

Charleston Medical District

Summer 2020 Charrette Report

21 September 2020



CHARLESTON MEDICAL DISTRICT



Charleston Peninsula 1919
 USGS Historical Topographic Map:
 CMD Boundary Superimposed

Acknowledgements

Steering Committee

The Charleston Medical District (CMD) Steering Committee includes:

- Dr. David Cole, Medical University of South Carolina
- Lisa Montgomery, Medical University of South Carolina
- Craig Self, Roper St. Francis Healthcare
- Scott Isaacks, Ralph H. Johnson VA Medical Center
- The Honorable John Tecklenberg, Mayor, City of Charleston

Charleston Medical District Advisory Group (AG)

The Charleston Medical District Advisory Group includes:

- Dennis Frazier, CMD and MUSC
- Ken Hill, Roper St. Francis Healthcare
- Ray Huff, Architect
- Rick Mahon, Ralph H. Johnson VA Medical Center
- Mark Wilbert, City of Charleston

CMDAG Support Team

The CMDAG Support Team includes:

- Louise Burne, CMD
- Steve Hargett, CMD
- John Runyon, MUSC
- Stewart Mixon, MUSC
- Christine von Kolnitz, MUSC
- Brad Taylor, MUSC
- Dr. Janice Barnes, Climate Adaptation Partners (CAP)
- Leo Temko, CAP



Ralph H. Johnson
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Credits

Map Data:

General Reference Base Maps: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

City of Charleston GIS Features: (2020, July 15). Retrieved from <https://data-charleston-sc.opendata.arcgis.com>

National Flood Hazard Layer (NFHL) | FEMA.gov. (2020, July 15). Retrieved from <https://www.fema.gov/national-flood-hazard-layer-nfhl>

Elevation Products: USGS TNM Download. (2020, April 29). Retrieved from <https://viewer.nationalmap.gov/basic>

Halsey Map (1949) courtesy of Historic Charleston Foundation

Bathymetry: Charleston Harbor (2018) Bathymetric Digital Elevation Model - NOAA/NOS Estuarine Bathymetry - NOAA Data Catalog. (2020, August 03). Retrieved from <https://data.noaa.gov/dataset/dataset/charleston-harbor-s080-bathymetric-digital-elevation-model-noaa-nos-estuarine-bathymetry>

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USGS Historical Maps: Esri Topo Explorer. (2020, September 02). Retrieved from <https://livingatlas.arcgis.com/topoexplorer/index.html>

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View to the CMD across
Alberta Sottile Long Lake



Preface

The Charleston Medical District struggles with nuisance flooding interrupting the ability for patients, staff and students to access and provide health services. Coupled with other water risks, too much heat as well as regional earthquake exposure and infrastructure fragility, the District needs to address its challenges while remaining fiscally conservative and making every dollar invested count toward risk reduction.

As part of an ongoing effort to address these risks, the Charleston Medical District Advisory Group (AG) facilitated a series of virtual charrettes in the summer of 2020 that focused on hazard identification and the intersection of those hazards with known transportation issues across the District as related to the ability to access health services. Drawing on the expertise of over 60 technical experts, these charrettes provide the foundation for development of an overall climate adaptation strategy, identifying near-term, mid-term and long-term opportunities to reduce flooding, improve transportation and address other hazards as raised by the City of Charleston Vulnerability Assessment. This summary provides context, opportunities and action steps based on the outputs of those charrettes.

Participants / Virtual Charrettes

City of Charleston

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 Matt Fountain
 Morgan Gundlach
 Robert Hauck
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 Steve Hargett, CMD
 Ken Hill, Roper St. Francis
 Ray Huff, Ray Huff Architect
 Rick Mahon, RHJVAMC
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 Elizabeth Fly, The Nature Conservancy
 Dale Morris, The Water Institute
 Andy Sternad, Waggonner & Ball
 Michael Maher, WestEdge

Virtual Charrettes

17 July 2020
CMD Transportation Workshop #1

20 July 2020
LCRT Routing Workshop #1

24 July 2020
LCRT Routing Workshop #2

31 July 2020
CMD All Hazards Workshop

7 August 2020
CMD Water Workshop #1

14 August 2020
CMD Water Workshop #2

21 August 2020
CMD Transportation Workshop #2

Charrette Process

The Summer 2020 Virtual Charrettes represent an alternative process used by the AG in order to continue to make progress and respect COVID 19. With many ongoing planning efforts, it was imperative that the AG continue the necessary work and thus the virtual format was the only viable solution.

Using a combination of technologies such as digital whiteboards as well as conferencing functions, the process replicated a more traditional charrette with less cost, more participant availability and recording capability. Drawbacks include less spontaneity and less ability for multiple parallel discussions. Depending on pandemic conditions in late 2020 and 2021, the virtual charrette format may continue to offer the best feasible means for advancing CMD work.

The AG is grateful to the many technical experts who embraced this alternative approach and who offered their guidance.

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“We especially appreciate your comments and advice during our work sessions and...for giving your time and effort as we attempt to improve our ability to provide consistent access to health service and education for patients, staff, students, and visitors to our campus”

Dennis J. Frazier and The Charleston Medical District Advisory Group

Executive Summary



Executive Summary

In 2020, the Charleston Medical District Advisory Group (AG) developed a charrette process to gather insights on existing exposures to climate hazards and vulnerabilities as these relate to the ability for patients, staff and students to access and provide health services. Recognizing that flooding is the most prevalent hazard and that climate projections illustrate increases in the types of events that lead to flooding, the AG sought guidance on ways to improve the current flooding conditions in the near-term while developments of more comprehensive city-wide flood reduction strategies occur long-term. Also recognizing that the City of Charleston recently completed a city-wide vulnerability assessment, the AG asked experts to explain other projected climate and human-made hazards as these relate to the District. In parallel, the AG acknowledged that ongoing transportation challenges will likely be exacerbated by such hazards and in turn gathered feedback about proposed transportation plans related to the Charleston Medical District (CMD) and the ability to mitigate or adapt those plans to address projected hazards. Finally, the AG compared the results of the inputs on the various hazards to the range of planned CMD investments to understand where opportunities for greater efficacy might be found as well as to better understand the impacts of doing nothing.

Following the work throughout late 2019 and 2020, the Charleston Medical District institutions intend to deepen their collaboration on climate change adaptation. Based on the results of the vulnerability assessment, there is general consensus that an all-hazards approach should be part of the analysis for each investment within the CMD. Multiple ongoing, parallel projects warrant closer coordination to better leverage investments within and adjoining the CMD, including those of the institutions, city, county, state, federal and private sector. With so many parallel efforts and so little cross-coordination, the extent to which each investment could better contribute to overall CMD resilience and draw down the risks for the CMD was unclear. Inputs gathered to date provide much needed clarity and hope. To understand more fully, water assignments for the CMD need to be articulated and inclusive of new stormwater projects as well as possible green infrastructure that offers multiple benefits to the patient, staff and student experience in the district. Small projects for storing water and larger projects for storing and moving water must be coupled in a CMD comprehensive strategy that links institutional masterplanning, area transportation improvements and individual building and site projects.

As always, patient and medical professional access comes first given that the CMD serves a regional medical catchment area so defining priority pathways for supporting access to health care is critical for any investment decision-making. Priority pathway enhancements increase the ability to access health services during high water events, acknowledging that not all of the CMD will be dry in such events. These enhancements include prioritized ground level improvements as well as strategically located and integrated elevated walkways connecting upper levels of buildings across the district. Such future vision must balance funding and service-life viability of investments. The charrette feedback is critical to the district's attempt to develop more coordinated undertakings and to leverage projects in a way that optimizes economy, efficiency and effectiveness.

A shared vision establishes the Charleston Medical District as a Resilient Health District, prepared to face increasing climate risks while continuing to provide excellent health services. Specific Opportunities identified in the Charrettes, Action Steps with requested SC support, Resilience Guideline Recommendations, Work to Date and Proposed Schedules follow.

The Charleston Medical District should provide consistent and safe patient, staff and student access to health services and education. This requires a Health First, All Hazards approach to all investments.

Without aggressive measures, the CMD should expect a growing deterioration of its ability to provide health services, research or medical education by, or before, the end of the century.

Charleston Medical District
Advisory Group

Vision for Resilience

Improve Health Service Access

Address Service Life of District

Manage Response to Expected Storm Levels

Improve Cloudburst Response

Improve Response to High Tide Floods

Improve Storm Surge Protection and Preparedness

Address Sea Level Rise

Reduce Urban Heat Impact

Manage Drought

Assess Hazardous Materials and Infrastructure Failure Readiness

Integrate Planning Efforts (including Transportation)

Develop an Evaluation and Monitoring System for Investments



Charleston Medical District Resilient Health District Plan

Opportunities

Towards a Resilient Health District Plan (RHDP)

At a summary level, there are immediate opportunities for the CMD. These relate to (1) Vulnerabilities Assessments, (2) Water Management, (3) Transportation Management and (4) the development of a Resilient Health District. Each of these is briefly explained below and further described in supporting sections that follow. These opportunities clarify existing risk exposures, develop strategies for flooding, heat and transportation improvements as part of an overall Resilient Health District Plan and institute a Program Management Office to implement that plan.

Vulnerabilities and Impacts Assessments	CMD Vulnerability Assessment: Considering that the City of Charleston Vulnerability Assessment summarized data across the City, the AG recommends engagement with a Technical Consultant for a CMD-specific data summary. A CMD-specific evaluation would allow the CMD to understand the probabilities and potential impacts of each hazard and then to respond accordingly.	CMD All Hazards Approach: The AG recommends that the CMD immediately adopt an All Hazards approach to any investments. An all-hazards approach to CMD investments would allow the CMD to prioritize the most likely exposures and to assure that planned investments as well as safety protocols take these hazards into consideration.	Vulnerabilities and Impacts Assessments	CMD Impacts Summary: The AG recommends that CMD institutions quantify and richly describe current climate-related health service impacts in order to gain greater support for investment needs and to build network support within various political arenas as well as to improve grant applications and competitive advantage in allocation contexts.	CMD Existing Programs Review: Given that some existing programs or policies address some hazards, the AG recommends completing a summary review of those programs to better define any gaps that warrant immediate rectification and to synthesize and redistribute the related resources so that departments work with those resources to manage risks.
Water Management	CMD Water Management Plan: The AG recommends a district-specific water plan that reconciles the source of flooding, the near and mid-term expected exposures to patient, staff and student access and alternative strategies (elevated walkways, offsite redundancies) and planned downtime. All investments should play a role in the reduction of flooding and heat island effect.	CMD/USACE Integration: The AG recommends reconciling the USACE storm surge barrier and SLR projections. The CMD should leverage the USACE investment while finding ways to address future SLR given building service life commitments. CMD should develop a transition process including current flooding, SLR and implementation of the storm surge barrier.	Water Management	CMD First Floor Risk Assessment: The AG recommends review and quantification of first floor facility and critical infrastructure exposures and impacts of all CMD facilities given projected flood risks. Summarize these exposures and conduct an overall integrated risk review with joint operations teams to prioritize risk management strategies in concert with masterplanning.	
Transportation Management	CMD Transportation Plan: The AG recommends correlating various ongoing and proposed transportation projects (federal, other state, county, city, CMD) that impact the CMD with a consolidated district transportation plan, and a unified CMD voice, that connects and reconciles those investments with water and extreme heat risks. This plan should demonstrate optimized dry, cool access.	CMD Public Realm Guidance: The AG recommends that any planning / projects address the full public realm including all connectors to and through the CMD across multiple modes (bike, pedestrian experience, vehicular load (including EMS needs) as well as health benefits). This should include a Complete Streets approach with wayfinding as well as a recognizable CMD brand/identity.	Transportation Management	CMD Parking Strategy: The AG recommends that MUSC/Roper/VA collaborate on a district parking strategy. This includes possible consolidation between MUSC and Roper and management coordination across all three institutions.	
RHDP & Program Management Office	CMD Program Management Office: The AG recommends continuance of its meetings through FY 2021 along with the authority and funding to implement these near-term opportunities. The overall program management of these initiatives will be via the AG while individual institutions and departments continue to manage the details of individual projects.	CMD Resilient Health District Plan: The AG recommends the development of a Resilient Health District Plan that synthesizes flooding, heat and transportation strategies with ongoing master plans and proposed projects. This is not to eliminate the individual master planning efforts, but to establish a coherent district wide approach in which each effort coheres and complements the other.			

