



Geodesign: Applications Towards Smarter Planning and Urban Design Solutions

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Cities are under threat from the impacts of climate change. In recent years major urban centres have been struggling to cope with temperature extremes, urban heat islands, flooding and increased storm activity. The need to intelligently model and evaluate planning and design solutions for sustainable and resilient cities is a must. These design strategies need to take into account geographic data, designing with a thorough knowledge of the earth and its systems.

Storm Sandy- Image from i.telegraph.co.uk/multimedia

McHargian Mapping Overlay System



SLOPE



SURFACE DRAINAGE



SOIL DRAINAGE



BEDROCK FOUNDATION



SOIL FOUNDATION

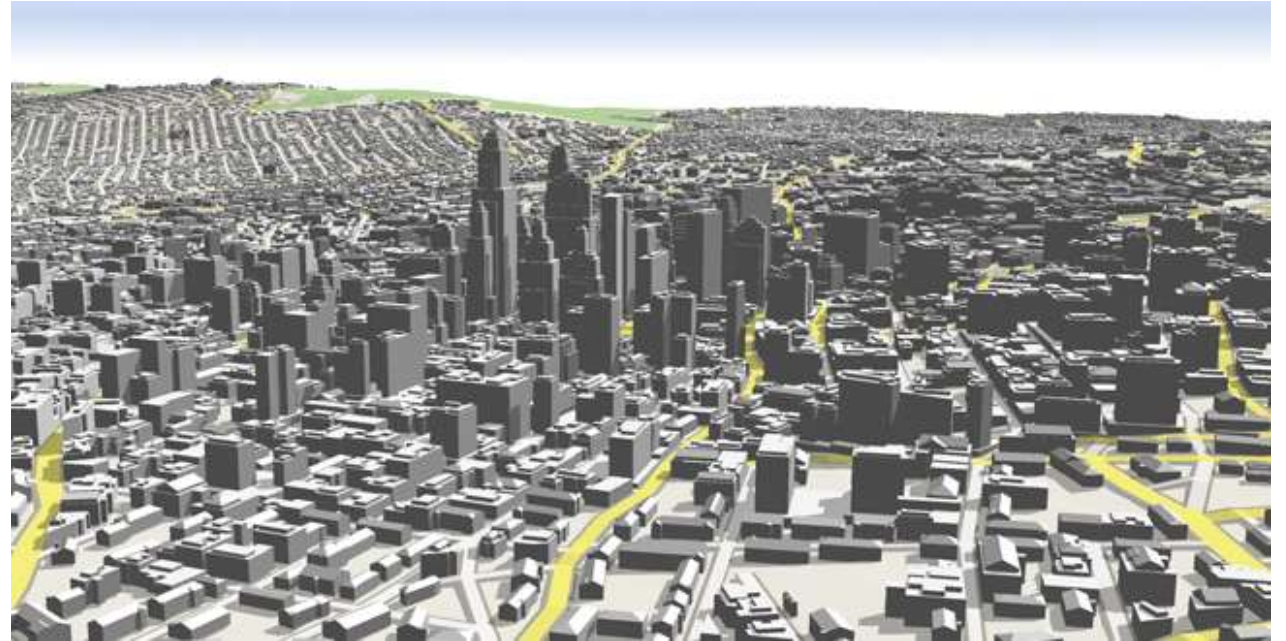



SUSCEPTIBILITY TO EROSION

Geodesign as a discipline has been evolving over the past half century. In 1969, landscape architect Ian McHarg published “Design with Nature”, documenting his revolutionary method of design; the McHargian Mapping Overlay System.

What is Geodesign and why is it important in the built environment design profession?

- **Geodesign** is a new way of thinking about the *design process* for landscape architects, urban designers and planners of the built environment.
- It is a smarter framework of utilizing the site's data and leveraging geographic information to *create, assess, design* and *visualize* your *smarter city designs* and *landscape concepts*.
- Geodesign takes *site inventory and analysis to a whole new level*. Utilize geographic data and create evidence-based designs.





“Geodesign promotes designing with geography instead of designing around geography. Geodesign integrates science, social, and aesthetic values into landscape planning with GIS tools that support rapid evaluation of design alternatives against the impacts of those designs. Geodesign infuses design with a blend of science- and value-based information to help designers, planners, and stakeholders make better-informed decisions.”

