Satellite Surrey

Change Detection based on Satellite Imagery

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History

- **Encompassing 140 square miles the City of Surrey is one of the Top Three Fastest Growing Cities in North America**

2003 GIS:

- **Added 740 Legal Survey Plans totalling 3000 new parcels and 2250 Addresses**
- **Added 1400 Infrastructure Drawings totalling 90 Km Water, 35 Km Sanitary and 60 Km Drainage**

Change Detection Background

- **Planimetric Features Historically Updated every 3-4 Years based on aerial orthophotos**
- **Labour-intensive process**
- **It can take up to 1 year from image acquisition for completion of the update of planimetric features**

Published Planimetric Data

Planimetric Data can be 1 year out of date by the time it is published

Data is not updated until the following acquisition of Aerial Orthophotos

Planimetric Features:

- Road Edges
- Building Footprints
- Swimming Pools
- *Drainage*
- *Poles*
- *Park Site Improvements*
- *Boulevard Trees*

Satellite Pilot

3 Main Objectives of the Pilot:

Shorten the time required for obtaining updated information to ensure a current database

Create a more efficient method to capture the planimetric features

Assess the benefits of classification of impervious surfaces to derive planimetric features

Create the ability to plan for future requirements by tracking historic information based on classification of multispectral data

Pilot Methodology

Extract impervious surfaces and water areas from the study area to determine planimetric features for extraction

Determine classes of impervious surfaces for update of sidewalks, roads and buildings

Determine classes of water for update of swimming pools

Planimetric feature types to be updated:

- Roads
- Building Outlines
- Swimming Pools

Image/GIS data processing

Satellite image orthorectification

Satellite Imagery pan-fusion

Image Classification

Ground truth/accuracy assessment

GIS export, Editing

- Resulting impervious surface classification represents all buildings, roads, parking lots, sidewalks, etc. in a single class
- Methods and relative efficiency to derive planimetric features from the impervious surface features will be explored

