

Stormwater Billing – Impervious Area Connecting GIS and Finance

Presented by:
Shiju Mathew, GISP – GIS Analyst

Outline

- **Corporate History**
- **Background on Stormwater Billing**
- **Impervious Area Project**
- **The Delineation Process**
- **Impervious Area Analysis**
- **The Challenges ahead**



Corporate History

City of Halifax
assumes
private water
supply system

1861

Public
Service
Commission
(PSC) is
formed to
address
critical state
of water
utility

1945

Commission
purchases
water utility
assets from the
City - Utility to
be run in a
business-like
manner

1952

PSC
renamed to
Halifax Water
Commission

1987

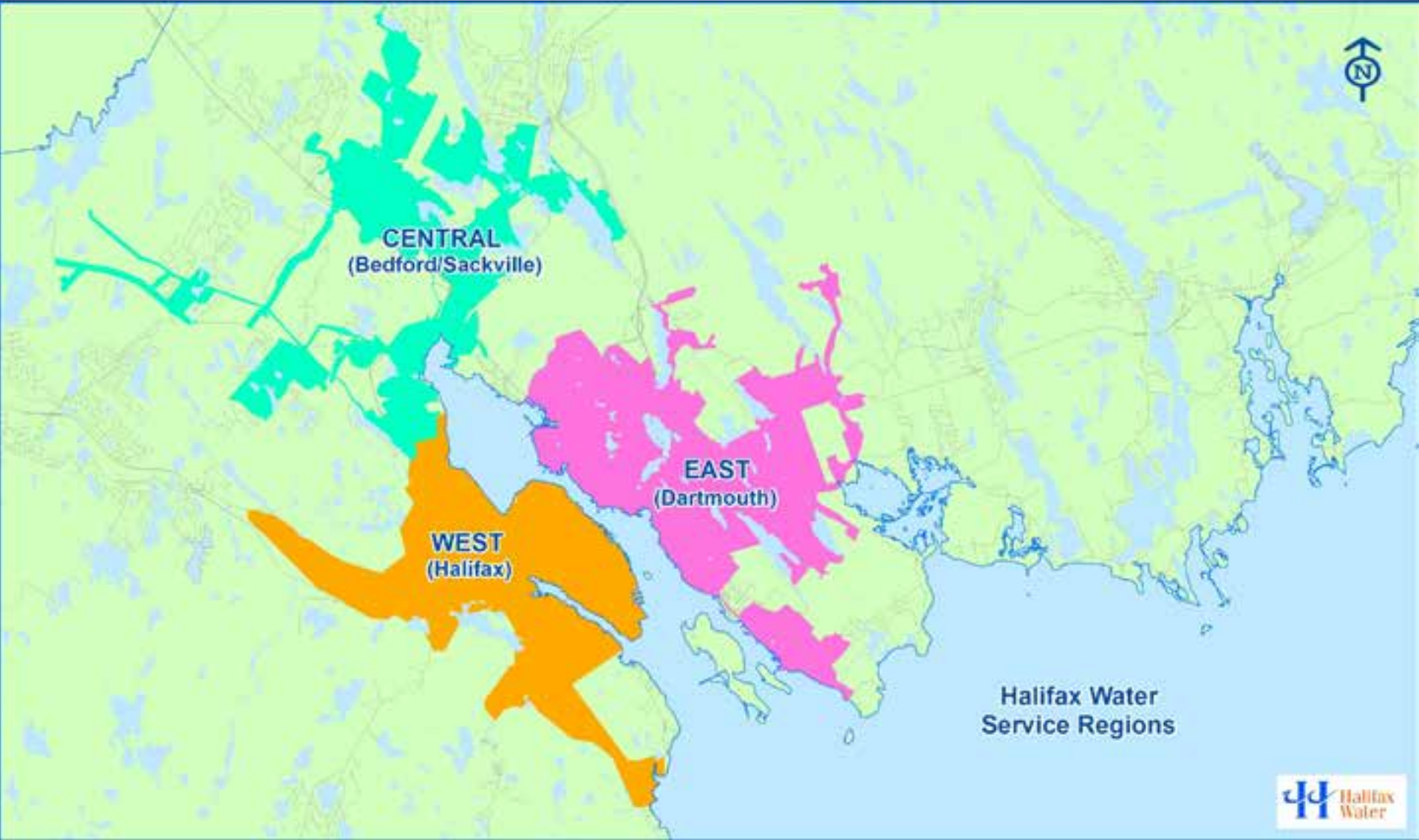
Metro
Amalgamation –
Merger of
Halifax,
Dartmouth and
Halifax County
Water Utilities
(HRWC)