– Esri Inc

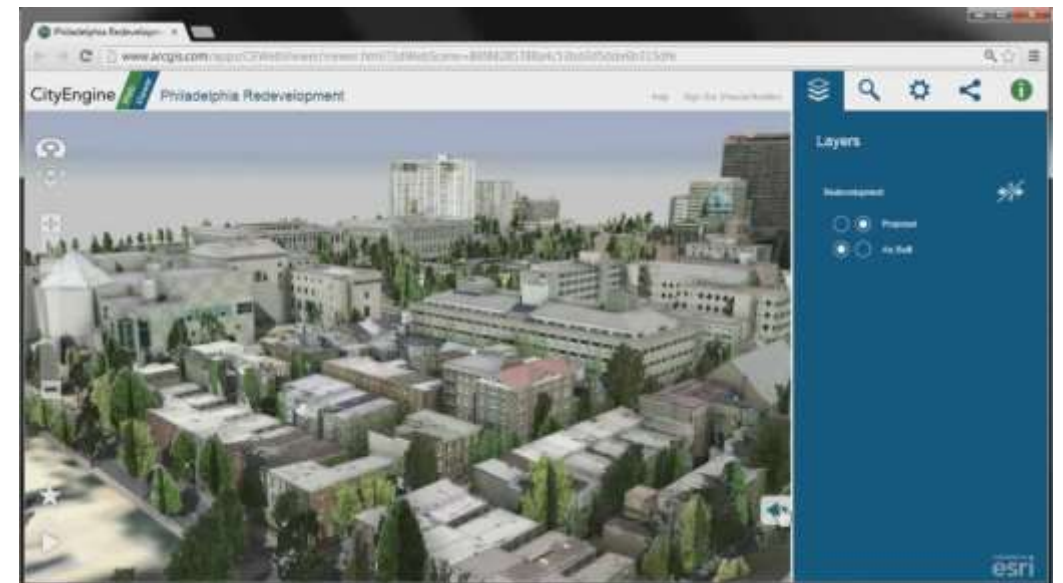
Geodesign: Creative Design with Data

Geodesign is supported by many acclaimed landscape architectural theorists and practitioners.

“Geodesign applies systems thinking to the creation of proposals for change and impact simulations in their geographic contexts, usually supported by digital technology.” - **Carl Steinitz**, Harvard’s GSD professor emeritus

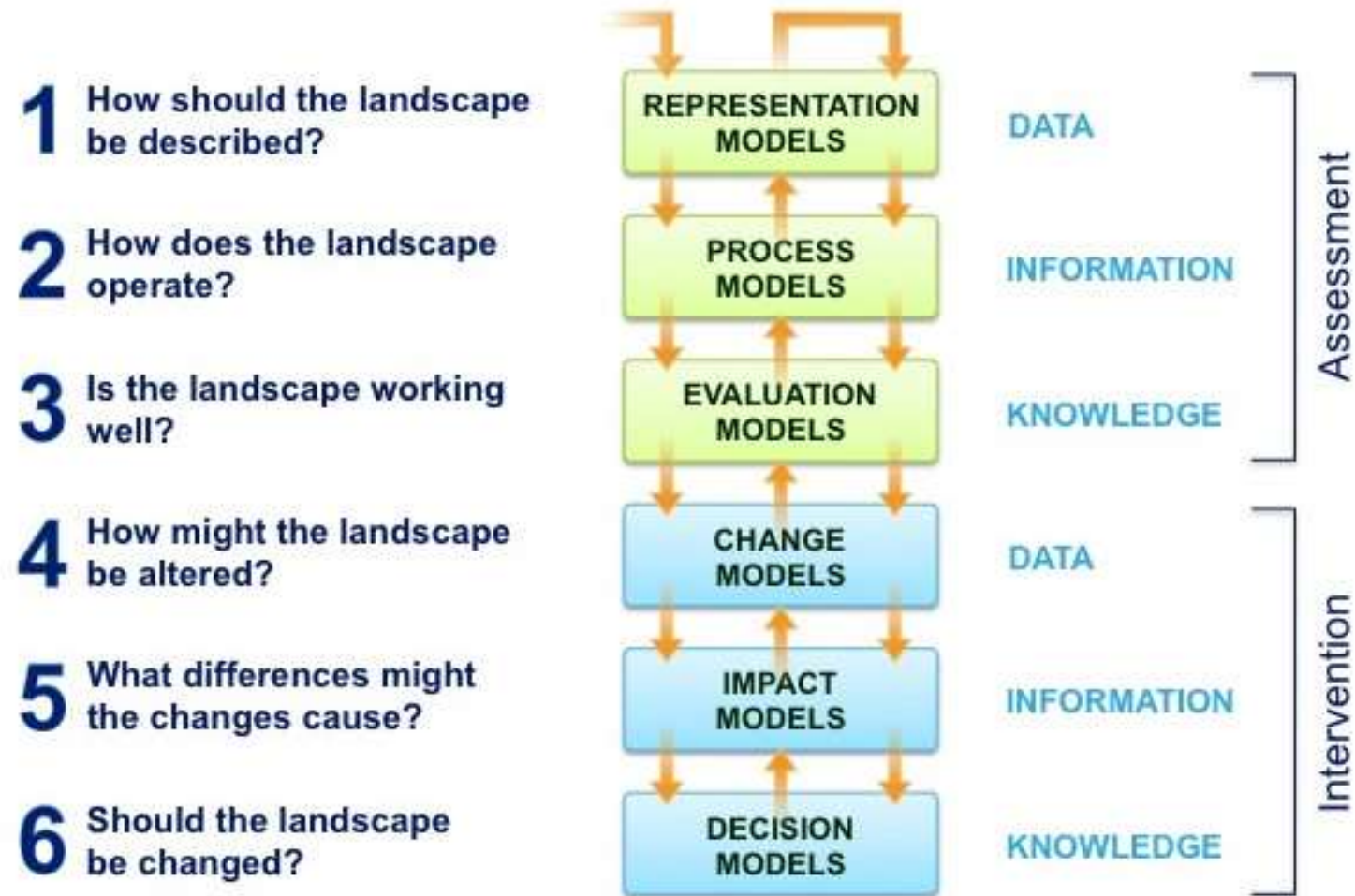
“Geodesign is a method which tightly couples the creation of proposals for change with impact simulations informed by geographic contexts and systems thinking, and normally supported by digital technology.”