Pilot Requirements

Image Analysis Software

- Image processing and classification

GIS Software

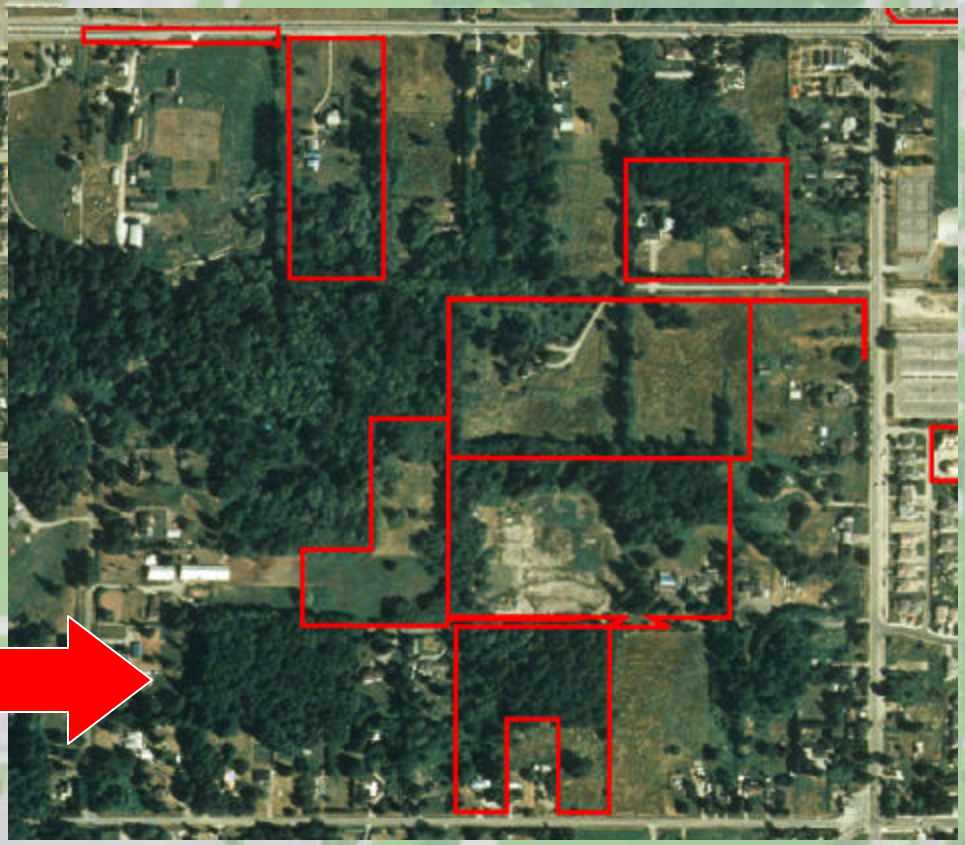
- Vector editing

Data Requirements

- Street centrelines – Ground Control, Baseline
- Building Footprints – Baseline
- Landuse – Baseline
- Zoning – Baseline
- Ground Control Points – Ground Control
- Contours and/or DEM – Ground Control

