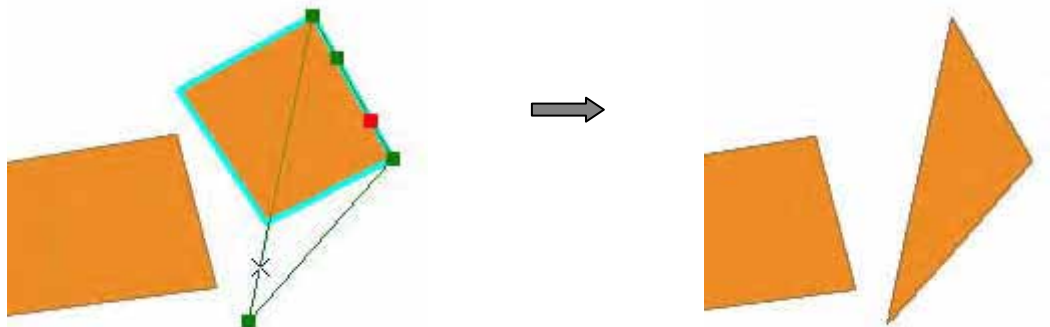


Figure 17 : Delete Vertex

Insert Vertex; as same as delete vertices, add the vertices by point mouse above the Sketch line and right click to open Context menu then select Insert Vertex

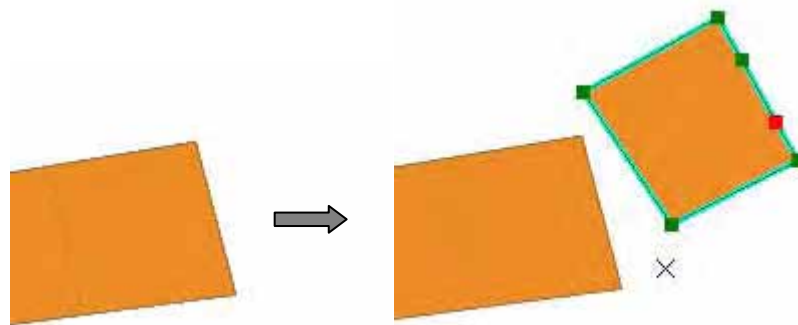



Figure 18 : Insert Vertex

Split Tool  use to split one line into two lines. Start by select the line and use Split tool at the position that want to split. It is default as copy an attribute data of original line to the new one.

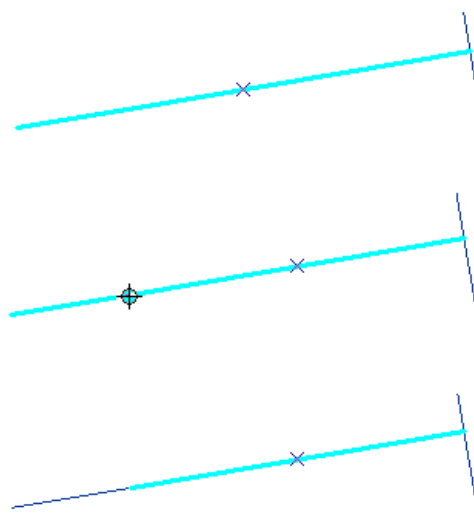



Figure 19 : Split

Delete object; select object or data from Table of Content and click Delete  at Standard toolbar or click Delete at Keyboard.

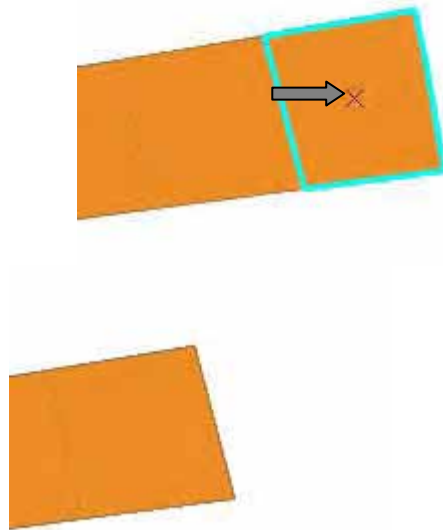


Figure 20 : Delete Object

The editing session as described above is show a variety of tools useful for editing, besides user can use various tool on Standard toolbar such as Cut, Copy, and Paste object between layers and Delete object. User can also use Undo and Redo command, for instance, use Undo to reuse latest working.

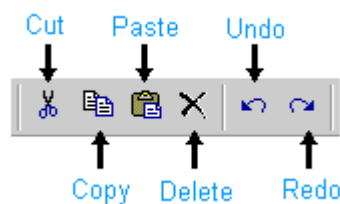


Figure 21 : Standard Toolbar

Save change and leave ArcMap program; Click Stop Editing from Editor Menu and click Yes when dialog box appear to ask save change or not. Or select File from Main Menu and click Exit and click No when dialog box appear to ask save document or not.

b.2.2. Attribute Data Editing

If user wants to edit an attribute data, use editing option by perform Start Editing and view attributes by click attributes button then the attributes window will be appeared.

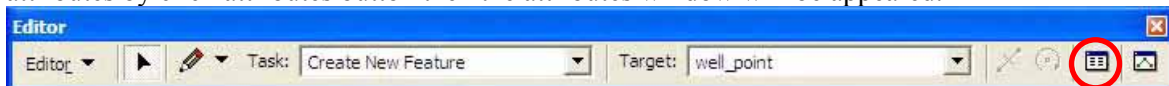


Figure 22 : Attribute Button

The attributes window is divided into 2 parts; 1) Data view located on left side is object lists and 1) Right side is details of selected object from left side.

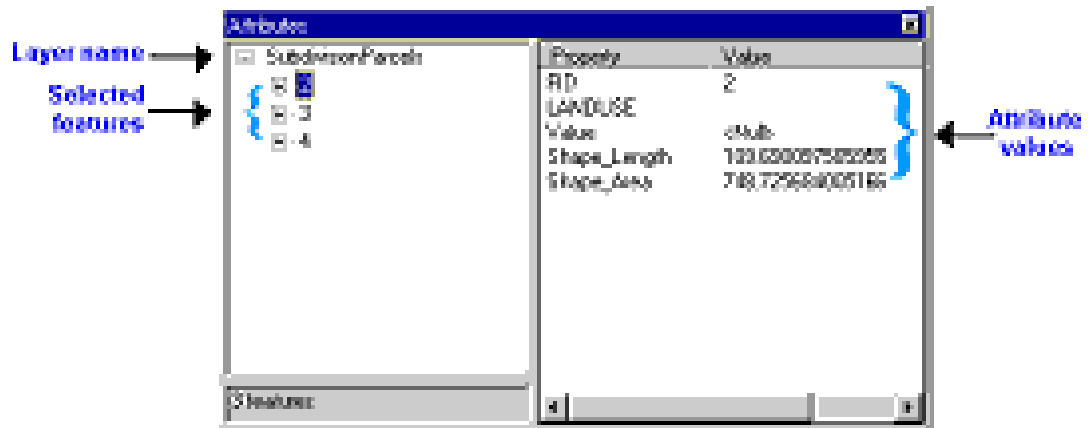


Figure 23 : Attributes Window

If select object more than one layer, each layer composed of selected object in list of data viewing. User can access interested object by click (+)symbol to expand the list. User can edit attribute data by click Field of each data appeared in right side and edit in Value to change the new one.

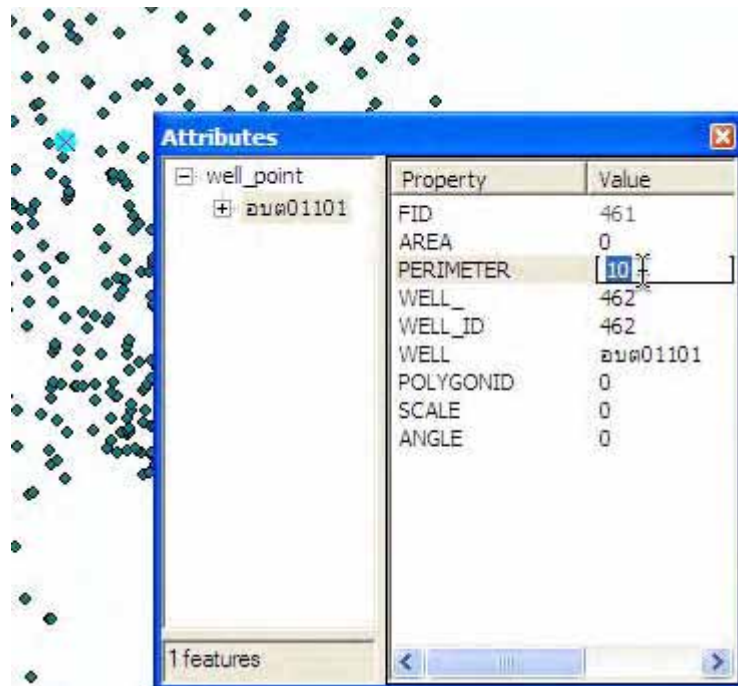


Figure 24 : Data Editing in Attributes Window

If user wants to change value of all objects, it can do by click at the name of layer and type a new value in data field as same. Then below of all selected data field will change to the new one.

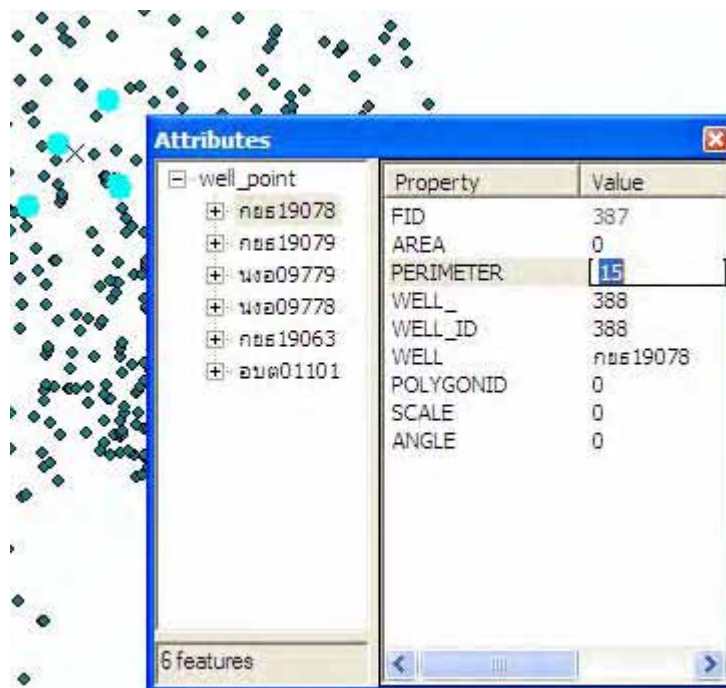


Figure 25 : Data Editing in Layer

Value in all PERIMETER field of WELL_POINT layer will change to be 15.

User can copy or cut to each value or all value of attribute data and paste as each object or all selected objects.

Additionally, for calculated option in ArcMap, user can edit attribute data of an object by create a simple calculation of define condition in Field Calculator. The Field Calculator will activate to selected object, if no one it will activate to all object.

To use Field Calculator, start with editing session first and open the table of each layer by right click at their name in Table of Contents and select "Open Attribute Table". When the table appeared, right click at the heading of data which want to edit, select Calculate Values from menu to show Field Calculator Window.

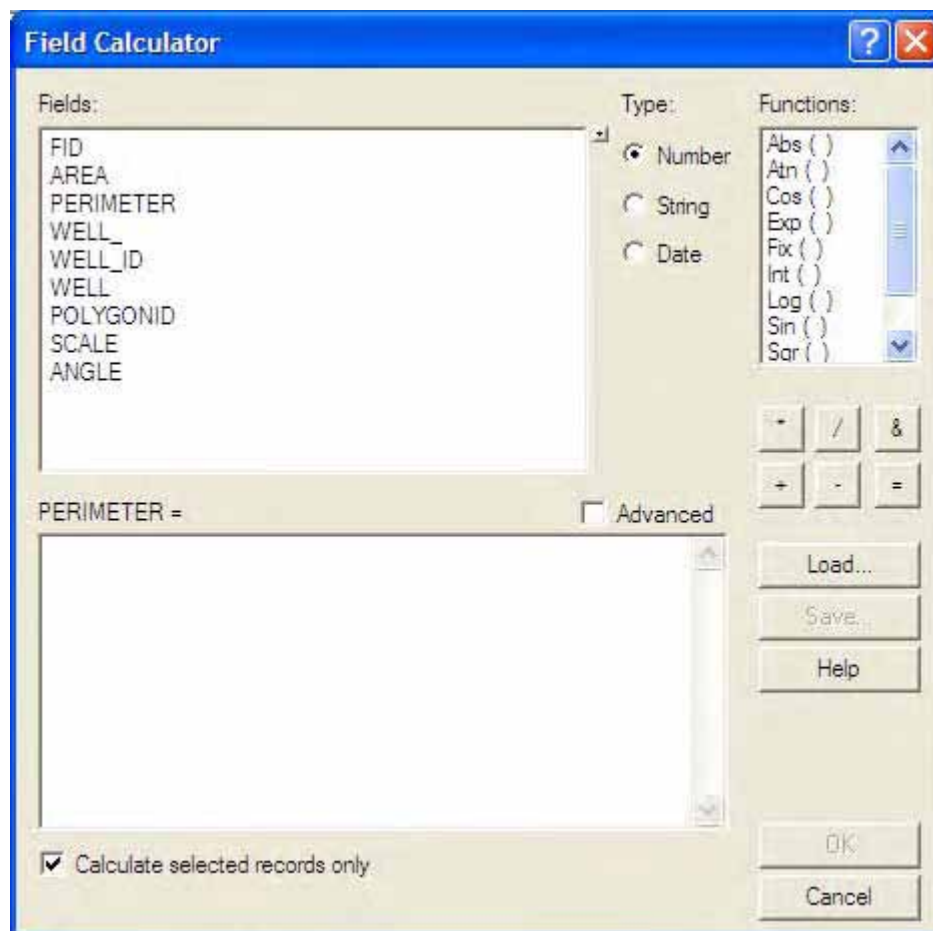


Figure 26 : Field Calculator Windows

To define a condition in Field Calculator, it has a field, function, and operation options support to user. User can click in area of field, the list of field will be appeared in Expression box for define condition. Otherwise user can type a condition directly as below example; the PERIMETER field is edited to be sum with 10 to each perimeter.

Using Field Calculator is useful for advance calculation and can be edit only selected data or edit all data in table.

When user defined a condition in Field Calculator already and click OK, the value in field will change as defined condition or calculation.

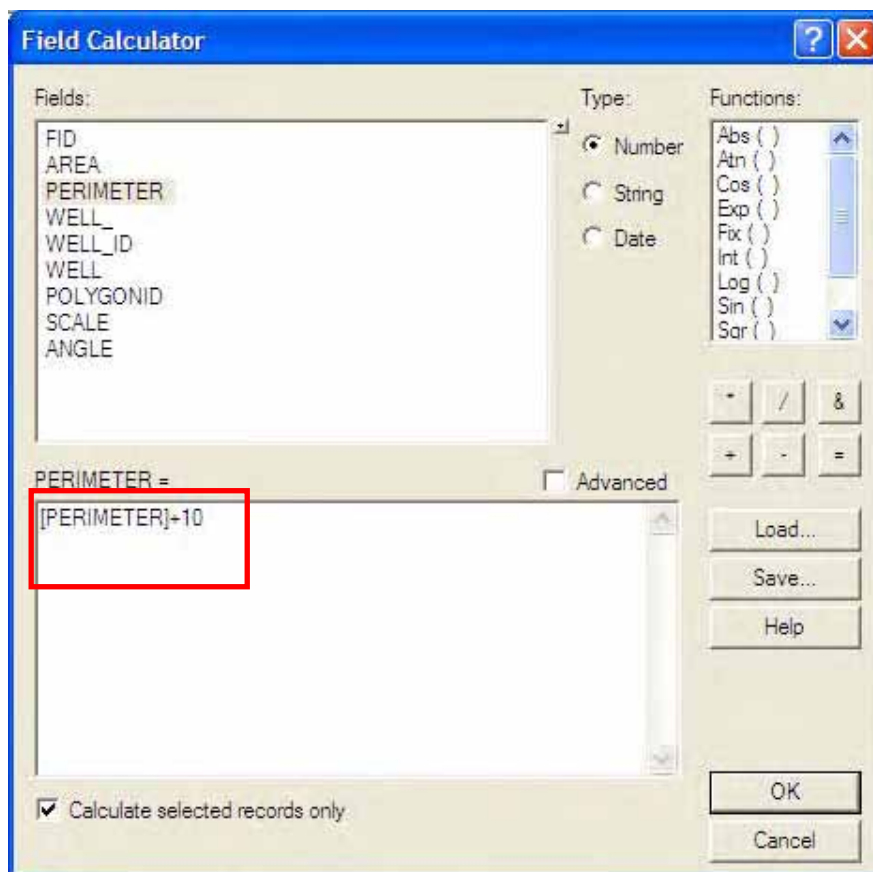


Figure 27 : Field Calculator Windows

c. Map Printing

The provided file is comprise of Layout or map printing format, just move the map to the wanted position, specify scale, edit heading and other then able to print out.

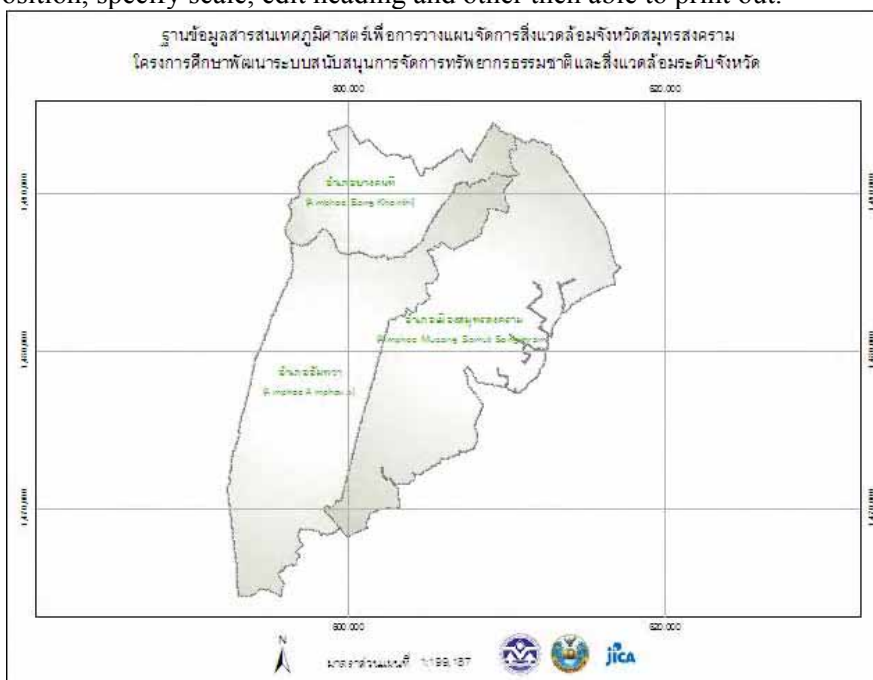


Figure 28 : Mode Layout View

Anyway, it has to change as Mode Layout View (usually working in Map Display) by click Layout View at the left below window or select View > Layout View on Main Menu

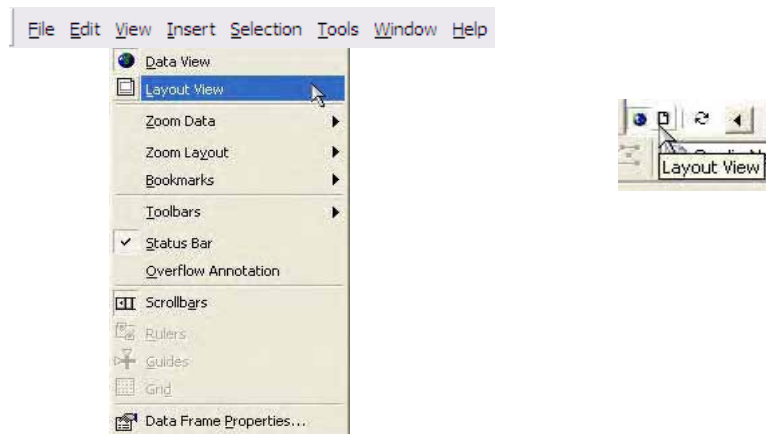


Figure 29 : Layout View Display

To create Map Layout, it is necessary to define size and printing property first; because ArcGIS will change Layout as paper size (default paper size is set as A4). If user wants to print other sizes, they should specify paper size by right click at outer Layout frame.

