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3D GIS VISUALIZATION IN YORK REGION

The Planning and Economic Development Committee recommends:

- 1. Receipt of the presentation by John Houweling, Director of Geomatics; and**
- 2. Adoption of the recommendation contained in the following report dated February 10, 2012, from the Executive Director, Corporate and Strategic Planning.**

1. RECOMMENDATION

It is recommended that this report be received for information.

2. PURPOSE

This report informs Council on the progress local municipalities and the Region have made on 3D Geographical Information System (GIS) visualization.

3. BACKGROUND

3D GIS is a computerized model of existing or proposed built environment that allows for exploration of spatial relationships between objects, such as buildings, and landscape features, such as hills and slopes.

3D visualization is a powerful tool for communicating urban growth scenarios to Council, staff, partners and the public. This view of reading maps and drawings is sometimes easier to understand than two dimensional maps. Flythrough and walkthrough visualizations are among the more common uses; however, 3D models can also be used for analytical purposes, such as optimizing cell-tower placement. The public is familiar with 3D visualizations from consumer web tools such as GoogleEarth and Bing, however these tools do not show many buildings in York Region.

Since 2005, York Region has been developing a 3D visualization model of buildings in the Regional centres and corridors

3D visualization is used to understand impacts of plans for intensification and built form, and effectively communicate options to government agencies, Council, consultants, and the public to aid in decision-making.

3D visualizations have been used to support public and inter-agency consultation for major Regional initiatives, including the York-Durham Sewer System, the Spadina Subway extension, the Yonge Subway extension, and several VIVANext projects. Over the past three years, the Region's 3D visualization program has expanded to include collaborations with interested local municipalities. At public meetings it helps to facilitate understanding and communication of physical conditions, envision the future, and evaluate design options among the participants.

Through the YorkInfo Partnership, 3D building models are shared with the local municipalities. Mutual knowledge sharing and training for 3D visualization techniques and methods have helped advance the program. The program currently has the Region maintaining and hosting the Regional 3D model, while local municipalities create future development scenarios for inclusion in the shared and centrally accessible 3D database. The central 3D database model now holds more than 90,000 buildings, of the approximately 300,000 existing structures across the Region.

Proposed buildings are created using information from site plans and planning reports. These models can be shown as a simple block building to provide the context of an area, such as subdivisions, or as more detailed and realistic representations with added architectural details and facades for buildings and areas of greater significance.

4. ANALYSIS AND OPTIONS

3D visualization enhances understanding and communication of the current and future built form

The real power of the 3D GIS comes from the ability to perform “what if” scenarios. Changes to a scenario can be generated and visualized quickly. This is especially useful to explore the impact of different building heights, or visualize changes to density and intensification targets.

The technology includes flythroughs that allow the user to investigate and interact with the models and scenarios from many perspectives. Viewed from a higher perspective, the user can interact with larger areas, or whole development scenarios. This allows future building scenarios to be compared with current buildings, and the impact of building forms representing higher densities to be evaluated. Creating street level views of key areas and bringing in urban design elements, such as people, cars, and trees can help create a sense of how a space might look from a pedestrian perspective.

3D has been used on real projects to aid decisions and show the public the impacts

An important goal of 3D GIS is to support decisions. 3D analysis supports decision making in many ways:

- Visual sensitivity of a proposed building or development can be assessed including the effect of changes to the skyline, impacts on lines of sight from surrounding buildings, or to determine the best location of a communication tower. Surface analysis is used to calculate and identify elevations, volume, and distance. These can be used to identify flood zones, development constraints, or ideal drainage locations.
- A line of sight analysis allowed staff to determine if a proposed communication tower location would be accessible to the Regional administrative building.
- Relationship between features can be evaluated. For example, 3D can be used to estimate the impact of shadows cast by proposed developments at different times of the day.
- Interacting with 2D GIS data, engineering drawings, and other planning drawings allows for scenario analysis. As an example, a video showing the engineering drawings of the proposed Transit Rapidway along Davis Drive in Newmarket was used to show residents which properties would be affected by the proposed development.