- **Michael Flaxman**, Professor at MIT's Department of Urban Studies and Planning, and **Stephen Ervin**, Professor at Harvard’s GSD



Framework for Geodesign

The geodesign framework – by Carl Steinitz



Esri's 3D Geodesign Platform



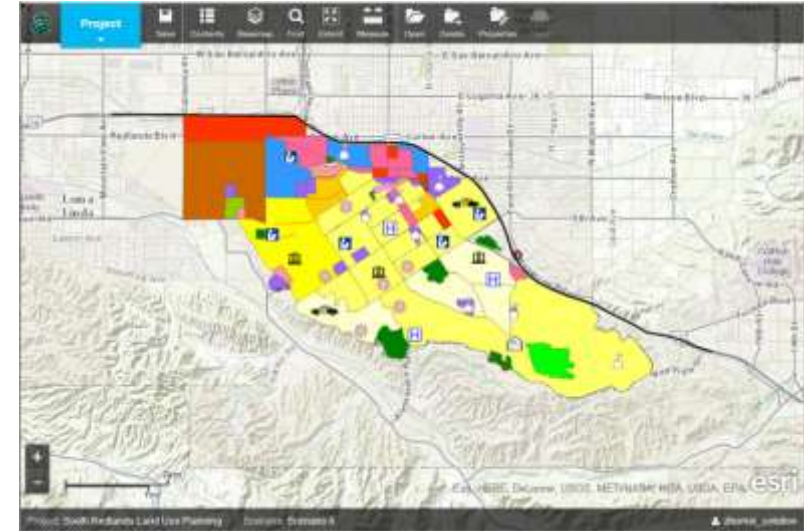
Landscape Architecture and Urban Design

Integrative Design- solves today's complex problems using integrative design techniques

Make Smarter Decisions- quick feedback the impact of your design decisions support smart planning and design

Enabling Technology- use the latest technologies and best practices to part of the Geodesign process

Collaboration- increase project success by using these collaborative tools that expand participation and increase transparency



Import Your Urban Design Proposals within Existing Built Urban Context in CityEngine



See Before and After Scenes
side by side to compare results



Design Streetscapes and Public Realm

Apply information to design street width, street furniture,
test and develop different options, parametrically.
Apply procedural rules to change street design.
See your changes quickly in 3D.



