



# *Queenston Manor Apartments*

*LID Saves the Day!*

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Designing for Impact: LID Lessons Learned

*May 20, 2016*

# Queenston Senior Apartments

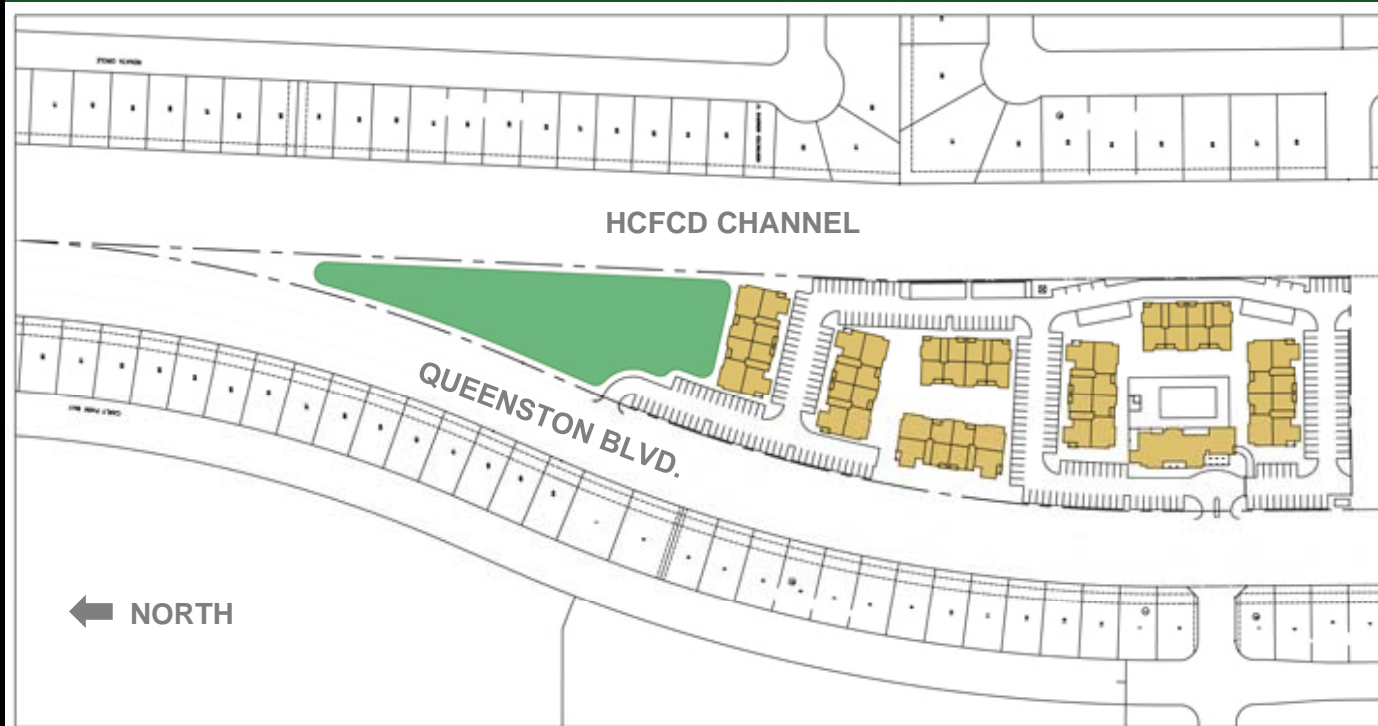
The site is 7.4 acres  
Additional  
development  
requires 4.07 ac-ft  
retention  
time



