

SPATIAL APPLICATION EXTENSION

ArcGIS 9.x Version

Ver 2.0.0, June 2010

The screenshot displays the ArcGIS 9.x interface. The main window shows a map of a residential area with various plots outlined in red and labeled with numbers. The 'Layers' panel on the left lists several layers: 'temple', 'House', 'plot_f', 'plot_g', and 'hospital'. A 'Attributes of plot f' table is overlaid on the map, showing the following data:

FID	Shape	PLOT_NO	ID	AREA	PERIMET
0	Polygon	0	362	34.354	67.06
1	Polygon	0	362	455.75	132.55
2	Polygon	0	362	516.35	132.65
3	Polygon	0	363	830.43	152.83
4	Polygon	110	363	1340.8	208.16
5	Polygon	254	363	324.89	206.97
6	Polygon	113	363	322.02	202.49
7	Polygon	114	363	984.67	215.48
8	Polygon	115	363	993.01	110.13

Below the main screenshot is a flowchart illustrating the workflow for creating the 'plot_f' layer. The process starts with 'Enable GIS', followed by 'Import the data into the GIS environment'. The data is then processed through several steps: 'Use the Buffer tool to create a buffer around the plot boundaries', 'Use the Dissolve tool to dissolve the buffer into a single feature class', 'Use the Intersect tool to intersect the buffer with the plot boundaries', 'Use the Select tool to select the features that are within the buffer', and finally 'Export the data to a new feature class'. The final output is a 'Spatial database' containing the 'plot_f' layer.

User's Manual

TABLE OF CONTENTS

1.	INTRODICTION	1
1.1	Introduction	1
1.2	What Can You Do With This Extension.	1
1.3	Tips For Learning	1
1.4	Getting Help	1
1.5	Installation	1
1.6	First Time Operation	1
2.	UNDERSANDING MODE OF OPERATION.....	2
2.1	General Operation.....	2
2.2	Program Toolbar	3
3.	UNDERSANDING THE SAExt GEODATABASE STRUCTURE	5
3.1	Parcel Feature Class.....	5
3.2	Construction Feature Class	6
3.3	Segments Feature Class.....	6
3.4	Parcel History Feature Class	7
3.5	Vertical Parcel Feature Class	7
4.	CREATING AND IMPORTING GEODATABASE	8
4.1	Creating New Geodatabase.....	8
4.2	Opening Geodatabase	8
4.3	Importing Geodatabase.....	8
5.	MAINTAINING GEODATABASE	9
5.1	Validating Parcel Data.....	9
5.2	Validating Parcel Geometry	9
5.3	Validating Segment Data	10
5.4	Validating Construction Data	10
6.	EDITING GEODATABASE.....	11
6.1	Parcel Split	11
6.1.1	Select Parcel for Splitting.....	11
6.1.2	One Point and Area Method	12
6.1.3	Move Line and Area Method	13
6.1.4	Offset Method.....	14
6.1.5	Join Point Method	15
6.1.6	Merge Polygon Method	16
6.1.7	General Editing Method	17
6.1.8	Performing Parcel Split	18
6.2	Parcel Merge	19
6.3	Edit Parcel Boundary	20
7.	QUERY FUNCTIONS	21
7.1	Search Geodatabase	21
7.2	View Parcel History	21
8.	MISCELLANEOUS FUNCTIONS	22
8.1	Using Area Converter.....	22
8.2	Printing Geodatabase	22
9.	GETTING SUPPORT	23
9.1	Getting Help	23
9.2	Contact Information.....	23
10.	Attribute Coding Standards	24
10.1	Coded Values For Parcel Type (Parcelty)	24
10.2	Coded Values For Construction Type (Consty)	24
10.3	Coded Values For Boundary Type (Boundty).....	24
10.4	Coded Values For Administrative Boundary Type (Aboundty)	25
10.5	Coded Values For Map Boundary Type (Mboundty)	25

1. INTRODUCTION

1.1 Introduction

Welcome to the DOLIA's Spatial Application Extension (SAExt), the parcel data management extension to the ArcGIS. The Spatial Application Extension adds a specialized Tool Bar to the ArcGIS for managing the parcel data. The extension has been specifically written for the Department of Land Information and Archive (DOLIA) and is best suited for the Nepali system of parcel data management at local district survey offices. The SAExt uses Geodatabase as the basic form of data format, which offers greater flexibility in data management. The SAExt operates only on ArcGIS 9.x under the windows XP system.

1.2 What Can You Do With This Extension.

- Loading of the Geodatabase.
- Building & Editing of the Segment database of the Parcel for the Boundary Information
- Parcel Search and Reporting Facilities
- Parcel Editing including Parcel Split and Merge. The Split operation with various types of geometry operation is provided within ArcGIS environment.
- Maintenance routines for checking overlapping parcels, overlapping buildings and validating the attribute data
- Printing of the parcel data and map at user specified scale and paper sizes.

1.3 Tips For Learning

The learning of the SAExt requires significant experience of using the ArcGIS's ArcMap as well as general background of the parcel management system in Nepal. This manual is not intended for self learning but for the user's who have already undergone through the training conducted by the DOLIA. The program comes with a sample data set, which can be used for various exercises. A comprehensive training is provided by DOLIA on application of this software.

1.4 Getting Help

This user's manual is also provided in PDF format. Further help can be obtained from the DOLIA's Spatial Application Development Group.

1.5 Installation

The program comes in a CD-ROM along with the sample files and other accessories. Run the "SETUP.EXE" from the CD-ROM and follow the screen instructions, which create directory 'LIS_SYSTEM" in the specified root drive. Do not install this system under any other directories. The LIS_SYSTEM directory contains following sub-directories

LIS_Spatial_Applications	Contains the Program modules. Do not move or delete contents of this directory
LIS_Spatial_Data	Contains the Sample Data Files as well as provide the location for the other data files
LIS_Spatial_Data_Templates	Contains the template database files. Do not delete or move contents of this directory

Other directory may be included in the LIS_SYSTEM directory.

1.6 First Time Operation

SAExt is not registered automatically. It can be registered by selecting Tools->Customize->Add From File->SAEx.dll (Located in the LIS Spatial Applications ->Programs Directory)

2. UNDERSANDING MODE OF OPERATION

2.1 General Operation

The SAExt is developed especially for the Parcel Management, hence the data capture, processing of the parcel polygons etc are not supported by the system. The editing of the parcels are supported only for parcel merger and split. A topologically clean data is required to be loaded into the SAExt system. Topologically clean data can be generated either using the ESRI's DAK (Data Automation Kit) or ArcInfo/ArcView or any other third party software. The SAExt is capable to look into the overlapping parcels and construction items but not able to correct them automatically. The operating mode of the SAExt is as follows;

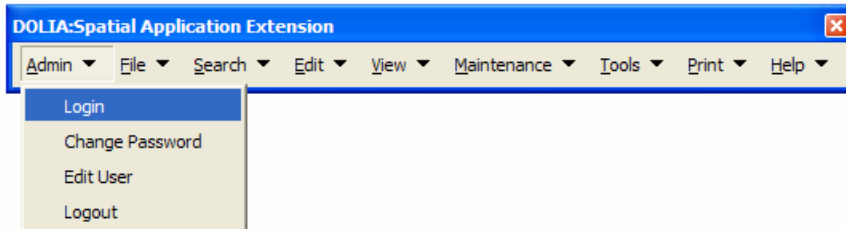
- a) Create the New Geodatabase if Geodatabase for the parcels/sheets is not created yet
- b) Load topologically clean parcel and construction polygons to the "Parcel" and "Construction" feature class. The minimum required fields while loading shall be; Parcel Feature Class : Parcelno, District, VDC, Wardno, GridS1 & ParcelTy. The ParcelKey is Generated by the SAExt Automatically and the Shape_length, Shape_Area & the ObjectID is maintained by the ArcGIS system.
- c) Use Maintenance Toolbar to validate the parcels and construction, which checks for the overlapping entities. If any errors are found at this stage, topology re-building is needed to be carried out through the platform used for topology building. Expert users can correct some of the minor errors using built-in editor of the ArcEditor however this is not recommended for the general use.
- d) After Successful loading of the 'Parcel' and 'Construction' feature classes, next step will be to build the segment feature class which is automatically built by the SAExt system. After building Segment feature class, the entry of the data can be carried out for the various boundary types using the SAExt or other system. The SAExt has built in module to input or edit the boundary types.
- e) After entering of all the boundary types, the Geodatabase is READY for the further use. Legend styling etc can be applied and the document can be saved for future uses.