Action Steps (SC and AG)



	Opportunity Number	Opportunity Name	Timing	Steering Committee Action	Advisory Group Action
Vulnerabilities and Impacts Assessments	V1	CMD Impacts Summary	CY2020/Q4	Direction to Departments to complete; Agreement on Summary Statement for grant purposes	Complete individual impacts summaries. Coordinate CMD Summary Statement.
	V2	CMD Vulnerability Analysis	CY2020/Q4	Approval to Proceed Funding Allocation	Work with City AccelAdapt to understand CMD exposure. If needed, engage Technical Consultant to complete CMD-specific data assessment.
	V3	CMD All Hazards Approach	CY2021/Q1	Direction to Departments to Review with AG / Integrate / Revise Scopes	Review with project teams existing, active, proposed projects for All Hazards integration. Provide guidance to departments for future engagements, including language on all hazards.
	V4	CMD Existing Programs Review	CY2021/Q1	Direction to Departments to identify and provide AG with existing programs, policies or strategies to address identified hazards	Consolidation of departmental responses across all hazards. Review commonalities and conflicts.
Water Management	W1	CMD Water Plan	CY2021/Q2	Approval to Proceed Funding Allocation	Engage Technical Consultant to prepare CMD Water Plan in the context of surrounding area initiatives. Commission H&H model (initial cost). Articulate water assignments for proposed projects. Anchor to new City stormwater guidelines. Evaluate pump priorities for VA, Calhoun or Long Lake locations (Add'l costs).
	W2	CMD / USACE Integration	CY2021/Q3	Approval to Proceed	Establish working relationship between CMD, Technical Consultants and USACE to determine how to leverage USACE intents for the storm surge barrier with CMD-specific water plan.
	W3	CMD First Floor Risk Assessment	CY2021/Q2	Approval to Proceed Direction to Departments	With CMDAG Program Management approach, work with the institutional departments responsible for first floor operations and inventories to review and quantify first floor exposures and impacts given flood risks



	Opportunity Number	Opportunity Name	Timing	Steering Committee Action	Advisory Group Action
Transportation Management	T1	CMD Transportation Plan	CY2020/Q4	Approval to Proceed Funding Allocation	Engage Technical Consultant to develop a Transportation Plan.
	T2	CMD Public Realm Guidance	CY2020/Q4	Approval to Proceed Direction to Master Planners	Engage Master Planning Teams to provide guidance on coordinated public realm improvements for an overall CMD approach. Include wayfinding as well as CMD brand/identity.
	T3	CMD Parking Strategy	CY2021/Q2	Approval to Proceed Funding Allocation	Engage Parking Consultant to evaluate and develop consolidated parking recommendations and funding approach.
RHDP & Program Management Office	R1	CMD Program Management Office	CY2020/Q4 Begins	Provide the AG with the authority and budget to establish a program management office providing oversight of these opportunities	Establish CMD Program Management Office and institutional outreach. Submit these charrette outputs to the City Planning Department for integration in the Comprehensive Plan update. Fund 2021 CMDAG and Support. Provide quarterly SC updates.
	R2	CMD Resilient Health District Plan	CY2021/Q4	Approval to Proceed Direction to Departments	Develop CMD Governance Approach, Communications Protocols and Masterplan integration Approach inclusive of service life expectations.

CY2020/Q4 and CY 2021 Budget Request

For the remainder of 2020, the CMD requests funding for the CMD Transportation Study, the CMD Vulnerability Assessment, and the CMD H&H model. The remaining activities will be managed within the previous funding request and within existing departmental allocations. For 2021, the CMDAG will develop budget requests per each component and present these to the SC in 10/2020.

Resilience Guideline Recommendations

The CMD has numerous ongoing projects *with POTENTIAL to increase resilience and improve long-term adaptive capacity*. However, most projects are not required to consider resilience as a core criterion. The AG recommends the adoption of Resilience Guidelines to assure that proposed and ongoing investments improve the overall resilience of the district and to reduce the likelihood of maladaptation in investments.

Initial considerations on such guidelines suggest that **ALL proposed CMD investments (whether renovation or new construction) should:**

Address / Consider All Hazards

1. Anchor all investments to the vulnerability assessment. Include an All Hazards Review of investments with a clear plan of action or operational strategy to reduce risk exposure or to manage to acceptable risk
2. Leverage and expand existing programs and policies to integrate hazards reduction
3. Consider extreme heat and material albedo / type / selection to reduce urban heat island impacts. Adopt a 'No Net Loss' protocol for tree canopy.
4. Consider potential impacts on adjacent CMD parcels. Isolate unintended consequences for other CMD entities

Establish Water Storage Targets

1. Identify each project's overall contribution to CMD Water Plan
2. Anchor to City **Stormwater Guidelines** (hold water where it falls, use nature based and grey solutions, etc.)

Integrate Transportation Impacts

1. Identify overall contribution to CMD Transportation Plan
2. Design with alternative uses in mind to allow for more cost-effective transformation
3. Leverage shared assets where possible to provide more effective use of funds

Increase Collaboration

1. Require resilience performance in all scopes as part of the base contract. Develop boiler plate language for consistency across institutions.
2. Develop evaluation and monitoring approaches to understand efficacies of investments and establish continuous improvement processes

A Resilient Health District Plan prioritizes health service access by addressing water risks in all investments, advocating for optimal, district-wide transport and parking strategies, and reducing heat exposures.

AG Completed Efforts

In 2020, to date the AG has:

1. Organized and conducted a planning meeting in December 2019 to identify ongoing projects that have impacts on the CMD. The outputs of that meeting are in the December 2019 Planning Meeting Summary.
2. Developed a Planning Brief to reconcile those respective projects, jurisdiction and scope as known. The outputs of that meeting are in the 2020 Planning Brief.
3. Developed an online database of resources related to those Programs, Policies and Projects to enable easier collaboration and shared reference materials. These are in the CMD AirTable.
4. Prepared a concept paper to advance funding request for the Ehrhardt Shaft and advocate on its importance to the CMD. This was presented to the City for grant application support.
5. Coordinated a series of grants team calls to link opportunities across all institutions and the City of Charleston.
6. Submitted a grant application to the Robert Wood Johnson Foundation, which included the development of a CMD cohort focused on extreme heat and health and the provision of numerous support letters for the CMD that can serve as a model for future funding opportunities.
7. Developed a resilient water management pamphlet to advocate for improved public realm strategies that address flooding.
8. Developed preliminary approach to CMD Rainproof, a subset of the City's Rainproof Charleston Program.
9. Assembled a network of technical experts in public and private sector roles to act as advisors and to participate in charrettes.
10. Identified an LCRT service alignment through the CMD, working with the LCRT, and prepared supporting letters for the LCRT application for Federal funds.
11. Negotiated with the City to close the eastern section of Doughty Street for the long-term use by the Greenway.
12. Updated the Charleston Medical District website to reflect recent accomplishments and share results broadly.
13. Developed a composite project priorities list to advance discussions on planned investments.
14. Initiated discussions about consolidated parking opportunities and financing strategies.
15. Conducted a series of charrettes addressing water, transportation, and all other hazards identified in the City of Charleston Vulnerability Assessment.
16. Presented Sustainability / Resilience efforts to MUSC Faculty Senate.
17. Participated in the Post and Courier Inside Business Live event, Rising Sea Waters.
18. Presented a brief update on CMD efforts to the City of Charleston Resilience and Sustainability Committee.
19. Coordinated a CMD position response for the USACE Storm Surge Barrier.

