NuTone Site Redevelopment:

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Traditional vs.

**Problems**
1) Required amount of parking
2) Traditional building layout
3) Amount of impervious area

**Solutions**
1) Reduced based on code
2) Kept existing, in order to be realistic
3) Reduced using green infrastructure
Bioretention

**Benefits**
- Reduces runoff to storm sewers
- Improves water quality
- Reduces heat island effect
- Creates landscape diversity to create a sense of space

**Bioretention Description**
Bioretention is a practice that utilizes the chemical, physical, and biological properties of plants and soils to control the quality and quantity of stormwater runoff. It seeks to mimic preexisting site conditions, allowing runoff to infiltrate back into the ground.
Green Roof

Green Roof Description
Green roofs consist of a soil layer, a drainage layer and an impermeable membrane. Special plants are utilized that can withstand the extreme conditions found on roofs. An extensive roof is proposed that would minimize the weight of the green roof.

Benefits
• Reduces runoff to storm sewers
• Increases the lifespan of the roof
• Reduce heating and cooling costs for the building
• Reduce the $CO_2$ impact of the building
Pervious Concrete

**Pervious Concrete Description**
Pervious concrete seeks to reduce runoff from parking lots by allowing rain water to infiltrate through the pavement. It is proposed that pervious concrete only be utilized in low traffic areas and parking spots.

**Benefits**
- Reduces runoff to storm sewers
- Improves water quality
- Aesthetic improvement over traditional paving
Calculations

**Traditional Design**
18.5 acres impervious area  
\((18.5/6) \times 4.08'' = 12.5 \text{ acres of bioretention}\)

**Proposed Design**
14.3 acres impervious area  
\((14.3/6) \times 4.08'' = 9.7 \text{ acres of bioretention}\)

*able to provide 6.9 acres by reducing parking*

\(9.7-6.9 = 2.8 \text{ acres of total untreated area}\)

**Runoff Calculations**
\(Q = CIA\)
\(C = \text{runoff coefficient} = .9\)
\(I = \text{intensity} = 5.45'' \text{ for 10-year storm}\)
\(A = \text{area} = 2.8 \text{ acres}\)
\(Q = 13.8 \text{ cubic feet per second}\)
## Cost Analysis

### Bio Retention Vs. Pipe Network

<table>
<thead>
<tr>
<th>Component</th>
<th>Construction Cost Per square foot</th>
<th>Total Construction Cost</th>
<th>Maintenance Cost Per square foot</th>
<th>Component Lifespan (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio Retention</td>
<td>$1.50</td>
<td>$310,080.00</td>
<td>$0.01</td>
<td>50</td>
</tr>
<tr>
<td>Pipe Network</td>
<td></td>
<td>$523,155.90</td>
<td>$0.01</td>
<td>50</td>
</tr>
</tbody>
</table>

By reducing the parking area and adding Bio Detention a pipe network is not require. Savings of $213,075

### Porous Concrete Vs. Standard Concrete

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<thead>
<tr>
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<th>Total Construction Cost</th>
<th>Maintenance Cost Per square foot</th>
<th>Component Lifespan (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porous Concrete</td>
<td>$5.30</td>
<td>$928,146.60</td>
<td>$0.04</td>
<td>18</td>
</tr>
<tr>
<td>Concrete</td>
<td>$3.40</td>
<td>$1,298,262.80</td>
<td>$0.03</td>
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</table>

Porous concrete will be added to parking spots only, the amount of Porous concrete reflects parking reduction. Savings of $370,116

### Green Roof Vs. Standard Roof

<table>
<thead>
<tr>
<th>Component</th>
<th>Construction Cost Per square foot</th>
<th>Total Construction Cost</th>
<th>Maintenance Cost Per square foot</th>
<th>Component Lifespan (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Roof</td>
<td>$12.00</td>
<td>$1,242,720.00</td>
<td>$0.75</td>
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<tr>
<td>Standard</td>
<td>$4.57</td>
<td>$473,269.20</td>
<td>$0.20</td>
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Extensive Green Roof was considered. Green Roofs can reduce cooling cost by 25-50% and reduce heat loss by 25% or more. Addition cost of $769,460
Funding

<table>
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<th>Maintenance Cost</th>
<th>Life Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Network</td>
<td>$523,155</td>
<td></td>
<td>50 years</td>
</tr>
<tr>
<td>Bio Retention</td>
<td>$310,080</td>
<td>$2,067/yr</td>
<td>50 years</td>
</tr>
<tr>
<td>Standard Concrete</td>
<td>$1,821,418</td>
<td>$11,080/yr</td>
<td>30 years</td>
</tr>
<tr>
<td>Porous Concrete</td>
<td>$928,146</td>
<td>$6,305/yr</td>
<td>18 years</td>
</tr>
<tr>
<td>Green Roof</td>
<td>$1,242,720</td>
<td>$77,670/yr</td>
<td>50 years</td>
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</tbody>
</table>

Additional Savings of 25% of energy cost

Total cost for proposed project is $2.48 Million
Total cost for Traditional design is $2.29 Million
Total cost with potential funding is $1.98 Million

*Yearly energy savings as a result of the green roof should also be considered

- MSD may offer to fund all or a portion of green infrastructure construction cost through “Green Infrastructure Demonstration Program”
- With the location, size, and scope of work proposed, this project would meet MSD’s review criteria
- Max funding awarded so far = $500,000
Conclusion

• Green infrastructure will not cost MedPace significantly more money
• Reduce runoff by a significant amount/ Reduce CSOs
• Reduction of Heat Island Effect in area
• Reduce runoff pollution through water quality
• Provide education to the public
• MedPace will receive positive recognition from public and Cincinnati