2.2 Program Toolbar

The SAExt is provided with a toolbar to access the functionality of the software. Each of the items of the toolbar also has further tools, which when activated provide access to the individual process screens.

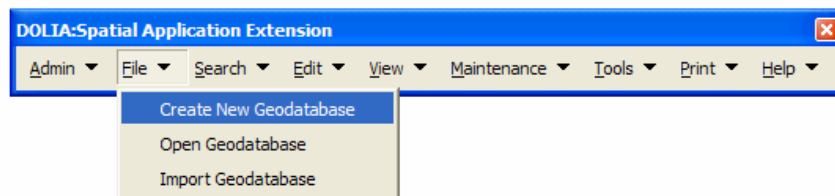
Admin

This provides the access to the software via user login. Users can be created by the super-user and provide appropriate access rights.



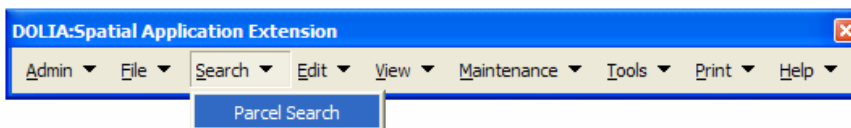
File

The file menu provides options for creating new geodatabase, open existing geodatabase and importing geodatabase.



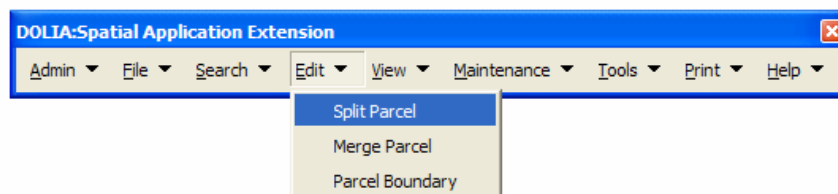
Search

The Search Menu Included the Parcel Search tool which can be used to locate the parcel and provide the report on it.



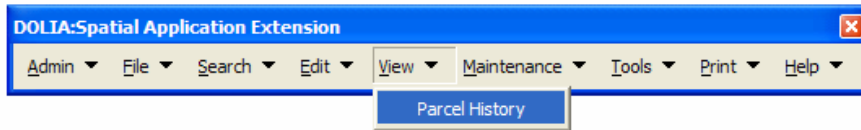
Edit

The Edit menu provides access to the tools for parcel split, parcel merge and editing of the parcel boundaries.



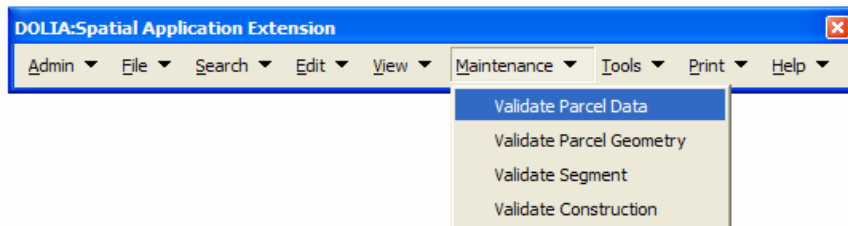
View

The View Menu includes the tool for retrieving the parcel history. The details of the parcel history are stored in the "Parcel_History" feature class which can be used to prepare details in tabular form using the ArcGIS query functions. The Parcel history tool only display the links of the splitted parcels in chronological order.



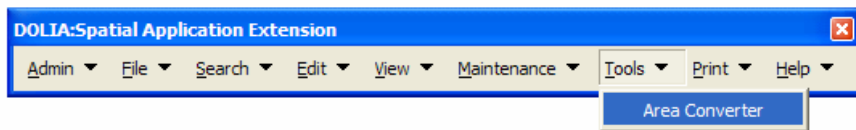
Maintenance

The Maintenance Menu includes tools Parcel Data Validation, Parcel Geometry Validation, Segment Validation and Validation of the Constuction.



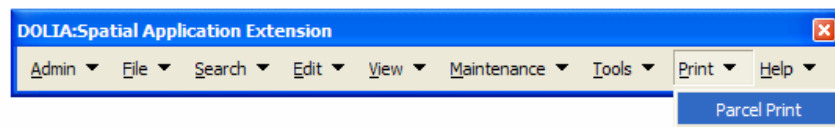
Tools

The Tools menu contain a Area Converter to various units of measurement.



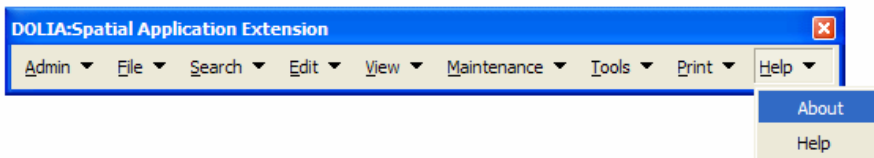
Print

The Print provides a tool to print the parcel map in user specified scale and paper sizes.



Help

The Menu provides access to "About" and "Help". Help is available in the PDF format in the installed directory



3. UNDERSANDING THE SAEEXT GEODATABASE STRUCTURE

The SAExt Geodatabase schema has been designed to take care of all the needs of the parcel management. Further feature class will be added to improve the system in the future releases as feedbacks from the implementations are received.

3.1 Parcel Feature Class

Field	Data Type	Holds	Remarks
OBJECTID	Object ID		System
SHAPE	Geometry		System
Shape_Length	Double	Perimeter of Parcel	System
Shape_Area	Double	Area of Parcel	System
PARCELKEY	Text	Unique Parcel Key	
PARCELNO	Short Integer	Parcel No	
DISTRICT	Short Integer	District Code	
VDC	Short Integer	VDC Code	
WARDNO	Text	Ward No + Character	
GRIDS1	Text	Grid Sheet Number	
Parcelty	Short Integer	Coded Domain for Parcel Type	
Parcel Note	Text	Remarks for the new parcels	

The PARCELKEY Contains the Unique parcel key of 23 Character which provides the unique identification for parcel such that no IDs are duplicated for the entire parcel data of Nepal. The DOLIA has devised a system for generating Unique Parcel Key based on the GridSheet No, Parcel No, Wardno, VDC & District;