September 2019:
Steering Committee Meeting 1

December 2019:
Institutional Planning Meeting

January 2020:
Planning Summary

February 2020:
Steering Committee Meeting 2

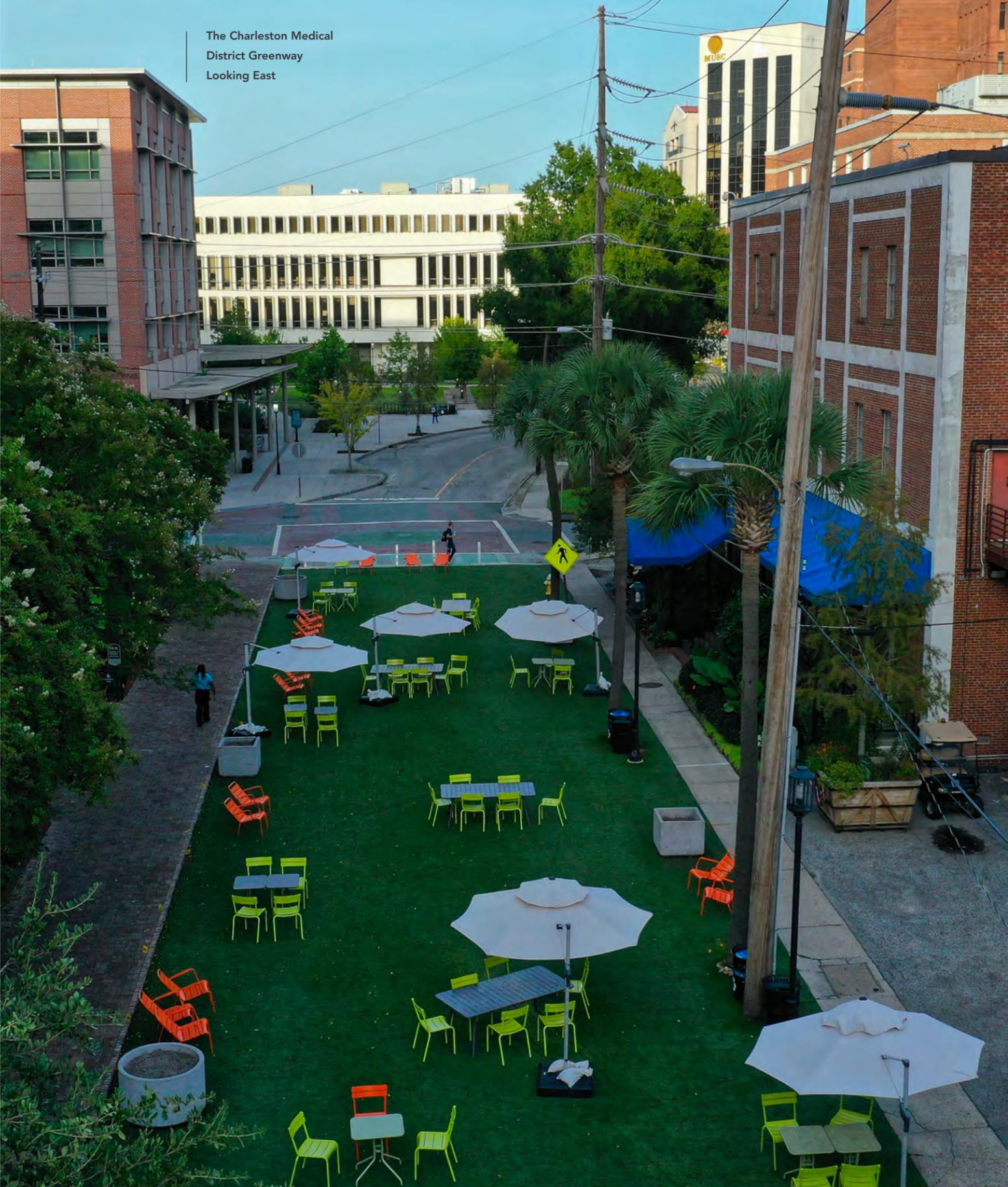
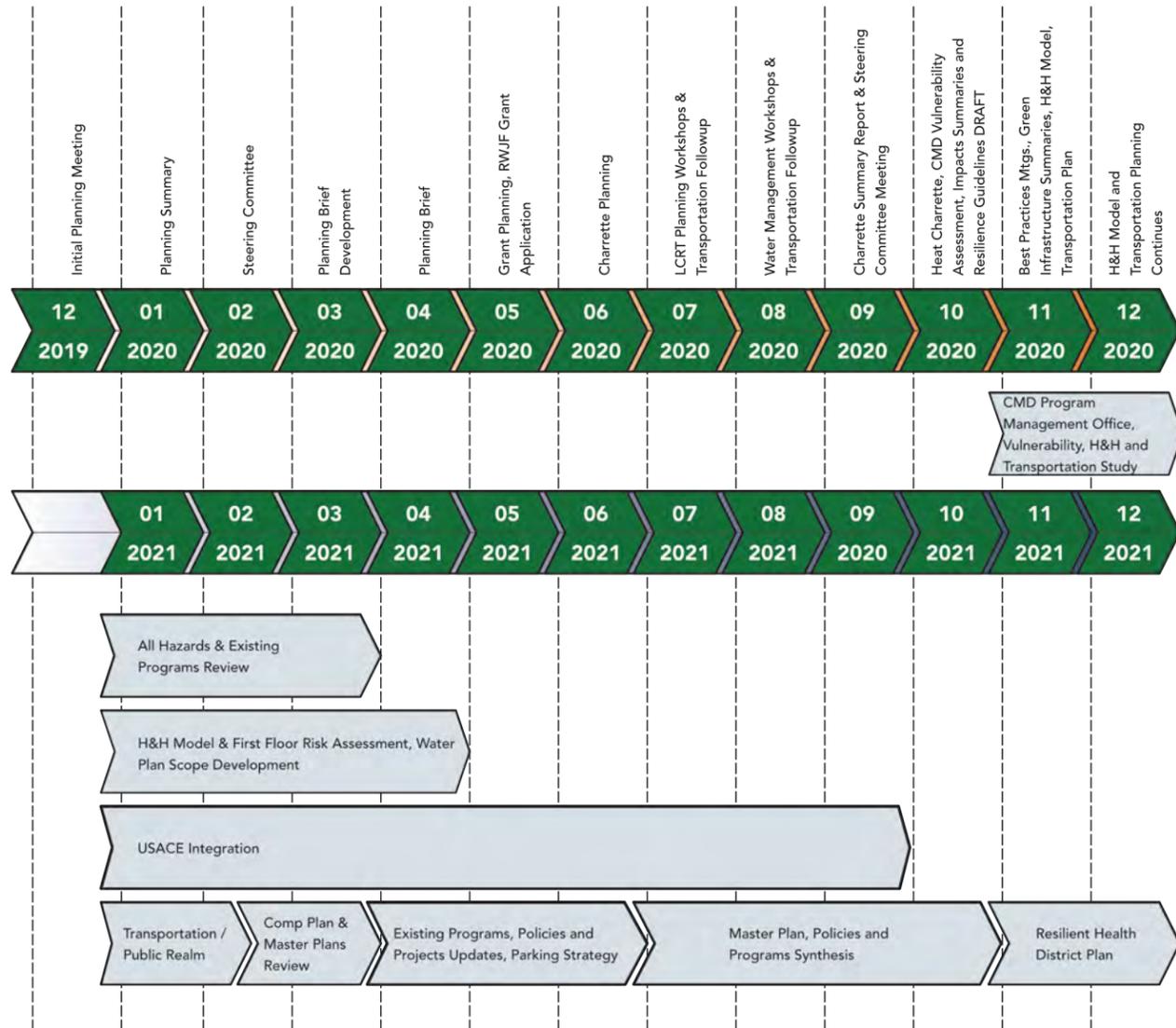
April 2020: Planning Brief

July-August 2020:
Virtual Charrettes

2020 - 2021 Schedule

Schedule Look Ahead: The AG recommends the latter part of 2020 include:

- **CMD Impacts Summary** - Completion of a CMD Impacts Summary will enable the City to better advocate for grant funding on behalf of the CMD.
- **CMD Vulnerability Assessment** - A CMD Vulnerability Assessment will improve CMD understanding of city-wide hazards as these relate to CMD exposures.
- **Heat Charrette** - A heat hazard and adaptation opportunity charrette with the S.C. Sea Grant and CISA teams will help the AG determine ways to leverage ongoing efforts to the greater benefit of the CMD.
- **CMD Transportation Plan** - A CMD Transportation Plan will focus on long-term implications for planning for the City, BCDCOG, the SCDOT, MUSC, Roper and the VA and adjoining neighbors at West Edge and USACE.
- **CMD H&H Model** - A CMD H&H Model will help the CMD to understand the movement of water on the campus and to use that data to prioritize projects and their respective water assignments.
- The proposed 2021 schedule is listed below and further described in the following sections.



The Charleston Medical District Greenway Looking East

View along Calhoun
Street Towards the
Cooper River

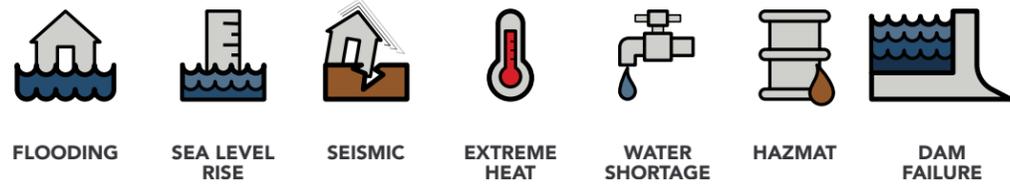
All Hazards



All Hazards

As part of the Summer 2020 Charrette, the AG hosted an All Hazards review to better understand the range of hazards introduced in the assessment and how these hazards relate to the CMD. In that session, the technical consultant noted that all hazards are relevant to the CMD and that future climate changes will further exacerbate these exposures.

In 2018, the City of Charleston engaged NEMAC/Fernleaf Interactive to conduct a city-wide Vulnerability Assessment. A vulnerability assessment compares a range of expected climate and human-made environmental hazards to the probabilities of occurrence (risks) and the various exposures (vulnerabilities) that assets or operations have to those risks. The analysis functions at the census tract scale and so for the CMD that includes tracts, 5, 6, and 11. The City of Charleston chose to focus the assessment on seven hazard areas (below) as these introduce risks to the city's core systems such as critical facilities, sensitive populations, jobs and employees and access to critical services, all of which relate directly to the CMD. The Lockwood Drive Corridor and the CMD support the city's core systems via health and medical lifeline services provided, the role as a transportation corridor, the number of jobs provided, and the populations served by the CMD.



Highlights related to the CMD include:

- **Flooding:** the CMD and Lockwood Corridor area are highly vulnerable to all types of flooding. For example, by 2100, with no interventions, tidal flooding will make 74% of major roads, and 85% of minor roads inaccessible along with 70% of properties. NOAA high tide projections, as released in July 2020, echo similar concerns.
- **Earthquake:** The area is of high susceptibility due to its location in a high-risk seismic/liquefaction area and its unstable landfill base and significant subsidence history.
- **Extreme Heat:** The area is vulnerable due to highly developed land use patterns, inconsistent and ineffective planting strategies, its sensitive patient populations and its moderate tree canopy coverage. For example, as part of the grant preparation, several physicians noted patients had passed out from heat exposure while going from parking to office visit.
- **HAZMAT Release:** While there are significant operational controls of hazardous materials within the purview of the CMD institutions, the high on-site concentration of these materials coupled with known flooding risk across the CMD suggests that contingency planning should address this potential hazard.
- **Dam Failure:** The CMD is within 2-4 days of potential inundation in the event of dam failure.

Risks associated with heat, hazardous material spills and infrastructure failure at the upstream dam are not CMD-specific, but the CMD should have protocols in place to address these risks. Extreme heat increases (duration and intensity) expose patients, staff and students to far greater risks than those of flood events. Extreme heat negatively impacts patients with co-morbidities such as cardiovascular or respiratory disease and those who spend extensive time outdoors on extreme heat days. Impacting expectant mothers, children and the elderly far more, such heat kills 20x more people annually than all other water-based events combined, yet receives much less attention, particularly in the south where heat is more common. Charleston's expected extreme heat days will likely increase three-fold this century. With surface temperatures reaching over 135 degrees in some areas, the CMD is quite heat-exposed yet lacks a heat plan to address the vulnerability.

Each of these hazards assume a range of impact and performance modifiers. Impact modifiers include the geomorphology of the CMD, its former landscape of creeks and lowland and its current structure of landfill materials and soils. Performance modifiers include the age of the existing building stock and the code requirements in place at their construction, the adaptive capacity of existing investments in site, infrastructure or building, the fragility of the district energy systems and the like. These

types of modifiers amplify risks. While the CMD has some programs or policies in place to address certain risks, there is no comprehensive all-hazards strategy as evidenced in the comparison of risks and programs.

