Resilience is…

the capacity of individuals, communities, institutions, businesses, and systems … to **survive, adapt, and grow** no matter what kinds of **chronic stresses and acute shocks** they experience.

—Rockefeller Foundation
Amina Rahill-Marier
Virginia Beach Office

Katie Coleman
Long Island City Office
Agenda

1. Introduction
2. The Reality of Using an Interdisciplinary Approach
   • Breakout Session #1
3. New Solutions to Old Problems
   • Breakout Session #2
4. Construction Under Pressure
   • Breakout Session #3
5. Group Report Out
6. Conclusions
THE REALITY OF USING AN INTERDISCIPLINARY APPROACH

Kris Edelman, Arcadis
Innovation
Economic Opportunity
Community Connections
PROJECT LIFE CYCLE
Planning
Implementation
Development
The capital project blueprint...

- Largely owner/client driven
- Establish specific project objectives
- Implementation typically achieved in the most cost efficient manner

- Team comprised of disciplines of engineering
- Public stakeholder engagement limited in most phases
- Facilities to serve the community but rarely serve as a community amenity
...and the linear delivery approach
An adapted approach

- Broaden interdisciplinary input by diversifying team and expanding stakeholders
- Urban planning and landscape architecture perspectives integrated throughout
- Design innovation challenging traditional ways of thinking
- Community engagement in planning through implementation
Norfolk Interdisciplinary Team

COMMUNITY

Office of Resilience

Program Manager (APTIM)

Planning/Design Team (Arcadis + M&N/W&B/Scape)

Environmental Compliance (VHB)

Construction Manager at Risk (MEB)
From vision to reality….
Envision Rating System

- 5 Categories - 14 Subcategories
- Checklist - 55 groups of questions
- Rating System - 60 Credits
  - 5 Innovation credits
- 5 Levels of Achievement ~
  - Improved, Enhanced, Superior,
  - Conserving, Restorative

- QUALITY OF LIFE
  - 13 Credits
- LEADERSHIP
  - 10 Credits
- RESOURCE ALLOCATION
  - 14 Credits
- NATURAL WORLD
  - 15 Credits
- CLIMATE AND RISK
  - 8 Credits
How is Envision being used?

- Sustainability Baseline
- Demonstrate Enhancements
- Recognize improvements
Floodtown, USA

Flooding Scenario

- Quality of Life
- Climate & Resilience
- Leadership & Resource Allocation
- Health Clinic
- Electrical Substation
- Elementary School

*Image: Floodtown map showing various flooding scenarios and related issues.*
Google Forms Feedback

Breakout Session #1

Please use this form to record notes and ideas that you come up with during the session (it might be helpful to have someone delegated to writing down ideas here as you go). These will be projected when it is time to report out to simplify the process, and will serve as a mechanism to collect ideas in a centralized location. You do not need to address all the guiding questions, they are simply there to help get ideas flowing. Feel free to use the space at the bottom for additional notes about topics that are not the guiding questions. At the end, there is space to note major out-takes as well as points you would like to bring up during report out.

* Required

Table Number *

Your answer

What are Floodtown's assets (think from an engineering, environmental, economic, and social standpoint)? Given your understanding of the risks and the community, what would you prioritize?

Your answer

What specific skills does your group possess that could be implemented in Floodtown? How do your group's skills complement each other to solve the community's problems? Where could you turn to find other necessary technical skills?