Unique Parcel Key = GridSheet No(Max 9 Char)+Parcel No (Max 6 Char)+District (Max 3 Char)+VDC (Max 2 Char)+Ward No(Max 3 char)

e.g. Parcel Key for the Following parcel will be

102134025000196002601104

Grid sheet - 102-1340-25

Parcel No - 1960

District - 26

VDC - 11

Ward - 4

“0” are placed to make up the required character width. In case of the Gridsheet the “0” is added at the end and for rest it is added in front. The ward number contains two numeric and one character such that ward can be represented by “04a” representing “a” part of the ward “04” In case of the Free sheets (Island Maps) the Grid Sheet Number will be 0. For such geodatabase, the wardno plays a important role and the ward no can contain one character at the end of the ward numbers itself. e.g for ward no 1 ka it can be denoted by 01a. It is proposed to use roman characters in place of the Devanagari Characters such that “Ka” is represented by “a” and so on. Hence the free sheet parcelkey will look like **000000000000196002601104a**

3.2 Construction Feature Class

The Construction feature class contains the polygons representing the construction items over the parcel and has following fields;

Field	Data Type	Holds	Remarks
OBJECTID	Object ID		System
SHAPE	Geometry		System
SHAPE_Length	Double	Perimeter of Polygon	System
SHAPE_Area	Double	Area of Polygon	System
ParFID	Long Integer	OBJECTID of the Parcel Polygon within which the construction item is included	
ConsTy	Short Integer	Specify the Construction Type e.g. Permanent Building etc See Domain "ConsTy" for the coded values for this field	

3.3 Segments Feature Class

The Segments feature class contains the boundary (polylines) of each of the polygons of the parcel class and has following fields;

Field	Data Type	Holds	Remarks
OBJECTID	Object ID		System
SHAPE	Geometry		System
SHAPE_Length	Double	Length of Segment	System
ParFID	Long Integer	OBJECTID of the Parcel	
Boundty	Short Integer	Specify the Boundary Type e.g. Wall, Fence, Kulo Etc See Domain "BoundType" for the coded values for this field	
Aboundty	Short Integer	Specify the Administrative Boundary e.g. District, Ward etc See Domain "ABoundType" for the coded values for this field	
Mboundty	Short Integer	Specify the Map Sheet Boundary e.g. Free Sheet, Grid Sheet etc See Domain "MBoundType" for the coded values for this field	

3.4 Parcel History Feature Class

The Parcel History feature class contains the parcel polygons which are split along with all the data related to the split parcels as well as the split date and link Ids for tracking the parcel history. The feature class has following fields;

Field	Data Type	Holds	Remarks
OBJECTID	Object ID		System
SHAPE	Geometry		System
Shape_Length	Double	Perimeter of Parcel	System
Shape_Area	Double	Area of Parcel	System
PARCELKEY	Text	Unique Parcel Key	
PARCELNO	Short Integer	Parcel No	
DISTRICT	Short Integer	District Code	
VDC	Short Integer	VDC Code	
WARDNO	Text	Ward No + Character	
GRIDS1	Text	Grid Sheet Number	
BDate	Date	Parcel Split System Date	
LINKFID	Long Integer	Link to the parent parcel	
SplitDateNep	Text	Date in Nepali	
LINKPARCELNO	Short Integer	Link to Splitted Parcel Number	
GivenBY	Text	Original Owner	
TakenBy	Text	New Owner	
FileMapNo	Text	File Map Number	
MapSDate	Text	Map Serial and Date	
RegSDate	Text	Registration Serial and Date	
SplitBy	Text	Split Personnel (Login ID)	
CheckedBy	Text	Person Checking Split Operation	
Remarks	Text	Remarks for the new parcels	

3.5 Vertical Parcel Feature Class

The Vertical Parcel feature class contains the vertical parcels to the parcel concerned which is provided with height and Owner ID. Further fields will be added in the later version as the system for registering the vertical parcels are made systematic by the Department of Survey. The feature class has following fields;

Field	Data Type	Holds	Remarks
OBJECTID	Object ID		System
SHAPE	Geometry		System
Shape_Length	Double	Perimeter of Parcel	System
Shape_Area	Double	Area of Parcel	System
ParFID	Long Integer	OBJECTID of the Parcel	
Height	Double	Height of the Vertical Parcel	
OwnerID	Short Integer	Short Integer Id of owner e.g 1,2 etc for the given parcel	

4. CREATING AND IMPORTING GEODATABASE

4.1 Creating New Geodatabase

The SAExt can create a new Geodatabase along with required datasets. The new Geodatabase is created based on the template Geodatabase specially designed for the Spatial application which is located in the LIS_Spatial_Data_Templates sub directory.

- 1) Click "File" Menu in the SAExt Tool Bar and Select "Create New Geodatabase" menu
- 2) Type in the Name of the New Geodatabase to be created and Press Proceed.
- 3) A new Geodatabase is created by the name supplied in the above step in the sub-directory LIS_Spatial_Data. While naming the Geodatabase a systematic approach is required such that the name of the Geodatabase alone can be used to indicate the area it is representing. e.g Free sheets (Island Maps) can be named as 23-11-09a-01 representing 23 as district, 11 as VDC/Municipality, 09a and ward number 9 part "a" (i.e "ka") and 01 as the sheet number (in case it contain many sheet numbers). Similarly the Geodatabase of ward-wise database may simply be 23-11-09 and Grid-sheet wise Geodatabase may have name representing the grid sheet number e.g. 102-1340-25. Details of the naming convention and other related standards are provided in the Annex to this document.
- 4) When a new Geodatabase is created following datasets and feature classes are created;
 - Dataset containing feature classes of Parcel, Construction & Segments
 - Feature Classes for Parcel History and Vertical Parcels.
- 5) After Creation of the New Geodatabase, loading to the Geodatabase can be performed

4.2 Opening Geodatabase

The SAExt can open the Geodatabase with all of its feature classes and apply predefined symbology. The SAExt provides automatic application of the predefined symbology for each of the feature class.

4.3 Importing Geodatabase

Geodatabase created by the extension can be imported to merge the geodatabase or to import to new file for further works. The old geodatabases (ArcGIS 8.x) version need to be imported to new geodatabase to work properly in this present release of the software.

- 1) Click "File" Menu in the SAExt Tool Bar and Select "Import Geodatabase" menu.
- 2) Select required geodatabase and press "Import"

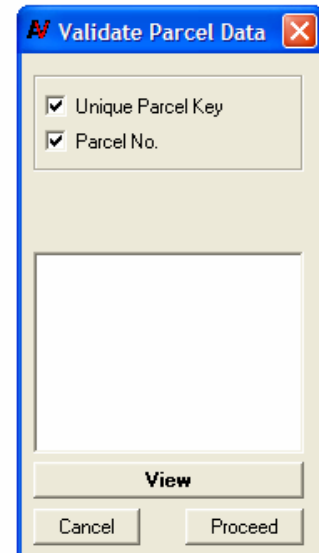
5. MAINTAINING GEODATABASE

The SAExt has built in tools for validating the Geodatabase. At present the program is able to validate the Unique Parcel Key, Parcel No, Parcel Geometry, Construction Items and Segment Data. All the Validation Routines are accessed through the "Maintenance" Menu in the SAExt Tool Bar.

5.1 Validating Parcel Data

The Validating Parcel Data provides means to build unique Parcel Key and the verify the duplicated parcel numbers per wards.

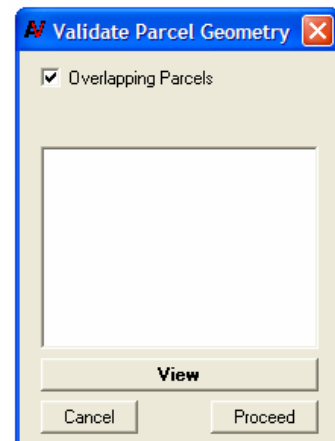
- 1) Click "Maintenance" Menu in the SAExt Tool Bar and Select "Validate Parcel Data" menu.
- 2) Select the options for the parcel data verification. The "Unique Parcel Key" option actually rebuilds the parcelkey rather than verifying and reporting the error. The option "Parcel No" verifies the duplicating parcel no in a given ward in given Geodatabase. A screen is presented with the conflicting Parcel No and user can go through each of the parcel and correct the parcel no.
- 3) The general mode of the operation is to select the "Parcel No" option at the beginning and correct all the parcel nos. Then run the "Validate Parcel Data" again and this time use only the "Unique Parcel Key", which will re-build the unique Parcelkey for all the parcels.