Queenston  
apartments

apartment storage

residential  
buildings



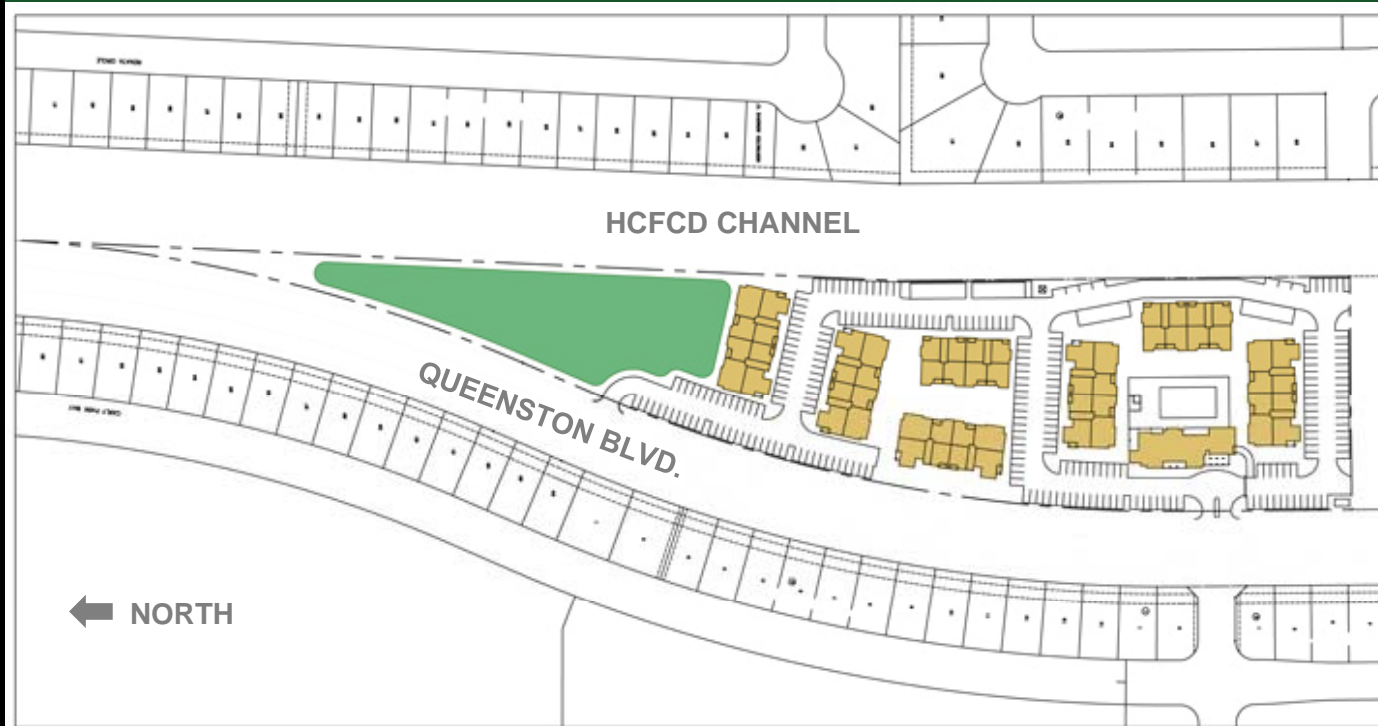
- Goal of modern “conventional” drainage is to remove runoff quickly, efficiently and completely
- Conventional drainage achieves this goal, but requires large infrastructure expense



## LID drainage concepts and principals:

- decentralize conveyance and detention
- distributed “micro-scale” practices - spread it out
- mimic natural drainage processes – time of concentration, infiltration, volume and flow
- time-tested technology, different application
- like conventional methods, drainage is still designed to avoid flood damages and support mobility
- slower does not mean less efficient