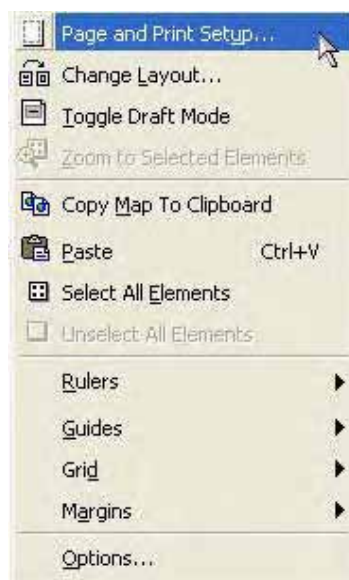


Figure 30 : Printing Preference

If user wants to change other details, they can double click to edit default map composition or add new element by click Insert at Main Menu.

c.1 Adding the Direction) North Arrow)

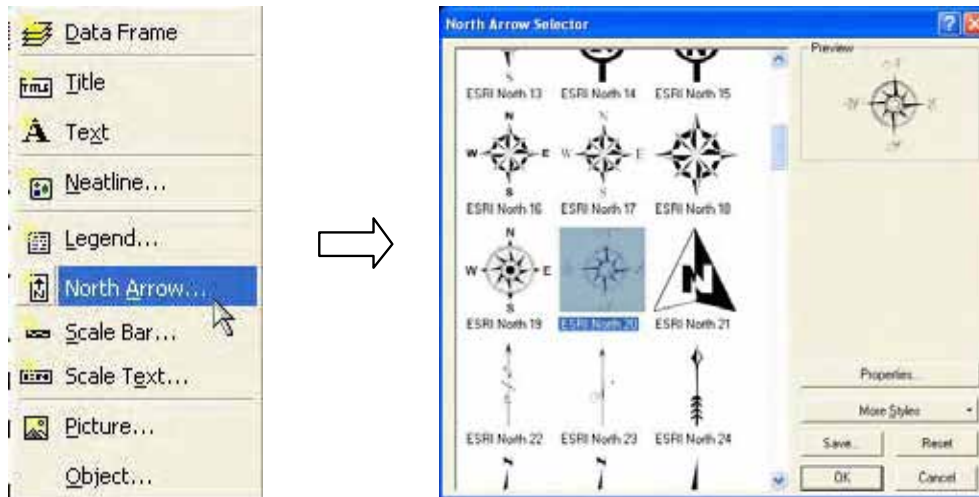


Figure 31 : North Arrow Addition

c.2 Adding the Scale) Scale bar & Scale Unit)

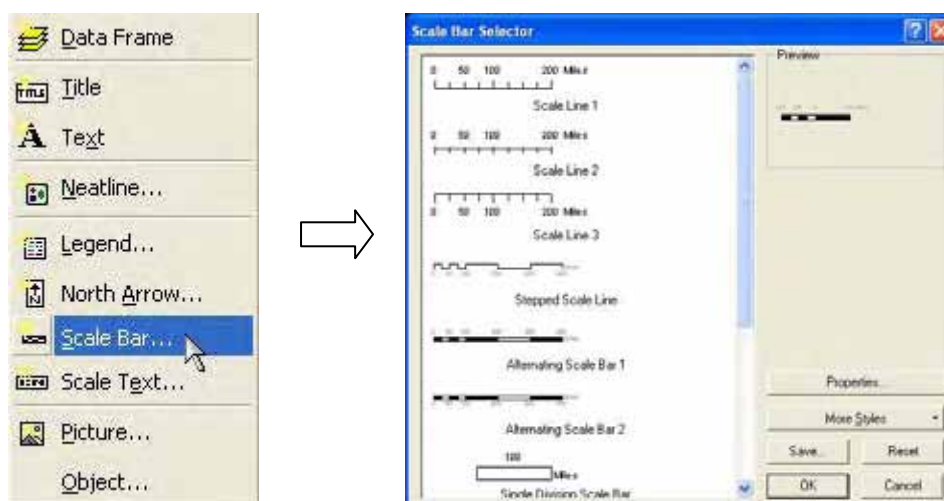


Figure 32 : Scale Addition

Other than to select scale format to display, user has to specify map unit too. When completed Insert Scale Bar, change the unit of measurement by right click at Scale bar and select Properties. Then the alternating Scale bar properties window will be appeared, select "Scale and Unit Tab" to change unit.

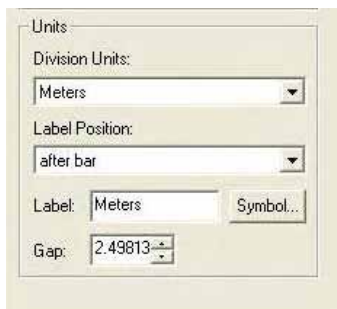


Figure 33 : Change the Unit of Measurement

c.3 Adding the Legend

As figure below, the name of layer will be appeared for user to define symbol of layer. The left frame is all names of layer and the right side is layer need to added symbol.

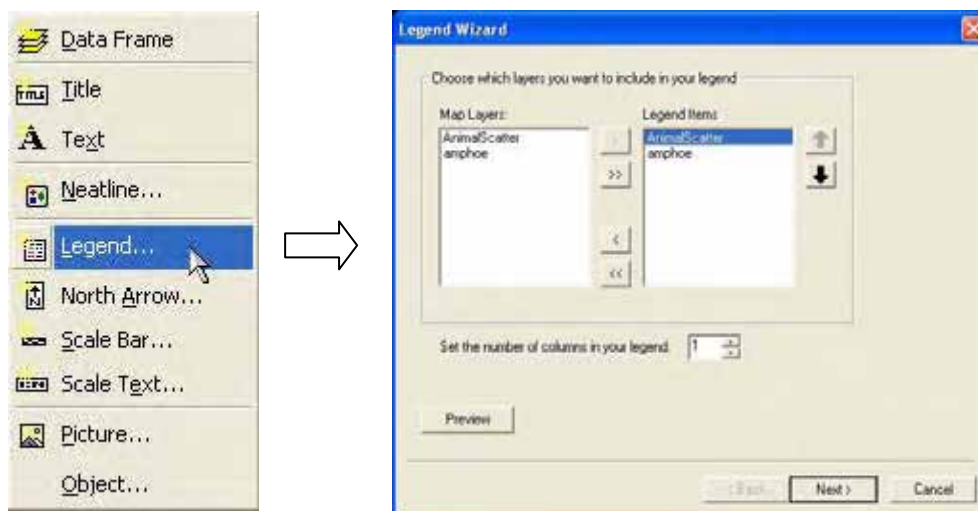


Figure 34 : Adding the Legend

To edit symbol, Legend has to convert as Graphic by right click at Legend Frame select Convert To Graphic and right click Ungroup again. Then Legend will be separated to single Graphic which can rename, delete, change color, and regroup.

c.4 Adding Map Title

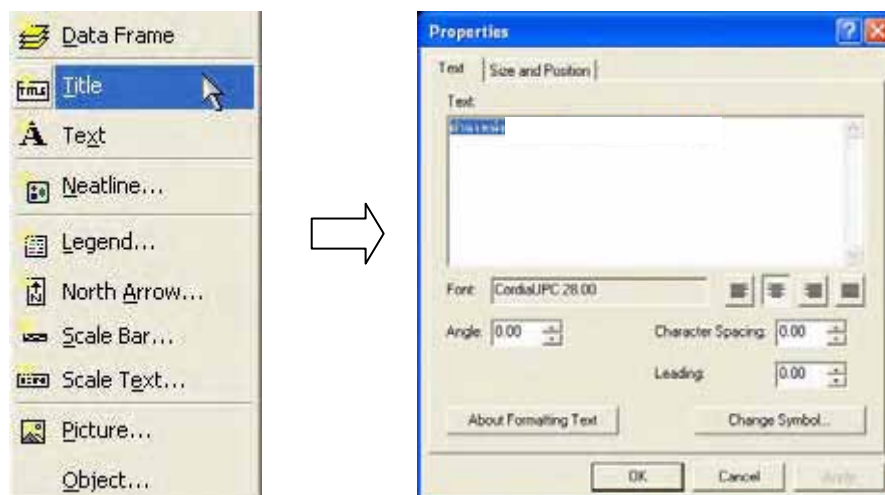


Figure 35 : Adding Map Title

After completed map editing, click Menu File and select Print Preview to verify before printing that map is outside paper margin or not and select Print.

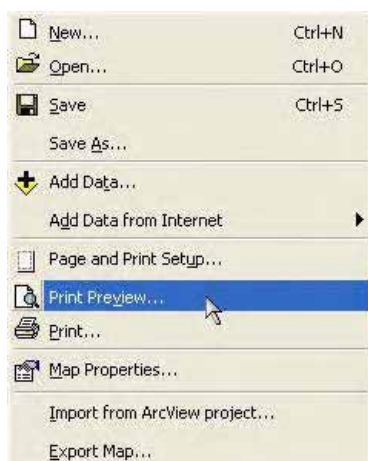


Figure 36 : Map Printing

In case of color map printing is not available or want to use as annotation in other programs such as Microsoft Word, PowerPoint, or HTML format, ArcGIS is compatible to convert map file in other file format as follows;

- PDF (Portable Document Format) is an Electronic Paper which can display on web in document format both text and picture.
- SVG (Scaleable Vector Graphic) support to Graphicpresentation which can reduce or expand or move picture without lost details. It can present through WebB rowserandin SVG Vi-Plug ewer.
- Picture file group such as
 - BMP (Windows Bitmap)
 - JPEG (Joint Photographic Experts Group)
 - TIFF (Tag Image File Format)
 - EMF (Enhanced Windows Metafiles)
 - EPS (Encapsulated Postscript)

c.5 Export Map by click File Menu and select Export Map

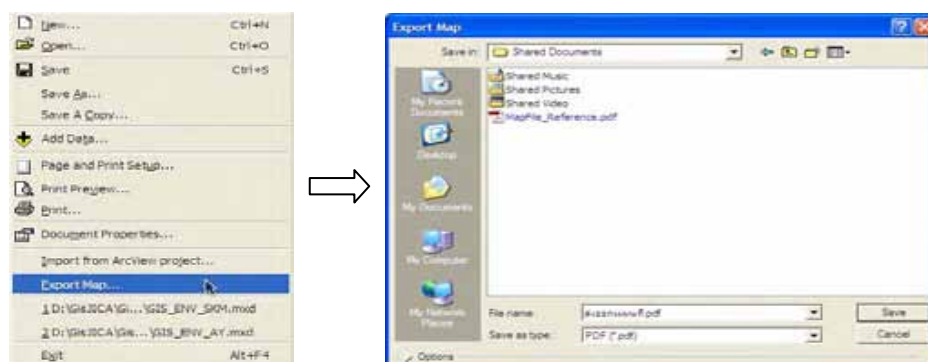


Figure 37 : Export Map

d. Geographic Information Database Program for Environmental Quality Management

The Geographical Information Database for Environmental Quality Management is a development of application program for support to GIS usability and convenient access to database. User who does not have deeply knowledge can use this database with a Graphic User Interface (GUI) that helpful to decrease complexion of procedures and confusing of data access.







This program was developed by Visual Basic for Applications (VBA) based on ArcMap 9.2 in order to benefit of specific work for environmental quality management of Phra Nakhon Si Ayutthaya Province.


Geographic Information System for Environmental Quality Management Installation

Install program by copy folder in CD-ROM to disk drive as required. The folder is GisAyutthaya as details described below.



Table 21 : Description of Data Storage Folder

Folder Name	Description
 GisAyutthaya	Folder of Ayutthaya Province
 Configdata	Folder of configuration program storage
 GisData	Folder of data storage
 Coverage	Folder of coverage data storage
 Satellite	Folder of satellite photo storage
 Topo	Folder of topographic map storage


 GIS_ENV_AY.mxd	Program file (ArcMap Document)
---	--------------------------------

d.1 Open Project File

After completed program installation, open ArcMap program which generally located in Start/All Programs/ArcGIS/ArcMap



Figure 38 : Arc Map Program

Program file can open by two ways, the first way open with ArcMap program and select project file (An Existing Map) and select file  GIS_ENV_AY.mxd

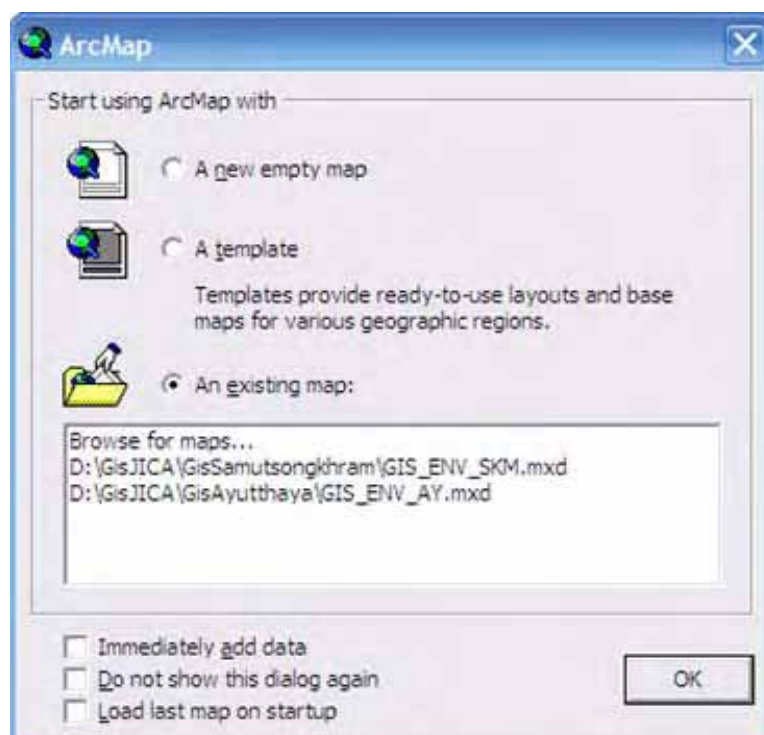


Figure 39 : Open Project File

The second way is select menu File > Open at Main Menu and select file



GIS_ENV_AY.mxd from folder (Browse for maps).

Otherwise double-click file  GIS_ENV_AY.mxd which copy to disk drive.

When open project file, welcome window will be appeared.



Figure 40 : Program Welcome Window

Then, click Login to the page of Geographic Information Database for Environmental Quality Management of Phra Nakhon Si Ayutthaya Province, the Study and Development of Provincial Natural and Environmental Resources Management System Project.

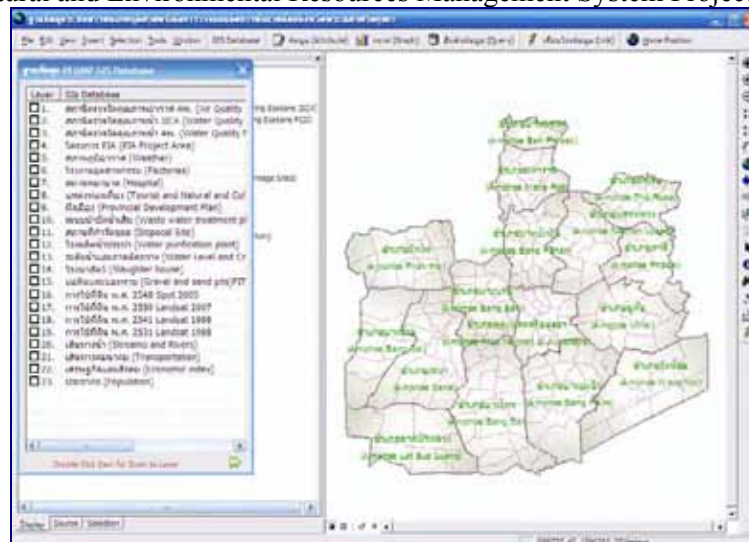


Figure 41 : Geographic Information Database Program

If user edits the default position of GUI and save change in original file, the position of GUI will change as user edited while open it next time.

The GUI of Geographic Information Database for Environmental Quality Management Planning of Phra Nakhon Si Ayutthaya Province is divided as usability as follows;

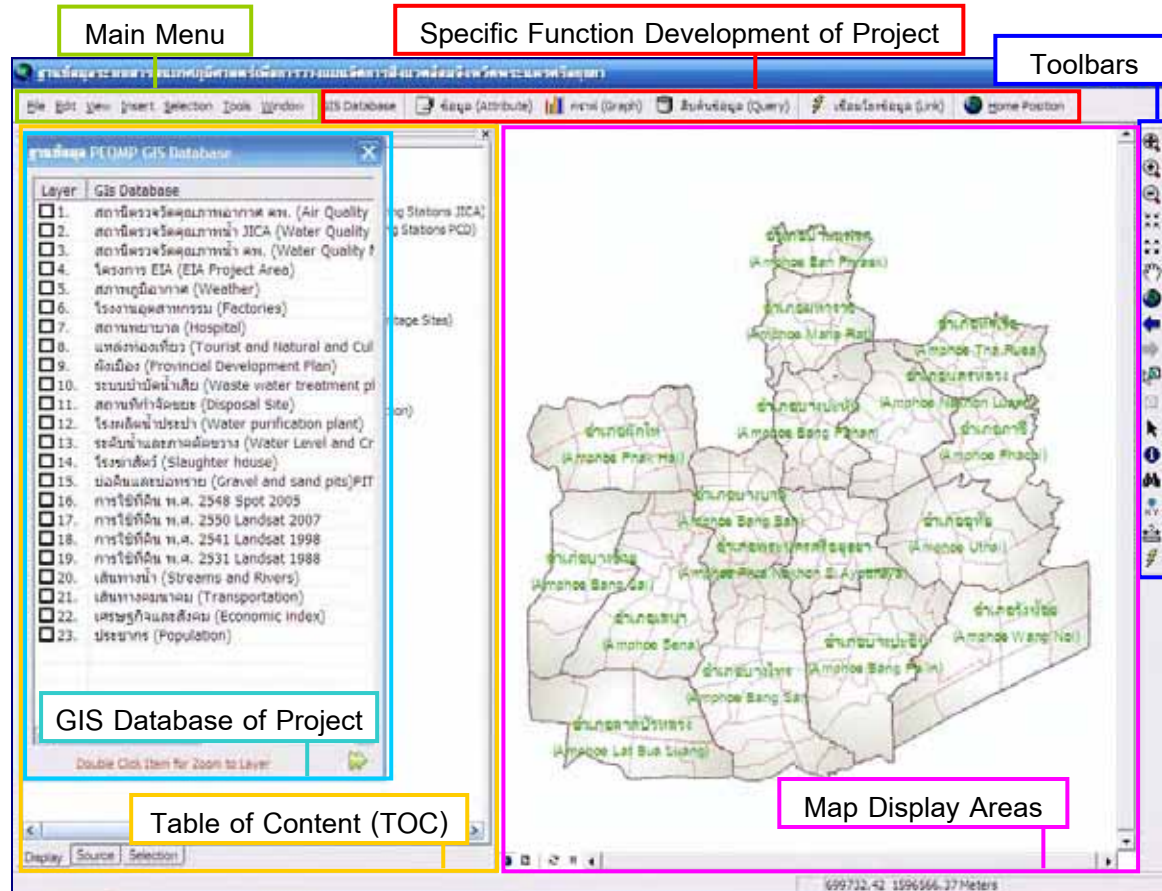


Figure 42 : Graphic User Interface

d.2 Main Menu

This part is defined as default of ArcGIS program and auto run when ArcGIS program is opened always. This main menu is cannot be removed.

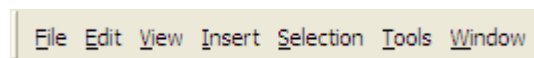


Figure 43 : Main Menu

The important commands orders are 1) File has orders to Add Data, Save, Print etc. 2) Edit has orders to Cut, Copy, Paste etc. 3) View has orders to Zoom, Toolbars etc. 4) Insert has orders to input map compositions 5) Selection has orders to Zoom to Selection, Clear Selected Features etc. 6) Tools has orders to Editor, Graph, Report etc. and 7) Window has orders to Magnifier ,Table Of Content (TOC) etc.

d.3 Specific Function Development of Project

This function is specific develop to the Geographic Information Database for Environmental Quality Management Planning of Phra Nakhon Si Ayutthaya Province Project only for convenient to user in order to database access. It is help to reduce complex procedures and

confuse data access with function components of GIS Database, Attribute, Graph, Query, Link, and Home Position “Functions Created within Program”.

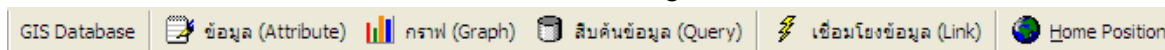


Figure 44 : Specific Function Development of Project

d.4 Toolbars

A group of tools prepared by ArcGIS for manage to graphic data. The tool sorts from the top to bottom are described as follows;

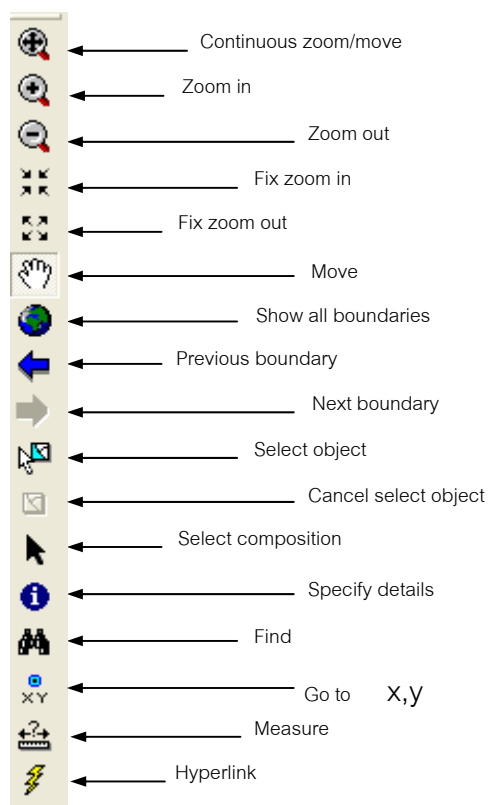


Figure 45 : Toolbars

d.5 GIS Database of Project

The database lists will appear when click GIS Database button on the bar of specific function development of project. It has two databases, which user can select one by one, such as PEQMP GIS Database and DEQP GIS Database. For more details, please see sub-section “GIS Database Windows” in section “Functions Created within Program”.