5.2 Validating Parcel Geometry

The Validating Parcel Geometry provides means to locate the overlapping and hanging parcels. At present only option for verifying the Overlapping Parcels is available.

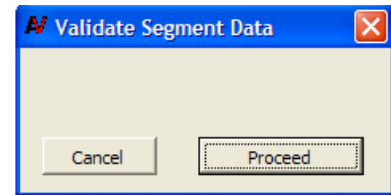
- 1) Click "Maintenance" Menu in the SAExt Tool Bar and Select "Validate Parcel Geometry" menu.
- 2) Select the Options for Validating the Parcel Geometry "Overlapping Parcels" & "Hanging Parcels" At present only the "Overlapping Parcels" is available for validation. Press "Proceed"
- 3) The SAExt takes few minutes depending on the size of the Geodatabase to validate the requested operation.
- 4) If no errors are found i.e there is no overlapping parcels then the Program report so and exits.
- 5) If overlapping parcels are observed, then program reports it and provides the list of the overlapping parcels
- 6) Select the Overlapping Parcel ID numbers and Press "View". This will zoom to the selected parcel.
- 7) The SAExt can only report the Overlapping parcel and do not contain tools for correcting them. Hence if the errors are detected after loading the Geodatabase, immediate measure to correct them should be taken via the software used for building the topology before proceeding to any other works in the SAExt. Expert users can correct some of the minor errors using built-in editor of the ArcEditor however this is not recommended for the general use



- 8) If the overlapping parcels are numerous the SAExt stops checking if the number exceeds 100. In event of such massive errors, the re-building of the topology is only option available to correct the errors.

5.3 Validating Segment Data

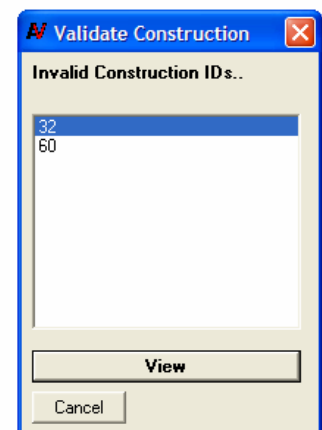
The Validating Segment Data provides means to maintain the Segments Feature Class up to date with the Parcel Feature Class. This tool will be used seldom unless major manual editing are done or new data are loaded by the user to correct the topology of the parcel feature class or to append the Data. Otherwise the segments feature class is automatically maintained by the SAExt during the split, merge etc operation. Validating segment data can be run once in a while to make sure that Segment Feature Class is up to date. The Tool does not report any errors but if any are found, it corrects it automatically.



5.4 Validating Construction Data

The Validating Construction Data provides means to build the construction item relationship to the parcel and also check for the construction items e.g. buildings etc that do not contain within the parcel. The SAExt can only report the construction items not contained (overlapped) within parcels but can not correct them.

- 1) Click "Maintenance" Menu in the SAExt Tool Bar and Select "Validate Construction Data" menu.
- 2) Press "Proceed"
- 3) The SAExt takes few minutes depending on the size of the Geodatabase to validate the requested operation.
- 4) If no errors are found i.e there are no overlapping construction items then the Program report so and also builds construction feature class database and exits.
- 5) If overlapping construction items are observed, then program reports it and provides the list of the overlapping construction items. However the construction feature class is built for the correct construction items and for those with error a NULL "ParFID" is provided.
- 6) Select the Overlapping Parcel ID numbers and Press "View". This will zoom to the selected parcel.
- 7) The SAExt can only report the Overlapping Construction Items but do not contain tools for correcting them. Hence if the errors are detected after loading the Geodatabase, immediate measure to correct them should be taken via the software used for building the topology before proceeding to any other works in the SAExt. Expert users can correct some of the minor errors using built-in editor of the ArcEditor however this is not recommended for the general use
- 8) If the overlapping construction items are numerous the SAExt stops checking if the number exceeds 100. In event of such massive errors, the re-building of the topology is only option available to correct the errors.



6. EDITING GEODATABASE

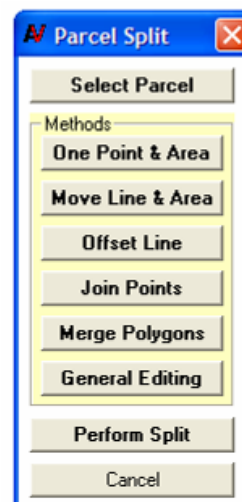
The SAExt is provided with editing tools related to Parcel Split, Merge, Segment data and some tools for adding construction items, buildings and tools for modifying and adding parcels. The SAExt do not contain tools for topology building, cleaning etc, which has to be performed before loading data to the SAExt.

6.1 Parcel Split

Once the Paper Map are converted to the digital and used in GIS environment, the further editing and maintenance works are to be carried out entirely on the GIS system. The creation of the digital map is a snap shot event such that a particular state of the map is converted to the GIS.

The change of the shape, boundary lines of the rivers, kulo etc do not happen unless a new system of the survey is carried out. Such case can be considered as isolated and does not come under the parcel maintenance works. The major update of the map by new survey works will require to build a new datasets with new attributes, which it shall will be a major project component as the survey works itself.

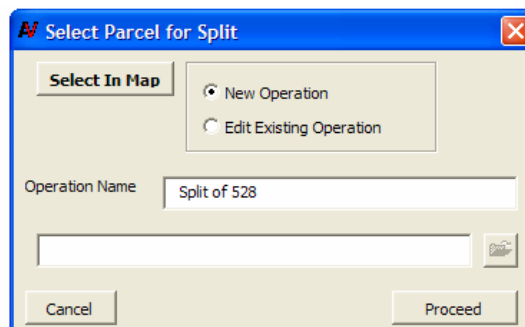
Splitting of parcel to two or many individual parcel is the most common tasks. Generally parcels are irregular in shape and splitting it to the required areas (which is the most common criteria) requires many iterative procedures. The procedure may include finding splitting polyline from offset from corner, angle and distance, co-ordinates etc. Various methods are provided to operate within the ArcGIS environment. The methods of splitting as well as the tools for performing the splits and finalizing is presented in the toolbar.