Street 1



Street 2



Street 3





Enhance and develop character of the space supported with evidence-based results

Ottawa Street North, Hamilton, Ontario - Adele Pierre



Site- Design Area

***Navigator**

Search for files in workspace All types

- ESRI.lib
- Hamilton
 - assets
 - Facades
 - General
 - Groundcover
 - Plants
 - Roofs
 - Streets
 - BUILDINGS.shp

F/Hamilton/assets

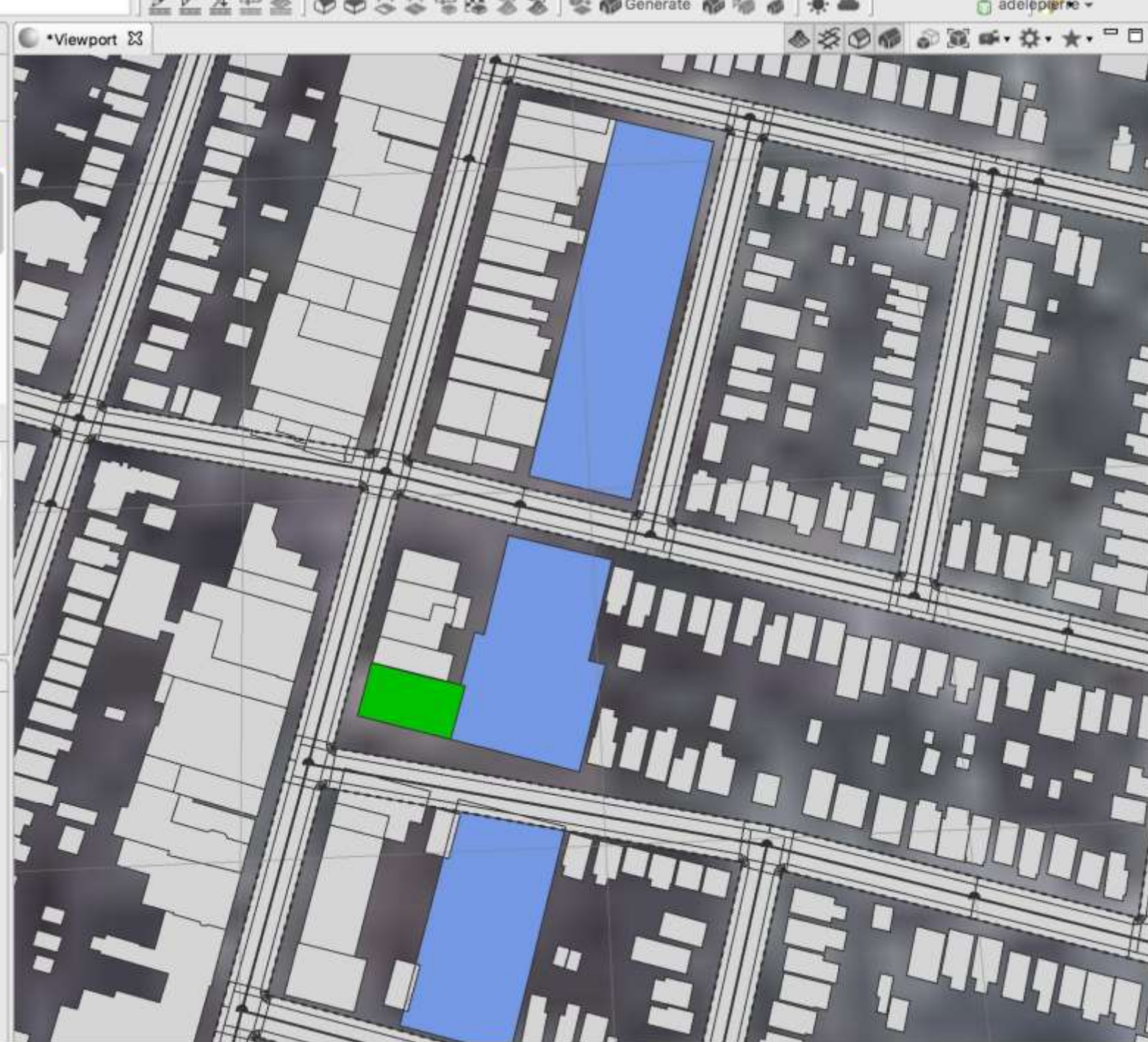
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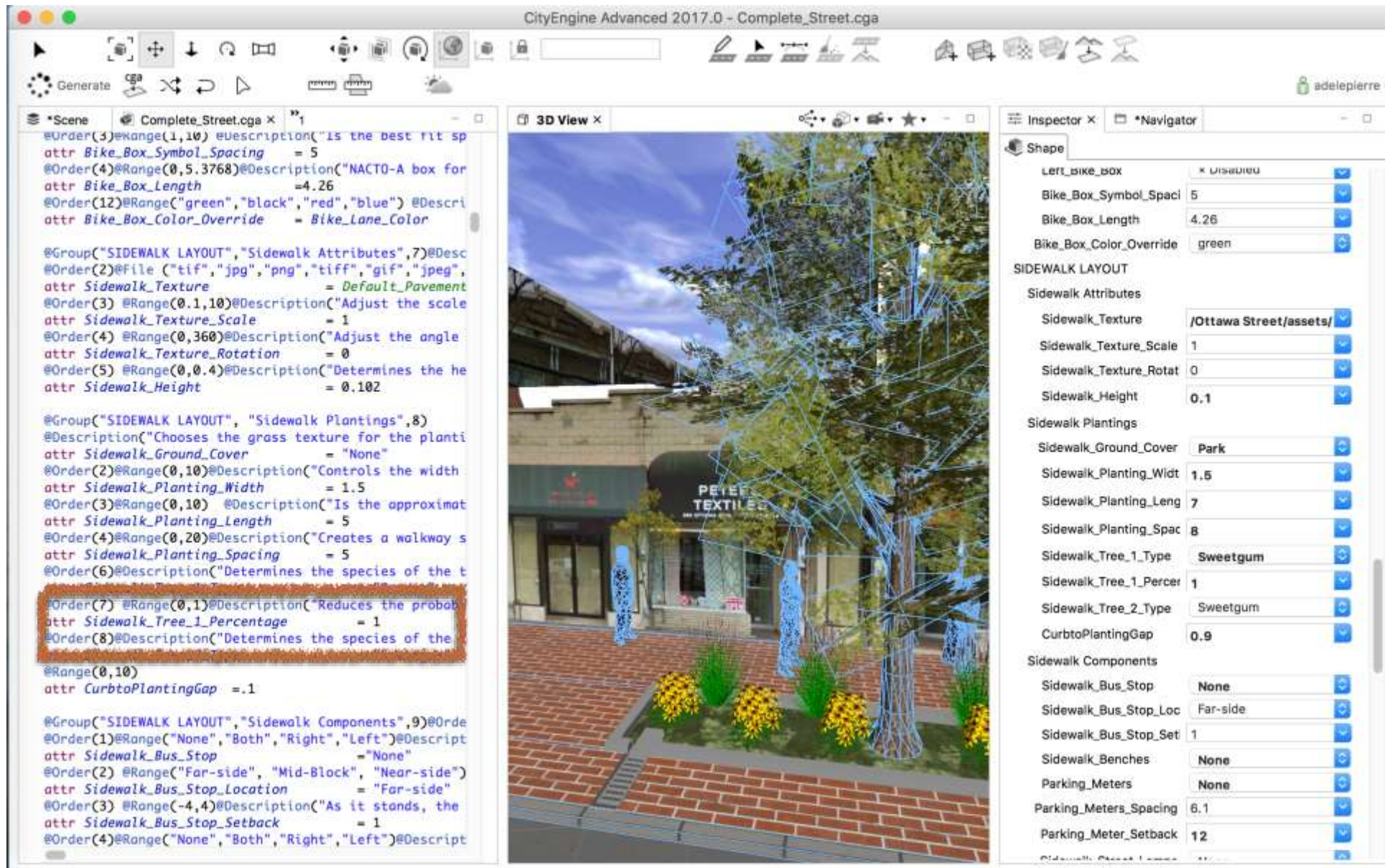
Last modified: Tue Sep 27 14:59:23 EDT 2016