Opportunities Detail

1. **CMD Vulnerability Assessment:** Considering that the City of Charleston Vulnerability Assessment summarized data across the City, the AG recommends engagement with a Technical Consultant for a CMD-specific data summary. A CMD-specific evaluation would allow the CMD to understand the probabilities and potential impacts of each hazard and then to respond accordingly. Currently the range of exposures across CMD properties and operations has not been identified nor a plan for risk reduction developed.
2. **CMD All Hazards Approach:** The AG recommends that the CMD immediately adopt an All Hazards approach to any investments. An all-hazards approach to CMD investments would allow the CMD to prioritize the most likely exposures and to assure that planned investments as well as safety protocols take these hazards into consideration. Ongoing programs fail to acknowledge the current and increasing exposures and risk wasting time and capital for less than optimal returns. Given costs and budget constraints, the CMD should anchor the near-term projects to no-regrets strategies to better leverage capital and achieve greater benefits.
3. **CMD Impacts Summary:** The AG recommends that CMD institutions quantify and richly describe current climate-related health service impacts in order to gain greater support for investment needs and to build network support within various political arenas as well as to improve grant applications and competitive advantage in allocation contexts. Current climate-related service impacts are a challenge to quantify, but with direct inputs and related proxies, ongoing costs easily tip toward millions of dollars annually. City applications for grant funds to mitigate against those losses are hampered by the lack of substantive CMD impact data to drive the grant applications.
4. **CMD Existing Programs Review:** Given that some existing programs or policies address some hazards, the AG recommends completing a summary review of those programs to better define any gaps that warrant immediate rectification and to synthesize and redistribute the related resources so that departments work with those resources to manage risks.

Action Steps

Given the opportunities identified, the AG recommends these Actions for 2020-2021. Details of each are in the Executive Summary, Action Steps Table. The AG assumes monthly reporting on progress of each.

- V1 CMD Impacts Summary: Complete individual impacts summaries.
- V2 CMD Vulnerability Analysis: Engage Technical Consultant to complete CMD-specific data assessment.
- V3 CMD All Hazards Approach: Review existing, active, proposed projects for All Hazards integration. Provide guidance to departments for future engagements, including language on all hazards.
- V4 CMD Existing Programs Review: Consolidation of departmental responses across all hazards. Review commonalities and conflicts.

Resilience Guideline Recommendations

Proposed CMD investments (whether renovation or new construction) should:

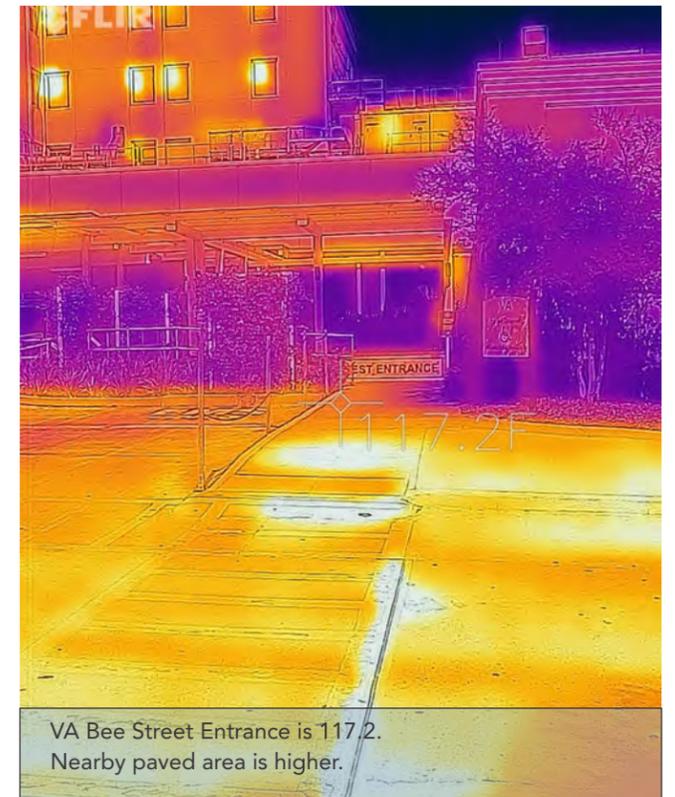
- Anchor all investments to the vulnerability assessment. Include an All Hazards Review of investments with a clear plan of action or operational strategy to reduce risk exposure or to manage to acceptable risk.
- Leverage and expand existing programs and policies to integrate hazards reduction.
- Consider extreme heat and material albedo to reduce urban heat island impacts. Adopt a 'No Net Loss' protocol for tree canopy.
- Consider potential impacts on adjacent CMD parcels. Isolate unintended consequences for other CMD entities.

CMD All Hazards Integration

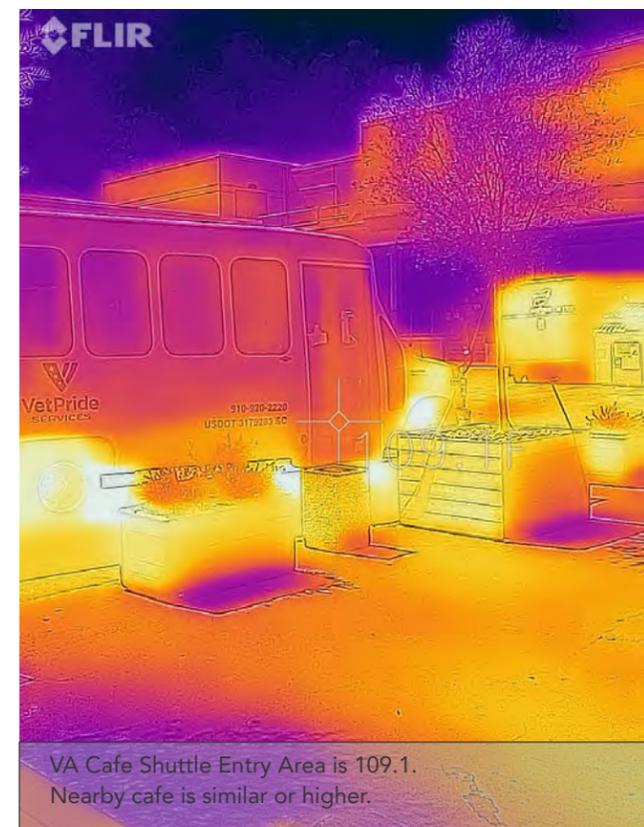
FLOODING SEA LEVEL RISE EARTHQUAKES EXTREME HEAT WATER SHORTAGE HAZMAT DAM FAILURE

Stormwater Guidelines	SLR Strategy	Building Code	CMD Hazard Mitigation Plan	CMD Hazard Mitigation Plan
Dutch Dialogues	USACE Perimeter Protection			
Spring/Fishburne Tunnel				
USACE Perimeter Protection				
Charleston Rainproof				
CMD Rainproof			+ various policies geared toward preparedness and numerous sustainability programs focused on mitigation	

Above: Charleston Hazards and CMD Active Programs. Note this summary will be refined and expanded with the proposed Existing Programs Review
 Below: City of Charleston Extreme Heat Example. These data, consistent with recent multiyear comparisons, reflect the extreme heat in the CMD.



Extreme Heat examples include the Charleston Medical District Greenway (above left), the VA Bee Street Entrance (above right), VA Shuttle Pick Up/Cafe Area (below left) and Charleston Medical District Office (below right). All images are from August 27, 2020. Thermal Images are surface temperatures, thus not inclusive of impacts of humidity or air movement. Image scales are relative with darker colors cooler and lighter colors hotter.



View to the Ashley River
and Alberta Sottile Long
Lake

Water



Water

While the USACE continues its investigation on the storm surge barrier, the City of Charleston continues its work on the application of the Dutch Dialogues® outcomes in the Comprehensive Plan update and rolls out its updated Stormwater Guidelines, the CMD must advance its own approach to district water management given the ongoing interruptions to health service access with increasing numbers of flooding events. To this end, the AG convened two water charrettes to establish baselines of existing water challenges and proposed programs and to garner feedback from technical experts engaged across the City. Charrette 1 focused on establishing a common understanding of water challenges and planned city and CMD investments to address those challenges. The intent was to better understand how these varied efforts lead to more consistent dry, reliable pathways for CMD access and the likely timing of implementation of those investments. Charrette 2 focused on water vision and the opportunities that proposed conceptual projects and broader integrative thinking introduce.

Water Management: Extreme rain events, high tides, storm surge and sea level rise along with projected periods of drought, potable water, stormwater and wastewater system fragility, introduce significant vulnerabilities to the CMD. While stormwater flooding events continue to increase annually, high tide events, hurricane and tropical storm surges, and sea levels also continue to increase. For example, in 2019 alone, the typical 50+ days of high tide flooding increased to 89 days. With so many water hazards to consider and without a district or city water plan to look at compounded impacts, the CMD lacks the necessary focus to prioritize investments. Going forward, the CMD should **approach new projects with integrated water management best practices.** The charrette participants discussed how to achieve a coordinated and integrated approach, how to quantify water issues and how to define means and methods to draw down water impacts. Participants considered other phased means to address water management at all levels. Comments encouraged broader thinking as **CMD flood waters may originate outside of the CMD boundaries.** Understanding causes of CMD flooding and basin interactions, including technical assessment of peak depth, duration and frequency/recurrence with planned projects is an important step.

Storm Surge Barrier and Sea Level Rise: Relatedly, **the USACE storm surge barrier will transform the way that water must be considered in the district.** Capturing the impact on the CMD and leveraging the USACE investment is critical. A storm surge barrier is not sufficient for CMD needs, but it is necessary. The AG recommends reconciling the USACE storm surge barrier and SLR projections as these relate to time that CMD intends to occupy the peninsula. The CMD should identify how the barrier and the City plans for SLR reconcile to CMD building service life commitments. Also the CMD should develop a transition process including projects addressing current flooding, planning for and addressing SLR at service life minimums (2080) and including implementation of the storm surge barrier. The reconciliation of these factors is central to the ability for the CMD to remain viable into the latter part of this century.

Grey and Green: Notably, **grey and green infrastructure requirements should acknowledge the timescale for implementation.** Current flooding will increase in the future while major capital projects are decades away. Smaller scale projects will have measurable benefits when considered in combination, but these will also take time. In that time, alternative strategies will need to be developed, such as elevated walkways and alternative scheduling. A structured approach to understanding how these unfold to the CMD's advantage and a prioritization of projects across institutions is critical for CMD investment decision-making as well as for others, such as the City Stormwater Department, to advocate for CMD funding locally and state-wide.

Green infrastructure offers multiple benefits for stormwater retention, heat reduction, patient, staff and student experiences and even respite/restoration. However, the amount of water that needs to be managed and the existing area allocated for green space do not align well enough to make a substantive impact. As a result, **bolder goals for green infrastructure warrant consideration.** For example, combining parking in order to open space for green infrastructure with substantive impact could be a near-term, scale-relevant strategy. In FY2020/Q4, the AG intends to work with MUSC Arboretum team to engage CMD Sustainability Experts per institution to develop a shared inventory of GI projects and expected benefits, expand existing tree inventory and allocate performance targets for water uptake, shading, energy reduction and air quality improvements. This will follow the NYC Street Trees Model as a subset of the CMD Rainproof program that is currently underway.

Grey infrastructure strategies, such as building cisterns at the Pharmacy addition, contribute to risk reduction, but these are **incremental improvements that require significant, district-wide implementation before substantial benefits will be realized.** The CMD is built out with non-contributing structures and until these are improved or replaced, the sites continue to shed water for other locations to manage. Therefore, grey infrastructure also needs bolder goals district-wide. Raised streets with water storage chambers, large scale retention, more onsite cistern capacity, and other similar tactics are necessary. For

example, it appears that the completion of the Spring/Fishburne tunnel and pump program will provide significant improvement to the northern section of the CMD. The addition of the Ehrhardt Shaft to that program, if funded, will also draw down flooding in part of the Ehrhardt area basin. However, the Ehrhardt Shaft does not drain the entire Ehrhardt Basin, leaving Jonathan Lucas access exposed. These improvements also do little to address Calhoun Street flooding so CMD access from the north via interconnected second-floor walkways deserves consideration. Also, the Calhoun West water program warrants a reconsideration of its overall approach, particularly given the planned storm surge barrier. With limited funding, there is no given timeline for this reconsideration and as a result, southern CMD improvements will necessarily rely on smaller scale grey infrastructure in the near term. Proposed pumps at the VA, Calhoun or Long Lake are too expensive to complete in total and so a difficult choice must be made regarding which serves the greatest good. The City Stormwater Department needs CMD feedback on this choice.