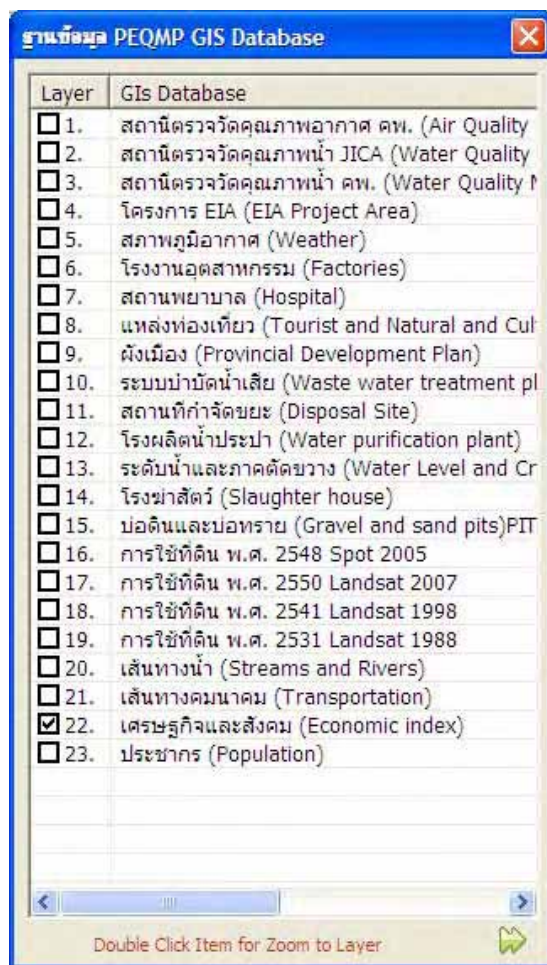


Figure 46 : GIS Database of Project

d.6 Table of Content (TOC)

A list of all data in program which can open/close layer as requires from Check Box in front of the name of layer. Besides, it is able to click to the + symbol at the front to show hidden details or click to the - symbol to hide details.

In addition, it is able to select view format as Display, Source, or Selection by click the bar in the left of below TOC window.

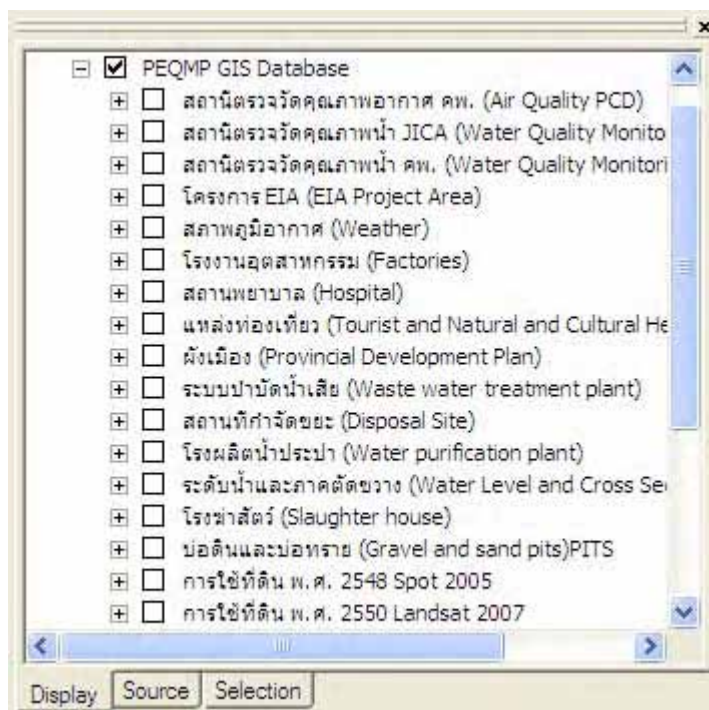


Figure 47 : Table of Content

d.7 Map Display Areas

The area to show Graphic Data and Attribute Data.

The order at left of below window will allow user to select Data View (show data), Layout View (show map printing layout), Refresh (may display adjustment), and Pause Drawing.



Figure 48 : Map Display Areas

e. Specific Function Development of Project

This program has divided into 6 parts; database window, attribute, graph, query, link, and home position. The functions of each part are the following expressed.

e.1 GIS Database Window

The project database is consists of two parts; PEQMP GIS Database and DEQP GIS Database.

To open-close layer in window by click to mark a check symbol in front of the layer (Check Box)

Besides, when double click to checking layer in window, program will expand to display in those layer field.



Figure 49 : GIS Database Windows

e.2 Attribute

Attribute is a tool for show details of selected object corresponding with database window.

When click attribute button, check box in front of layer, and select object on the map, program will show their attribute.

However, the attribute display format will different as program set up to access data in each layer.

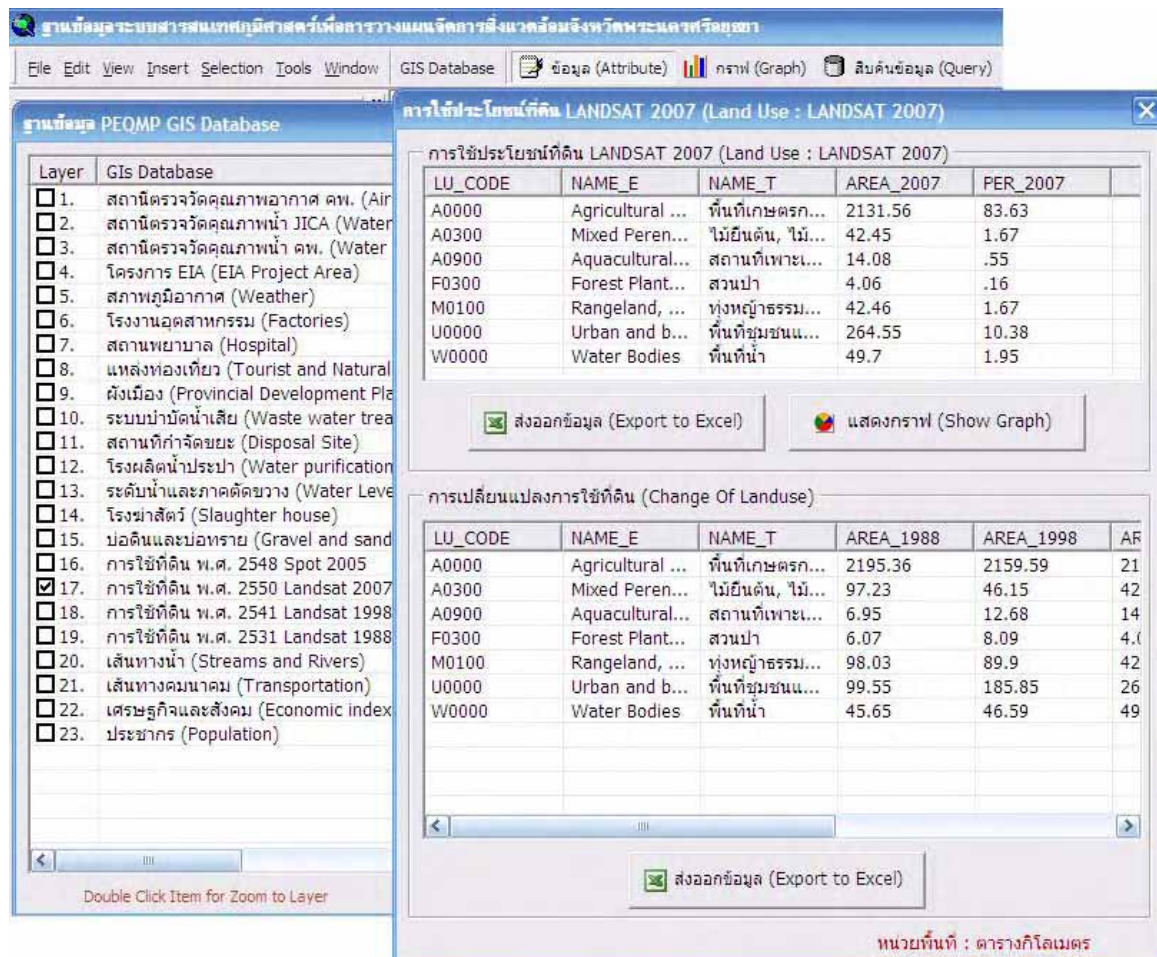


Figure 50 : Attribute Data Display

The attribute data can export to Excel Spreadsheet (Microsoft Excel Worksheet) by click export button.

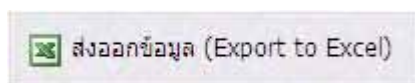


Figure 51 : Export Button (Export to Excel)

When click at export button, the window of Export to Excel will be appeared.

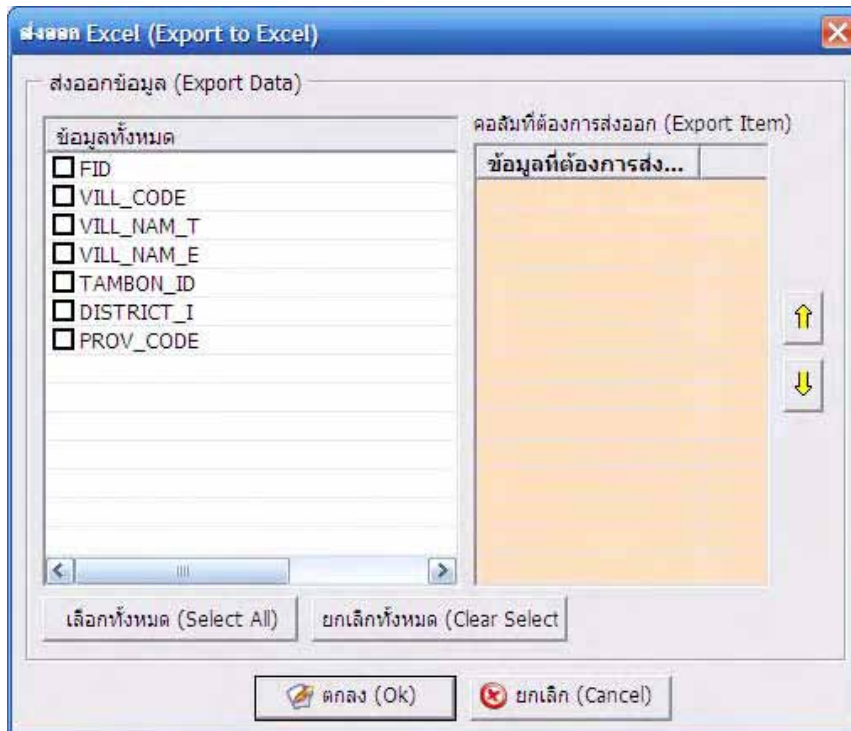


Figure 52 : Exports to Excel Window

The frame “All Fields” at left side will show the name of all fields. User can check box in each field to select an export field, then the selected field will be appeared in the right frame “Export Fields”.

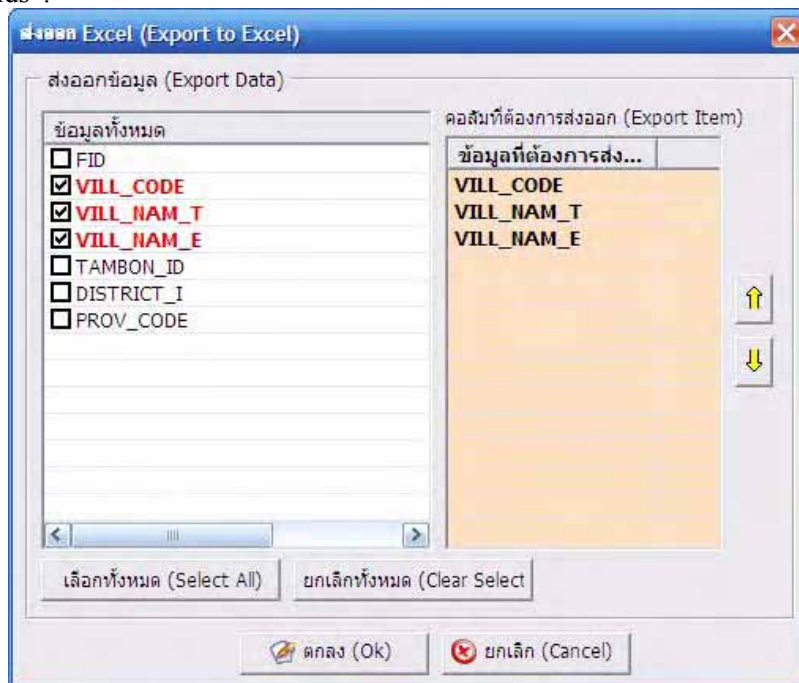
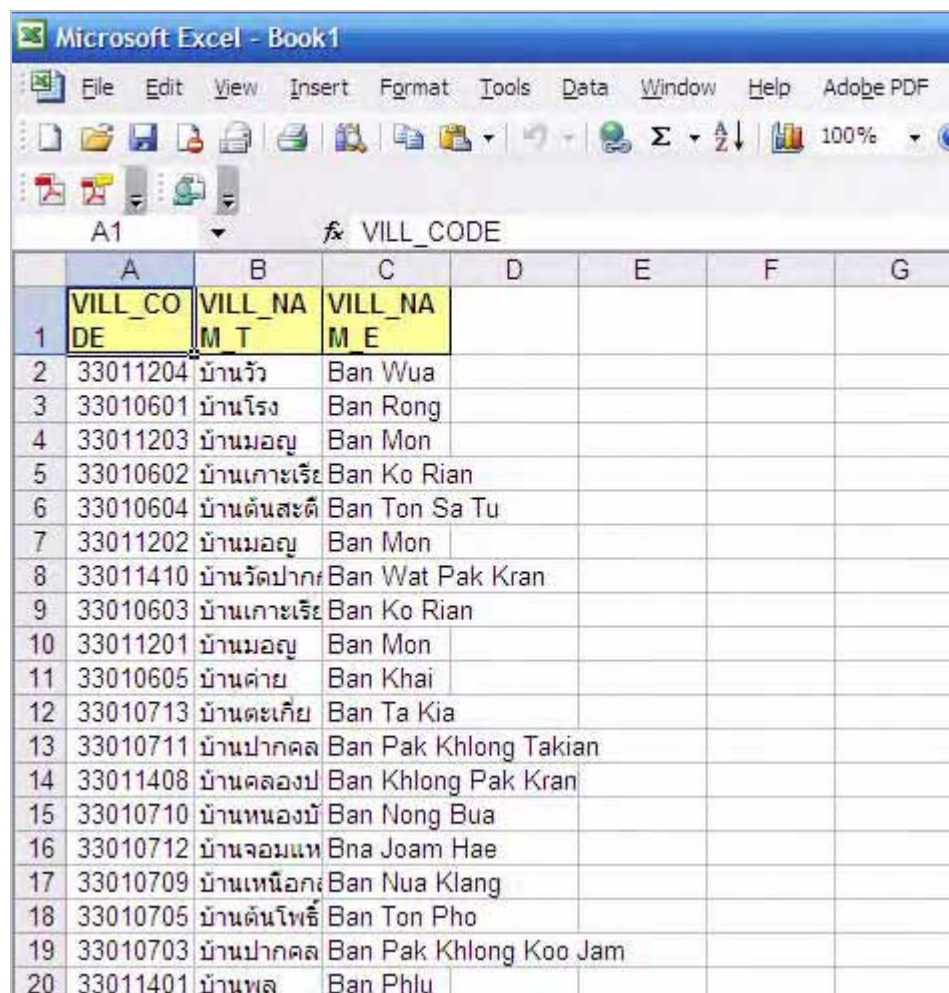


Figure 53 : Field Selections for Export to Excel

If user wants to export all fields, click Select All button. Otherwise if user wants to cancel all fields, click Clear Select button.

In the frame “Export Fields”, user can arrange the order of field export by select the field and click arrow to lift field up or down as requires.

Click OK button when finished for export fields to Excel, then the system will run Excel program for user to save data in Excel file.



	A	B	C	D	E	F	G
1	VILL_CODE	VILL_NAME	VILL_NAME				
2	33011204	บ้านวัง	Ban Wua				
3	33010601	บ้านโรง	Ban Rong				
4	33011203	บ้านมอญ	Ban Mon				
5	33010602	บ้านเกาะเรียน	Ban Ko Rian				
6	33010604	บ้านต้นสะตือ	Ban Ton Sa Tu				
7	33011202	บ้านมอญ	Ban Mon				
8	33011410	บ้านวัดปากห	Ban Wat Pak Kran				
9	33010603	บ้านเกาะเรียน	Ban Ko Rian				
10	33011201	บ้านมอญ	Ban Mon				
11	33010605	บ้านค่าย	Ban Khai				
12	33010713	บ้านตะเกียบ	Ban Ta Kia				
13	33010711	บ้านปากคลอง	Ban Pak Khlong Takian				
14	33011408	บ้านคลองป	Ban Khlong Pak Kran				
15	33010710	บ้านหนองบัว	Ban Nong Bua				
16	33010712	บ้านจอมแห	Bna Joam Hae				
17	33010709	บ้านเหนือ	Ban Nua Klang				
18	33010705	บ้านต้นโพธิ์	Ban Ton Pho				
19	33010703	บ้านปากคลอง	Ban Pak Khlong Koo Jam				
20	33011401	บ้านพลู	Ban Phlu				

Figure 54 : Export to Excel

Besides, in order to show attribute details, it can present with a graph by click Show Graph button, then result will show the graph as program set up. For more details, please see in Graph section.

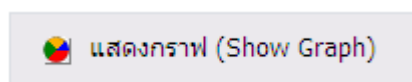


Figure 55 : Show Graph Button

e.3 Graph

Use for display data in graph pattern. The usability characterization as same as Attribute buttons that it will show graph of selected object related to database window.

When check box in front of the field, click Graph button and select object on the map, program will show graph data. Graph types of each field will show column, bar, or pie as appropriate with each field.

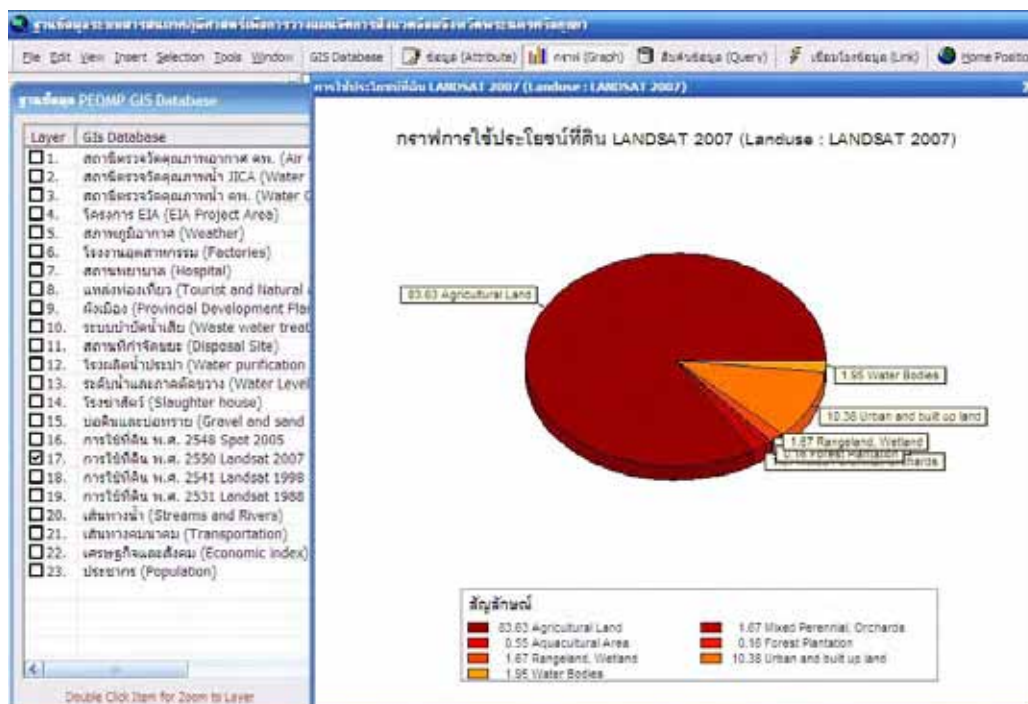


Figure 56 : Graph Display

Some field has to choose parameter, beginning time, and ending time of graph display.