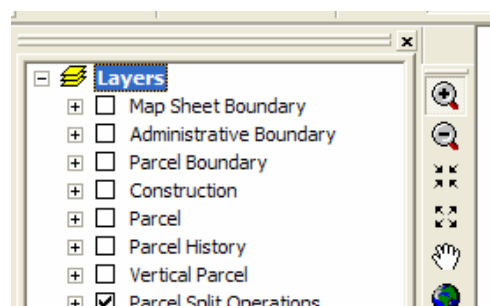
6.1.1 Select Parcel for Splitting

Initial step is to select parcel for split operation. Following are the procedure for this operation;

- 1) Select "Select Parcel" from the parcel split tool bar.
- 2) Always use "Select In Map" Button to select the parcel. This will avoid selection of non parcel layers.
- 3) If it is a new operation then select "New Operation"
- 4) if it is continuation of the previous operation for which parcel split is not finalized yet, select "Edit Existing Operation"

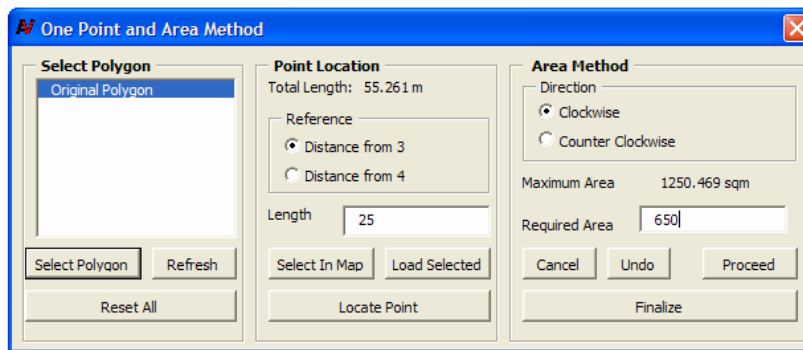


- 5) For New operation provide the file name (Operation Name) say "Split of 528 Ward 4" etc to record the correct operation. This will be easier to find the operation for editing later on.
- 6) For "Edit Existing Operation" select the operation file. If the parcel split has taken place the system will notify "Edit session has expired" which indicates the file is no longer usable as the split operation has already been completed. User can delete such files from \LIS_SYSTEM\LIS_Scratch_Data
- 7) New group layer "Parcel Split Operations" will be temporarily added for the split works.

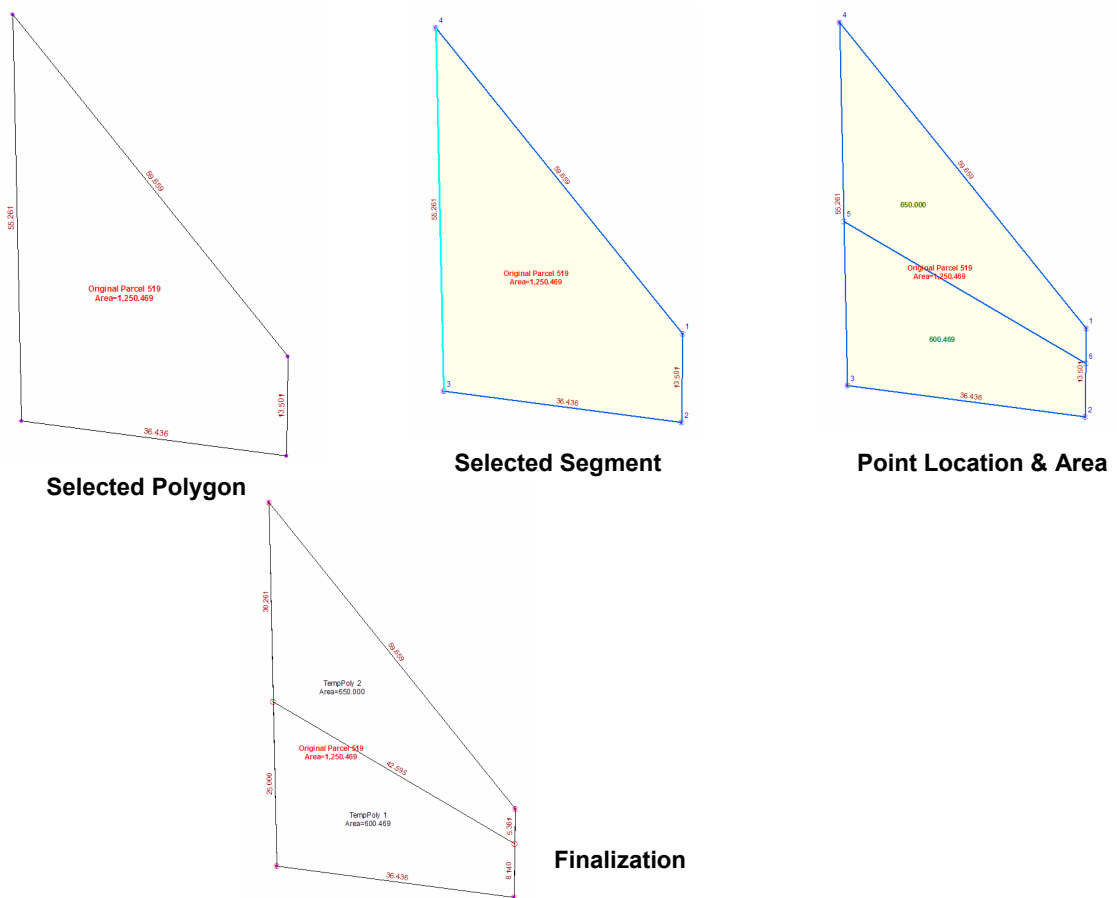


6.1.2 One Point and Area Method

The tool provides a means to locate point on any segment and divide the parcel with a given area criteria.

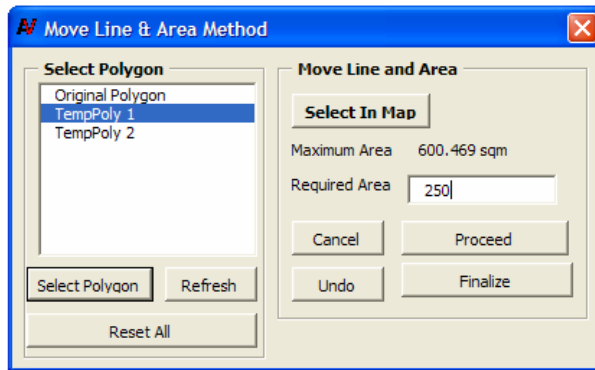


- 1) Select "Select Polygon" in which operation will be carried out. There may be many polygons resulted from the previous operations. Select the appropriate one.
- 2) From "Point Location", select "Select in Map" for selecting the segment of polygon on which point is to be located.
- 3) After selection of segment, use "Load Selected" to bring the segment in calculation
- 4) Provide the Length (distance) for location of point and press "Locate Point"
- 5) From "Area Method" chose either "Clockwise" or "Counter clockwise" direction and provide area
- 6) Press "Proceed" to Check the sub-division. If the Area is located in wrong side or area is not correct Press "Undo" after "proceed".
- 7) If it is OK then press "Finalize"

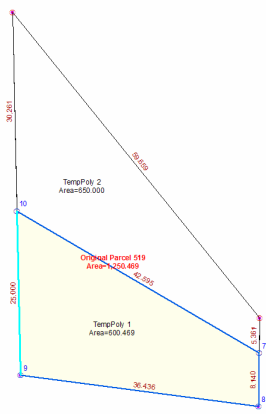


6.1.3 Move Line and Area Method

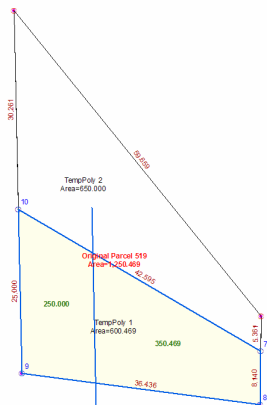
The tool provides a means to move any segment and divide the parcel with a given area criteria.