1996

Transfer of
HRM's
wastewater and
stormwater
service to
Halifax Water

2007

Geographic Scope



West Region Pipe Installation



Background on Stormwater Billing

- Operations of water and wastewater functions financed by water consumption.
- Revenue for stormwater was based on wastewater revenue.
- 2009 Nova Scotia Utility and Review Board (NSUARB) report concluded that this rate structure is not fair and needs to be revised.
- Consultants hired by Halifax Water recommended to split the charge based on the class.



Background on Stormwater Billing

- The two classes are:
 - Residential customers
 - Commercial / Industrial / Institutional – ICI Customers
- Residential Customers to be charged based on average impervious area of all lots in that class.
- ICI customers to be charged based on impervious area of their lot.
- Identify process steps to delineate and use impervious areas and identify the study area.



Impervious Area Project

- In-house data gap analysis
 - Data consistency across the study area
- Collecting data
 - In house survey
 - Outsourcing the survey
 - > High accuracy
 - > High Cost – resource, time, money
- Impervious area delineation using imagery and software



Impervious Area Project

- Aerial Photo Vs. Satellite imagery – 780 sq. km.
 - Detail Vs. Accuracy Vs. Cost
- Software – ENVI; e-Cognition, ERDAS-Imagine
- Pilot project was defined and used to outline some of our requirements.
- ITT – Exelis was identified as the successful consultant
- Pilot project was used to identify strengths and weakness of the software and accuracy of the resultant product



Impervious Area Project

- ITT provided a demo of the software and the results in ESRI shapefile format.
- In-house survey team surveyed the properties and the results were then compared to the one provided by ITT
- We found a 96% accuracy in the pilot study area.
- Based on the pilot project, and RFP was put out and ITT was once again successful proponent.
- In consultation with ITT, appropriate imagery was selected.



Impervious Area Project

- ITT completed the delineation process within 4 months
- A 2 month QC process was done at Halifax Water
 - Random check of the data for inaccurate delineation
 - Inaccurate classification
- Readjust some of the classification and adjust delineation
- Project Sign-off



The Delineation Process

- Imagery selected – Digital Globe WV2 Level 2A dataset
 - Separate panchromatic and multispectral
- Orthorectification of Imagery using GCPs
- Rater classification produced
- Based on spectral signatures only
 - Hybrid object-spectral approach was cost prohibitive
 - Supervised and unsupervised classification
 - Cloud and water masks incorporated
 - Vegetation index delineate vegetation
 - Anomaly detection – sun glint, specular reflection



The Delineation Process

- All classifications were done using raster data
- Raster data was then converted to vector data
- Class attribute was populated – impervious or pervious

Stormwater Billing

- Provincial Parcel Fabric
- Pervious and impervious areas
- Service and No Service areas
- Serviceable Impervious Area Analysis



Customer	Service	Value
1444 0000	Impervious Service	Customer: 28,85.00
1444 0001	Impervious Service	Customer: 1,046,216.50
1444 0002	Impervious Service	Customer: 88,476.75
1444 0003	Impervious Service	Customer: 58,537.75
1444 0004	Impervious Service	Customer: 30,738.75
1444 0005	Pervious Service	Customer: 65,763.50
1444 0006	Pervious Service	Customer: 1,046,216.50
1444 0007	Pervious Service	Customer: 58,476.75
1444 0008	Pervious Service	Customer: 55,735.25
1444 0009	Pervious Service	Customer: 8,887.25



The Finance Connection



GIS



Metering &
Finance



SAP



Challenges

- Data gaps

- Pre-project lack of data – Possible different path
- Post project lack of data
 - > Identifying parcel lots as Residential, Commercial, Industrial and Institutional

- Program sustainability

- How often do we update the delineation due to development?
- Snapshot in time – how often do we rerun the analysis?
- QC of result produced each time the analysis is run.



Challenges Continued...

- Change Management
 - Communicating to customers
 - Communicating to non-customers
 - Public meetings
 - Dealing with appeals
 - Maintaining a high level of customer satisfaction
 - Data accuracy
- Resource management
 - Allocation of staff to each appeal
 - Timely replies





Questions or
Comments?