Figure 57 : Graph Condition Windows

If any field is does not have graph display result, dialog box will appear to notice user.

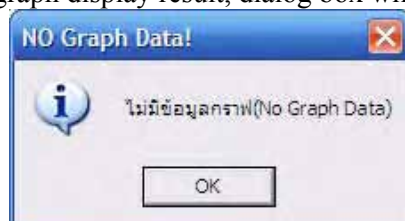


Figure 58 : Dialog box "No Graph Data Available"

e.4 Query

Query button is use for search data in Amphoe or all Amphoes in Province. User can define and select field of query from the database.

Click Query button; select one or all Amphoe and field data then click search, details of selected data will be appeared.

Besides, user can export result to Microsoft Excel.

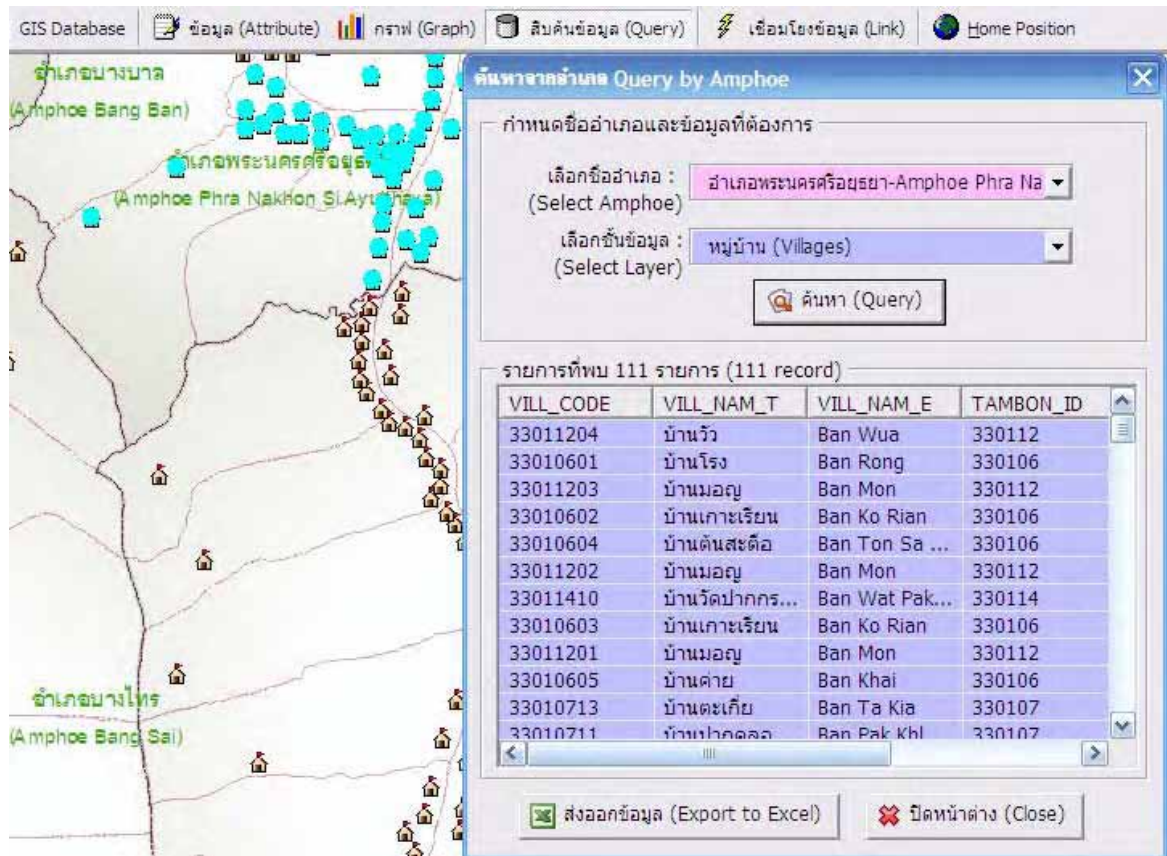


Figure 59 : Query

e.5 Link

The fields of town plan, tourism location, wastewater treatment plant, solid waste disposal site, and water supply plant are able to use Link button.

When click Link button and select object, the window will appear to show linkage data. For example, town plan data will link to Adobe Acrobat program to open town plan data file in “.pdf” format.

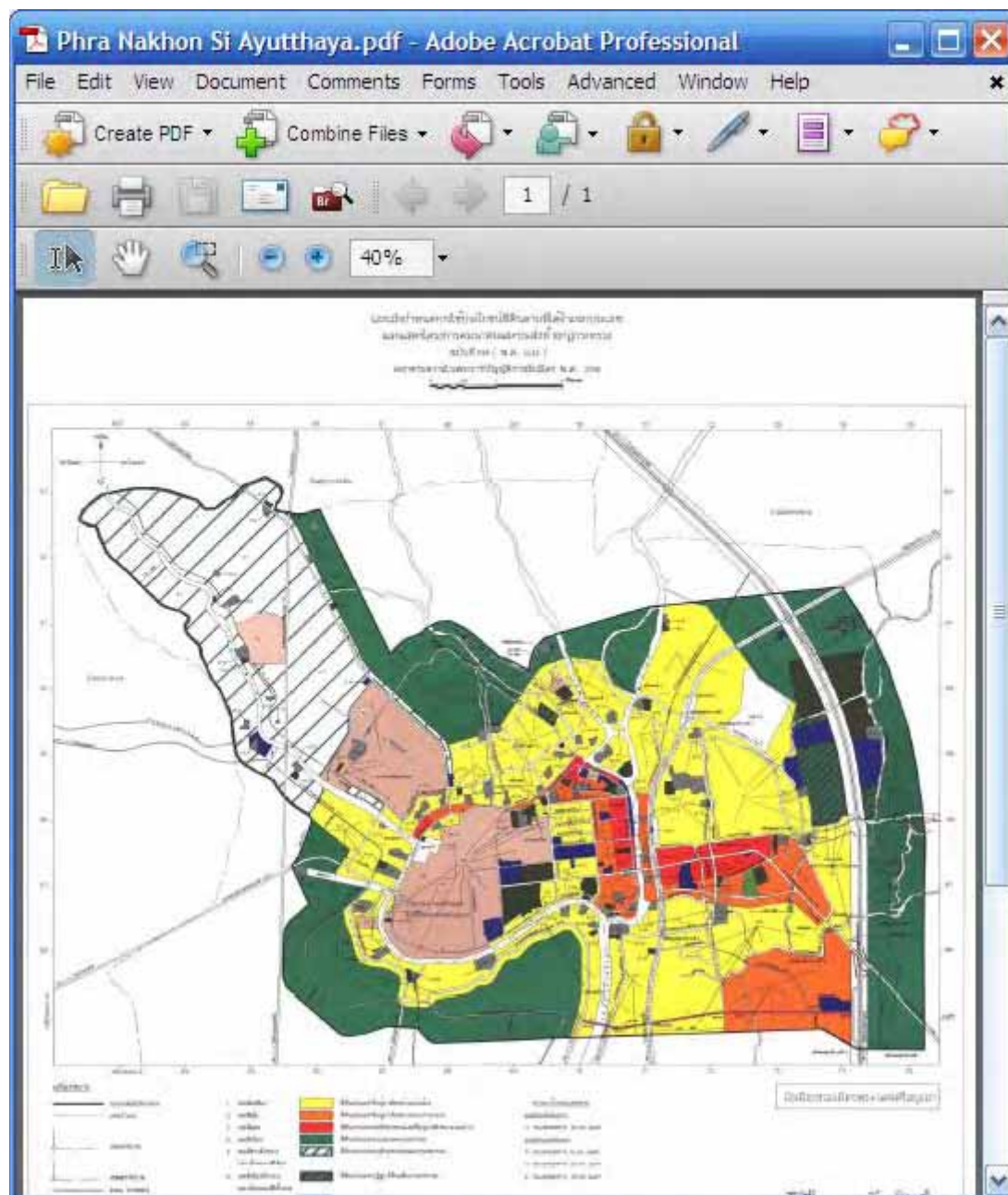


Figure 60 : Link Button Display

e.6 Home Position

Home Position is usable for set the screen back to the original setting at the beginning (show the map cover all area of Phra Nakhon Si Ayutthaya Province).

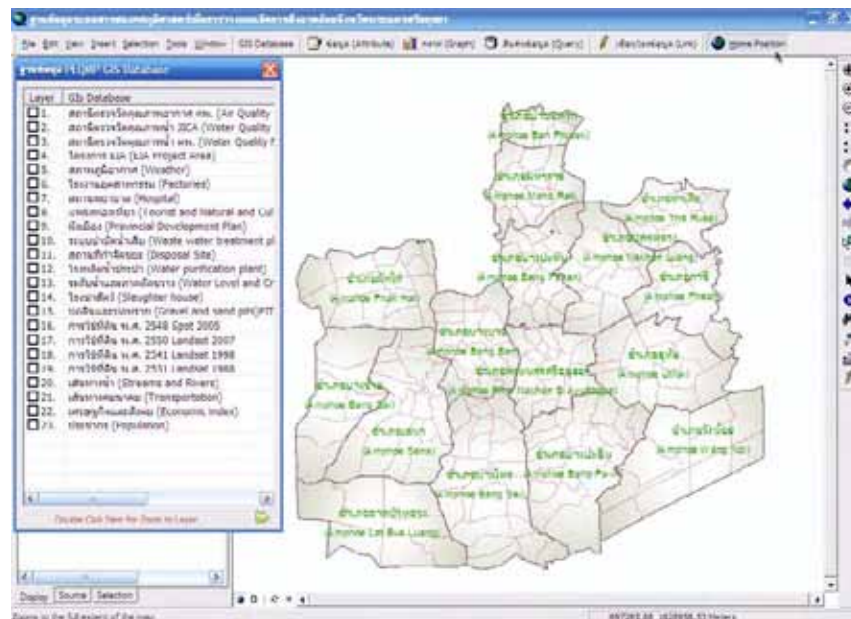


Figure 61 : Home Position Display

Besides, it has many tools and functions without showing in window, but can open and use by right click on area of Menu Bars or Toolbars then hidden functions will be appeared.

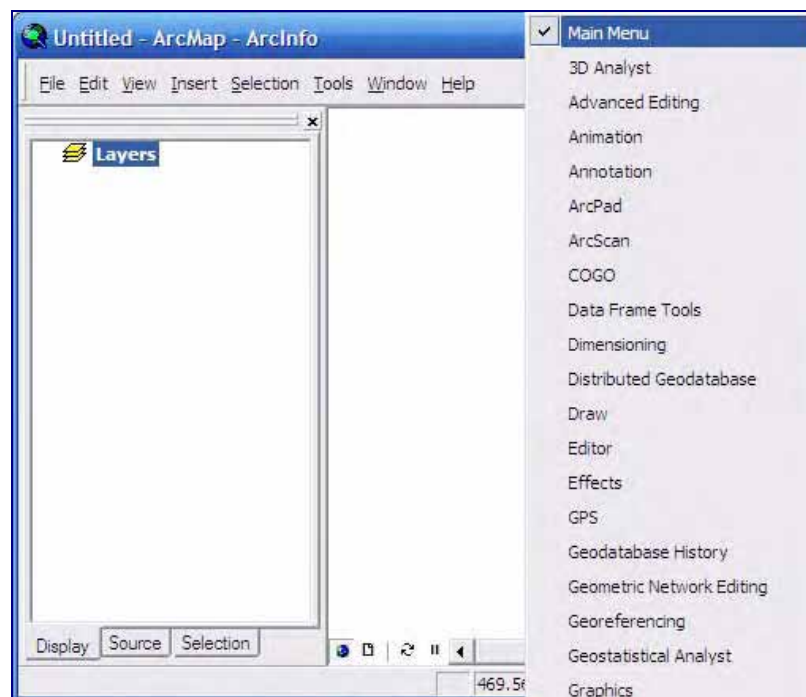


Figure 62 : On-off Tools and Functions Display

f. Usability Description of Each Field

The field is divided into three main parts; PEQMP GIS Database, DEQP GIS Database, and Base Map.


- ☐  **Geographic Information System**
 - ☒ **PEQMP GIS Database**
 - ☐ สถานีตรวจวัดคุณภาพอากาศ คพ. (Air Quality PCD)
 - ☐ สถานีตรวจวัดคุณภาพน้ำ JICA (Water Quality Monitoring Stations JICA)
 - ☐ สถานีตรวจวัดคุณภาพน้ำ คพ. (Water Quality Monitoring Stations PCD)
 - ☐ โครงการ EIA (EIA Project Area)
 - ☐ สภาพภูมิอากาศ (Weather)
 - ☐ โรงงานอุตสาหกรรม (Factories)
 - ☐ สถานพยาบาล (Hospital)
 - ☐ แหล่งท่องเที่ยว (Tourist and Natural and Cultural Heritage Sites)
 - ☐ ผังเมือง (Provincial Development Plan)
 - ☐ ระบบบำบัดน้ำเสีย (Waste water treatment plant)
 - ☐ สถานที่กำจัดขยะ (Disposal Site)
 - ☐ โรงผลิตน้ำประปา (Water purification plant)
 - ☐ ระดับน้ำและภาคตัดขวาง (Water Level and Cross Section)
 - ☐ โรงฆ่าสัตว์ (Slaughter house)
 - ☐ บ่อดินและบ่อทราย (Gravel and sand pits)PITS
 - ☐ การใช้ที่ดิน พ.ศ. 2548 Spot 2005
 - ☐ การใช้ที่ดิน พ.ศ. 2550 Landsat 2007
 - ☐ การใช้ที่ดิน พ.ศ. 2541 Landsat 1998
 - ☐ การใช้ที่ดิน พ.ศ. 2531 Landsat 1988
 - ☐ เส้นทางน้ำ (Streams and Rivers)
 - ☐ เส้นทางคมนาคม (Transportation)
 - ☐ เศรษฐกิจและสังคม (Economic index)
 - ☐ ประชากร (Population)
 - ☒ **DEQP GIS Database**
 - ☐ ท่าเรือ (Ports)
 - ☐ ธรณีวิทยา (Geology)
 - ☐ สถานที่สำคัญ (Places)
 - ☐ โรงเรียน (Schools)
 - ☐ จุดระดับความสูง (Spot Height)
 - ☐ ความลาดชัน (Slope)
 - ☐ ระดับความสูง (Elevation)
 - ☐ ทิศทางความลาดชัน (Aspect)
 - ☐ ชุดดิน (Soil Series)
 - ☐ ป่าอนุรักษ์ (Forest Conservation)
 - ☐ บ่อน้ำบาดาล (Well)
 - ☐ ลุ่มน้ำ (Basin)
 - ☐ ขัณคูปภาพลุ่มน้ำ (Watershed)
 - ☐ ขัณน้ำบาดาล (Aquifer)
 - ☐ พื้นที่โครงการชลประทาน (Irrigation Project Area)
 - ☒ **แผนที่พื้นฐาน (Base Map)**
 - ☐ หมู่บ้าน (Villages)
 - ☒ อำเภอ (Amphoe)
 - ☒ ตำบล (Tambon)
 - ☐ เทศบาล (Municipalities)

Figure 63 : List of all GIS Fields of Project

Details of each layer and described below.

f.1 PEQMP GIS Database

f.1.1. Air Quality Monitoring Station of PCD) Air Quality PCD)

When click Attribute and select station, program will show window of air quality monitoring station of PCD) Air Quality PCD). If click Export to Excel, program will show window as addressed in page 39.

สถานีตรวจวัดคุณภาพอากาศ PCD (Air Quality PCD)

รหัสสถานี : 33201
(Sta. IDN)

ชื่อสถานีไทย : โรงเรียนอยุธยาวิทยาลัย
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Ayutthaya Witthayalai School
(Sta. Name Eng)

AQ_STA_IDN	DATE	SO2 (ppb)	NO2 (ppb)	CO_1HR (pp...	CC
33201	2007/11/23	3.8	16.4	0	0
33201	2007/11/22	3.6	20.3	.7	.7
33201	2007/11/21	2.3	22.3	.9	.9
33201	2007/11/20	1.6	15.2	.9	1
33201	2007/11/19	.6	12.3	0	0
33201	2007/11/18	1.7	15.3	0	0
33201	2007/11/17	1.9	18.3	0	0
33201	2007/11/16	0	14.4	0	0
33201	2007/11/15	1	14.7	0	0
33201	2007/11/14	1	14	0	0
33201	2007/11/13	1.3	17.1	0	0
33201	2007/11/12	1.7	13.9	0	0
33201	2007/11/11	2.2	18.1	0	0

หมายเหตุ 0 คือ ไม่มีข้อมูล
Remark 0 : No Data

ส่งออกข้อมูล (Export to Excel)

Figure 64 : Details of Air Quality Monitoring Station of PCD

When click Graph and select station, program will show graph window.

กราฟคุณภาพอากาศ Air Quality Graph

รหัสสถานี : 33201
(Sta. IDN)

ชื่อสถานีไทย : โรงเรียนอยุธยาวิทยาลัย
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Ayutthaya Witthayalai School
(Sta. Name Eng)

พารามิเตอร์ : [เลือกพารามิเตอร์]
(Parameter)

ช่วงเวลาเก็บข้อมูล : [เลือกวันที่] [เลือกวันที่]
(Survey Date) yyyy/mm/dd To yyyy/mm/dd

แสดงกราฟ (Show Graph)

Figure 65 : Graph of Air Quality Monitoring Station of PCD

User can select parameters and data collecting period by select the beginning time and check the box to select ending time of air quality monitoring of PCD) Air Quality PCD).

กราฟคุณภาพอากาศ Air Quality Graph

รหัสสถานี : 33201
(Sta. IDN)

ชื่อสถานีไทย : โรงเรียนอยุธยาวิทยาลัย
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Ayutthaya Witthayalai School
(Sta. Name Eng)

พารามิเตอร์ : SO2
(Parameter)

ช่วงเวลาเก็บข้อมูล : 2007/11/15 ถึง 2007/11/23
(Survey Date) yyyy/mm/dd To yyyy/mm/dd

แสดงกราฟ (Show Graph)

Figure 66 : Specify Graph Condition of Air Quality Monitoring Station of PCD

Then click show graph.

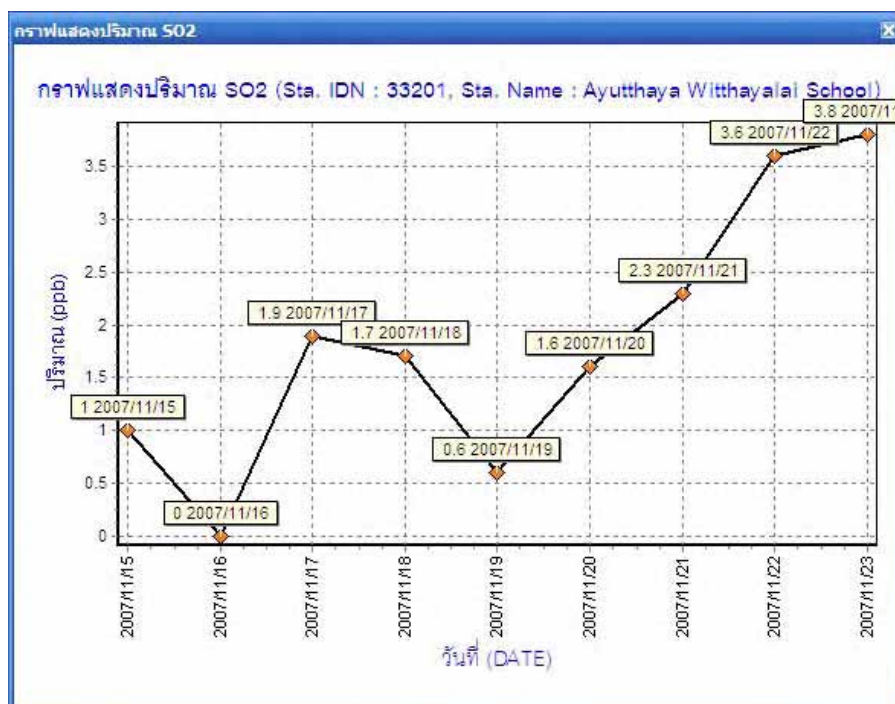


Figure 67 : Example Graph of Air Quality Monitoring Station of PCD

f.1.2. Water Quality Monitoring Stations JICA

When click Attribute and select station, program will show window of Water Quality Monitoring Stations JICA.

WQ_STA_IDN	DATE	AAT (degree...)	WT (degree...)	PH	DO (mg/l)
3	28/08/2007	34.2	31	8.4	7.65

Figure 68 : Details of Water Quality Monitoring Stations JICA

Then click show graph.

Figure 69 : Specify Graph Condition of Water Quality Monitoring Stations JICA

f.1.3. Water Quality Monitoring Stations of PCD

When click Attribute and select station, program will show window of Water Quality Monitoring Stations of PCD. User can choose to view Raw Data or Summary Data by click selection bar at the top.