Many municipalities have used 3D to plan and articulate key urban planning concepts

Over the past three years, York Region has provided a number of YorkInfo Partners with existing building models and knowledge sharing sessions on the 3D model building process, scenario building and video production techniques. Local municipalities used the existing models, standards and methodologies to develop 3D visualizations of proposed buildings and scenarios and have provided these models back for integration into a common shared central 3D database.

The models are being used at local municipalities as an analytical tool for staff and consultants to understand characteristics for growth and revitalization of areas. They are also used at public meetings to help visualize and communicate planning proposals.

The first joint 3D project was with the Town of Richmond Hill. Planning staff were able to use 3D visualization to illustrate proposed building heights outlined in the Downtown Design and Land Use Strategy and to show future massing of proposed development along Yonge Street and of its downtown and town centre. This provided a valuable input towards developing the Town's new Official Plan. The Town contributed its existing buildings, and the proposed 2051 build out along Yonge Street and of its downtown and town centre for inclusion in the central 3D database.

The Town of Aurora staff used the existing 3D models as a base to illustrate, as part of its Downtown Revitalization Project, the potential future development in the Yonge

Wellington Corridor in two future scenarios. Video flythroughs of these scenarios were created by town staff for consultation. The Town contributed future 10 and 15 year build out scenarios of the Yonge Wellington Corridor study area.

The Town of East Gwillimbury staff used development applications to create realistic 3D models of the approved commercial development at Yonge and Green Lane. This allows town staff to plan for anticipated changes in traffic patterns and volume before the developments are built. East Gwillimbury supplied these buildings for inclusion into the central 3D database.

The Town of Markham worked with consultants on a number of 3D projects: Markham Centre, Cornell planning area, and the Langstaff Gateway area. The results were used in presentations at consultation meetings, public meetings and are available on the Town's web page for the community to view. Markham provided existing buildings along Highway 7 and Yonge Street, and the 2051 build out of the Langstaff Gateway and Cornell planning area to the central 3D database.

The Town of Newmarket Visualization, Massing and Height Study documented a vision for Newmarket's Yonge Street Corridor and Urban Growth Centre. As part of this report, 3D building models of the proposed built form were created to show the potential future of the Town of Newmarket. The documents are posted online for public viewing. Newmarket has contributed to the central 3D database all its existing buildings, as well as the proposed 2051 build-out of the Newmarket Centre.

The City of Vaughan has expressed interest in participating in the program to develop 3D models for the Vaughan Metropolitan Centre, Carrville District Centre, Vaughan Hospital lands and intensification corridors such as Highway 7, Yonge Street and Centre Street. These models will help communicate the options for the City's future urban structure and how it may evolve over time.

The next stage will allow staff and partners to interact with the 3D model directly

The introduction of GoogleEarth 3D visualization changed the way people interact with 3D mapping. In response to user expectations, Geomatics developed *yrGeo3D*, the Region's web-based 3D viewer. This viewer allows users to visualize and navigate existing and future build environments and create dynamic presentations. It has been successfully piloted with select Region staff. It will be released to local municipalities and Regional staff in 2012.

Link to Key Council-approved Plans

The progress made on 3D GIS visualization directly supports the priority area of the 2011-2015 Strategic Plan by providing Centralized Information to all staff and partners.

5. FINANCIAL IMPLICATIONS

There are no financial implications associated with this report. Geomatics Branch operations are included in the operational budget.

6. LOCAL MUNICIPAL IMPACT

Through the YorkInfo Partnership, local municipalities benefit from sharing York Region's existing building models, standardized methodologies and knowledge transfer. The Region benefits from the local municipalities providing 3D models of future building scenarios for integration into the central 3D database. Together we are developing a central 3D database for use by decision makers and staff to visualize building densities, select and validate planning decisions, and as an effective communication tool for public consultation.