***Scene**

Search for layers, objects or attributes

- Shapes BUILDINGS [192223 objects] ☐ ☐ ☒
- Shapes LAKES [271 objects] ☒ ☐ ☐
- Shapes PARKING_LOTS [56 objects] ☐ ☐ ☒
- Shapes PARKS [250 objects] ☒ ☐ ☒
- Graph Network SHORELINE [41324 objects] ☐ ☐ ☒
 - Network ☒
 - Blocks ☒





ESRI's CityEngine- Complete Street Rule



Name			
Rules			
Reports			
Report	N	%	Sum
# Spaces	196	0.00	196.00
# Streets	9	0.00	9.00
Area Parking	196	0.00	2648.80
Area Street	9	0.00	2298.13
Area Un-utilized Asphalt	29	0.00	171.42
Cost Parking	196	0.00	7946.40
Cost Street	9	0.00	4596.25
Cost Un-utilized Asphalt	29	0.00	514.28
Daily Parking Loss	29	0.00	139.70
Daily Parking Profit	196	0.00	1960.00
Duration Parking Loss	29	0.00	50292.11
Duration Parking Profit	196	0.00	70560.00
Un-utilized Asphalt Runoff	29	0.00	171.42
Object Attributes			
Materials			
Vertices			
Information			

INCREASING PERMEABILITY OF PARKING LOTS

The Advanced Street cga rule is used to create permeable parking spaces and a central planting bed, or bioswale. Total area of the parking lots is 'Area Parking' combined with 'Area Streets'.