สถานีตรวจวัดคุณภาพน้ำ PCD (Water Quality Monitoring Stations PCD)

รหัสสถานี : PS02
(Station ID)

ชื่อสถานีไทย : สะพาน อ.นครหลวง
(Station Name Thai)

ชื่อสถานีอังกฤษ : Bridge, Amphoe Mueang
(Station Name Eng)

ข้อมูล (Raw Data) | ข้อมูลสรุป (Summary Data)

IDN	WQ_STA_IDN	COUNT	DATE	AAT	WT (de
90	PS02	1/1997	1997/04/03	31	30
91	PS02	1/1998	1998/03/03	31	27
92	PS02	1/1999	1999/09/02	0	27.3
93	PS02	1/2000	2000/01/02	0	24
94	PS02	1/2001	2001/02/13	37	29
95	PS02	1/2002	2002/01/29	29	26
96	PS02	1/2003	2003/02/04	0	30
97	PS02	1/2004	2004/01/29	0	25.8
98	PS02	1/2005	2004/12/02	37	27.3

หมายเหตุ 0 คือ ไม่มีข้อมูล
Remark 0 : No Data

ส่งออกข้อมูล Export to Excel

Figure 70 : Raw Data of Water Quality Monitoring Stations of PCD

สถานีตรวจวัดคุณภาพน้ำ PCD (Water Quality Monitoring Stations PCD)

รหัสสถานี : PS02
(Station ID)

ชื่อสถานีไทย : สะพาน อ.นครหลวง
(Station Name Thai)

ชื่อสถานีอังกฤษ : Bridge, Amphoe Mueang
(Station Name Eng)

ข้อมูล (Raw Data) | ข้อมูลสรุป (Summary Data)

WQ_STA_IDN	Number	Year	DO (mg/l)	BOD (mg/l)	TCB (Mf
PS02	1//40	1997	5.2	2.6	14000
PS02	1//41	1998	7	2.7	3400
PS02	1//42	1999	4.4	2.1	3500
PS02	1//43	2000	6.6	2.1	9000
PS02	1//44	2001	5.1	.6	1300
PS02	1//45	2002	4.8	1.3	17000
PS02	1//46	2003	8	.6	2300
PS02	1//47	2004	5.7	1	2300
PS02	1//49	2006	3.2	1.5	1300

ส่งออกข้อมูล Export to Excel

Figure 71 : Summary Data of Water Quality Monitoring Stations of PCD

When click Graph and select station, program will show graph window.

กราฟคุณภาพคุณภาพน้ำ PCD (Water Quality PCD Graph)

รหัสสถานี : PS02
(Sta. IDN)

ชื่อสถานีไทย : สะพาน อ.นครหลวง
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Bridge, Amphoe Mueang
(Sta. Name Eng)

พารามิเตอร์ : [เลือกพารามิเตอร์]
(Parameter)

ช่วงเวลาเก็บข้อมูล : [เลือกวันที่] To [เลือกวันที่]
(Survey Date) yyyy/mm/dd yyyy/mm/dd

แสดงกราฟ (Show Graph)

Figure 72 : Graph of Water Quality Monitoring Stations of PCD

f.2 EIA Project

When click Attribute and select station, program will show window of EIA Project.

โครงการประเมินสภาวะสิ่งแวดล้อม (EIA Project)

รหัสโครงการ : 1
(Project ID)

ชื่อโครงการไทย : นิคมอุตสาหกรรมบางปะอิน
(Project Name Thai)

ชื่อโครงการอังกฤษ : Bangpain Industrial Estate
(Project Name Eng)

เจ้าของโครงการ : บริษัท ที่ดินบางปะอิน จำกัด
(Project Owner)

คุณภาพน้ำ (Water Qua.)		คุณภาพอากาศ (Air Qua.)		คุณภาพเสียง (Noise Qua.)	
EIA_PRJ_NO	DATE	PH	COD (mg/l)	BOD (mg/l)	
1	2007/01-20...	7.5-8.5	32.1-51.5	4.0-17.6	
1	2006/07-20...	7.6-8.1	28.1-53.6	3.2-8.6	
1	2006/01-20...	7.1-8.2	28.6-47.5	8.2-14.8	
1	2005/07-20...	6.4-8.3	35.6-77.9	4.6-12.9	
1	2005/01-20...	7.6-8.6	17.6-55.4	5.8-20.2	
1	2004/07-20...	7.8-8.1		2.3-7.7	
1	2004/01-20...	7.8-8.5	33.9-51.5	5.4-8.7	
1	2003/07-20...	7.4-8.5	20.0-34.3	2.5-4.1	
1	2003/01-20...	7.8-8.4	27.7-36.4	3.3-5.9	

ส่งออกข้อมูล (Export to Excel)

Figure 73 : Water Quality data of EIA Project

โครงการประเมินผลกระทบสิ่งแวดล้อม (EIA Project)

รหัสโครงการ : 1
(Project ID)

ชื่อโครงการไทย : นิคมอุตสาหกรรมบางปะอิน
(Project Name Thai)

ชื่อโครงการอังกฤษ : Bangpain Industrial Estate
(Project Name Eng)

เจ้าของโครงการ : บริษัท ที่ดินบางปะอิน จำกัด
(Project Owner)

คุณภาพน้ำ (Water Qua.)		คุณภาพอากาศ (Air Qua.)		คุณภาพเสียง (Noise Qua.)	
EIA_PRJ_NO	DATE	TSP (ug/m3)	PM10 (ug/m3)	SO2 (ppb)	
1	2007/01-20...	0.258-0.346	0.108-0.181	<0.001	
1	2006/07-20...	0.052-0.058	0.034-0.049	<0.001-0.00	
1	2006/01-20...	0.188-0.249	0.149-0.199	<0.001-0.00	
1	2005/07-20...	0.08-0.126	0.042-0.071	<0.001-0.00	
1	2005/01-20...	0.156-0.171	0.083-0.113	0.004-0.005	
1	2004/07-20...	0.074-0.172	0.045-0.108	<0.001-0.00	
1	2004/01-20...	0.091-0.217	0.052-0.177	<0.001	
1	2003/07-20...	0.053-0.124	0.044-0.121	<0.001-0.00	
1	2003/01-20...	0.072-0.103	0.023-0.073	<0.001	

ส่งออกข้อมูล Excel

Figure 74 : Air Quality data of EIA Project

โครงการประเมินผลกระทบสิ่งแวดล้อม (EIA Project)

รหัสโครงการ : 1
(Project ID)

ชื่อโครงการไทย : นิคมอุตสาหกรรมบางปะอิน
(Project Name Thai)

ชื่อโครงการอังกฤษ : Bangpain Industrial Estate
(Project Name Eng)

เจ้าของโครงการ : บริษัท ที่ดินบางปะอิน จำกัด
(Project Owner)

คุณภาพน้ำ (Water Qua.)		คุณภาพอากาศ (Air Qua.)		คุณภาพเสียง (Noise Qua.)	
EIA_PRJ_NO	DATE	LEQ_TIME	MAX_DBA	AVG_DBA	
1	2007/01-20...	24	59.8	57.6	
1	2006/07-20...	24	55.3	54.8	
1	2006/01-20...	24	55.5	55	
1	2005/07-20...	24	65.1	59.7	
1	2005/01-20...	24	57.8	57.1	
1	2004/07-20...	24	0	54.6	
1	2004/01-20...	24	0	57.7	
1	2003/07-20...	24	0	54.9	
1	2003/01-20...	24	0	59.7	

ส่งออกข้อมูล Excel

Figure 75 : Noise Level data of EIA Project

f.3 Weather

When click Attribute and select station, program will show window of Weather. The data is consists of steam, cloud, humidity, precipitation, wind speed, sunlight, and temperature. User can select data type at left bar.

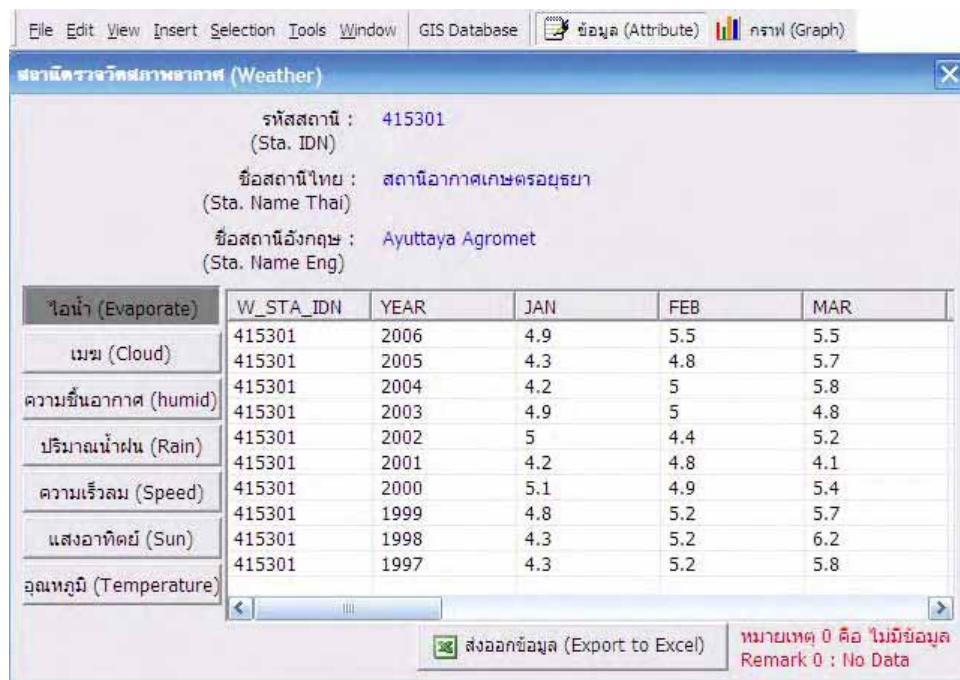


Figure 76 : Weather Data

When click Graph and select station, program will show Weather Graph window. User can select to view data of cloud graph, steam graph, humidity graph, precipitation graph, wind speed graph, sunlight graph, and temperature graph.

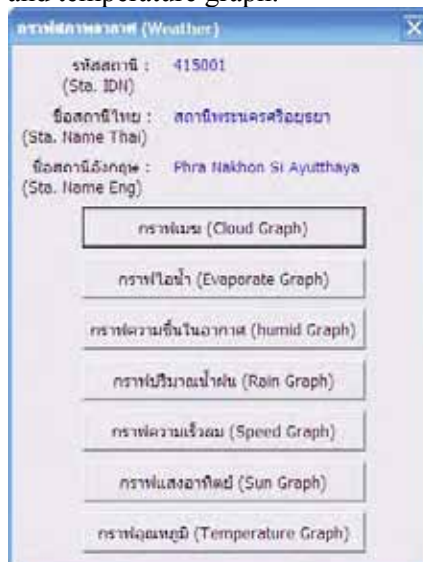


Figure 77 : Window Selection of Weather Graph

When select graph, window will be appeared to show selected graph as example below.

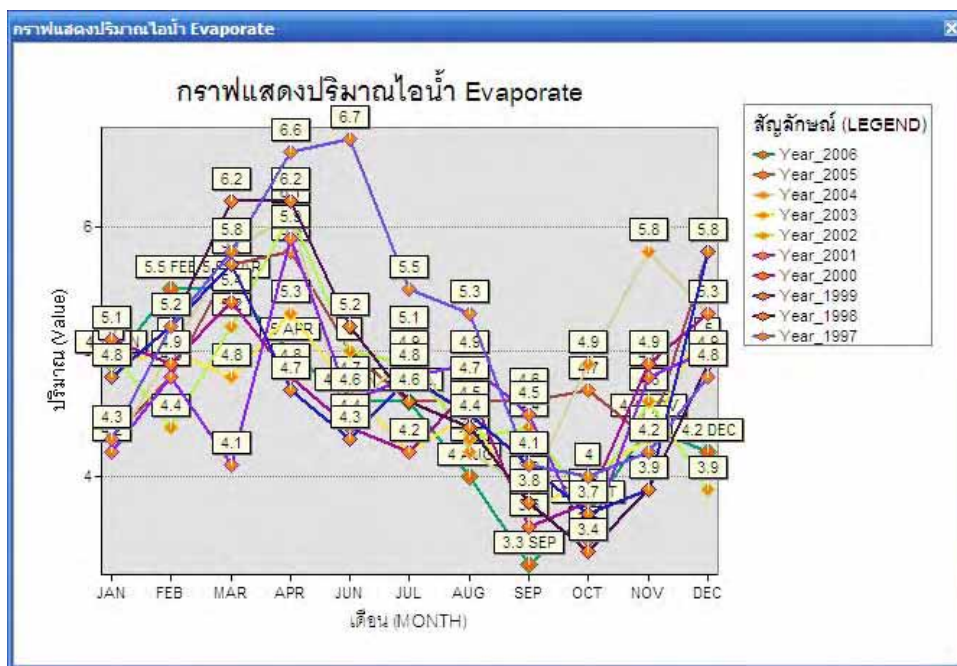


Figure 78 : Windows of Evaporate Graph

f.4 Factories

When click Attribute and select factory, program will show window of factory details.

Identify Results	
Layers:	<Top-most layer>
โรงงานอุตสาหกรรม (Factories)	Location: (651414.846957 1565505.194259)
3-009(01)-012/22อย	
Field	Value
FID	55
Shape	Point
FACTORY-ID	55
FAC_REG	3-009(01)-012/22อย
NON_HIW_GA	222
HIW_GA	0
FAC_NAME_T	โรงสีไฟสุขเจริญพาณิชย์
DIW_CODE	009
TEAM_CODE	G01
HIW_NON	NON
REG_YEAR	1979
FAC_OWNER	โรงสีไฟสุขเจริญพาณิชย์
PRODUCT_T	สีข้าว กำลังสีสูงสุดของร้านสีข้าว 40 เกวียน/วัน
FAC_CAP	1035000
FAC_SIZE	3
FAC_HP	100
FAC_WORKER	8

Figure 79 : Window of Factory Details

f.5 Hospital

When click Attribute and select hospital, program will show window of hospital details.

f.6 Tourist and Natural and Cultural Heritage Sites

When click Attribute and select tourism location, program will show window of tourism location details.

When click Link and select tourism location, program will show window of tourism location pictures

f.7 Provincial Development Plan

When click Attribute and select provincial development plan, program will show window of provincial development plan details.

When click Link and select provincial development plan, program will open Adobe Acrobat to show provincial development plan file (.pdf).

f.8 Wastewater Treatment Plant

When click Attribute and select wastewater treatment plant, program will show window of wastewater treatment plant details.

When click Link and select wastewater treatment plant, program will show window of wastewater treatment plant pictures.

f.9 Solid Waste Disposal Site

When click Attribute and select solid waste disposal site, program will show window of solid waste disposal site details.

When click Link and select solid waste disposal site, program will show window of solid waste disposal site pictures.

f.10 Water Purification Plant

When click Attribute and select water purification plant, program will show window of water purification plant details.

When click Link and select water purification plant, program will show window of water purification plant pictures.

f.11 Water Level Section

When click Attribute and select water level section, program will show window of water level and cross section details. User can select to view data of water level and cross section.

ระดับน้ำและภาคตัดขวาง (Water Level and Cross Section)

รหัสสถานี : S.5
(Sta. IDN)

ชื่อสถานีไทย : แม่น้ำป่าสัก
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Mae Nam Pasak
(Sta. Name Eng)

ระดับน้ำ (Water Level) | ภาคตัดขวาง (Cross Section)

STR_X	DATE	MAX	MIN	MEAN
S.5	2002/04/01	.75	0	.39
S.5	2002/04/02	.75	-.08	.43
S.5	2002/04/03	.74	-.05	.45
S.5	2002/04/04	.92	-.06	.59
S.5	2002/04/05	.84	-.04	.53
S.5	2002/04/06	.88	-.06	.56
S.5	2002/04/07	.78	-.15	.41

ส่งออกข้อมูล (Export to Excel)

Figure 80 : Water Level Data

ระดับน้ำและภาคตัดขวาง (Water Level and Cross Section)

รหัสสถานี : S.5
(Sta. IDN)

ชื่อสถานีไทย : แม่น้ำป่าสัก
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Mae Nam Pasak
(Sta. Name Eng)

ระดับน้ำ (Water Level) | ภาคตัดขวาง (Cross Section)

STR_X	PNTSEQ_NO	SOUNDING	DATUM_ADJ	ELEV
S.5	0	0	0	5.15
S.5	0	0	0	4.82
S.5	0	0	0	4.66
S.5	0	0	0	4.61
S.5	0	0	0	4.47
S.5	0	0	0	4.35
S.5	0	0	0	4.51

ส่งออกข้อมูล (Export to Excel)

Figure 81 : Cross Section Data

When click Graph and select any position on the map of water level section, program will show graph. When click Cross Section, program will show window of Graph of Water Level and Cross Section details.

ระดับน้ำและภาคตัดขวาง (Graph of Water Level and Cross Section)

รหัสสถานี : S.26
(Sta. IDN)

ชื่อสถานีไทย : แม่น้ำป่าสัก
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Mae Nam Pasak
(Sta. Name Eng)

ภาคตัดขวาง (Cross Section)

ระดับน้ำ Water Level

ช่วงเวลาเก็บข้อมูล : ถึง
(Survey Date) yyyy/mm/dd To yyyy/mm/dd

ระดับน้ำ (Water Level)

Figure 82 : Window of Graph of Water Level and Cross Section

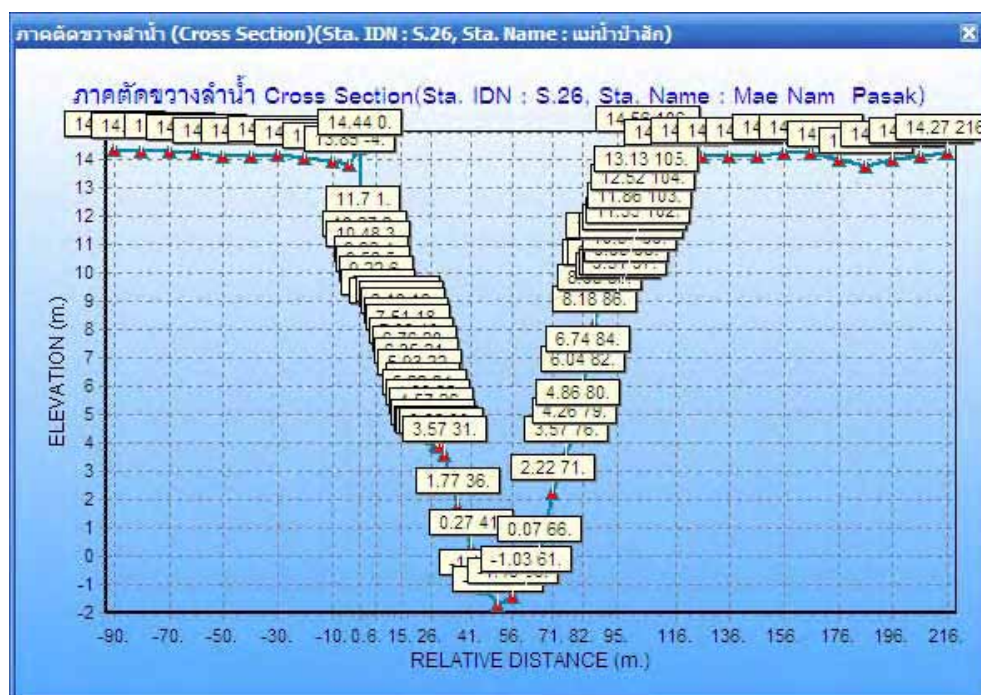


Figure 83 : Windows for Display Graph of Cross Section


User can view water level data by selected time interval for collect data.