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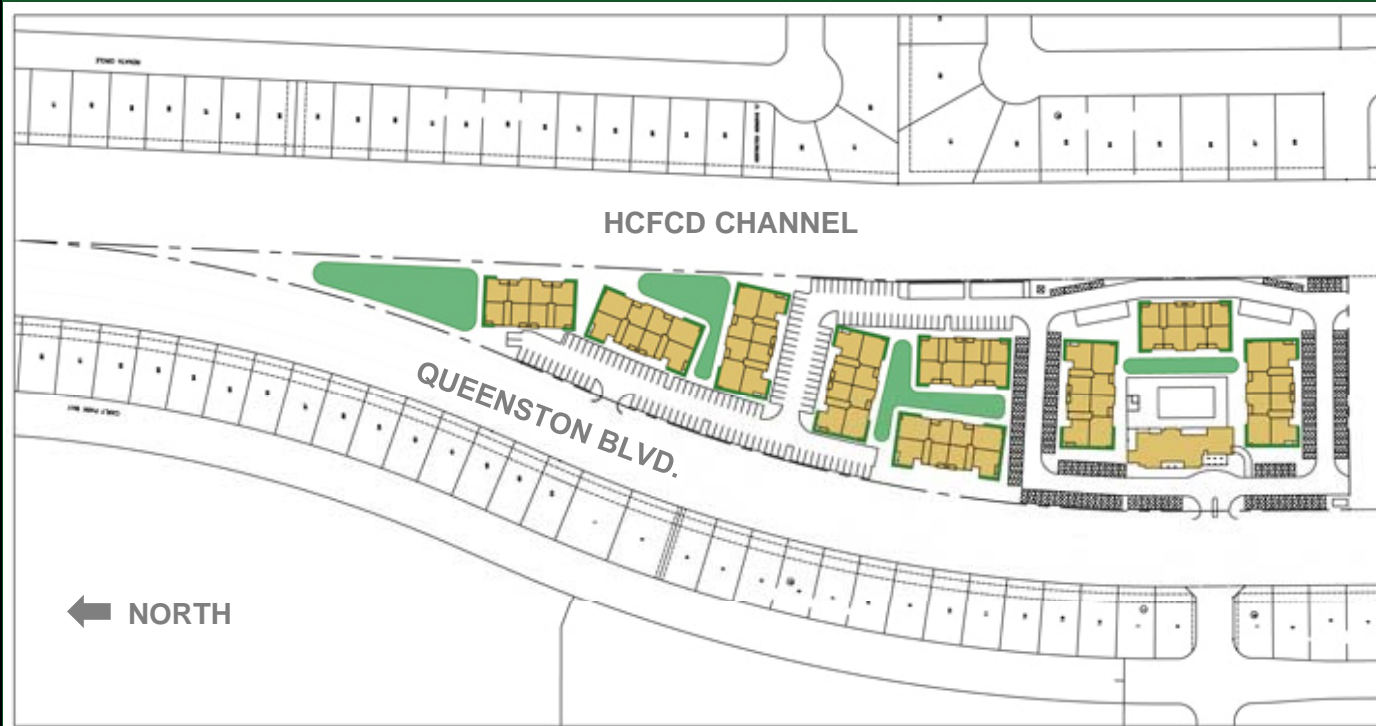
**Queenston  
Senior  
Apartments**