Near-term Operational Exposures: The first-floor exposures of each CMD building need to be examined and summarized in terms of quantitative impact on capital and operations. Water hazards include extreme rain, storm surge, tidal, riverine, potable water, wastewater, and perhaps oddly, drought. All of these water hazards expose the CMD to greater risks. While hurricane preparedness is well integrated, rain, storm, tidal, riverine and perhaps potable, wastewater and drought risks need further consideration. Moreover, without a clear impact summary, it is far harder for others to advocate for CMD to receive investment prioritization.

Opportunities Detail

- 1. CMD Water Plan:** The AG recommends a district-specific water plan that reconciles the source of flooding, the near and mid-term expected exposures to patient, staff and student access and alternative strategies (elevated walkways, offsite redundancies) and planned downtime. All investments should play a role in the reduction of flooding and heat island effect. For each investment, quantify value and benefits to draw down flood risk with each \$ spent and use the prioritization framework adopted by the City to determine the order of investments. Commission an H&H model. Assess each project for its impact on the dry pathways priorities as a near-term step and reconcile any remaining exposure.
- 2. CMD/USACE Integration:** The AG recommends addressing how the USACE storm surge barrier and SLR reconcile to the CMD. Leverage the USACE investment, find ways to look longer into the future given the CMD service life commitments and develop a transition process from current flooding to implementation of the storm surge barrier.
- 3. CMD First Floor Risk Assessment:** The AG recommends review and quantification of first floor facility and critical infrastructure exposures and impacts of all CMD facilities given projected flood risks. Summarize these exposures and conduct an overall integrated risk review with joint operations teams to prioritize risk management strategies in concert with masterplanning.

Action Steps

Given the opportunities identified, the AG recommends these Actions for 2020-2021. Details of each are in the Executive Summary, Action Steps Table. The AG assumes monthly reporting on progress of each.

W1 CMD Water Plan: Engage Technical Consultant to prepare CMD Water Plan in the context of surrounding area initiatives. Commission H&H model. Articulate water assignments for proposed projects. Anchor to new City stormwater guidelines. Evaluate pump priorities for VA, Calhoun or Long Lake locations. Present to SC.

W2 CMD / USACE Integration: Establish working relationship between CMD, Technical Consultants and USACE to determine how to leverage USACE intents for the storm surge barrier with CMD-specific water plan.

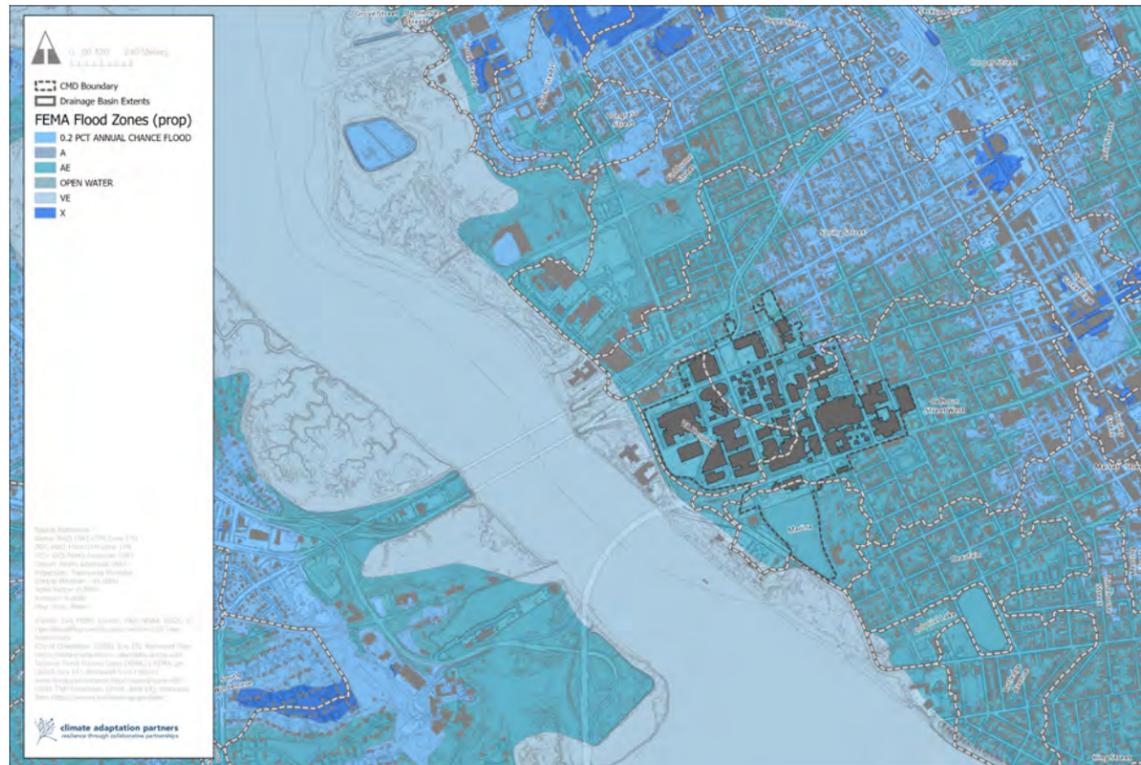
W3 CMD First Floor Risk Assessment: As part of the CMDAG Program Management approach, work with the institutional departments responsible for first floor operations and inventories to review and quantify first floor exposures and impacts given flood risks.

Resilience Guideline Recommendations

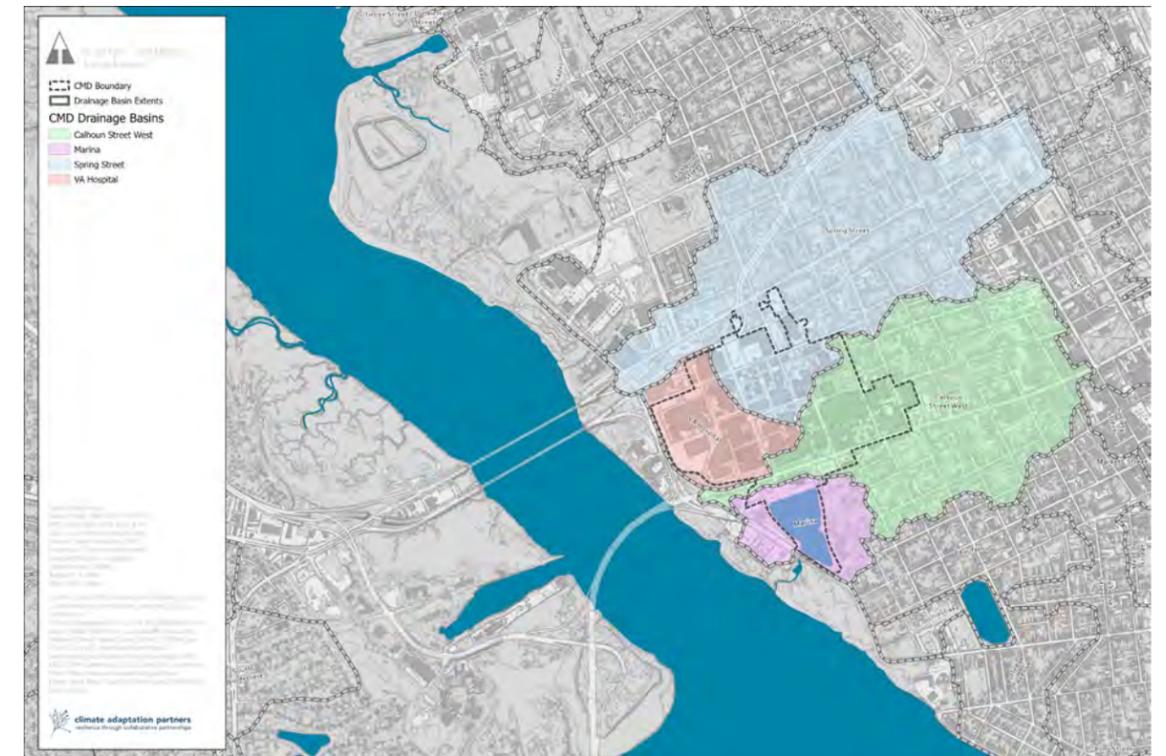
Proposed CMD investments (whether renovation or new construction) should:

Identify each project's overall contribution to CMD Water Plan.

Anchor to City Stormwater Guidelines (hold water where it falls, use nature based and grey solutions, etc.)



Above: CMD Flood Zones per FEMA proposed mapping.
 Below: USACE Storm Surge Barrier Preferred Alternative 3, April 2020: Source: USACE



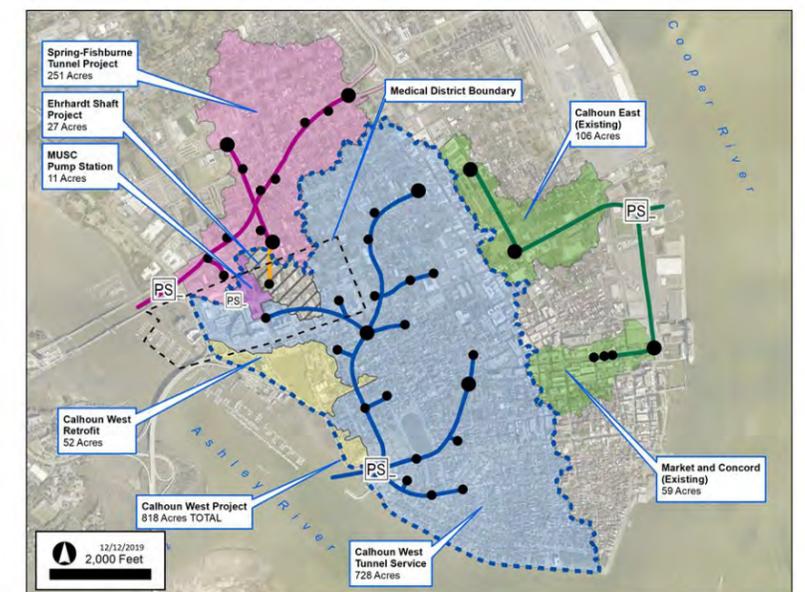
Above: CMD Relevant Drainage Basins. Note that the Spring/Fishburn Deep Tunnel Project does not address the three southern basins
 Below: City of Charleston Deep Tunnel Systems. Source: City of Charleston Stormwater Department