ระดับน้ำและภาคตัดขวาง (Graph of Water Level and Cross Section)

รหัสสถานี : S.5
(Sta. IDN)

ชื่อสถานีไทย : แม่น้ำปาสัก
(Sta. Name Thai)

ชื่อสถานีอังกฤษ : Mae Nam Pasak
(Sta. Name Eng)

 ภาคตัดขวาง (Cross Section)

ระดับน้ำ Water Level

ช่วงเวลาเก็บข้อมูล : 2002/04/01
(Survey Date) yyyy/mm/dd

☒ ถึง 2003/04/01
To yyyy/mm/dd


 ระดับน้ำ (Water Level)

Figure 84 : Specify time intervals in collect data

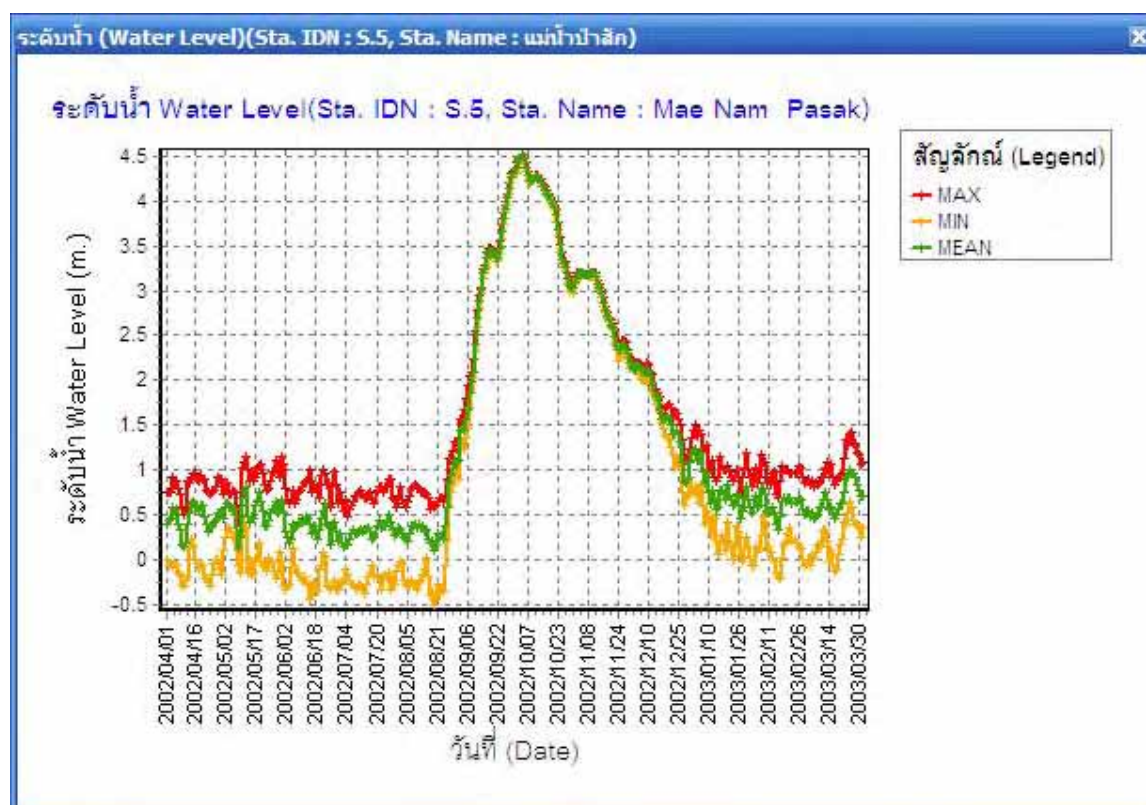


Figure 85 : Graph from selected time interval

f.12 Slaughter House

When click Attribute and select slaughter house, program will show window of slaughter house details.

f.13 Gravel and sand pits

When click Attribute and select gravel and sand pits, program will show window of gravel and sand pits details.

f.14 Land Use in 2005 (B.E. 2548) Spot 2005

When click Attribute and select any position on the map of land use in 2005 (B.E. 2548) Spot 2005, program will show details.

การไต่ที่ดิน SPOT 2005 (Landuse : SPOT 2005)

LU_CODE	NAME_E	NAME_T	SUM_AREA	PERCENT
A0100	Paddy Field	นาข้าว	2073.63	81.45
A0300	Mixed Peren...	ไม้ยืนต้น, ไม้...	69.51	2.73
A0900	Aquacultural...	สถานที่เพาะ...	12.71	.5
F0300	Forest Plant...	สวนป่า	4.36	.17
M0100	Rangeland	ทุ่งหญ้าธรรม...	47.5	1.87
M0200	Wetland	พื้นที่ลุ่ม	45.49	1.79
U0100	City, Town,...	ตัวเมืองและย...	46.92	1.84
U0200	Villages	หมู่บ้าน	143.3	5.63
U0500	Industrial	พื้นที่อุตสาหกรรม	11.27	0.45

ส่งออกข้อมูล (Export to Excel)

หน่วยพื้นที่ : ตารางกิโลเมตร

Figure 86 : Land Use Data in 2005 (B.E. 2548) Spot 2005

When click Graph and select any position on the map of land use in 2005 (B.E. 2548) Spot 2005, program will show graph.

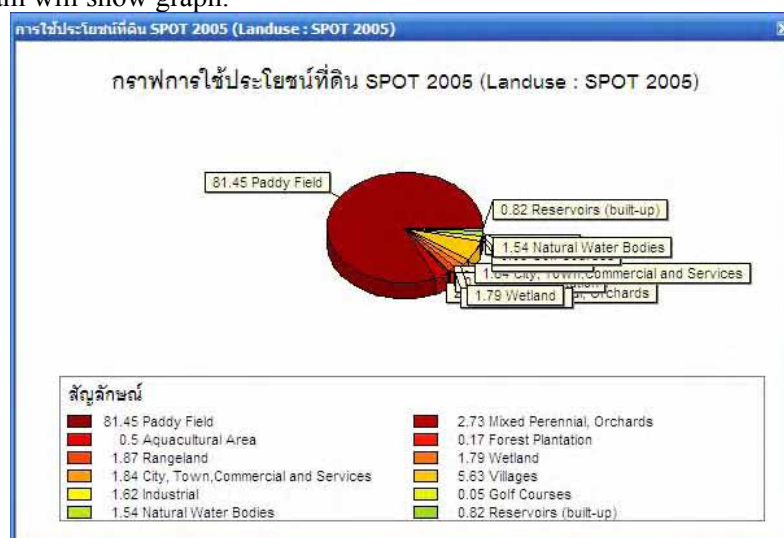


Figure 87 : Land Use Graph in 2005 (B.E. 2548) Spot 2005

f.15 Land Use in 2007 (B.E. 2550) Landsat 2007

When click Attribute and select any position on the map of land use in 2007 (B.E. 2550) Landsat 2007, program will show graph.

การใช้ประโยชน์ที่ดิน LANDSAT 2007 (Land Use : LANDSAT 2007)

การใช้ประโยชน์ที่ดิน LANDSAT 2007 (Land Use : LANDSAT 2007)

LU_CODE	NAME_E	NAME_T	AREA_2007	PER_2007
A0000	Agricultural ...	พื้นที่เกษตร...	2131.56	83.63
A0300	Mixed Peren...	ไม้ยืนต้น, ไม้...	42.45	1.67
A0900	Aquacultural...	สถานที่เพาะ...	14.08	.55
F0300	Forest Plant...	สวนป่า	4.06	.16
M0100	Rangeland, ...	ทุ่งหญ้าธรรม...	42.46	1.67
U0000	Urban and b...	พื้นที่ชุมชนแ...	264.55	10.38
W0000	Water Bodies	พื้นที่น้ำ	49.7	1.95

ส่งออกข้อมูล (Export to Excel) แสดงกราฟ (Show Graph)

การเปลี่ยนแปลงการใช้ที่ดิน (Change Of Landuse)

LU_CODE	NAME_E	NAME_T	AREA_1988	AREA_1998	AR
A0000	Agricultural ...	พื้นที่เกษตร...	2195.36	2159.59	21
A0300	Mixed Peren...	ไม้ยืนต้น, ไม้...	97.23	46.15	42
A0900	Aquacultural...	สถานที่เพาะ...	6.95	12.68	14
F0300	Forest Plant...	สวนป่า	6.07	8.09	4
M0100	Rangeland, ...	ทุ่งหญ้าธรรม...	98.03	89.9	42
U0000	Urban and b...	พื้นที่ชุมชนแ...	99.55	185.85	26
W0000	Water Bodies	พื้นที่น้ำ	45.65	46.59	49

ส่งออกข้อมูล (Export to Excel)

หน่วยพื้นที่ : ตารางกิโลเมตร

Figure 88 : Land Use Data in 2007 (B.E. 2550) Landsat 2007

When click Attribute and select any position on the map of land use in 2007 (B.E. 2550) Landsat 2007, program will show details.

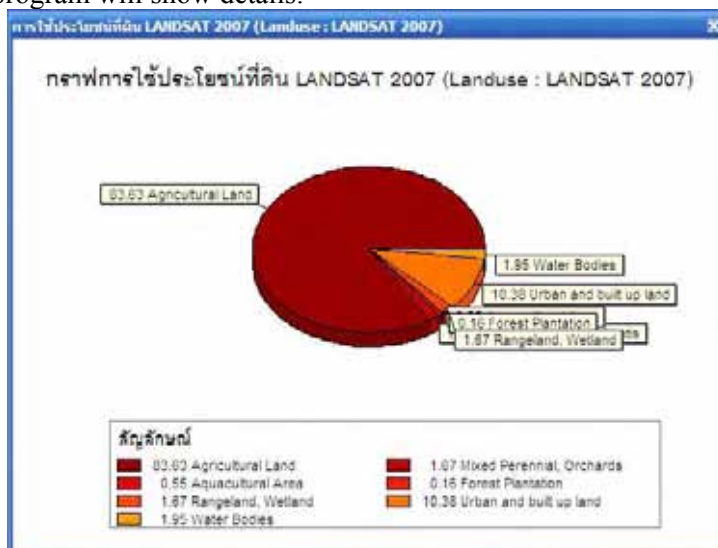


Figure 89 : Land Use Graph in 2007 (B.E. 2550) Landsat 2007

f.16 Land Use in 1998 (B.E. 2541) Landsat 1998

When click Attribute and select any position on the map of land use in 1998 (B.E. 2541) Landsat 1998, program will show details.



LU_CODE	NAME_E	NAME_T	AREA_1998	PER_1998
A0000	Agricultural ...	พื้นที่เกษตรก...	2159.59	84.73
A0300	Mixed Peren...	ไม้ยืนต้น, ไม้...	46.15	1.81
A0900	Aquacultural...	สถานที่เพาะ...	12.68	.5
F0300	Forest Plant...	สวนป่า	8.09	.32
M0100	Rangeland, ...	ทุ่งหญ้าธรรม...	89.9	3.53
U0000	Urban and b...	พื้นที่ชุมชนแ...	185.85	7.29
W0000	Water Bodies	พื้นที่น้ำ	46.59	1.83

ส่งออกข้อมูล (Export to Excel)

หน่วยพื้นที่ : ตารางกิโลเมตร

Figure 90 : Land Use Data in 1998 (B.E. 2541) Land sat 1998

When click Graph and select any position on the map of land use in 1998 (B.E. 2541) Landsat 1998, program will show graph.

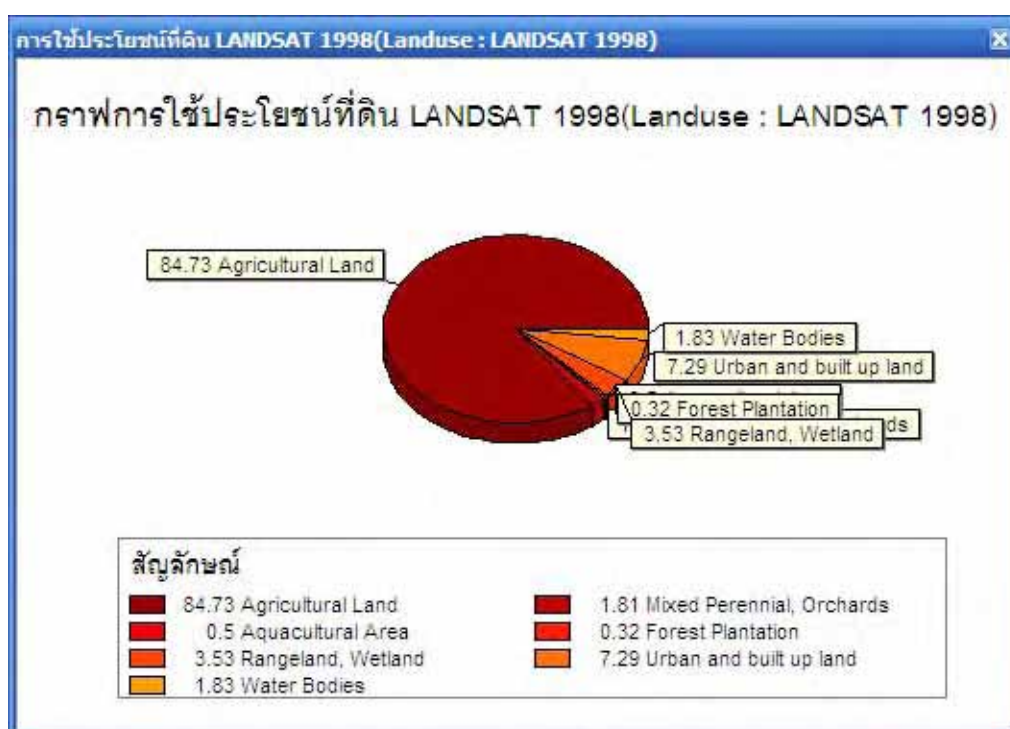


Figure 91 : Land Use Graph in 1998 (B.E. 2541) Landsat 1998

f.17 Land Use in 1988 (B.E. 2531) Landsat 1988

When click Attribute and select any position on the map of land use in 1988 (B.E. 2531) Landsat 1988, program will show details.

การใช้ที่ดิน LANDSAT 1988 (Landuse : LANDSAT 1988)

LU_CODE	NAME_E	NAME_T	AREA_1988	PER_1988
A0000	Agricultural ...	พื้นที่เกษตรก...	2195.36	86.13
A0300	Mixed Peren...	ไม้ยืนต้น, ไม้...	97.23	3.81
A0900	Aquacultural...	สถานที่เพาะ...	6.95	.27
F0300	Forest Plant...	สวนป่า	6.07	.24
M0100	Rangeland, ...	ทุ่งหญ้าธรรม...	98.03	3.85
U0000	Urban and b...	พื้นที่ชุมชน...	99.55	3.91
W0000	Water Bodies	พื้นที่น้ำ	45.65	1.79

☒ ส่งออกข้อมูล (Export to Excel)

หน่วยพื้นที่ : ตารางกิโลเมตร

Figure 92 : Land Use Data in 1998 (B.E. 2531) Landsat 1988

When click Graph and select any position on the map of land use in 1988 (B.E. 2531) Landsat 1988, program will show graph.

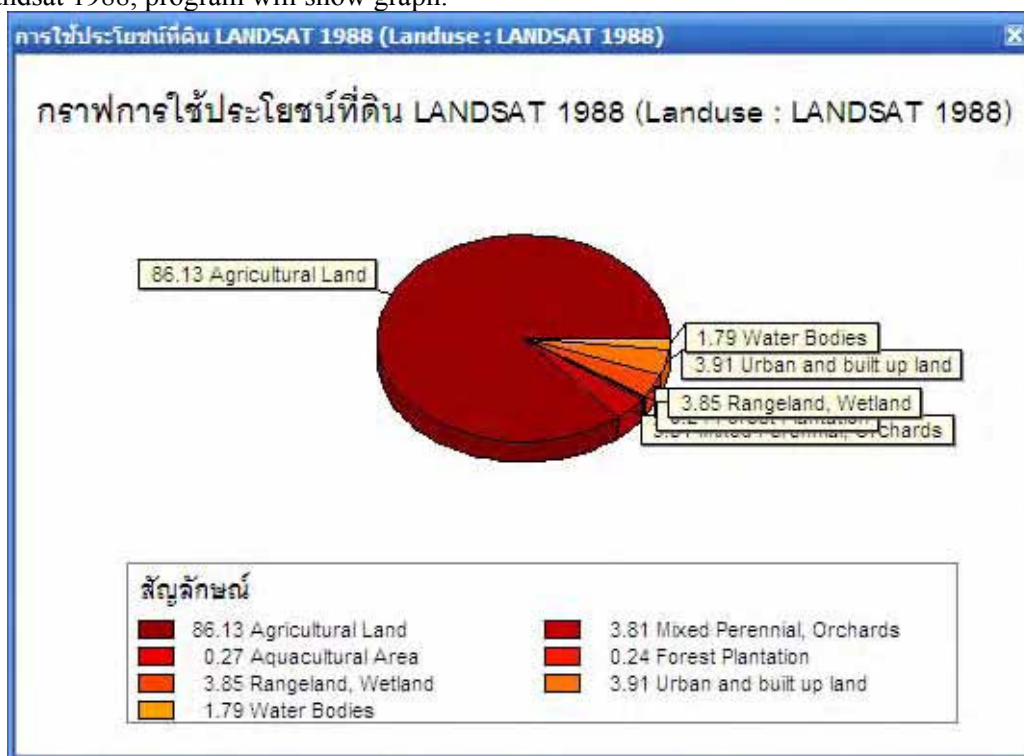


Figure 93 : Land Use Graph in 1988 (B.E. 2531) Landsat 1988

f.18 Streams and Rivers

When click Attribute and select stream and river, program will show window of stream and river details.

f.19 Transportation Route

When click Attribute and select transportation route, program will show window of transportation route details.

f.20 Socio-economic) Economic Index)

When click Attribute and select any position of socio-economic data, program will show window of socio-economic details of the province.

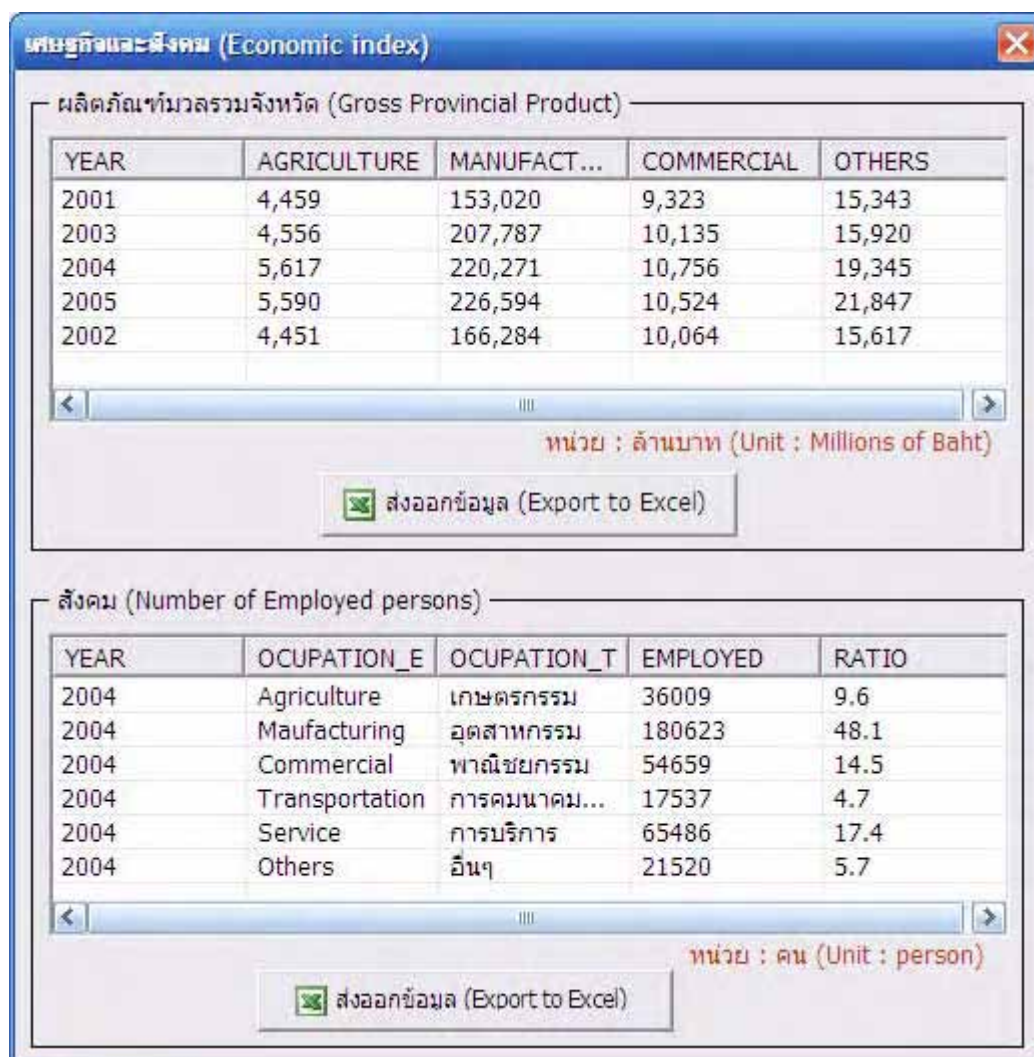


Figure 94 : Socio-economic Data

When click Graph and select any position, program will show graph of socio-economic data.



Figure 95 : Socio-economic Graph

f.21 Population

When click Attribute and select population, program will show window of population details. When click Graph and select the position of population data, program will show graph of population numbers of Phra Nakhon Si Ayutthaya Province.



Figure 96 : Population Graph

f.22 DEQP GIS Database

When click Attribute and select the position in each field under DEQP GIS Database, program will show details window to explain the selected object as below example.