gardens

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etated swales

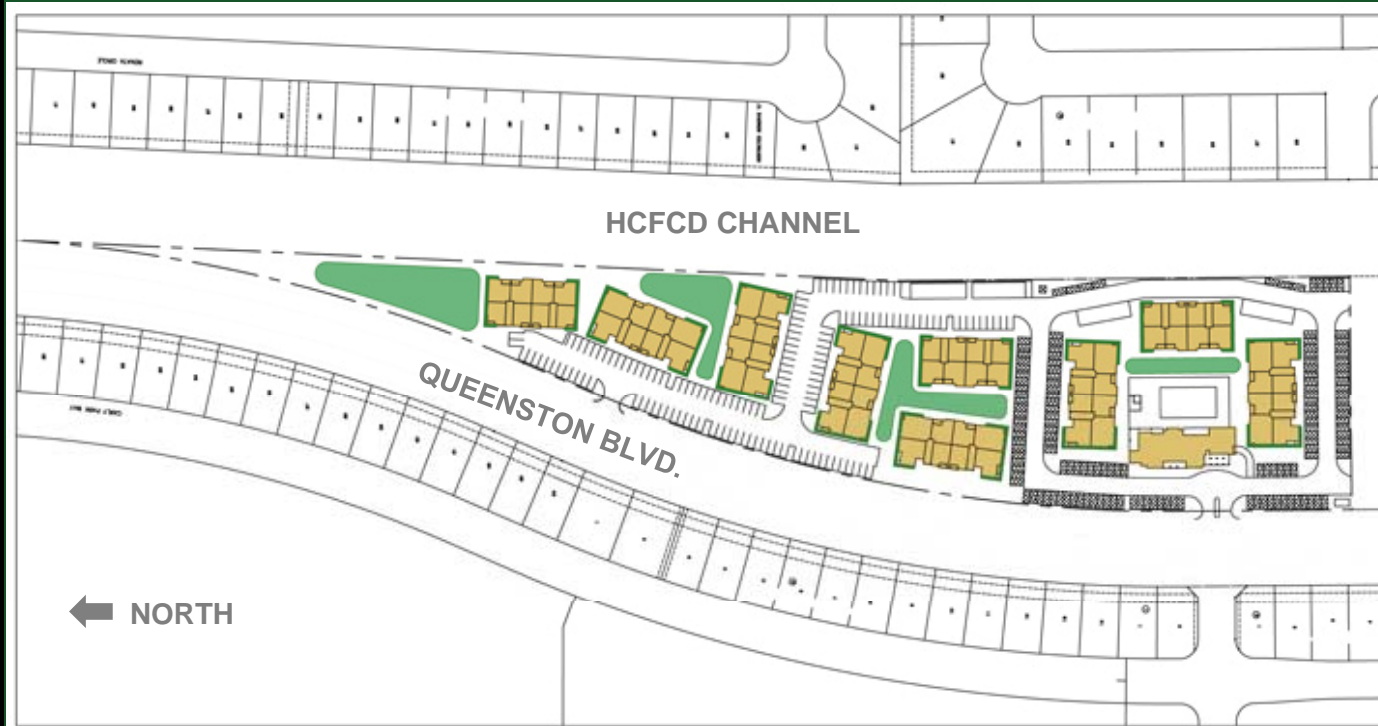


# Queenston Senior Apartments

Design spreads  
greenery throughout  
the site as an amenity

Design yielded 2  
main buildings

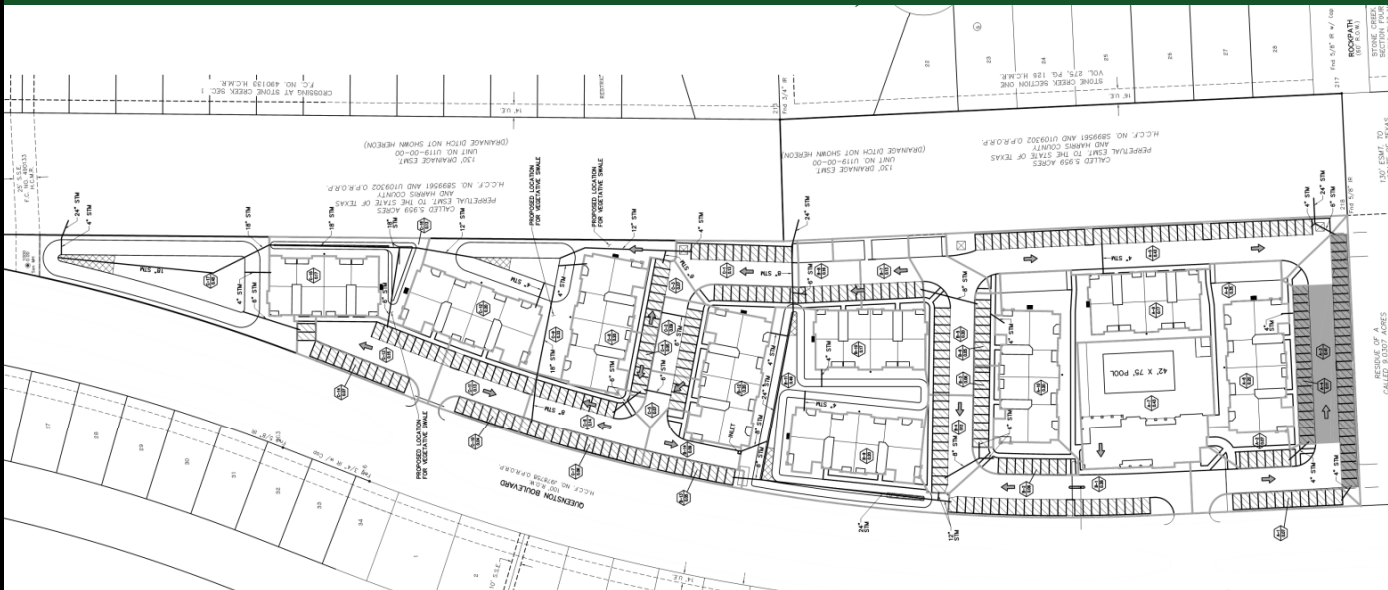
more apartment





- Analyzed 2-year (6-hour), 10-year (24-hour) and 100-year (24-hour) events