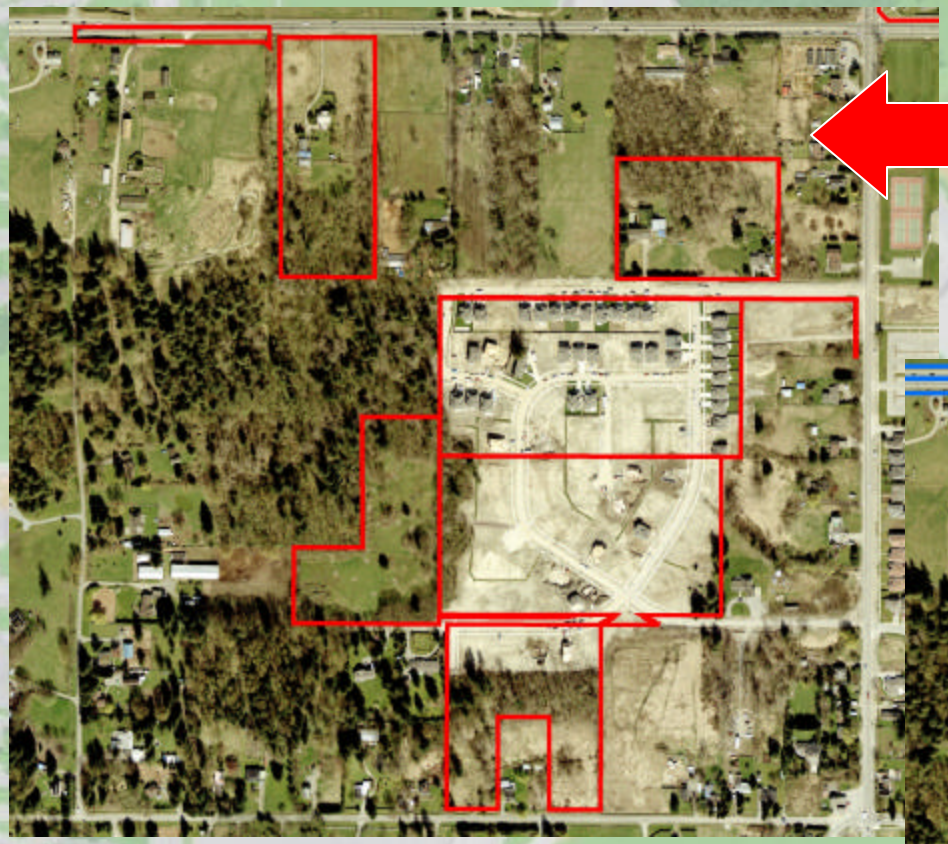
Determining Growth

1998 Orthophoto

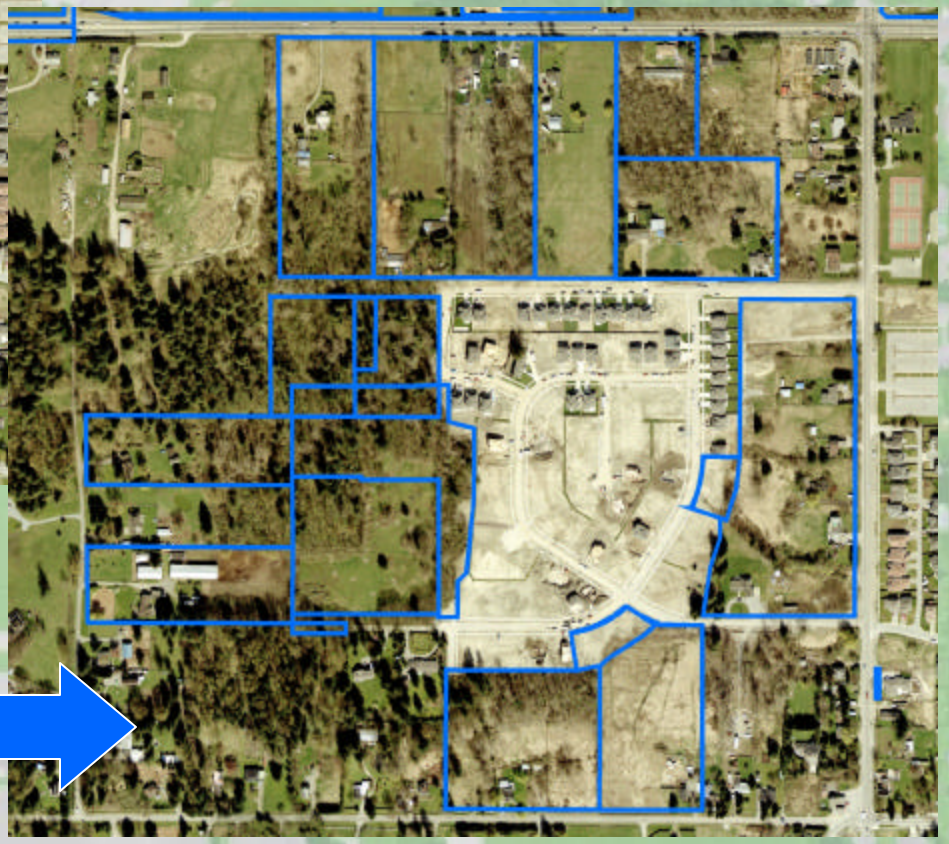


1998-2001
Growth Areas

Changes 2001 - 2003

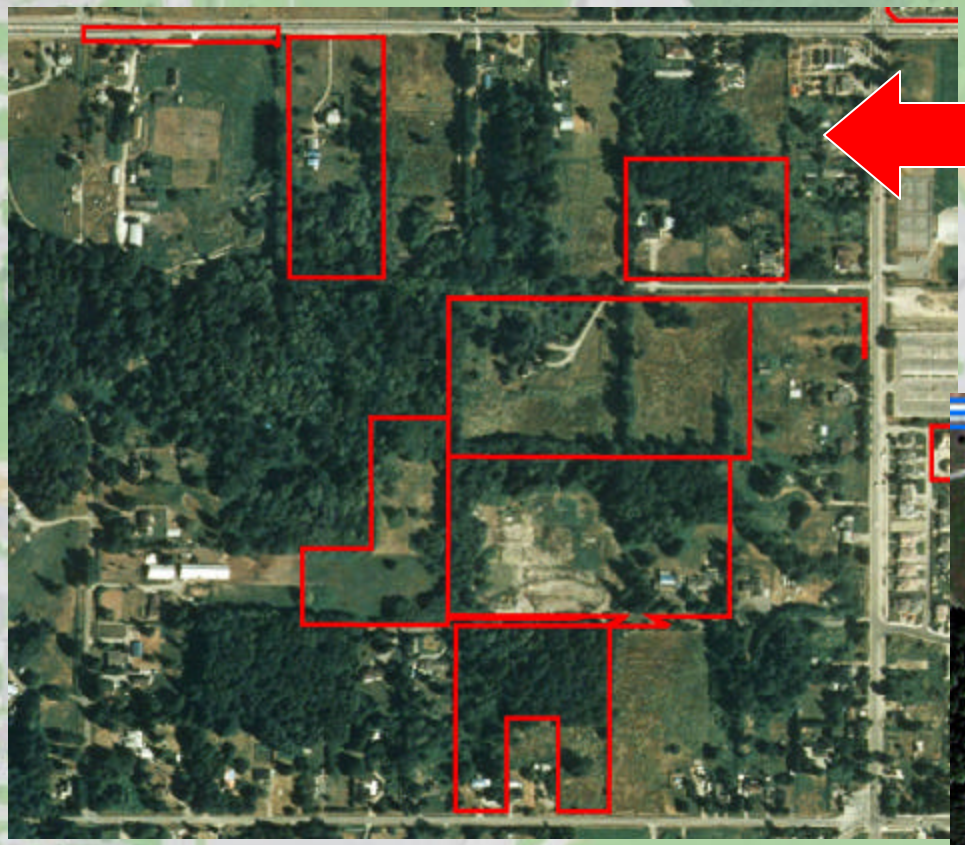


1998 – 2001 Growth