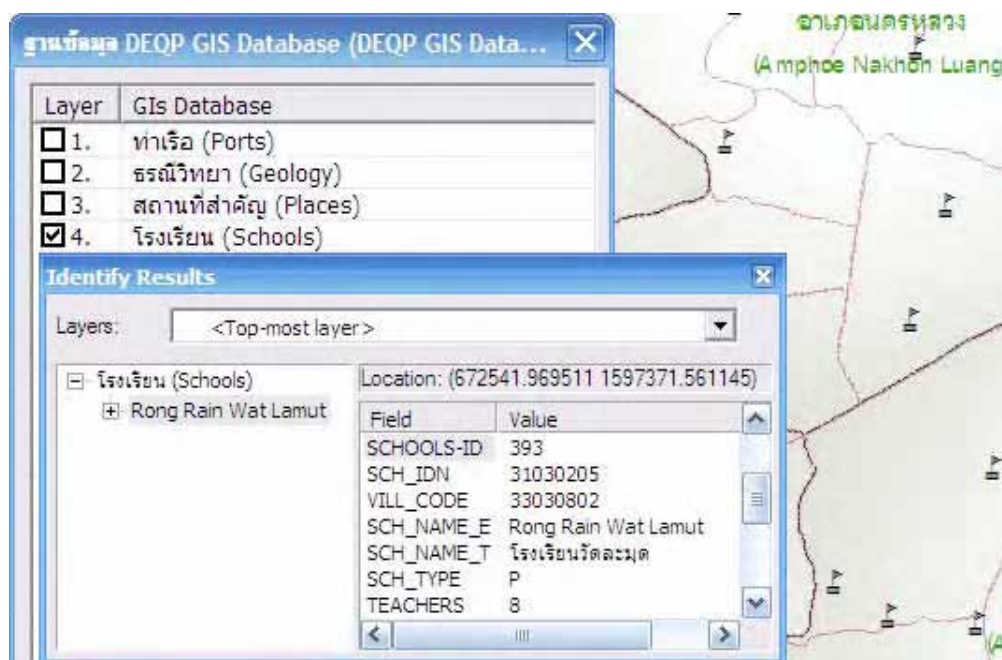


Figure 97 : Data Example

- Ports
- Geology
- Places
- Schools
- Spot Height
- Slope
- Elevation
- Aspect
- Soil Series
- Forest Conservation
- Well
- Basin
- Watershade
- Aquifer
- Irrigation Project Area

f.23 Base Map

Base Map is usable to specify object position by administration boundary area divided into 4 levels as follows;

- Villages
- Amphoe
- Tambon
- Municipalities

Appendix

Related Table for Program Function with Phra Nakhon Si Ayutthaya Province GIS Database

PEQMP GIS Database		Attribute	Graph	Link
1.	Air Quality PCD	✓	✓	

2.	Water Quality Monitoring Stations JICA	✓	✓	
3.	Water Quality Monitoring Stations PCD	✓	✓	
4.	EIA Project Area	✓		
5.	Weather	✓	✓	
6.	Factories	✓		
7.	Hospital	✓		
8.	Tourist and Natural and Cultural Heritage Sites	✓		✓
9.	Provincial Development Plan	✓		✓
10.	Waste water treatment plant	✓		✓
11.	Disposal Site	✓		✓
12.	Water purification plant	✓		✓
13.	Water Level and Cross Section	✓		✓
14.	Slaughter house	✓		
15.	Ports	✓		
16.	Gravel and Sand Pits	✓		
17.	Landuse year 2005 (Spot-5)	✓	✓	
18.	Landuse year 2007 (Landsat-5)	✓	✓	
19.	Landuse year 1998 (Landsat-5)	✓	✓	
20.	Landuse year 1988 (Landsat-5)	✓	✓	
21.	Streams and Rivers	✓		
22.	Transportation	✓		
23.	Population	✓	✓	
24.	Economic index	✓	✓	

**Related Table for Program Function with Phra Nakhon Si Ayutthaya Province
GIS Database**

PEQMP GIS Database		Attribute	Graph	Link
1.	Geology	✓		
2.	Places	✓		
3.	Schools	✓		
4.	Spot Height	✓		
5.	Slope	✓		
6.	Elevation	✓		
7.	Aspect	✓		
8.	Soil Series	✓		

9.	Forest Conservation	✓		
10.	Well	✓		
11.	Basin	✓		
12.	Watershade	✓		
13.	Aquifer	✓		
14.	Irrigation Project Area	✓		
Base Map				
1.	Villages	✓		
2.	Amphoe	✓		
3.	Tambon	✓		
4.	Municipalities	✓		

5.2 ArcReader Manual for Ayutthaya Province (for GIS Database User)

ArcReader is an application program for map display, attribute data viewing, and published map document (*.pmf) printing. This program is based on ArcGIS with ArcPublisher using, and is also available for free to download.

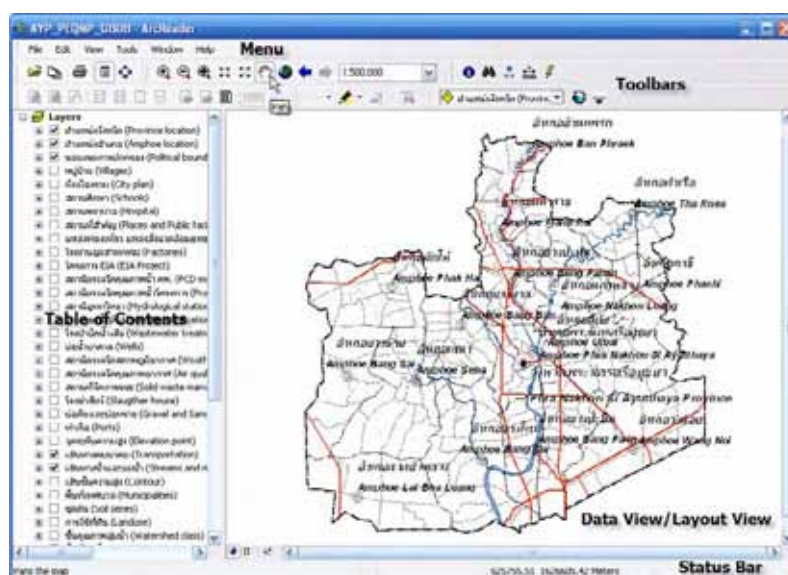
a. Open ArcReader

Click “Start” at Windows taskbar and go to ArcGIS > ArcReader, then click to open program



b. ArcReader Components

- 1) Menu
- 2) Toolbars
- 3) Table of Contents
- 4) Data View
- 5) Layout View
- 6) Status Bar



c. ArcReader Instructions

ArcReader instructions can access from “Menu” or “Toolbars”. The Menu options are provided below.

File Edit View Tools Window Help

Frequently used instruction in Menu can access from Toolbars. When point the mouse to each tool, it will have balloon pop-up to show their name and explanation at “Status Bar”. All features are described below.

c.1 File Toolbars










Tool	Name	Function
	Open	Open “Published Map Documents” file (*.pmf)
	Recent Files	Open used file
	Print	Map printing
	Toggle Table of Contents	Show/hide “Table of Contents”
	Toggle Application Into Full Screen Mode	Switch to normal and full screen

c.2 Navigation Toolbars








Tool	Name	Function
	Zoom In	Expand the map by click desired area or drag mouse as square area
	Zoom Out	Compress the map by click desired area or drag mouse as square area
	Continuous Zoom/Pan	Continuous expand/compress the map by hanging mouse then move down to expand or

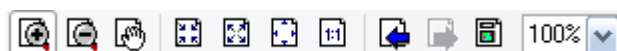
		move up to compress
	Fixed Zoom In	Expand the map in center area
	Fixed Zoom Out	Compress the map in center area
	Pan	Move the map by hanging mouse then move to desired direction
	Full Extent	Show the coverage map
	Go Back To Previous Extent	Back to previous screen before expand/compress or move the map
	Go Back To Next Extent	Back to next screen before expand/compress or move the map
<input type="text" value="1:100,000"/> 	Zoom To Scale	Show the map in specified scale












c.3 Data Toolbars



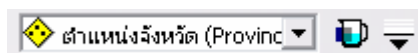
Tool	Name	Function
	Identify	Look up attribute data by click to the tool of desired data
	Find	Explore data by click to fill in the term condition
	Go To XY	Go to XY position by click to fill in the co-ordinates
	Measure	Distance measure by click to estimate distance of the map
	Hyperlinks	Linkage to hyperlinks data




c.4 Layout Toolbars



Tool	Name	Function
	Zoom In	Expand the map in "Layout View" by click desired area or drag mouse as square area
	Zoom Out	Compress the map in "Layout View" by click desired area or drag mouse as square area
	Pan	Move the map in "Layout View" by hanging mouse then move to desired direction
	Fixed Zoom In	Expanding center area of the map in "Layout View"
	Fixed Zoom Out	Compressing center area of the map in "Layout View"
	Zoom Whole Page	Show the coverage "Layout View"
	Zoom To 100%	Show 100% scale of "Layout View"
	Go Back To Previous Extent	Back to previous screen before expand/compress or move the map in "Layout View"
	Go Back To Next Extent	Back to next screen before expand/compress or move the map in "Layout View"
	Change Title	Rename map in "Layout View"
<input type="text" value="100%"/> 	Zoom To Percent	Show "Layout View" in specified scale




c.5 Layer Effects Toolbars




Tool	Name	Function
 ตำแหน่งจังหวัด (Provinc)	Layer List	Select desired layer
	Transparency	Modify transparency of the selected layer
	Swipe Layer	Modify hidden layer

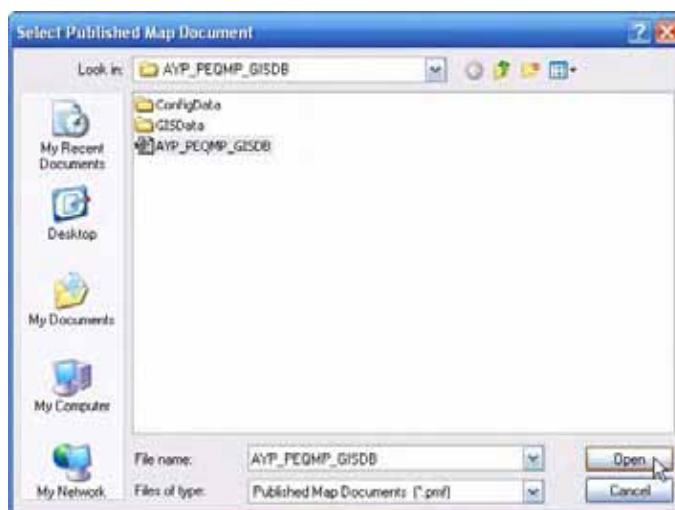
c.6 Markup Toolbars




Tool	Name	Function
	Pen	Graphic drawing on the map
	Highlighter	Graphic highlighting on the map
	Eraser	Delete graphic on the map

d. Open Published Map Documents

Click to  “Open” or click to menu “File > Open” then select “Published Map Documents” file (*.pmf) and click to “Open”



In addition, user can open used files by click to “Recent Files”  or go to “Windows Explorer” then double-click at “Published Map Documents” file (*.pmf) to open and access program directly.



e. Table of Contents Usage

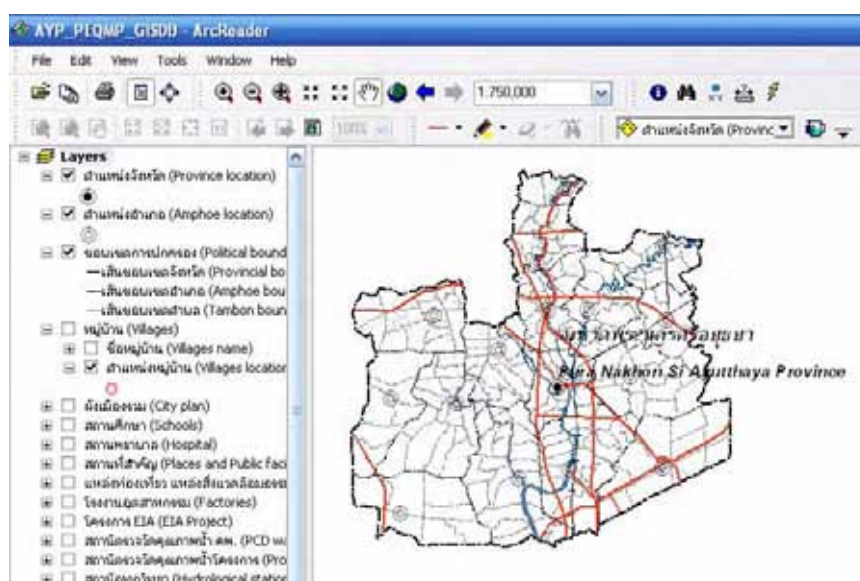
“Table of Contents” is a space to show data list and symbol. User can access step-by-step as shown below.

e.1 Open/close data layer

User can open/close layers to display in “Data View” and “Layout View” from “Table of Contents” by select ☒ in front of wanted layer to display or select ☐ in front of wanted layer to not display. The open/close selected layer is comprised of data label and layer.

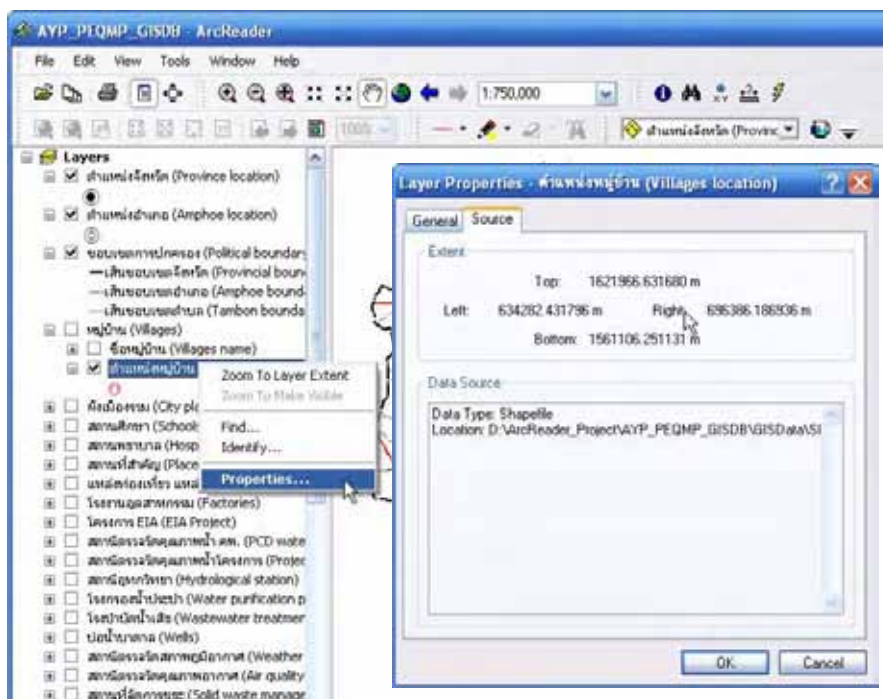
e.2 View hidden layer

User can view hidden layer and their symbol by click  to show details of layer or click  to hide details of layer.



e.3 View layer properties

User can view layer properties such as general data and data source by right-click to layer and choose “Properties”.

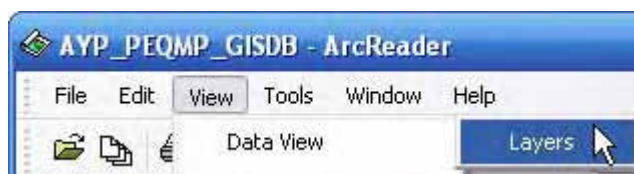


f. Data View Usage

“Data View” is a map display window which user can display selected layer of the map from “Table of Contents”. User allowed applying various tools for mapping from “Navigation Toolbars”. When point the mouse at “Data View”, the geographical co-ordinates will appear in status bar also.

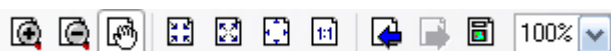


If current status is “Layout View”, it can back to “Data View” by click to menu “View > Data View”.

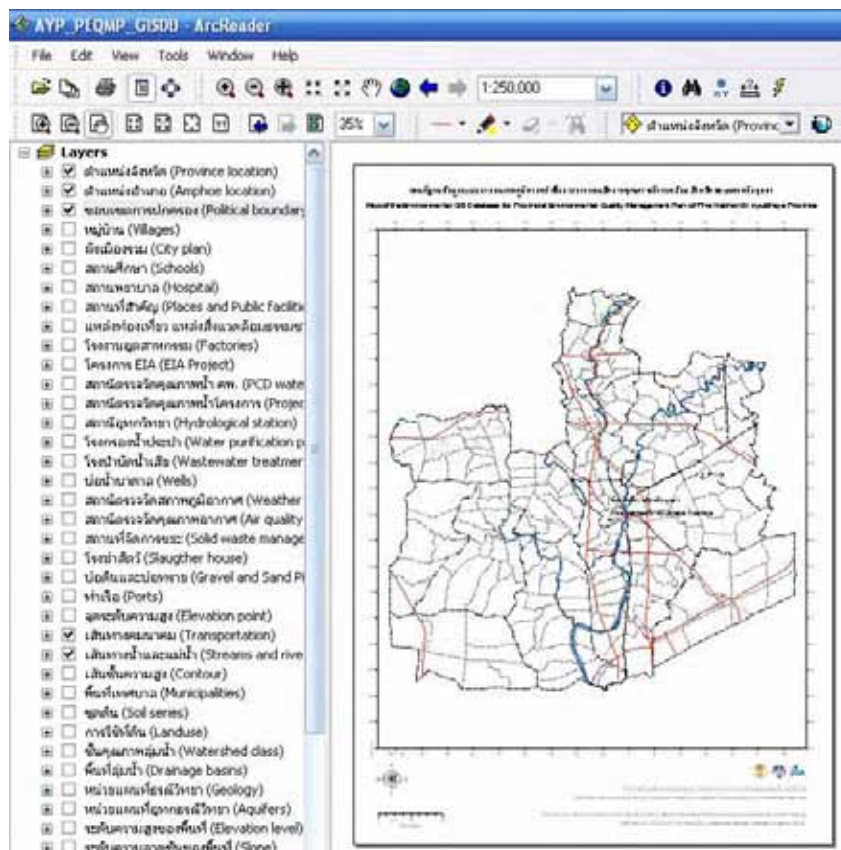
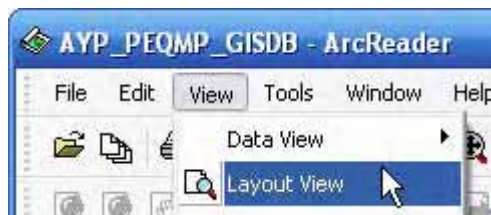


g. Layout View Usage

“Layout View” is a map printing window which user can display selected layer of the map from “Table of Contents”. User allowed applying various tools for mapping from “Navigation Toolbars” to defined scale and boundary for display mapping in “Layout View”. For display a printing map, user can apply various tools in “Layout Toolbars”. When point the mouse at “Data View”, the geographical co-ordinates will appear in status bar also.



User can go to “Layout View” by click to menu “View > Layout View”.

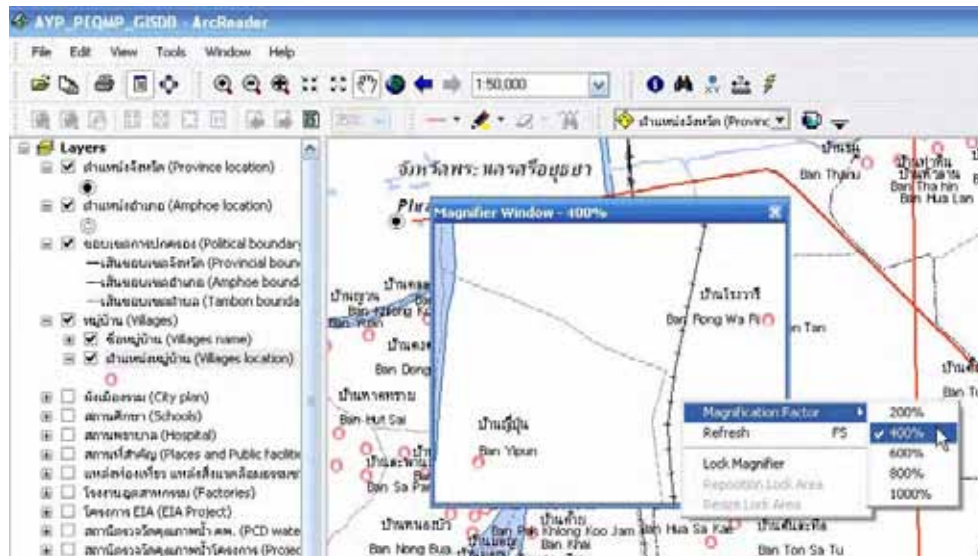


h. Magnifier Window Usage



“Magnifier Window” is a tool for details map showing without mapping adjustment in “Data View”. User can access to this function by click to menu “Window > Magnifier”.