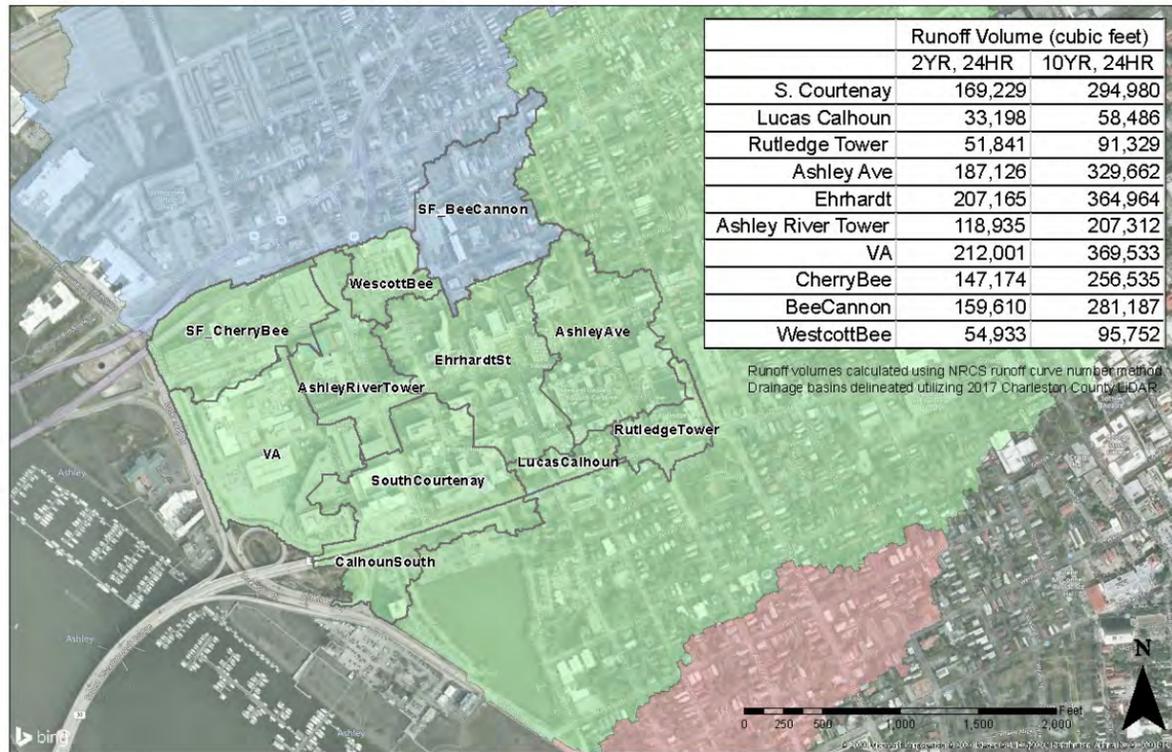
The USACE storm surge barrier will transform the way that water must be considered in the district. Capturing the impact on the CMD and leveraging the USACE investment is critical. A storm surge barrier is not sufficient for CMD needs, but it is necessary.



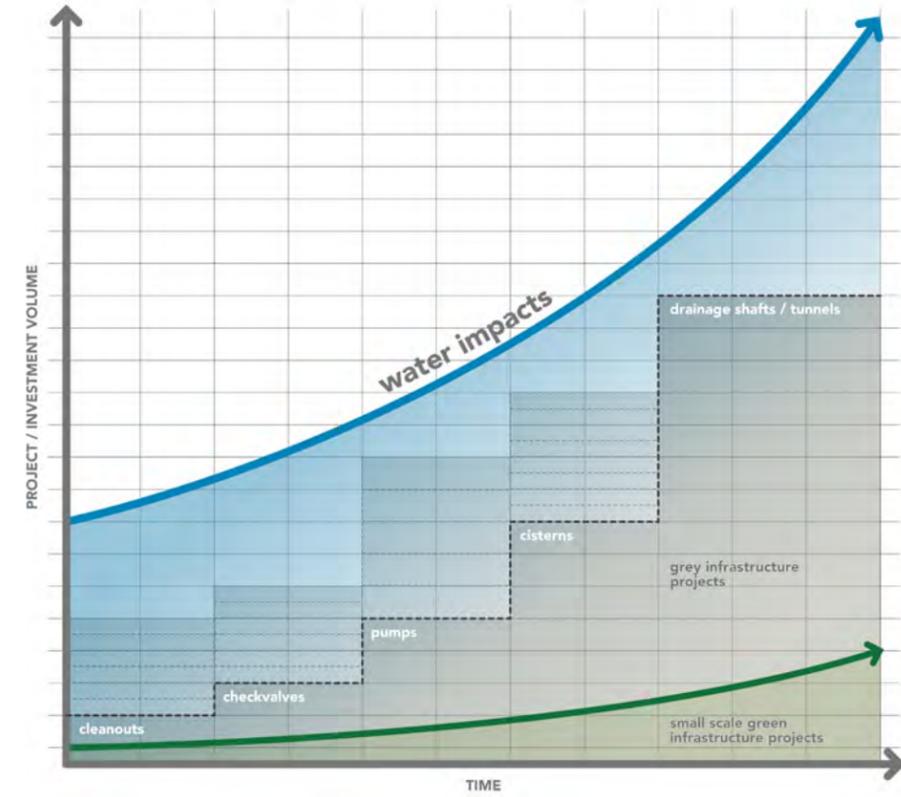
Figure ES-1. The National Economic Development and Tentatively Selected Plan. Official mapping product of the Management Support Branch, Charleston District, USACE

PENINSULA DEEP TUNNEL SYSTEMS

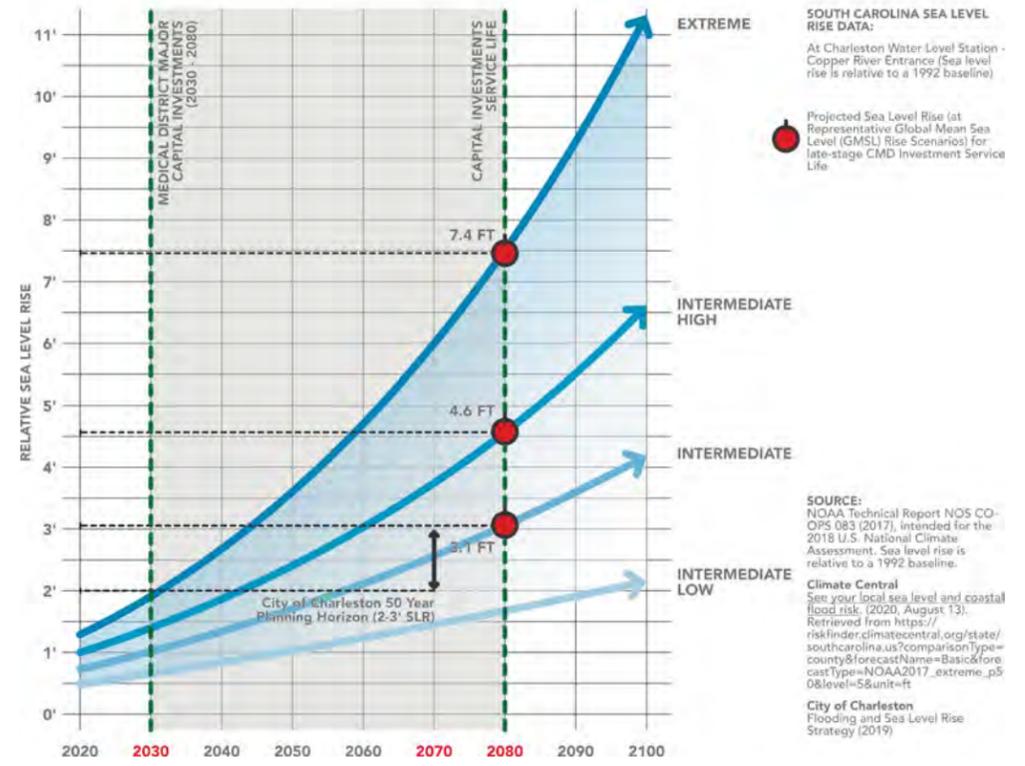
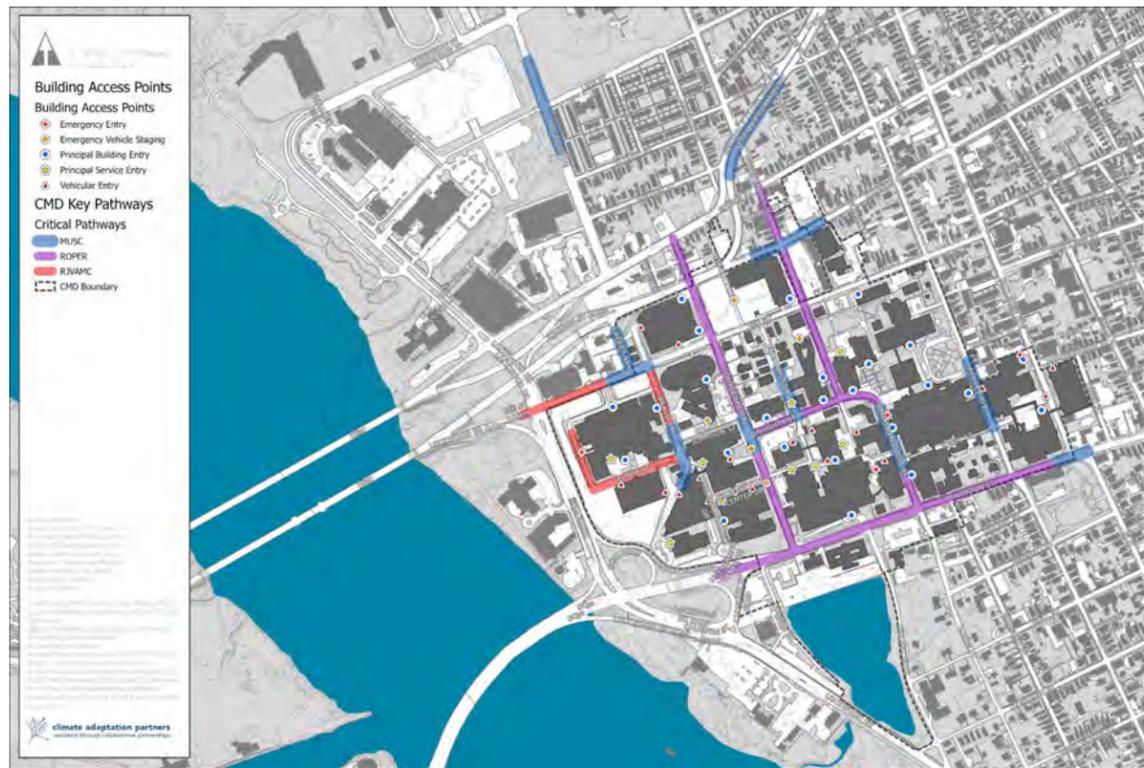




Above: CMD Drainage Sub-basins and related rough estimates of expected runoff volume by storm type. Source: Jared Bramblett
Below: CMD Priority Pathways and Building Access Points. The AG team identified these priority areas for improvements to flooding.