- Rational Method Peak Flow for each DA
- Hydrographs for each DA using Clark's Method in HEC-HMS
- Used actual  $T_c$  and calibrated Storage Coefficient  $R$  to match Rational Method Peak Flow

# Greenston Senior Apartments Hydrology

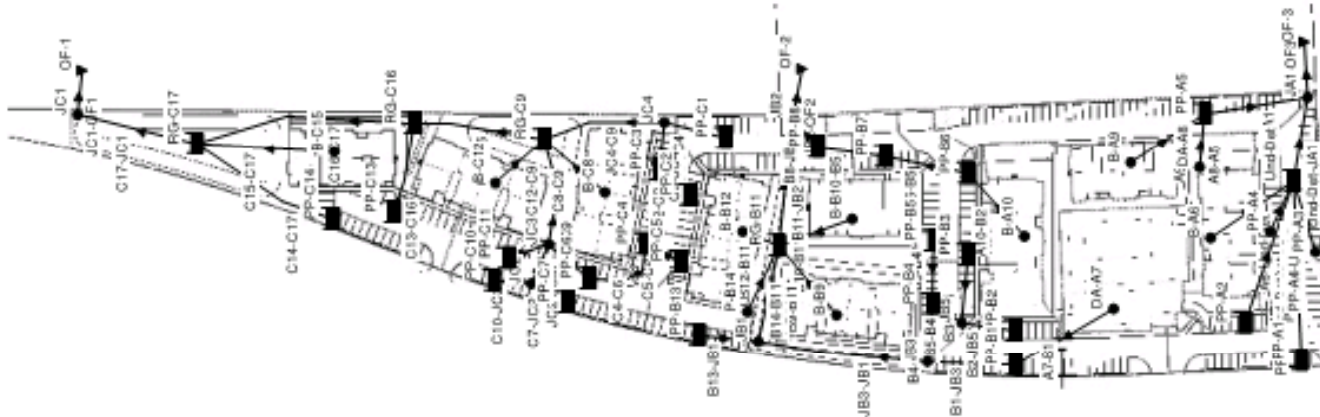


7.4 acre site divided into 41 “inlet” drainage areas:

- Pervious pavement sections
- Vegetated swales
- Raingardens

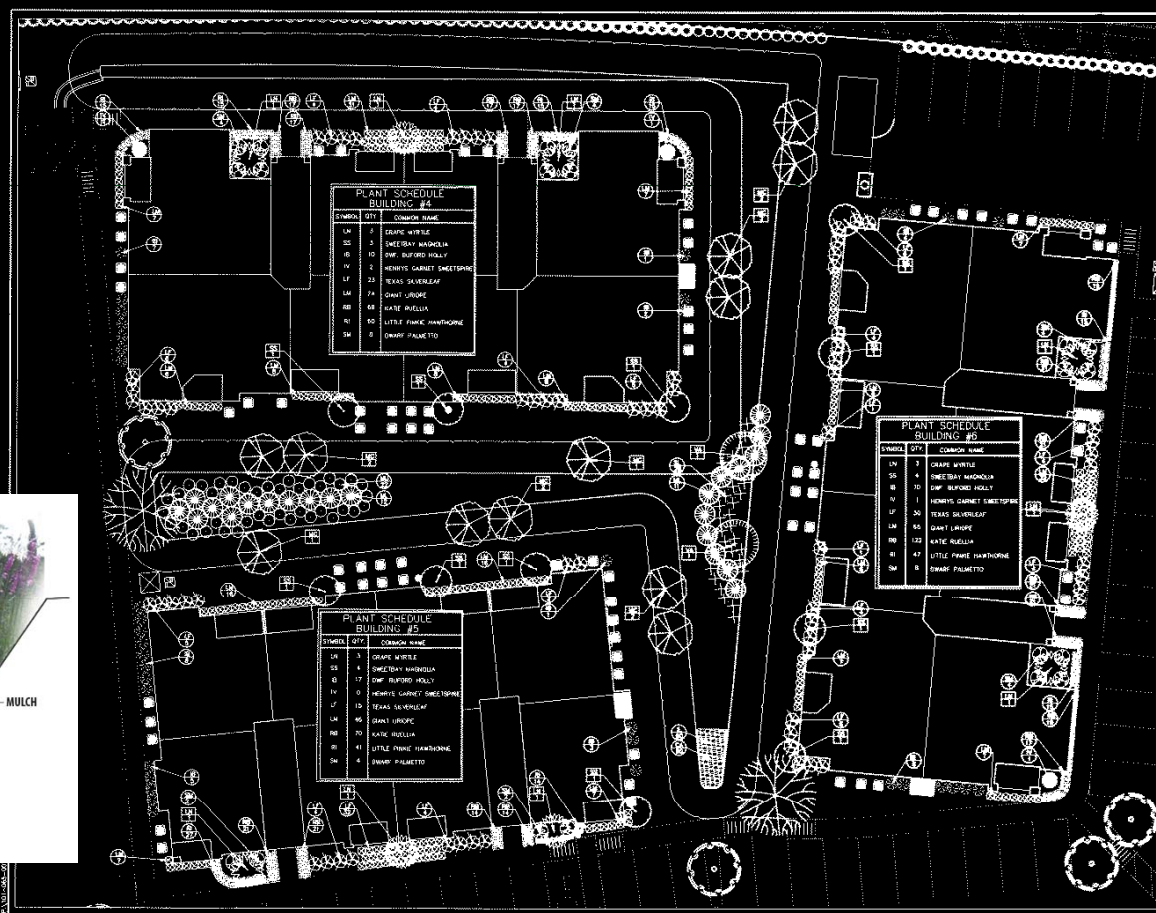
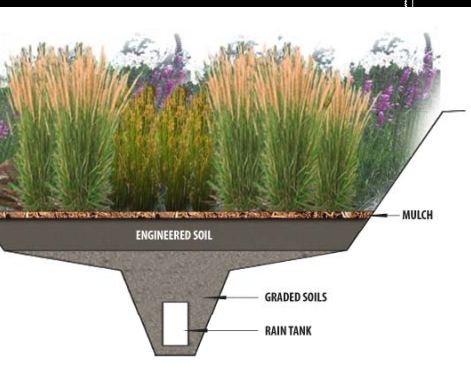
- Dynamic routing using EPA-SWMM software
- System of nodes and links
- Nodes:
  - Raingardens (storage area)
  - Pervious Pavement (storage area)
  - Manholes/Junctions
- Links:
  - Underground pipe (6" - 24")
  - Overflow Inlets

Greenston  
Major  
Departments  
Hydrology



- 3 outfalls into adjacent HCFCD channel
- 54 nodes
- 51 links

# Greenston Manor Apartments Landscaping



The Board of Directors has approved this plan and the Engineer's Certificate for this plan is hereby approved by the Board of Directors.



**CLEEBSTON MANOR APARTMENTS**  
Landscape Plan

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www.greenstonmanor.com

L-4

# Greenston Senior Apartments

## Landscaping

Engineered soil

Plant selection

Plant placement



**Greenston  
Senior  
Apartments**

ing area  
erdrain



**Greenston  
Innor  
Departments**

ing area  
erdrain





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ing area  
r installation



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**LESSON:  
Select porous  
curbs during  
construction**