7. CONCLUSION

3D GIS is a powerful tool to visualize, understand, evaluate and communicate existing and future built environments. It has been used to support Regional and local municipal initiatives, such as the York-Durham Sewer System and the Spadina Subway extension into York Region.

The Towns of Aurora, East Gwillimbury, Markham, Newmarket and Richmond Hill, and the Region have collaborated in the creation and sharing of 3D models and scenarios which are hosted in a central 3D database. This collaboration reduces effort and creates a common base for understanding the emerging future growth within the Region. The City of Vaughan has expressed interest in working with the Region to undertake 3D visualization projects of key areas of development within the City.

In 2012, *yrGeo3D* the Region's web-based 3D viewer will be released to local municipalities and Regional staff giving users the capability to interact with, and create virtual presentations of existing and future build environments.

For more information on this report, please contact John Houweling, Director, Geomatics at 905- 830-4444 at Ext. 1529.

The Senior Management Group has reviewed this report.



3D Visualization in York Region

Presentation to Planning and
Economic Development
Committee

John Houweling
February 29, 2012

Agenda

- ❑ Background on 3D program
- ❑ Working together
- ❑ Where 3D is heading
- ❑ Summary

Initiation of 3D Program at York Region



Former Proposed Vaughan Corporate Centre 2051



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Slide 3

Creating 3D models



Site plans, planning reports
and building footprints



Building heights



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Slide 4

The right Level of Detail



Level of Detail 2



Level of
Detail 3

York Region Administrative Centre



Richmond Hill Centre

Level of Detail 3



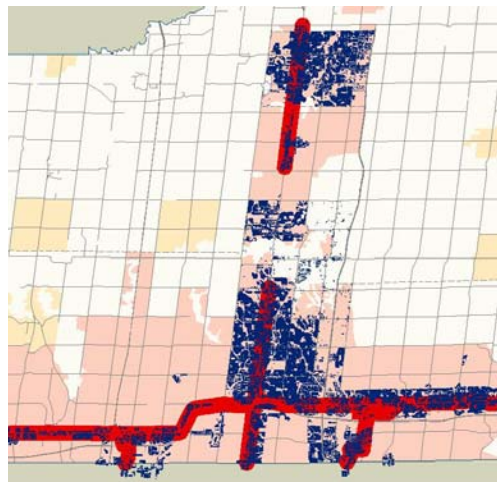
Level of Detail 3

Yonge and Wellington



90,000 + buildings in warehouse

- ❑ 90,000+ existing and proposed buildings
- ❑ Authoritative source of 3D data
- ❑ Available upon request
- ❑ Work with locals and consultants to add to warehouse



Quickly produce alternate scenarios



Lower Floor Space Index



Higher Floor Space Index

Future build out scenario



Building 3D with local municipalities



Building 3D with local municipalities



Aurora – Yonge Wellington Corridors



Markham – Highway 7 and Ninth Line

East Gwillimbury – Green Lane and Yonge Street

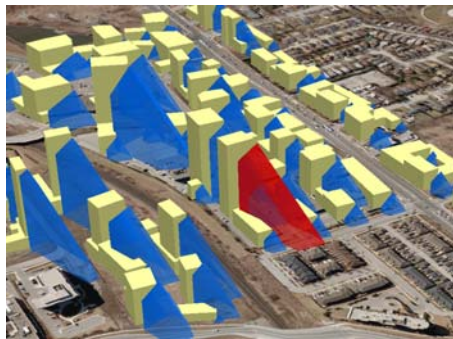


Using 3D to analyze impacts

- ❑ Integrating GIS and engineering data
- ❑ Powerful tool for public consultation



Using 3D to analyze impacts



Shadow from proposed building



What can I see from this spot?



Summary

- ❑ Powerful visualization and communication tool for
 - ❑ Drafting policy
 - ❑ OMB hearings to illustrate points
 - ❑ Intensifications, height and density issues
 - ❑ Analysis of impact on existing environment
- ❑ GIS, Planners and Designers need to be part of the process
- ❑ Collaboration will result in a more robust, centrally accessible warehouse with authoritative 3D data