2001 - 2003 Growth

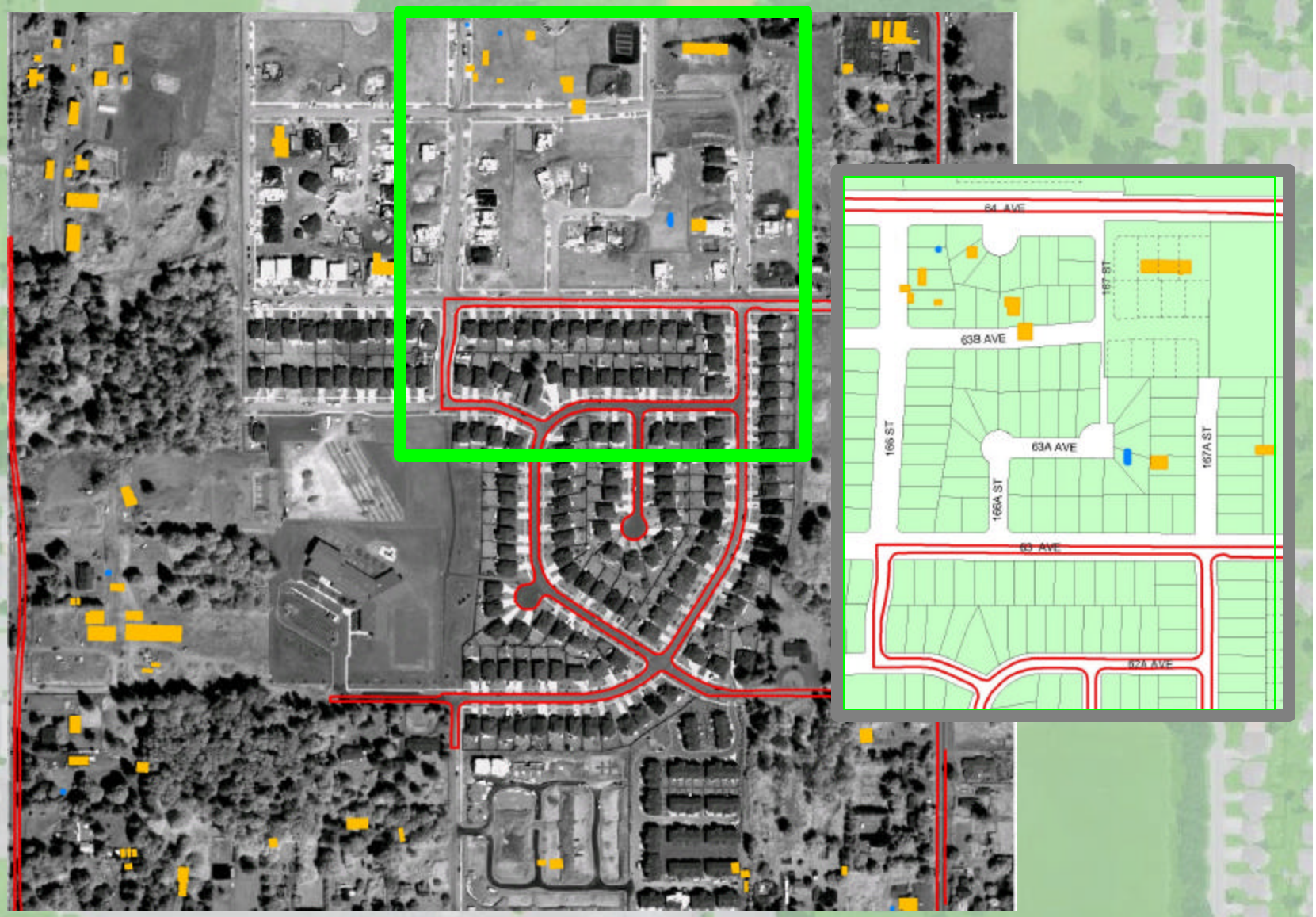
Using Satellite



1998 – 2001 Growth

2001 - 2003 Growth

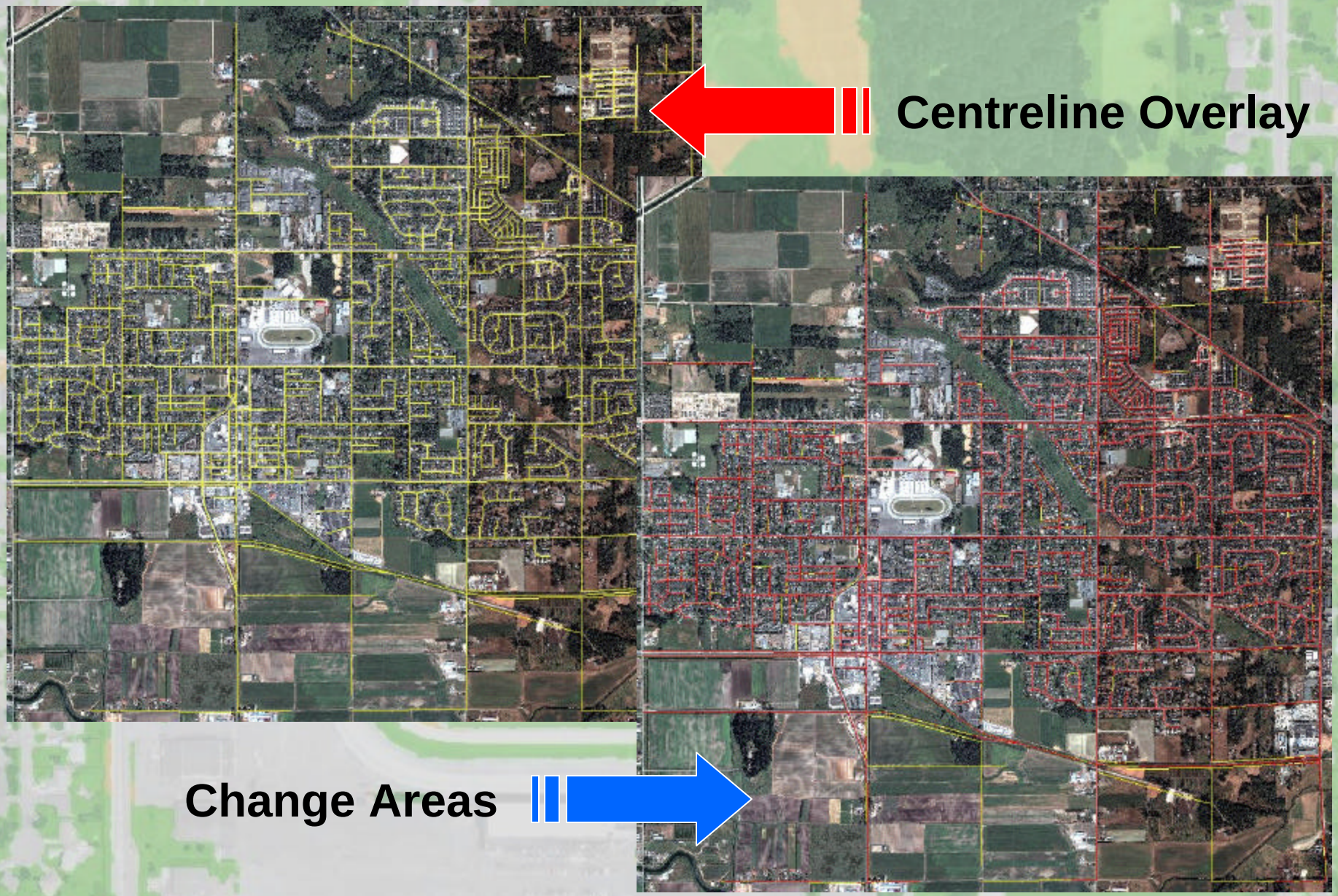
Planimetric Features



New Process

- Satellite Imagery will not replace the 15cm aerial orthophotos
- Obtain Aerial Orthophotos every 3-4 years
- Obtain Satellite Image during interim years
- Utilize Aerial Orthophotos and Satellite images to update planimetric features on a yearly basis to augment update process
- Satellite Imagery will provide Surrey the ability to complete image analysis during interim years
- Satellite Imagery will also provide Surrey with additional functionality for image analysis as compared to orthophotos