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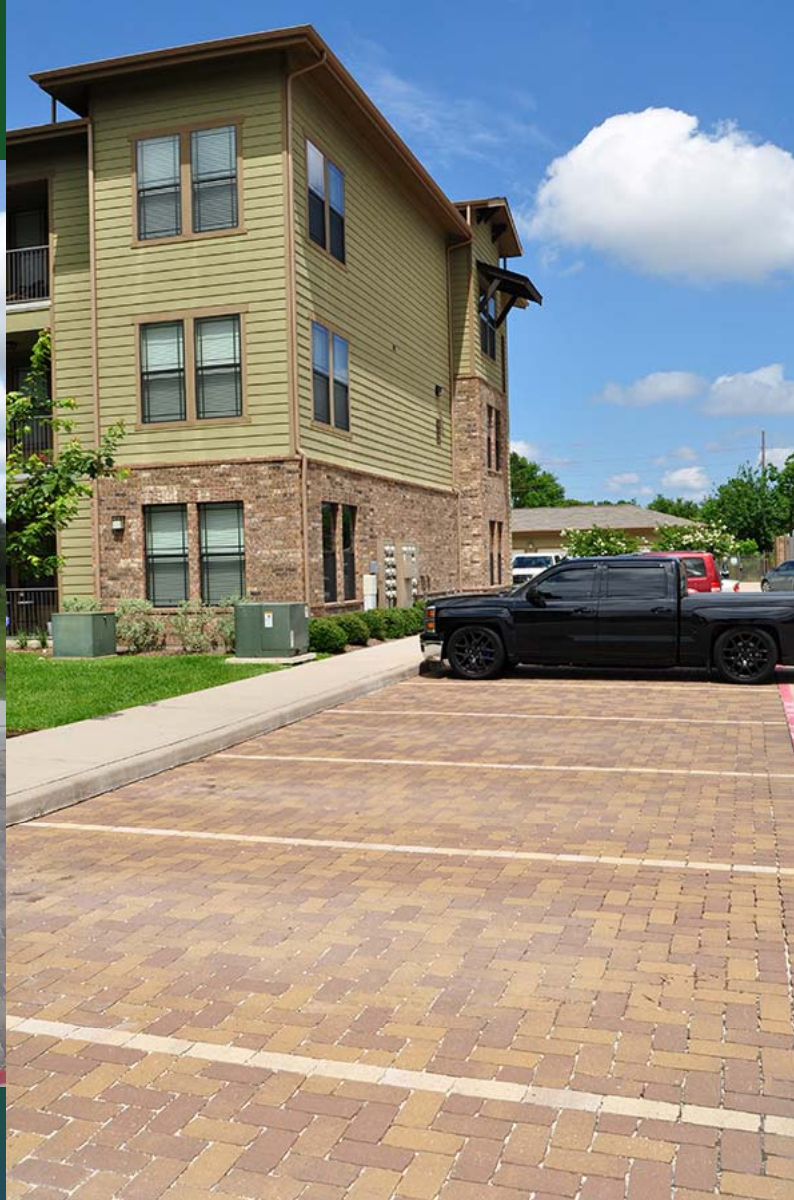