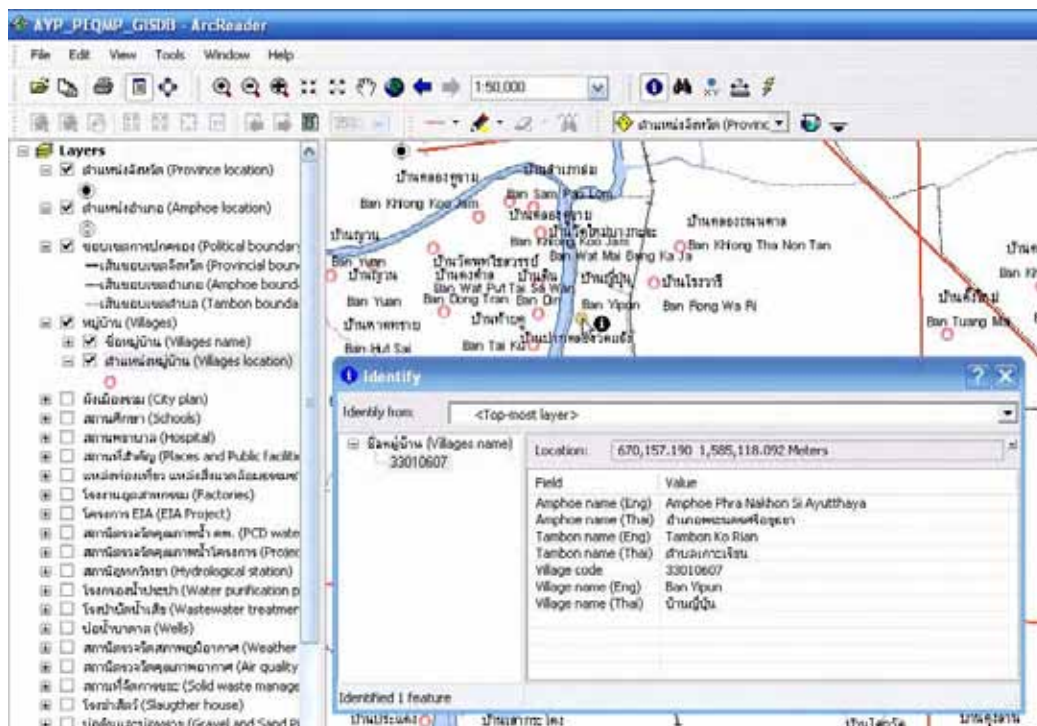


In this regard, user can move “Magnifier Window” to the position that wants to expand. Then choose the wanted size to be enlarged by right-click at “Magnifier Window” and select “Magnifier Factor”.

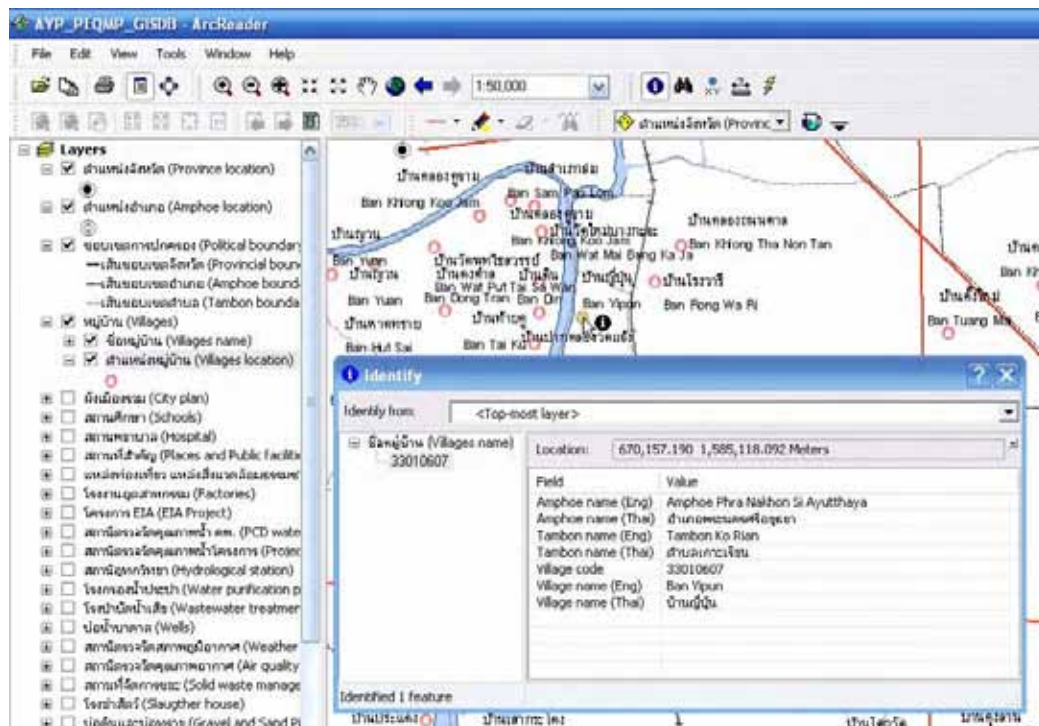


i. Attribute Data Viewing

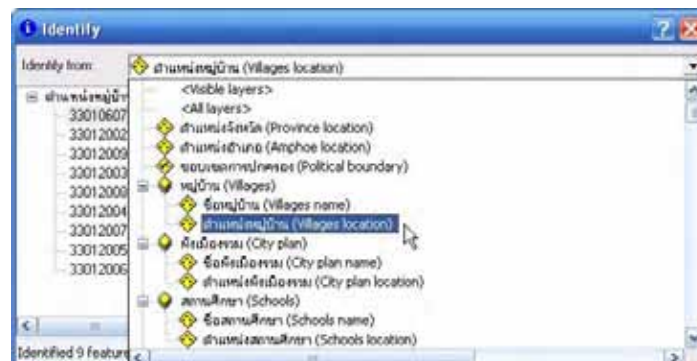
User can use “Identify”  tool to view an attribute data by click to  “Identify” at the position that want to view their attribute data in “Data View” or “Layout View”.






User can also use “Identify” tool to drag frame in “Data View” or “Layout View” for display a group of selected data.



The “Identify” command will use the top layer as default; therefore, it can not select wanted layer in sometime. User can specify a condition to “Identify” by using “Identify from”.



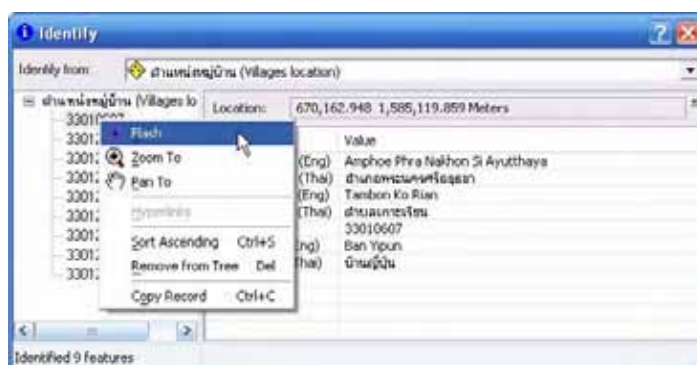
Furthermore, the “Identify” view is allowed user to apply other commands by right-click to activate selected layer as follows.


-  Flash – Flash to layer
-  Zoom To – Expand to layer
-  Pan To – Move to layer

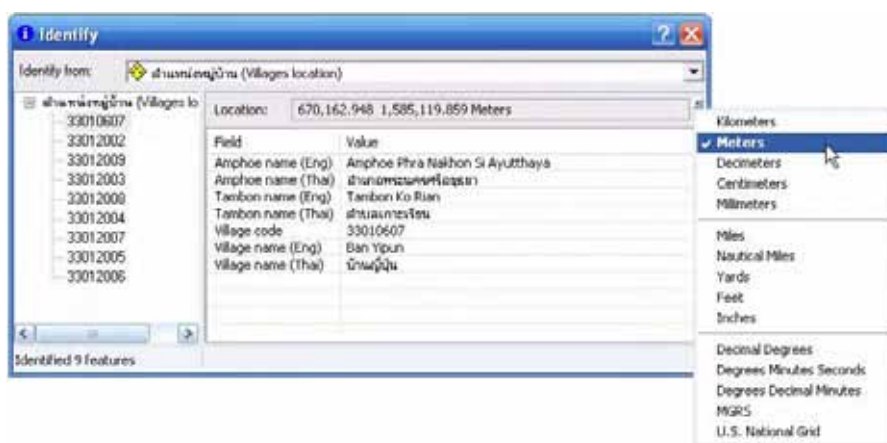
Sort Ascending – Data sort from less to more

Remove from Tree – Delete layer from “Identify” window




Copy Record – Copy attribute data

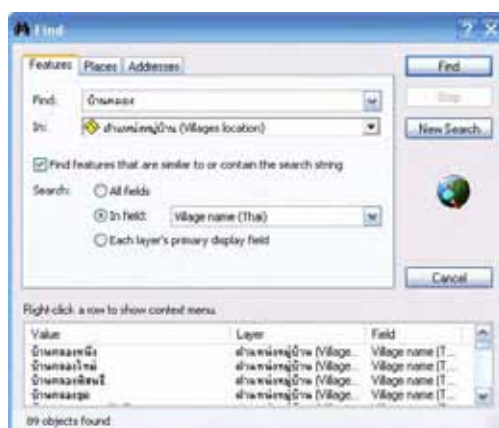


The “Identify” window also shows geographical co-ordinates of active layer in “Location”. User can change the co-ordinates system to display by click to “Choose Units” .









j. Data Searching

“Find”  is a tool for data searching. User can explore by click to “Find”  and fill the condition in “Find” window, then click to  button. Finding results will appear at below window.



From “Find” window in search results, user can apply other commands by right-click to activate a search results as follows.

-  Flash – Flash to layer
-  Zoom To – Expand to layer
-  Pan To – Move to layer
-  Identify – View attribute data of layer
-  Add to My Places – Create “My Places” position
-  Manage My Places – Manage “My Places” position

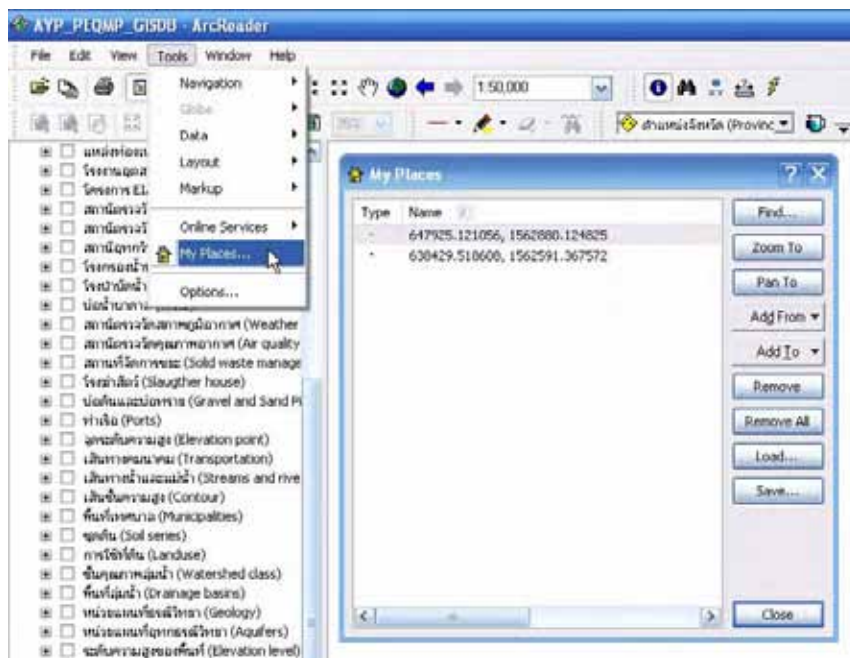


k. My Place Usage


“My Places” is a data making to identify the position or place which user want to use again without searching. From “Find” window in search results, user can bookmark any results in “My Places” by right-click to wanted data and select “Add to My Places”.











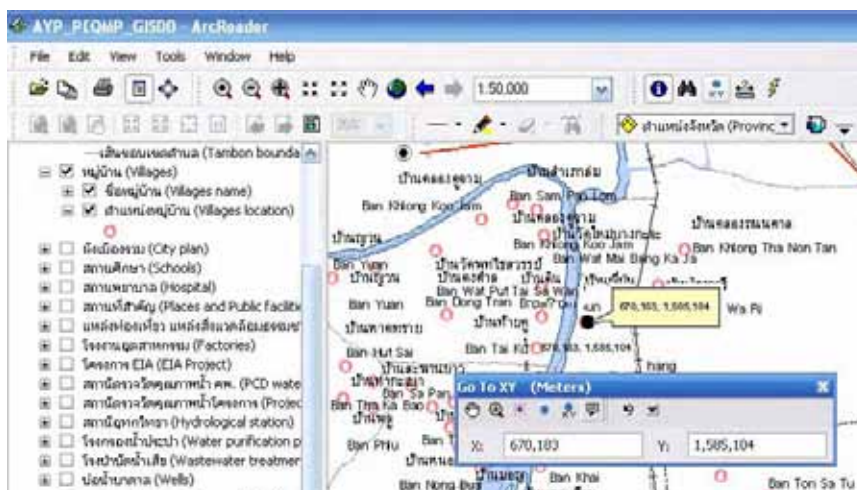
User can manage “My Places” by click to menu “Tools > My Places”.





I. Go to XY Position








User can use “Go To XY”  tool to go to XY position by fill co-ordinates in “XY” gap and apply below commands.

-  Pan To – Move to co-ordinates position
-  Zoom To – Expand to co-ordinates position
-  Flash To – Flash to co-ordinates position
-  Mark XY – Show co-ordinates point on the map
-  Text XY – Show co-ordinates value on the map
-  Label XY – Show co-ordinates label on the map
-  Undo – Select previous co-ordinates
-  Choose Units – Change co-ordinates input system

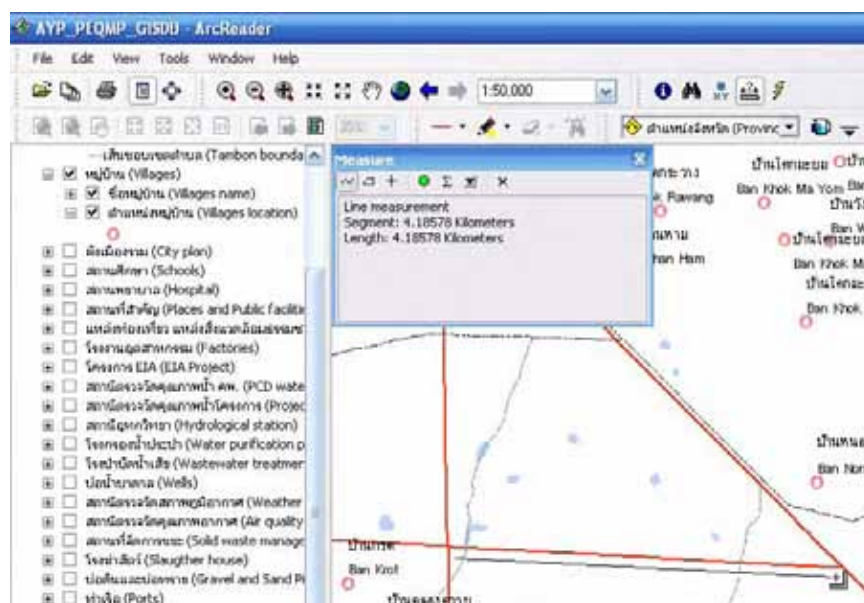


m. Distance Measurement

User can use “Measure”  tool to measure a distance by click “Measure” , then “Measure” window will appear to show below commands.



-  Measure Line – Length measurement
-  Measure An Area – Area measurement
-  Measure A Feature – Position measurement
-  Snap to Features (on/off) – On/off move the measured position to data
-  Show Total (on/off) – On/off show total distance measurement
-  Choose Units – Change unit of measurement
-  Clear and Reset Results – Clear “Measure” window

In order to measure, user can click to the beginning position and click to the next position until to the last position for distance or area measurement. Results will show in “Measure” window.




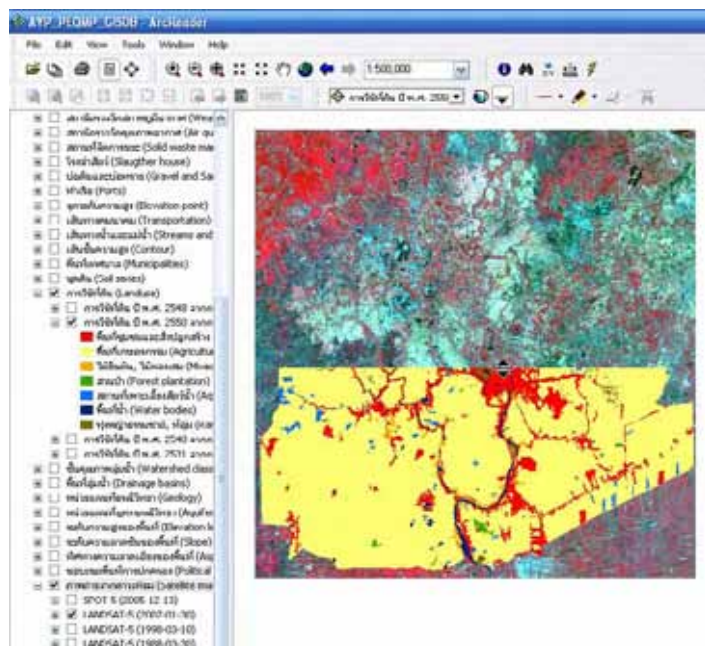
n. Linkage to External Data

Some layer of “Published Map Documents” is link to external data such as picture, document, website etc. User can view those linkages in “Table of Contents” and click to “Hyperlinks”

 tool. The linkage data will show  symbol, user can click to view details.

o.2 Swipe Layer – Manage hidden layer

Select layer by click to “Layer List” from “Layer Effects Toolbars”, then click “Swipe Layer”  tool to move a selected layer by hanging mouse and move up/down or left/right.



p. Graphic Drawing on the Map

User can draw a graphic to highlight an interested data on the map to use for another propose such as report or presentation. In order to labeling on the map, click “Markup Toolbars” to mark any figure by following tools.



Pen – Graphic drawing on the map

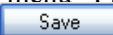
Highlighter – Graphic highlighting on the map

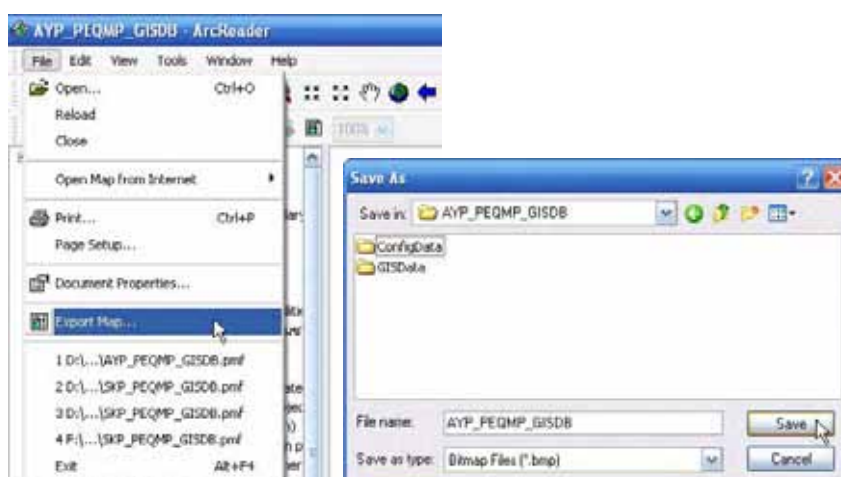
Eraser – Delete graphic on the map

After used “Markup Toolbars”, a pmfink file will be created to keep the created graphic file. It has a same file name with “Published Map Documents”. Next time to open “Published Map Documents”, program will run dialog box to ask user that want to use “Markup” with “Published Map Documents” or not? User can determine on this option.



q. Map Exportation

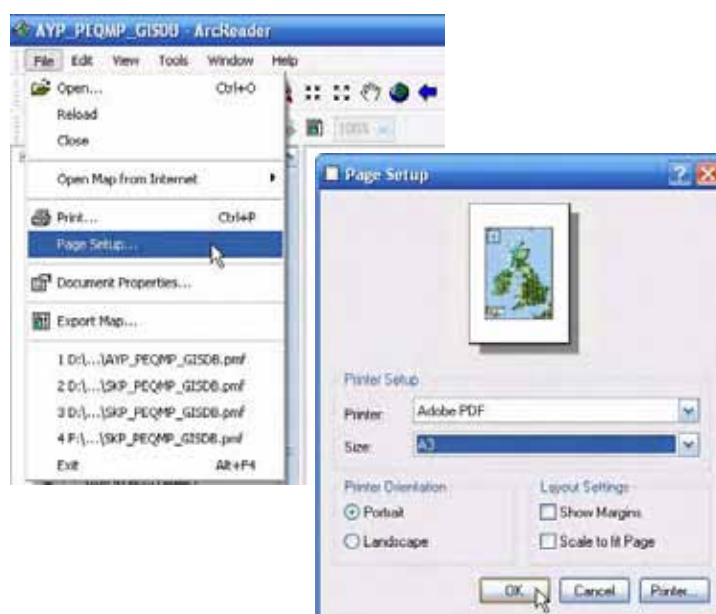
User can export mapping data to picture as Bitmap Files (*.bmp) to use for report or presentation by click to menu “File > Export Map”. Then browse and save file location, put the file name, and click  to save data.



While exporting map in “Data View” window, it will export data display in “Data View” only. Similarly, while exporting map in “Layout View” window, it will export full map.

r. Map Printing

User can print out map by click menu “File > Page Setup” to define paper size and click



After that, click menu “File > Print” to define printer properties and click