Your answer
Breakout Session #1

Floodtown, our fictitious municipality, suffers from serious flooding during rain events, and its coastal location makes it susceptible to worsening conditions such as sea level rise and more frequent and severe storms. Floodtown is uniquely susceptible to various environmental, economic, and social issues, as outlined on the factsheet. The team assembled today represents a group of diverse specialists. Together, you must propose an interdisciplinary solution to Floodtown’s problems. How will you put your skills to work to address resilience of the following three asset types: environment, economic, and social? Focus especially on how interdisciplinary work will directly impact quality of life of those in Floodtown. Address some initial action items as well as ways to maintain the plan over time.
NEW SOLUTIONS TO OLD PROBLEMS

Brian Joyner, Moffat & Nichol
Street & Property Flooding Resilience

- Maintain and build economic / social resilience
- Why new solutions?
- Green infrastructure, storage, landscaping, and pumping
Why Do We Need New Solutions?
Or why can’t we just use bigger pipes?
• Constrained conveyance and in-pipe storage capacity
• Evidence toward increased rainfall intensities
• Drawing out peak flows has real benefit
Micro-storage Using Green Infrastructure (GI)

- St. Roch Parish (New Orleans)
Micro-storage Using Green Infrastructure (GI)
Micro-storage Using Green Infrastructure (GI)

Existing Condition  With Intersection-level GI
Micro-storage Using Green Infrastructure (GI)

Without GI

With Intersection-level GI
Landscaping with Water
Landscaping with Water

WILD WETLAND WALK

CONCEPT: A winding eco-path provides unique educational and hands-on experiences that connect users to the ecology and natural history of the tidal stream that once existed here.

- Sit in a shady grove
- Learn about wetlands
- Watch wildlife from above
- Walk along a winding path

RESILIENCE PARK DESIGN UPDATE
January 2019
Underground Storage Cisterns

Storage cistern under surface stormwater storage area

Inflow pipe

Gravity outfall

To pump station
Pumping Systems

• Required for interior drainage of the berm-protected area

• Inter-disciplinary design
Pumping Systems

- Groundwater lowering at Whalehead (NC)
Breakout Session #2

The 21st century has already brought innumerable technological improvements to our world, ranging from having self-driving cars hit the roads to making huge strides forward in artificial intelligence applications. The infrastructure sector, however, has remained more traditional. As technical specialists in the industry, we are in the position to push for increased implementation of new technologies. On the neighborhood scale of Floodtown, where do you see room for improvements like those presented (green infrastructure, cisterns, landscaping, pumping systems)? Do you have any ideas for other new solutions? For example, how can growing industries such as big data and AI be woven in to infrastructure over the coming years? Or, how can local high schools, universities, or start-ups contribute to projects? Think outside the box, be creative.

“CREATIVE PEOPLE, PRACTICAL SOLUTIONS”
CONSTRUCTION UNDER PRESSURE

Scott Smith, City of Norfolk
Typical APD Methods

Design-Bid-Build (DBB)
Owner
Designer
Contractor

Construction Management At-Risk (CMAR)
Owner
Designer
CMAR or GC
Early Contractor Involvement (ECI)

“Progressive” Design-Build (GMP)
Owner
Design/Builder

Lump Sum Design-Build (LS)
Owner
Design/Builder

Design-Build-Operate (DBO)
Owner
Design/Builder/Operator

Traditional

Alternative Project Delivery
Construction Methods

TRADITIONAL PROJECT DELIVERY

- Owner
  - Designer
    - Subcontractor
  - Contractor
    - Subcontractor
Construction Methods

DESIGN-BUILD PROJECT DELIVERY

Owner

Design-Build Entity

Subconsultants
Construction Methods

CONSTRUCTION MANAGER AT RISK

Owner

Architect & Design Team

General Contractor

Subcontractors

Competition
Project Delivery

Project Delivery Constraints

- Schedule 3 years to implement
- No construction activity to occur until Release of Funds
- City Procurement Regulations
- HUD Procurement Regulations

Funding expires September 2022, Congress needs to take action to extend deadline
Project Schedule