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ing area  
ormance

**SSON:**

you vacuum  
er a parked



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Apartments**

garden under  
construction



**Greenston  
Minor  
Departments**

Point  
Drain inlet  
overflow



# Greenston Senior Apartments

Final Point  
Drain inlet  
overflow after  
raining



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garden after  
installation





**Greenston  
Senior  
Apartments**

garden 1 year  
installation



**Greenston  
Senior  
Apartments**

garden 3 days  
– 2.5 years  
installation



**Greenston  
Senior  
Apartments**

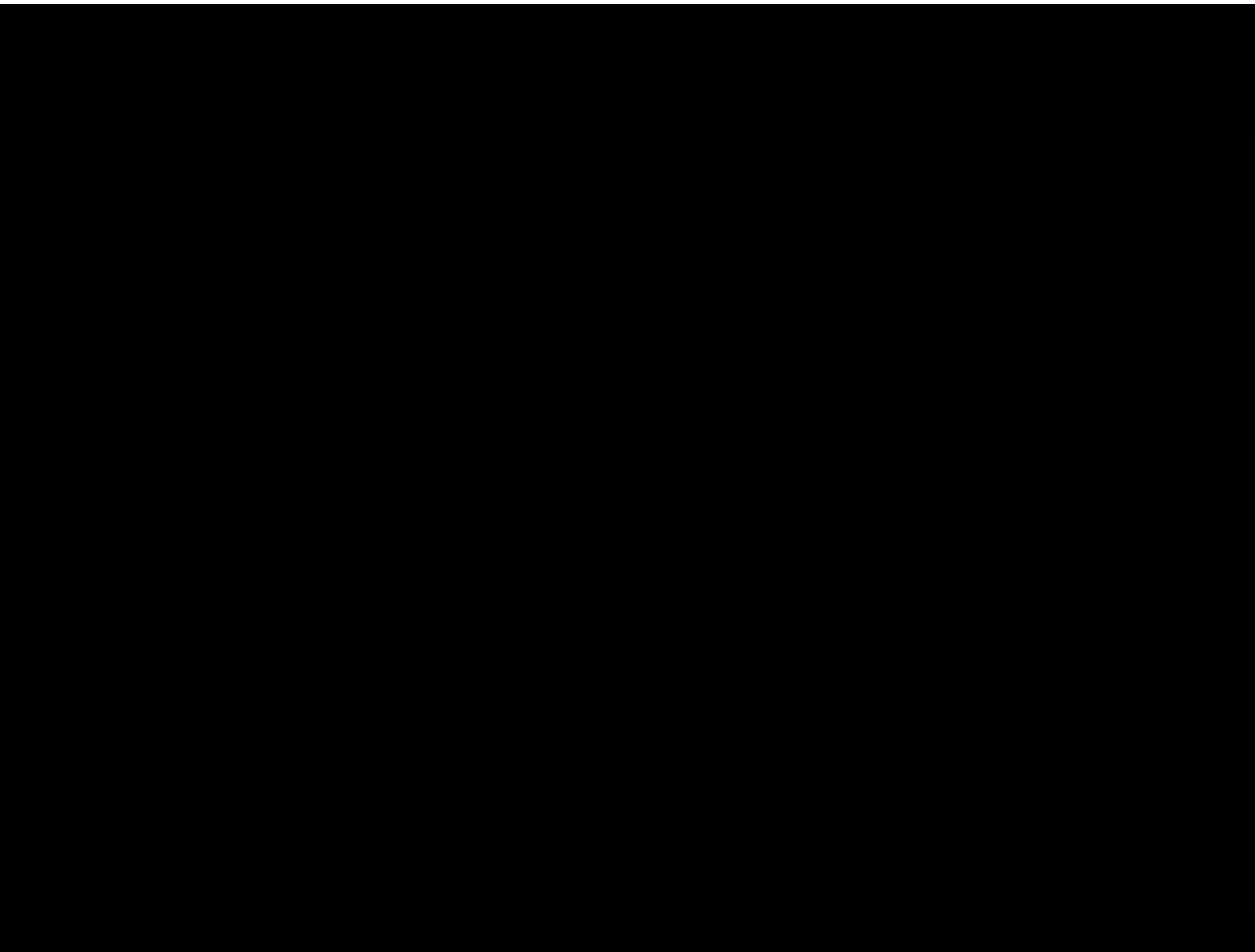


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Apartments**

**LESSON:**

**Not the best  
design choices  
and to be  
proven**





- Distributed features contribute to more efficient detention storage and land use
- Engineered soil filter provides dramatically better SWQ benefits compared to conventional “trash rack”
- Much greater engineering/analysis effort required than conventional route
- Increased return on investment for developer

*Greenston  
Major  
Departments*

*Inclusion*

## NET RESULT

More Efficient Land Plan

+

Attractive Development

+

MORE Product

=

**Happy Client!**

# *Thank You – Questions?*

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## *HRA Engineering*

*Civil Engineering*

*Surveying*

*Land Planning*

*Platting*

*Landscape Architecture*

- *Hydrology & Hydraulics*
- *Construction Phase Services*
- *Public Works*
- *Bridges & Structures*
- *Transportation Planning*