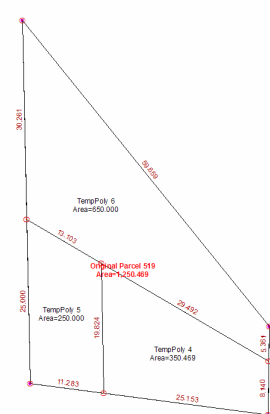
- 1) Select "Select Polygon" in which operation will be carried out. There may be many polygons resulted from the previous operations. Select the appropriate one.
- 2) From "Move Line and Area" chose "Select in Map" to Select the Segment of the Polygon to move and provide required area
- 3) Press "Proceed" to Check the sub-division. If the Area is not correct Press "Undo" after "proceed" and either select new segment or provide new area.
- 4) If it is OK then press "Finalize"



Selection of Segment to Move



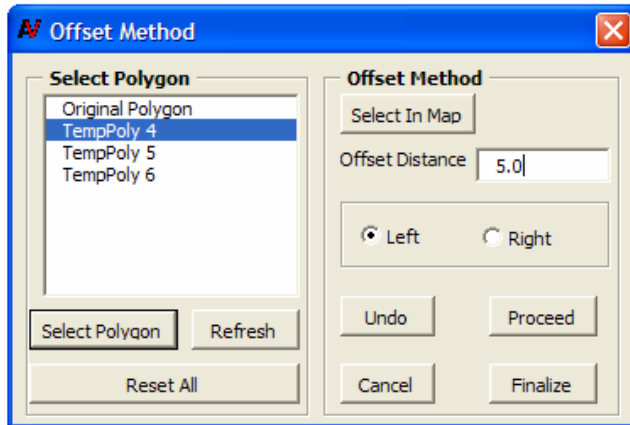
Segment Moved for Given Area



Finalization

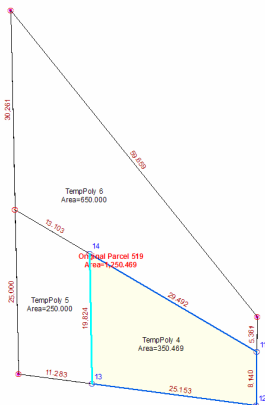
6.1.4 Offset Method

This method does offset of any segment of a parcel and sub-divide the area.

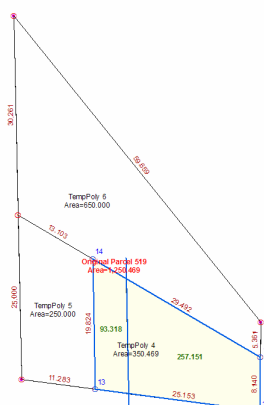


- 1) Select "Select Polygon" in which operation will be carried out. There may be many polygons resulted from the previous operations. Select the appropriate one.
- 2) From "Offset Method" chose "Select in Map" to Select the Segment of the Polygon to offset and provide offset distance.
- 3) Press "Proceed" to Check the sub-division. If the Area is not correct Press "Undo" after "proceed" and either select new segment or provide new area.
- 4) If it is OK then press "Finalize"

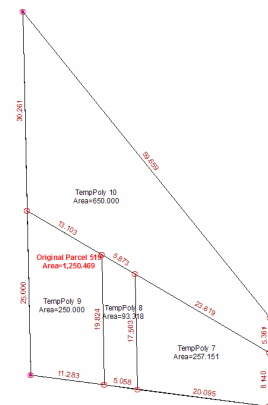
Selection of Segment to offset



Selection of Segment to offset



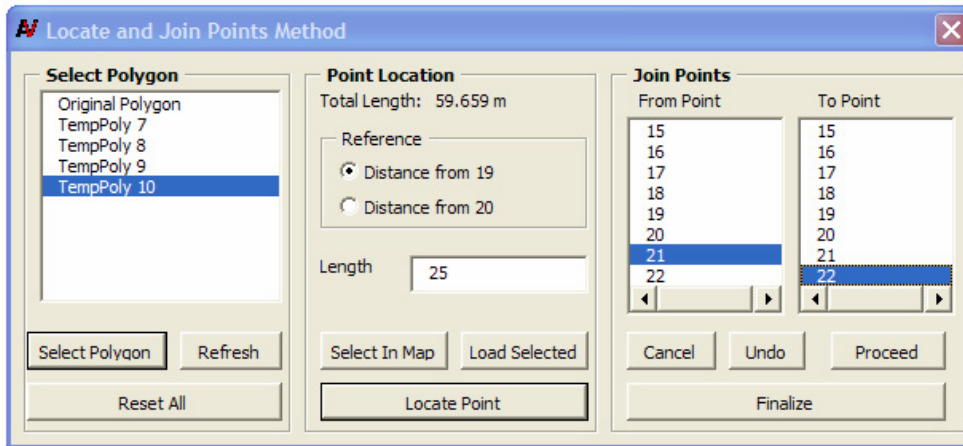
Offset of Segment to given Distance



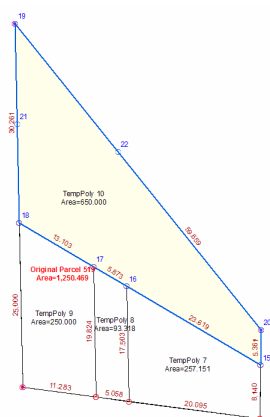
Finalization

6.1.5 Join Point Method

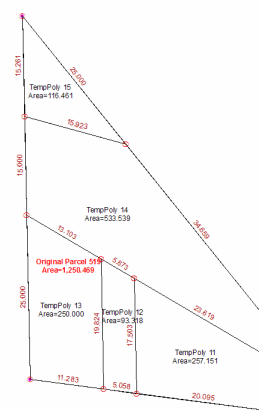
This method provides sub-division by locating points and joining them. Existing points can also be joined to make sub-divisions.



- 1) Select "Select Polygon" in which operation will be carried out. There may be many polygons resulted from the previous operations. Select the appropriate one.
- 2) From "Point Location", select "Select in Map" for selecting the segment of polygon on which point is to be located.
- 3) After selection of segment, use "Load Selected" to bring the segment in calculation
- 4) Provide the Length (distance) for location of point and press "Locate Point"
- 5) From "Join Points" chose "From Point" & "To Point" .
- 6) Press "Proceed" to Check the sub-division. If the sub-division is not correct, press "Undo" after "proceed".
- 7) If it is OK then press "Finalize"



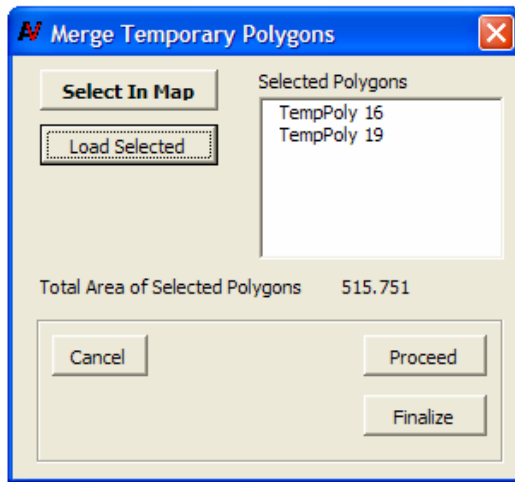
Selection of point 21 & 22



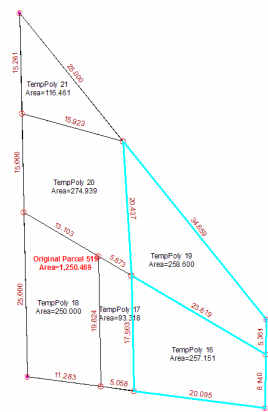
Finalization

6.1.6 Merge Polygon Method

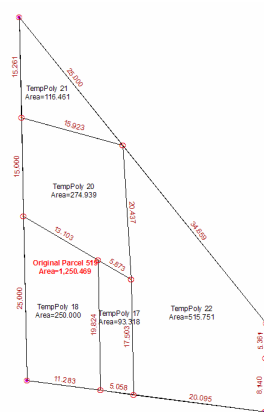
This tool can be used to merging to sub-division. Due to complex operations, temporary polygons may need to be merged.