Notice of Award

Jan 2016

Environmental Impact Statement Start

Mar 2017

Design Start

Apr 2017

Contract Executed – City start of Work

May 2017

CMAR Awarded

May 2018

60% Design

Sept 2018

EIS Approved

Feb 2018

Release of Funds

Apr 2019

Construction Starts

Apr 2022

Construction Complete

May - Sep 2022

Project Closeout

Sep 2022

Funding Expires

24 July 2018
## Summary of Major Advantages

<table>
<thead>
<tr>
<th>DBB</th>
<th>CMAR</th>
<th>FPDB</th>
<th>PDB</th>
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</thead>
</table>
| • QBS of designer; cost-based selection of constructor  
• Well-known method  
• Owner- controlled  
• Well-defined project (low risk premium) | • QBS for designer  
• Select CM on quals and $  
• CMAR bids out work  
• GC input during design  
• GMP established collaboratively with contractor | • Select on quals, cost, and other criteria  
• Single point of DB responsibility  
• Design efficacy risk transfer for testing/ warranty period  
• Potential for schedule reduction  
• GC design input  
• Guaranteed price at proposal receipt  
• Project configuration and detail known at proposed recipient stage | • Select on quals, cost, and other criteria  
• Single point of DB responsibility  
• Design efficacy risk transfer for testing/ warranty period  
• Potential for schedule reduction  
• Collaborative approach for finalizing designs  
• GC design input  
• Construction pricing negotiated after initial stage |
## Summary of Major Disadvantages

<table>
<thead>
<tr>
<th></th>
<th>DBB</th>
<th>CMAR</th>
<th>FPDB</th>
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<tbody>
<tr>
<td></td>
<td>• No design efficacy guarantee</td>
<td>• No design efficacy guarantee</td>
<td>• Scope &amp; quality must be well defined before design complete</td>
<td>• Final designs not known until initial stage is completed</td>
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<td>• No single point of responsibility</td>
<td>• No single point of responsibility</td>
<td>• Reduced control</td>
<td>• Less competitive pricing opportunity as compared to Lump Sum DB</td>
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<td></td>
<td>• Least risk transfer</td>
<td>• Scope &amp; quality must be well defined when GMP established</td>
<td>• Critical to shift design risk &amp; have warranty period – market may resist</td>
<td>• Some states do not allow PDB</td>
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<td>• Cost uncertain until bids rec’d</td>
<td>• Extensive coordination req’d</td>
<td>• No O&amp;M guarantees</td>
<td>• No “design competition”</td>
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<tr>
<td></td>
<td>• Change orders</td>
<td>• Add’l cost of CM</td>
<td>• Additional procurement effort</td>
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<td>• Low bidder</td>
<td>• No O&amp;M guarantees</td>
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<td></td>
<td>• No O&amp;M guarantees</td>
<td>• Additional procurement effort</td>
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<td>Owner Objectives, and Project Drivers and Priorities</td>
<td>Priority Weighting</td>
<td>Design-Bid-Build</td>
<td>CMAR</td>
<td>Fixed Price Design-Build</td>
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<td>Reliability &amp; Operational Flexibility</td>
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<td>Single Point of Responsibility</td>
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<td>Budget Constraints and Uncertainty</td>
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<td>Treatment Processes - Innovation</td>
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<td>Operator Involvement and Input</td>
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<td>Schedule Compliance – Time Requirements</td>
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<td>Risk allocation</td>
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<td>Owner-Engineer Control/Trusted Relationship</td>
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<td>100%</td>
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Breakout Session #3

Construction can often prove to be the riskiest part of a project when it comes to timelines and budget. Using a Construction Manager at Risk (CMAR) can help mitigate these risks by shortening the timeline and setting a cap on potential costs. Discuss whether Floodtown should use a CMAR to implement the changes discussed in your previous sessions. What are the anticipated benefits and possible challenges to your choice? How will the goal of maximizing resilience be supported by your choice?

Towards the end of this session, take some time to discuss what you will be reporting back to the group and who will be speaking. Results from Google Forms will be projected for the room.
Group Report Out
Feedback Survey

Please provide feedback from this afternoon’s forum at the following link:
https://goo.gl/forms/AVTtqlpo9rrpitOF2