Above: Cumulative Project Impacts as compared to Water Impacts. This illustrates the many ongoing grey and green infrastructure projects as compared to the projected rainfall, stormwater, storm surge, high tides, and sea level rise impacts. While compound flooding is not yet fully analyzed, it is clear that bolder moves are required to outpace the water risks. Source: Climate Adaptation Partners | Below: Charleston Sea Level Rise Projections as compared to CMD Facility Service Life Assumptions. Source: Climate Adaptation Partners



Transportation



CHARLESTON MEDICAL DISTRICT

Transportation

With pending CMD expansions, planned city investments, county road improvements, SCDOT considerations, BCDCOG LCRT planning, and private sector developments, the AG established four charrettes focused on transportation. Charrette 1 established a common understanding of the optional routes for LCRT via the CMD and potential terminus locations and identified key transportation challenges across the CMD. Charrette 2, hosted by BCDCOG/HDR presented initial LCRT routing, station and terminus locations as well as station designs and the context of a transit-oriented development at Spring Street, bridging the West Edge development to the CMD. Charrette 3, also hosted by BCDCOG/HDR, presented revised routing and station locations based on feedback from Charrette 2. Charrette 4 focused on the Bee Street corridor, last mile connectivity and possible elevated pathways to assure patient, staff and student access to the CMD in high water events.

Charrette outputs reinforced the need for LCRT to consider flooding and heat exposures on routing and station location. While the proposed routing is reasonable and generally centralized for all institutions, the station locations remain unresolved. Calhoun Street station locations directly conflict with either the Roper entrance or the historic Jonathan Lucas House and fail to tackle the conflict between locations and areas of extreme flooding at Calhoun and Jonathan Lucas. Similarly, the Courtenay Street station, intended near the Doughty/Courtenay intersection, requires coordination with planned flood improvements, MUSC Phase 3 Replacement Hospital, and elevated walkway connectivity. While the route and the application for NEPA review are reasonable, there is more work to do to improve CMD station location and integration with flooding and heat projections.

Critical Intersections: The initial LCRT route will terminate at Fishburne and Hagood where in the near-term the LCRT will turn around and return to CMD along the same route. With the Hagood Connection completed, LCRT will run southward on Hagood Avenue, crossing US 17 and entering the CMD. While this route introduces greater convenience and reduces transit time, it introduces greater pressure on the Hagood Connection/Bee Street/Cherry/Bravo exchange. This same intersection will carry an additional 700-100 cars as the RJVAMC expands its existing parking deck, builds a second deck on campus, builds a new bed tower, and improves Bravo Street. Simultaneously MUSC intends to remove the Wellness Center and build the Phase 3 Replacement Hospital, connecting north to the Bee Street garage and to the east with elevated walkways. Charleston County has road improvements in the area while the City intends to execute the Ashley River Crossing/Bee Street Connector. Private sector investments on the north side of Bee are also in process. At the same time, MUSC intends to decrease its onsite population via telemedicine, remote workers and online learning motivated by the COVID 19 pandemic. **This area faces enormous coordination and optimization challenges, but also presents an incredible opportunity to design the northern edge of the CMD, improve patient, staff and student experiences and establish dry access with the Spring/Fishburn completion. With this level of complexity, a coordinated Bee Street transportation strategy is warranted.**

Parking Strategies: While MUSC and Roper consider shared parking strategies that might free space for green infrastructure, MUSC continues to draw down parking demand, and VA considers parking expansion, the optimal functional fit of garages as part of a coordinated master plan remains a question. For example, active ground and street facing levels of garages with retail or other pedestrian-friendly functions are thought to enliven the street. Unfortunately, there is an open question about market support for these retail functions and case studies illustrate how efforts to enliven the street can result in the opposite result. What other functions might best serve the CMD? EMS functions? Sheltered, but not enclosed/conditioned Wellness Areas? Incubator Businesses related to Medical Services? And how might these be designed to address flooding? Similarly, garage demand is expected to fluctuate in the future suggesting that structures designed solely for garage functions may quickly become outdated. More progressive thinking should include alternative use strategies so that garages might transform to take on other functions should parking demand substantially reduce over time. Lastly, parking management varies significantly between the city and the three institutions. Some charge; others don't. Charges and subsidies vary. Costs vary. Availability and Hours of Operation vary. A CMD parking strategy should evaluate approaches to parking and determine whether there are optimal strategies that improve the overall situation and what the parameters of those should be.

Complete Streets: CMD street improvements lack "Complete Streets" standards, which means that pedestrian and cycling modes are not required to be considered along with vehicular transit modes. However, with increased cycling traffic promoted by the Ashley River Crossing and with a desired increase in pedestrian traffic on the Charleston Medical District Greenway, a more comprehensive approach to streetscape design that accommodates multimodal transit options responsive to climate risk is necessary. Existing policies that narrowly focus necessary improvements should be updated. For example, SCDOT's planting specification requirement for trees focuses on maintenance, street visibility, nuisance fruit deposits and other issues related to overall right-of-way maintenance. SCDOT's specification standard, which prefers Hybrid Crape Myrtles, discourages selection of more water-absorbent/shade providing species and could be expanded to include tree characteristics and species that provide

climate adaptive support. Similarly, the Charleston Planning, Preservation & Sustainability's Board of Architecture Review has, in the past, ruled against the use of climate adaptive strategies like "green facades" in projects. These narrow policy perspectives place a significant limitation on the CMD's ability to cool the public realm through design. Without reconsideration, these policies and disparate transportation systems remain isolated in their efficacy as opposed to becoming part of a larger interconnected, resilient Charleston.

"Last Mile" Connectivity: With major street improvements, water projects such as Spring/Fishburn, and investments like the LCRT, patients, staff and students may better access the CMD and in some areas, may experience less flooding in the near term. However, comprehensive change will take time and in the interim it is important to determine the horizontal and vertical connection points that enable the greatest improvements in access and the relationship of these access points to the various planned projects across the CMD. For example, if the LCRT stops at Doughty and Courtenay and a patient steps off the bus onto a flooded sidewalk, little has been gained. If the pathway from that station to various buildings remains flooded, the patient will not make the appointment. Or if the pathway is dry to a point, but the elevated walkway only serves MUSC, the LCRT still misses the Roper and VA populations. For EMS or supply chain management this is also a prime consideration. How might the CMD develop an interconnected second level that ameliorates the near-term flooding impacts, that connects to other transportation and water mitigation investments and that retains value for decades as the larger water management projects develop? These connectivity questions warrant assessment before either institution invests too much effort.

Opportunities Detail

- 1. CMD Transportation Plan:** The AG recommends correlating various ongoing and proposed transportation projects (federal, other state, county, city, CMD) that impact the CMD with a consolidated district transportation plan, and a unified CMD voice, that connects and reconciles water and extreme heat risks. This plan should demonstrate optimized, dry, cool access. This requires significant CMD coordination to assure no negative impact to the RJVAMC. The CMD should be explicit about potential benefits of better access, include heat impacts/cool corridor planning and work with BCDCOG to improve station location on Calhoun and to coordinate station location on Doughty/Courtenay.
- 2. CMD Public Realm Guidance:** The AG recommends that any planning / projects address the full public realm including all connectors to and through the CMD across multiple modes (bike, pedestrian experience, vehicular load (including EMS needs) as well as health benefits). This should include a Complete Streets approach with wayfinding as well as a recognizable CMD brand/identity.
- 3. CMD Parking Strategy:** The AG recommends that MUSC/Roper/VA collaborate on a district parking strategy. This includes possible consolidation between MUSC and Roper and management coordination across all three institutions.

Action Steps

Given the opportunities identified, the AG recommends these Actions for 2020-2021. Details of each are in the Executive Summary, Action Steps Table. The AG assumes monthly reporting on progress of each.

T1 CMD Transportation Plan: Engage Technical Consultant to develop Transportation Plan.

T2 CMD Public Realm Guidance: Engage Master Planning Teams to provide guidance on coordinated public realm improvements for an overall CMD approach. Include wayfinding as well as CMD brand/identity.

T3 CMD Parking Strategy: Engage Parking Consultant to evaluate and develop consolidated parking recommendations and funding approach

Resilience Guideline Recommendations

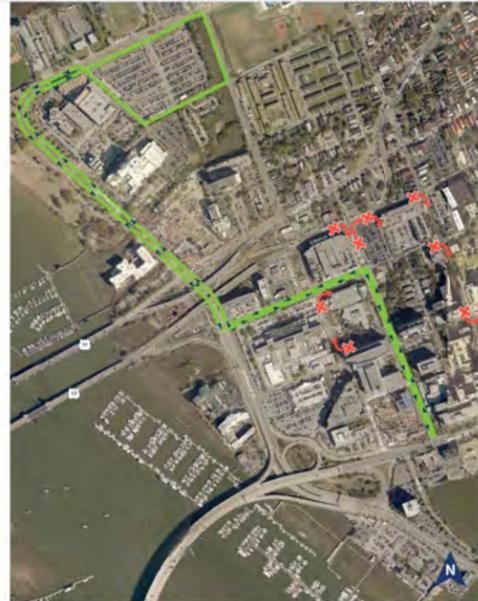
Proposed CMD investments (whether renovation or new construction) should:

Identify overall contribution to CMD Transportation Plan

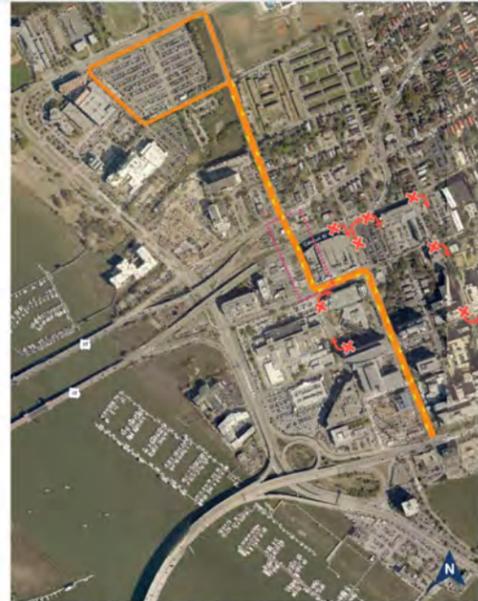
Design with alternative uses in mind to allow for more cost-effective transformation

Leverage shared assets where possible to provide more effective use of funds

Lockwood Dr vs. Hagood Ave



Medical District Route: Option 3, Bee & Lockwood
 Conceptual Alignment X Insufficient Turn Radius
 Route Direction of Travel *Interim routing pending Hagood Ave. construction.