- 1) Use "Select in Map" to select tempPolys for merging
- 2) After Selection, use "load Selected". This will provide a list of polygons and the total area. If selected polygons are not adjacent, it will give an error message.
- 3) Press "Proceed" to Check the merge.
- 4) If it is OK then press "Finalize"



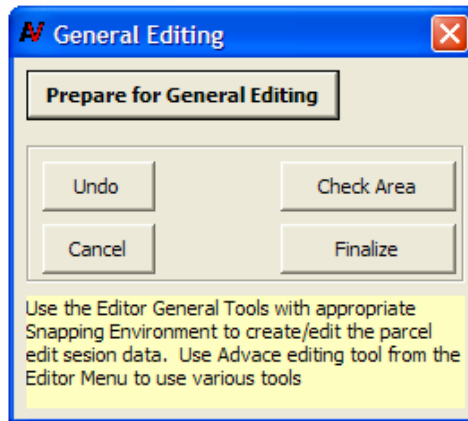
Selection of Two Polygons for Merging



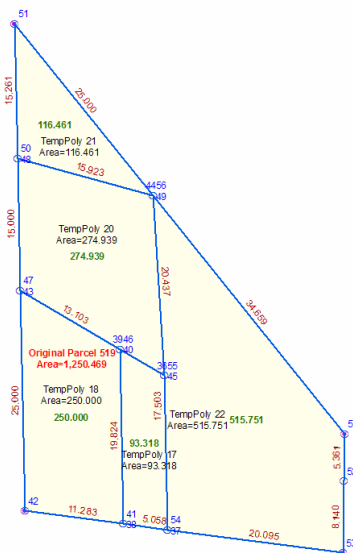
Merged Polygon after finalization

6.1.7 General Editing Method

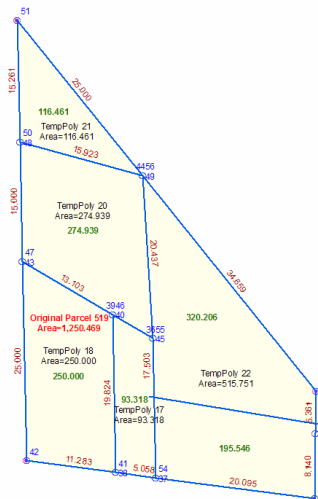
General editing provide the user to use the ArcGIS Editor to modify the segments, check the area and finalize. User must be familiar with the arcGIS editor environment to use this tool effectively. The tool can also be used to delete unnecessary segments created by previous operations (e.g. segment outside the parcels etc)



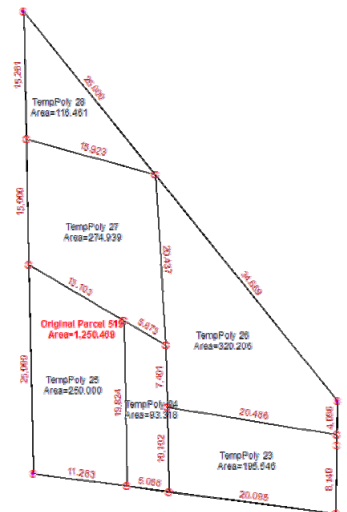
- 1) Use "Prepare for General Editing" for initialization of editing environment.
- 2) Use ArcGIS editor to add, split, delete, trim, extend, copy parallel segments
- 3) Press "Check Area" to see the changes in the areas
- 4) Press Finalize to complete the editing



Initialization of General Editing



Adding of Segment



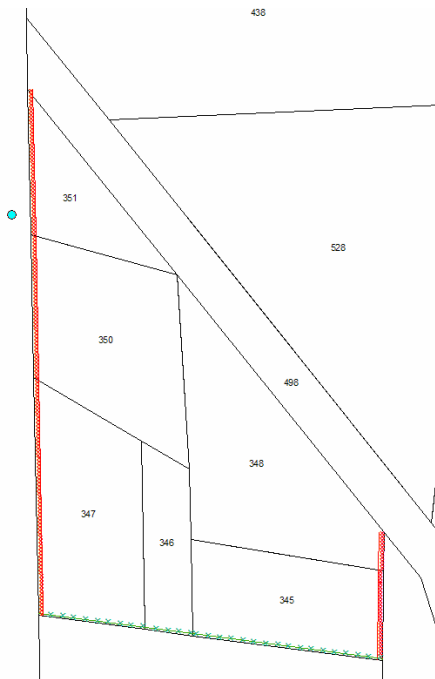
Finalization

6.1.8 Performing Parcel Split

After performing sub-divisions, these are updated into the parcel database. The operation required various information as per the parcel split rule of the department of survey. The form provides all the necessary inputs.

After providing all the necessary inputs and new parcel numbers, press "perform Split". The process is automatic and will include the new sub-division to the parcel database, update the segments (including neighbours), update the parcel history. The data provided in this form is included in the parcel history to trace back the split operations.

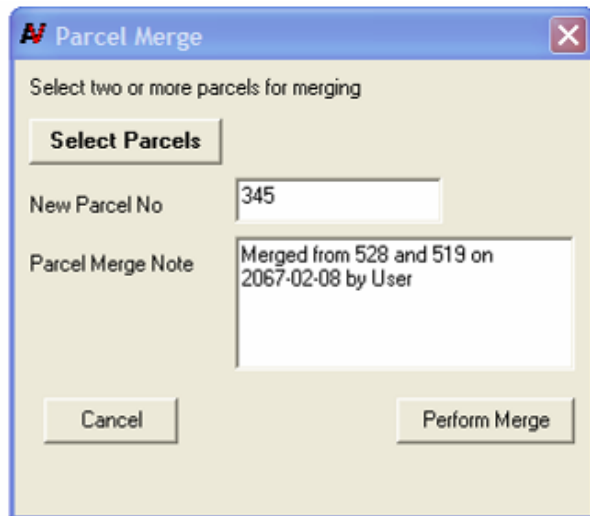
S.No	Temporary ID	New Parcel No	Area	New Owner Details
3	25	347	250.000	z
4	26	348	320.206	a
5	27	350	274.939	b
6	28	351	116.461	c



Completion of Performing Split

6.2 Parcel Merge

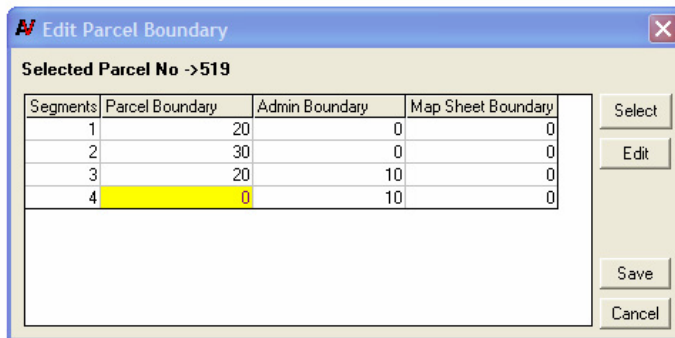
The merging of the parcel takes two or more parcel and makes a single parcel. Conditions are checked for the merger and parcel with following conditions are not merged i) Parcel not neighbours to each other ii) Parcels falling in different wards or VDC iii) Parcels of different types.