The amount of stormwater runoff generated is easily calculated based on areas of impermeability, storm size and runoff coefficient.

By changing the parameters of the permeable areas, size of aisles, street ends and planting beds, different scenarios are quickly generated to determine the amount of stormwater managed through point source infiltration.

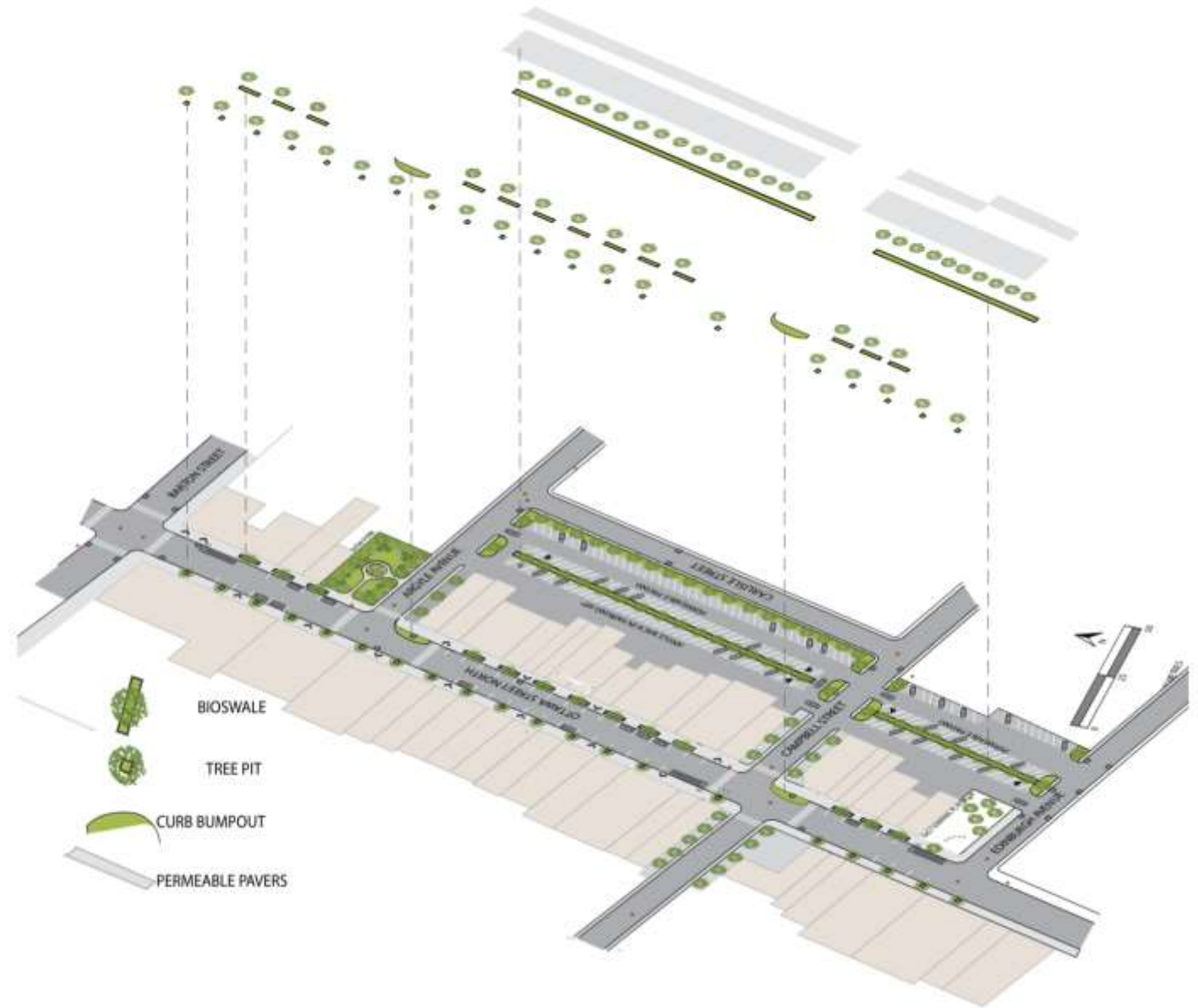
Streetscape:

- 20 tree infiltration pits measuring 1.2m x 1.2m are used on the west sidewalk.
- 13 Bioswales on the east sidewalk are 1.5m wide and 7m long.
- 2 curb bump-outs
- Estimated to divert 75% of runoff from combined sewers.

Significant reduction in oil and grease, total suspended solids and phosphorus.