Additional Functionality



Classifications

Sample Area

Classified

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Grass

Impervious

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Soil

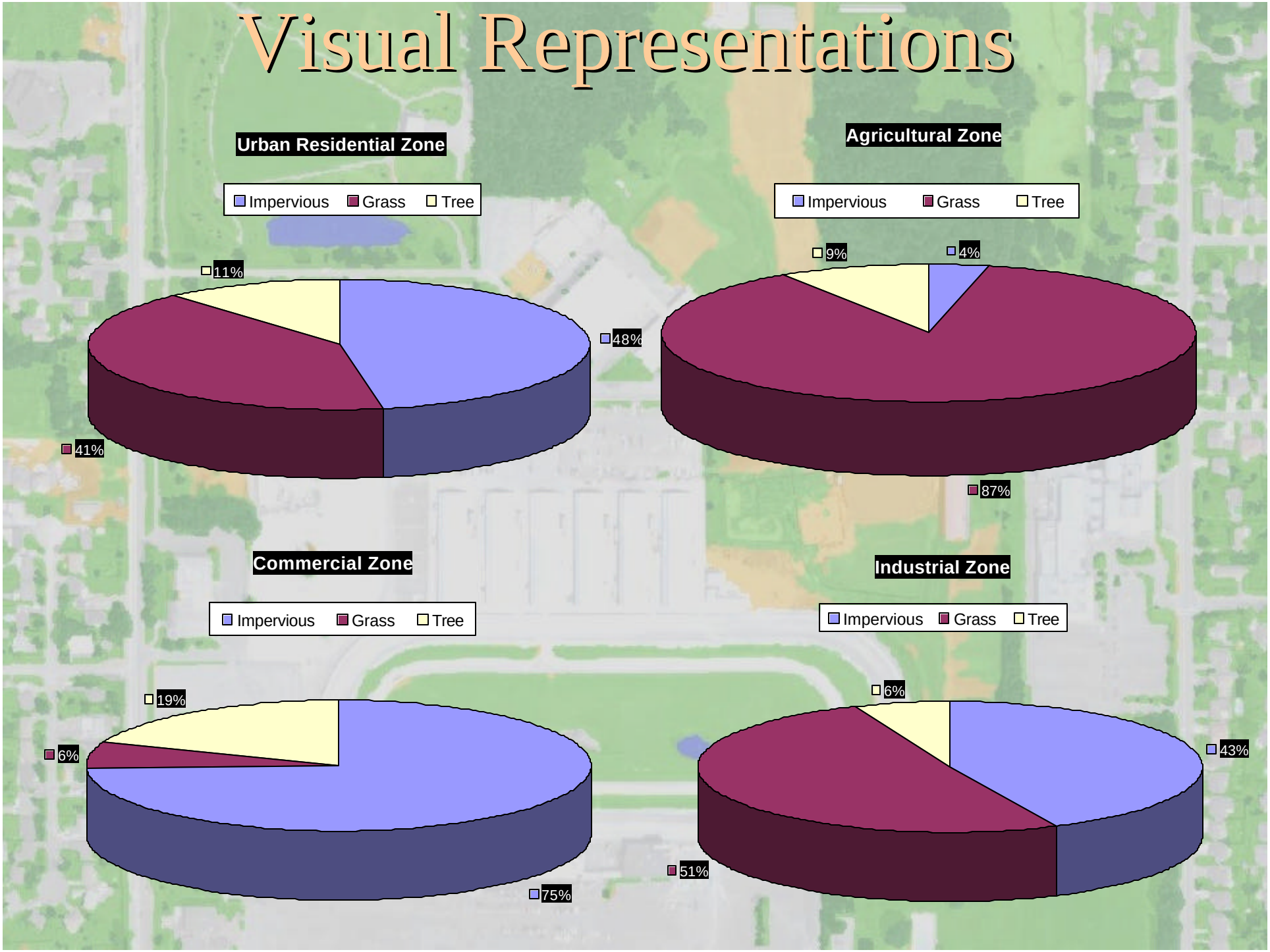
Trees

Satellite Surrey

Sample Analysis

Based on Zoning Data Captured by the City of Surrey in the GIS					
Sum of Area (Sq.M)		**Impervious**	**Grass**	**Tree**	**Total Area**
Agricultural Zone		287325.4500160	6712385.4832950	704539.1966590	7704250.1299690
	Percentage	3.7294408	87.1257471	9.1448121	
Commercial Zone		964644.0940390	81035.5292570	247793.0336950	1293472.6569910
	Percentage	74.5778497	6.2649588	19.1571915	
Industrial Zone		648271.4937010	765687.4398890	93960.8258330	1507919.7594220
	Percentage	42.9911134	50.7777310	6.2311556	
Institutional Zone		97721.5652620	90026.3481430	27778.3342580	215526.2476630
	Percentage	45.3409115	41.7704800	12.8886085	
Multiple Residential Zone		99231.2478430	33828.1404690	13728.4147960	146787.8031090
	Percentage	67.6018346	23.0456072	9.3525583	
Sub-Urban Residential Zone		902194.6138250	2468625.7643530	1375708.7210080	4746529.0991860
	Percentage	19.0074599	52.0090726	28.9834675	
Urban Residential Zone		3085564.9126860	2696936.8833080	734777.9071990	6517279.7031930
	Percentage	47.3443684	41.3813279	11.2743037	
Entire Clayton Heights AOI		15153854.2451190	14657650.2724630	3297050.7207050	33108555.2382850
		45.7702069	44.2714886	9.9583044	

Visual Representations



Conclusion

Using Satellite Imagery Surrey Spatial Information Staff will have the ability to:

- Provide timely updates to Planimetric Features during interim years
- Provide enhanced image analysis capabilities in comparison to aerial orthophotos (eg.: Land Cover Classifications)
- Planning and Analysis for future requirements based on classification of multispectral data

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Thank you!

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