- 1) Click "Edit" Menu in the SAExt Tool Bar and Select "Merge Parcels" menu.
- 2) Click "Select Parcels" Button to select two or more parcels. Use "SHIFT+CLICK" to add the parcels to the previous selection
- 3) Click "Perform Merge" button, if the conditions of the parcel merger as described above is met then the program will merge the parcel and ask for conformation.
- 4) If the conditions are not met, appropriate message will be displayed and the program will exit.
- 5) After successful merger, the parcel no etc will be updated
- 6) If there are construction items in the merged parcel these will also be updated automatically.

6.3 Edit Parcel Boundary

Editing of the Parcel Boundary Type can be carried out using the SAExt.



- 1) Click "Edit" Menu in the SAExt Tool Bar and Select "Parcel Boundary" menu.
- 2) Click "Select" Button in the Edit Segment Screen and select one parcel. Selection of more than one parcel will result in error.
- 3) Click "Edit" Button in the Edit Segment Screen the segments and its boundary types will be loaded to the screen.
- 4) Click at any segment number, which will highlight the selected segment in "Red" and the existing values will be shown in the "Boundary Type" Textbox
- 5) Input or Edit the Boundary Type value. The coded value of the boundary types are given in the last chapter of this document. Use appropriate coded values. Editing of any segment can be done by clicking the segment numbers which automatically highlights the selected segment in display.
- 6) After edit or input of all the boundary types click "SAVE" which will result in confirmation dialog and selecting 'Yes' will permanently record the edits.



7. QUERY FUNCTIONS

7.1 Search Geodatabase

The SAExt has built in tool for searching the parcels and reporting them.. At present only the parcel search with options of highlighting the neighbors etc are provided. Additional search capability will be added in the future releases. Visualize Parcels takes the Unique Parcel ID as Input or Build Unique Parcel ID from supplied information and searches the coverage or Geodatabase and zoom to the selected parcels. It also provides a button for generating the report of the selected parcel. The report button is only enabled if the search is successful i.e if the parcel exists in the database.

- 1) Click "Search" Menu in the Toolbar and Select "Parcel Search" menu.
- 2) Provide the search information. Minimum required information are VDC, Ward No and Parcel No. To use the Minimum Option Tic the "Use Only VDC, Ward & Parcel No". To highlight the neighbours as well Tic "Highlight the Neighbours"
- 3) Press Search Button to proceed. If the search is successful the SAExt will zoom to the searched parcel and select it. If "Highlight Neighbours" are requested the searched parcel and Neighbours are highlighted with two different colors. If the search is not successful, an error message will be displayed.
- 4) The 'Report' button will be enabled after the successful search operation. The "Report" button provides the access to reporting of the parcel including its area, parcel geometry, neighbours etc. The Content of the report can be copied to the clipboard and placed in any Word Processing Software and Printed.

7.2 View Parcel History

Parcel history can be viewed for all the parcels which have been created from split operation in the Geodatabase. A parcel history feature class is automatically maintained by the SAExt system when ever the split operation is carried out. The parcel history feature class can be used for undo purpose in the later release of the SAExt.

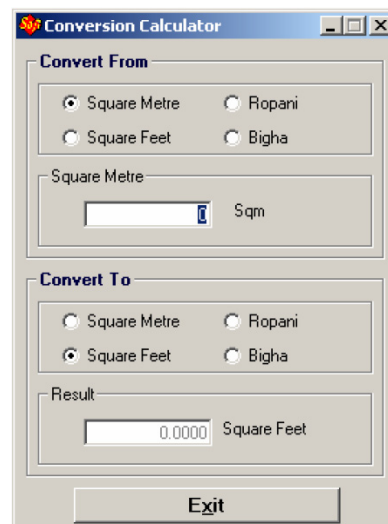
- 1) Click "View" Menu in the SAExt Tool Bar and Select "Parcel History" menu.
- 2) Select Parcel using selection tool of the ArcGIS for loading parcel history. Select only one parcel, selection of multiple parcel will result in error.
- 3) Click "Load Parcel History" Button. If there is history record of that parcel the list will appear.
- 4) Select the history items and click "View" button to view the originating parcel.

8. MISCELLANEOUS FUNCTIONS

8.1 Using Area Converter

The "Area Converter" tools can be used to convert various units of Area e.g. (sqm to Ropani and so on). The tool is completely interactive and self explanatory.

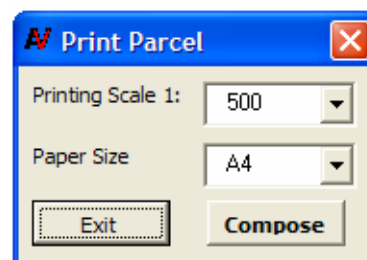
- 1) Click "Tools" Menu in the SAExt Tool Bar and Select "Area Converter" menu.
- 2) A separate "Area Converter" screen will appear, which contains all the options for input and output.
- 3) Select unit of input at the "Convert From" Tab and input the required Area to be converted. Select the required unit in "Convert To" Tab, the area will be automatically converted.



8.2 Printing Geodatabase

The "Print" Menu in the SAExt toolbar provides means for printing of the Geodatabase. At present only automatic composition of the parcel printing is available. It has been assumed that the user of the SAExt is familiar with the ArcMAP system, hence the printing of grid-sheet or all of the free-sheets can be done using the ArcMAP layout methods hence such automated tools are not provided in the present release of the SAExt. The "Parcel Print" tool is intended for printing of each individual parcels with details of related information from the parcel feature class. The tool can automatically compose the print for A4/A3 size paper which is best suited for printing the parcel details.

- 1) Click "Print" Menu in the SAExt Tool Bar and Select "Parcel Print" menu.
- 2) Enter the scale of printing e.g 500, 2500 etc and paper Size (A4/A3). Click the "Compose" Button, which will switch to the layout mode and compose



9. GETTING SUPPORT

9.1 Getting Help

The SAExt has been developed for the Department of the Land Information and Archive (DOLIA) . The “Help” menu in the SAExt toolbar contains the “About” menu, which displays the “About” s

10. ATTRIBUTE CODING STANDARDS

The SAEExt Geodatabase includes the “Domains” for Parcel Types, Construction Types, Boundary Types and for the Administrative Boundary. The Domains includes the coded values for each classification of the fields. When a new Geodatabase is created, the domains are also automatically created such that the display of the coded value is possible during symbology, enquiry as well as printing of the tables.

The user can further expand the domains if new coded value has to be included. In such circumstances, the “Blank.mdb” located in LIS_Spatial_Data_Template subdirectory also need to be upgraded along with the Geodatabase concerned. This way the template Geodatabase will be updated for subsequent creation of new Geodatabase.

10.1 Coded Values For Parcel Type (Parcelty)

Code	Description	Remarks
0	Private	Default Value
20	River	
30	Forest	
60	Government	
70	Institutional	

10.2 Coded Values For Construction Type (Consty)

Code	Description	Remarks
0	Permanent Building	Default Value
10	Temporary Building	
20	Damaged Building	
30	Wall	
40	Pond	
50	Gate/Entrance	
60	Temple	

10.3 Coded Values For Boundary Type (Boundty)

Code	Description	Remarks
0	None	Default
10	Building Foot Print	
20	Wall	
25	Shared Wall	
30	Fence	
35	Shared Fence	
40	Gate	
50	Line Kulo	
52	Line Kulo & Wall	
54	Line Kulo & Fence	
58	Line Kulo & Gate	

10.4 Coded Values For Administrative Boundary Type (Aboundty)

Code	Description	Remarks
0	None	Default
10	Ward	
20	VDC/Municipality	
30	District	
40	Zone	
50	National	

10.5 Coded Values For Map Boundary Type (Mboundty)

Code	Description	Remarks
0	None	Default
10	Grid Sheet	
20	Free Sheet	