Parking lots:

- 2 bioswales in the parking lots combined with permeable paving have the potential to divert 90% stormwater runoff from combined sewers.

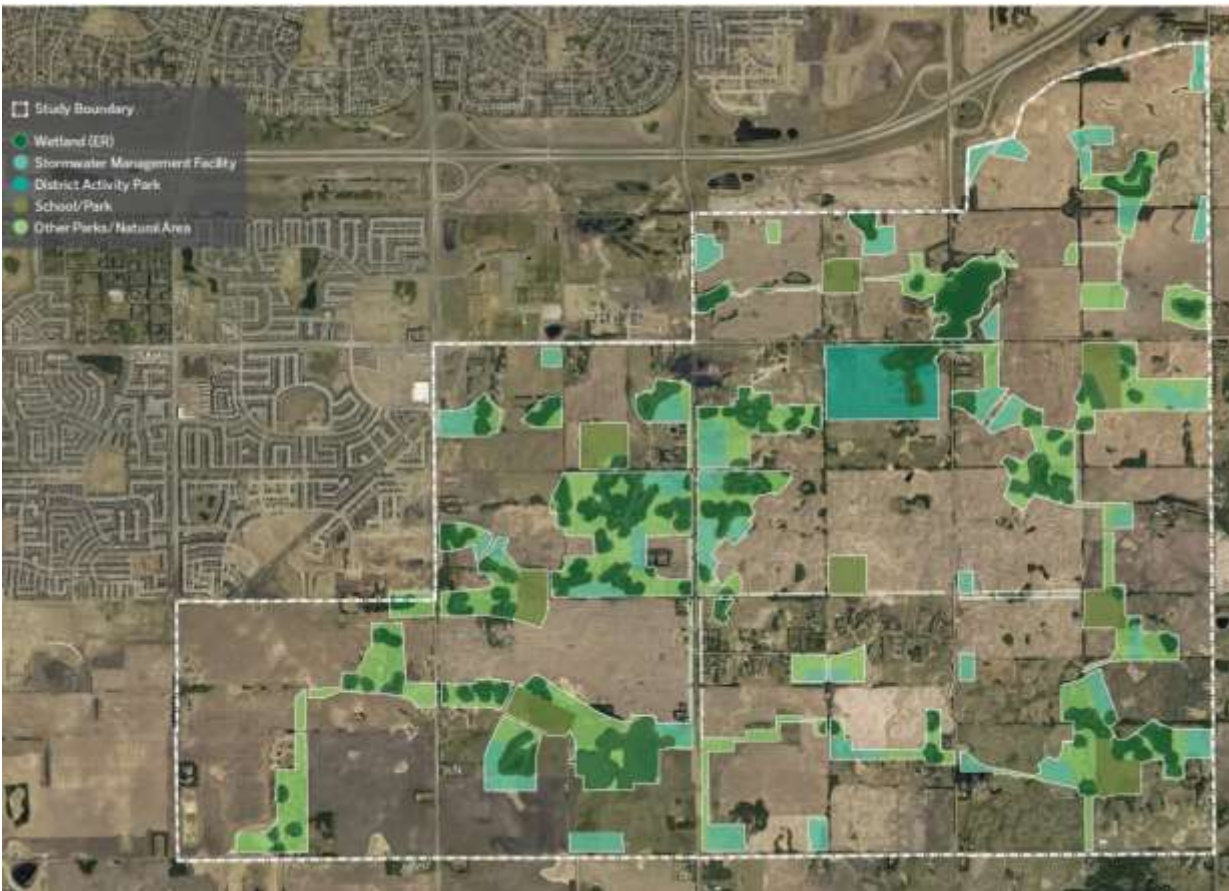




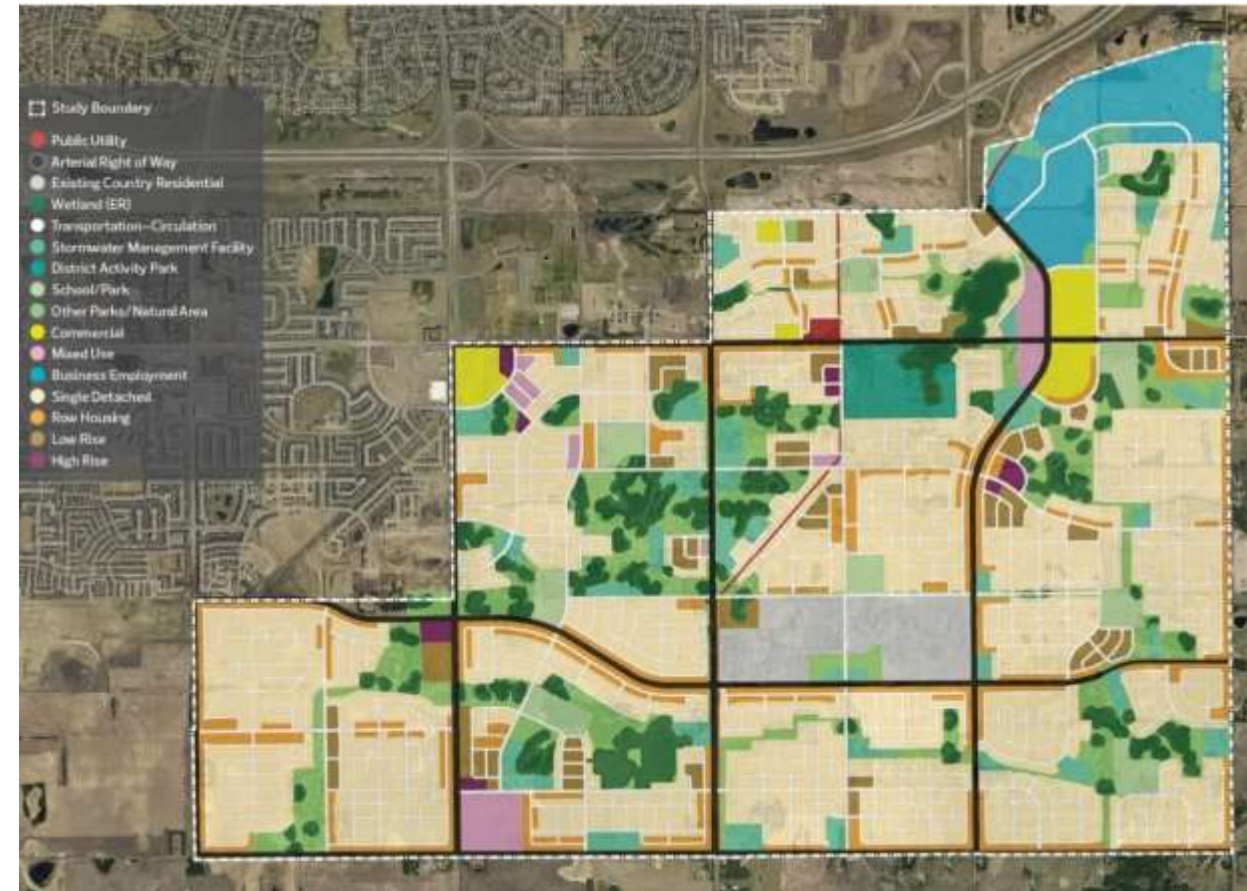
Reference to ESRI's Complete Streets Rule-
<https://community.esri.com/docs/DOC-6915-complete-street-rule-update>

Link to story map <https://bit.ly/2t5dEJg>

Emerald Crescent- City of Edmonton- O2 Design + Planning



Wetlands, school sites, stormwater management infrastructure, and other parkland are connected to form the Emerald Crescent.



The Emerald Crescent Land Use Concept



The Emerald Crescent concept master plan rendered using the CityEngine and Unreal virtual engine.



The Emerald Crescent rendered using CityEngine and the Unreal virtual engine, showcasing community development and greenscape and wetlands.

Minhu Wetland Park, China - Turenscape



Stormwater management
Water purification
Public amenity

Source: <http://www.archdaily.com/590066/minhu-wetland-park-turenscape/54bf2150e58ece1abf0001d1-detail>



Talks on Geodesign

TED TALK on GeoDesign by Jack Dangermond, President and Founder of Esri

<http://video.esri.com/watch/125/jack-dangermond-talks-about-geodesign-at-ted2010>

Lecture by Carl Steinitz, Professor of Landscape Architecture and Planning, Emeritus, Harvard's GSD

<http://video.esri.com/watch/3140/geodesign-with-little-time-and-small-data>

Lecture by Kongjian Yu, Professor and Dean, College of Architecture and Landscape Architecture, Peking University and President and Principal Designer

<http://video.esri.com/watch/3142/the-art-of-survival-and-the-promise-of-geodesign>

Experience Esri's Geodesign Platforms

GeoPlanner for ArcGIS--<http://www.esri.com/software/geoplanner-for-arcgis/free-trial>

ArcGIS Pro--<http://www.esri.com/software/arcgis-pro>

CityEngine- <http://www.esri.com/software/cityengine/free-trial>

THANK YOU
GRAZIE

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