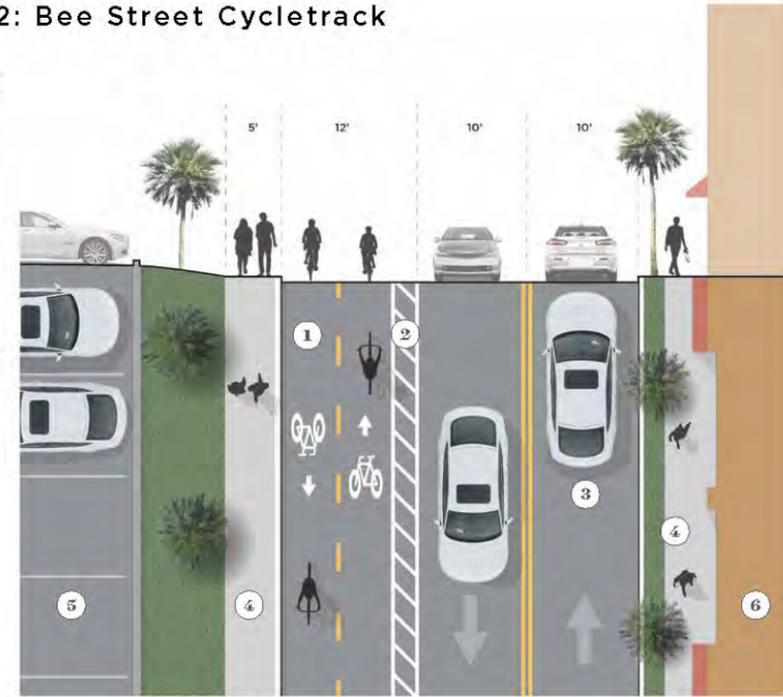


Medical District Route: Option 4, Bee & Hagood
 Conceptual Alignment Hagood Extension Project
 Route Direction of Travel X Insufficient Turn Radius

Above: LCRT Route Preferences. Option 3 is near term. Option 4 assumes completion of the Hagood Connection. Source: BCDCOG/HDR
 Below: CMD Critical Intersections illustrate the high impact areas of the planned CMD and City investments. No transportation plan integrating these investments currently exists.

Alternative 2: Bee Street Cycletrack

- 1 10' CYCLETRACK WITH MARKINGS
- 2 2' PAINTED BUFFER
- 3 ONE WESTBOUND TRAVEL LANE REMOVED
- 4 EXISTING SIDEWALK AND STREETScape REMAINS
- 5 VA HOSPITAL PARKING LOT
- 6 BEE STREET LOFTS CONDOMINIUMS



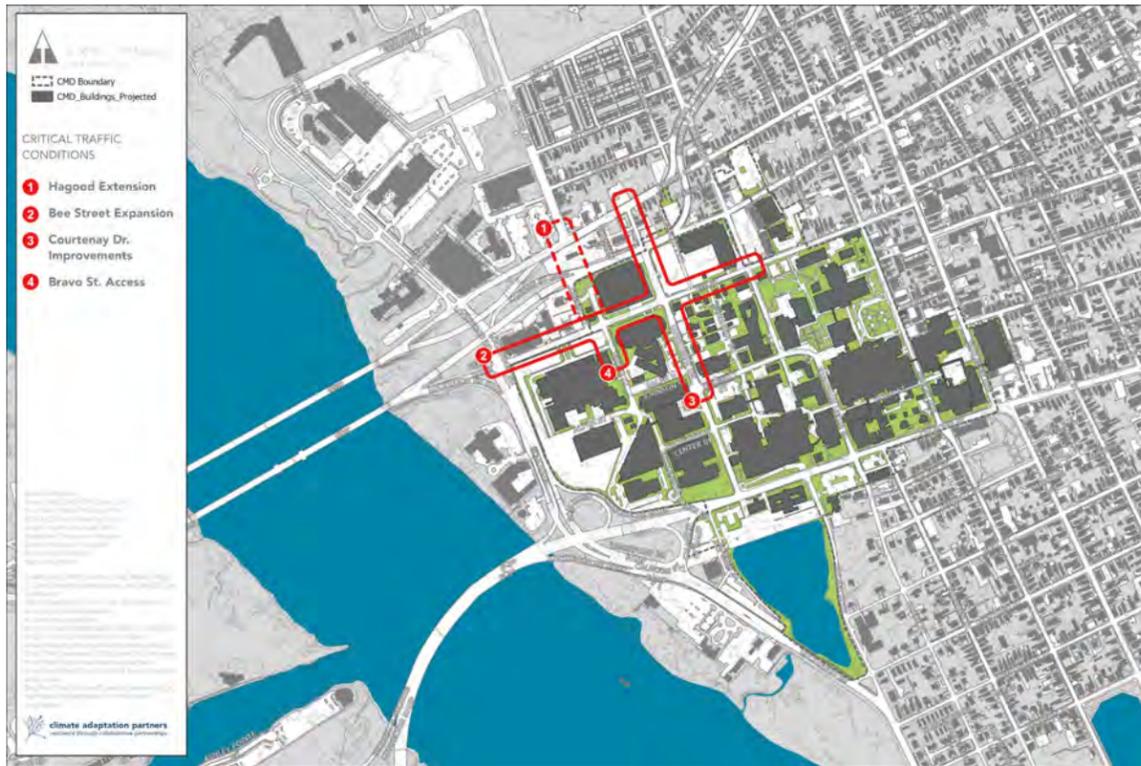
DESIGN DIVISION

Bee Street at the Ashley River Crossing

CONCEPT DESIGN

12

Above: Bee Street Cycle Track, one of several proposed approaches to the Ashley River Crossing/Bee Street Intersection. Source: City of Charleston Design Division. | Below: CMD Vertical and Horizontal Connection Opportunities illustrate the need for a coordinated elevated walkway approach. Source: Climate Adaptation Partners



Collaboration



Collaboration

Reflecting on the outputs of the charrette and the parallel processes for grant applications, letters of support for various initiatives and the need for engagement with multiple external consultants, **it is clear that for the CMD to fully realize the goals of the Memorandum of Understanding from 2015, collaboration must deepen beyond the AG; partnerships must expand; coordination across projects must increase and district governance and budgeting must be established, and the CMD must begin speaking with a unified voice.** A first step toward that level of coordination is to establish a clearer articulation of the CMD and its governance structure, its voices and its priorities. The value of such collaboration is immediately evident when requesting very limited state and federal funds.

Business-as-Usual Risk: There is heightened risk to the CMD and the member institutions in a business-as-usual environment where the member institutions act independently and without regard to all risks. Even as the AG attempts to integrate the CMD's best interests, there are ongoing, in situ processes complicating the effort. The transfer of ownership of 295 Calhoun, for example, may present a challenge to desired CMD improvements at Alberta Sottile Long Lake as bulkhead maintenance was included as part of the transfer and development / access restrictions are not yet fully understood. Also, as the USACE continues development of the storm surge barrier, the execution of which will foundationally change the nature of the western perimeter of the CMD and how the water on the CMD is managed, MUSC, Roper, and the VA are conducting parallel but disconnected institutional masterplans which vary in requirements to integrate hazards or to integrate with each other. Individual, well-intentioned projects such as the elevated walkway for MUSC lack a requirement to connect to the other institutions or to the various garages on which patients and staff depend. Infrastructure projects such as the Ehrhardt Shaft risk funding shortfalls and missed opportunities for connectivity that may limit the ability of the project to move forward to completion. **To mitigate these risks, or at least to draw down the risks, a far more coordinated approach is necessary. The program management and governance activities recommended are central to that effort, as is the direct requirement, from institutional and city leadership, to immediately begin the coordination.**

Best Practices: To quickly learn from others who have transformed from institutions to districts, the AG intends to host a series of best practice calls FY2020/Q4. These calls with other Health Districts in the country seek to understand how each is organized and to understand how each has tackled the types of planning and climate readiness that CMD needs to tackle. Guidance collected will inform AG recommendations to the SC.

Resilience Health District Plan: While it is fortuitous that each institution (as well as the Citadel and West Edge) are actively engaged in master planning efforts, currently these efforts are not coordinated and unfortunately not all have requirements for climate change integration. **A Resilient Health District Plan, an integrated master plan, inclusive of climate adaptation strategies should be the minimum.** Such a plan should articulate and prioritize phasing of new projects to optimize effectiveness and expenditures and to draw down the risks identified in the vulnerability assessment. This type of coordination should include a shared planning horizon that coordinates with the City's sea level rise strategy and other ongoing projects such as the USACE Storm Surge Barrier. A planning horizon uses dates and service life expectations to align investments, but also recognizes environmental tipping points that may occur sooner than planned. A Resilient Health District Plan should address water risks in all investments, advocate for optimal, district-wide transport and parking strategies, improve energy performance and security and reduce heat exposures through shading strategies, avoidance of canopy loss, and material choices. It should review proposed projects that still have time to course-correct for resilience improvements. Lastly it should integrate existing programs and policies to understand the current gaps toward risk avoidance and how to quickly reduce those gaps.

Innovative Financing: **The CMD should welcome innovative financing models that link health outcomes, critical services and private sector investors seeking social impact.** These should be coupled with more traditional financing and expand the awareness of the CMD catchment and population health impacts. Investors seeking such impact may well support the CMD's targeted, health-forward interests, but only if the CMD structures the work in such a way as to articulate and measure over time. Social impact investing toward population health continues to grow in scope and scale. The CMD, given its catchment area, its population served, and its range of services warrants consideration for such innovative financing. Initial AG work included meeting with representative teams who have positioned financing for other health-focused outcomes. Additional research and evaluation of possible finance innovations should run in parallel with the more obvious climate-related planning. To better understand the potential of such models to CMD needs, the AG intends to host a series of exploratory calls in FY2020/Q4 with finance leaders addressing these areas.

Evaluation and Monitoring: To access such funding, but more importantly to assure that CMD investments perform to expected standards, **the CMD should establish an evaluation and monitoring protocol for each project.** Basic questions such as those for cost/benefit should be complemented with ongoing performance rankings so that the CMD might learn over time and in doing so, reduce risks most effectively.

Communications: Finally, with such work in progress, **the CMD should articulate the work through a significant communications program** that gives greater voice to the framing of a Resilient Health District and through doing so, signals greater stability to the Charleston and regional business community.

Opportunities Detail

- 1. CMD Program Management Office:** The AG recommends continuance of its meetings through FY 2021 along with the authority and funding to implement these near-term opportunities. The overall program management of these initiatives will be via the AG while individual institutions and departments continue to manage the details of individual projects. Part of this discussion includes a more structured approach to City/CMD coordination across departments such as Planning and Stormwater. A standing oversight process will ultimately save time and improve outcomes. Without such oversight, recommendations and opportunities lack the resolve and ability to see through to completion at a district scale and in coordination with broader City of Charleston, Charleston County, BCDCOG, State of South Carolina and USACE efforts. To do this, the AG needs the SC to provide the authority and budget to establish a program management office providing oversight of these opportunities and integrating these within and across the three institutions and with external partners.
- 2. CMD Resilient Health District Plan:** The AG recommends the development of a Resilient Health District Plan that synthesizes flooding, heat and transportation strategies with ongoing master plans and proposed projects. This is not to eliminate the individual master planning efforts, but to establish a coherent district wide approach in which each effort coheres and complements the other. Current approaches tend to not always be climate-inclusive, lack integration of the vulnerability assessment and tend to limit the ability for the district to function holistically. Institutional integration is not currently required and as a result, parallel processes hinge on the reconciling actions of the AG instead of building from a shared vision of the future of the CMD. Moreover, with this limited integration, straightforward concerns about the viability of projects during their expected service life and the assumed planning horizon for the district remain unanswered, exposing investments to earlier than expected end of service life or other capital loss risks. Implementation timing is not typically measured against risk exposure and so performance expectations or performance evaluation is missing. Developing a Resilience Health District Plan could address these challenges.

Action Steps

Given the opportunities identified, the AG recommends these Actions for 2020-2021. Details of each are in the Executive Summary, Action Steps Table. The AG assumes monthly reporting on progress of each.

R1 CMD Program Management Office: Establish CMD Program Management Office and institutional outreach. Submit these charrette outputs to the City Planning Department for integration in the Comprehensive Plan update.

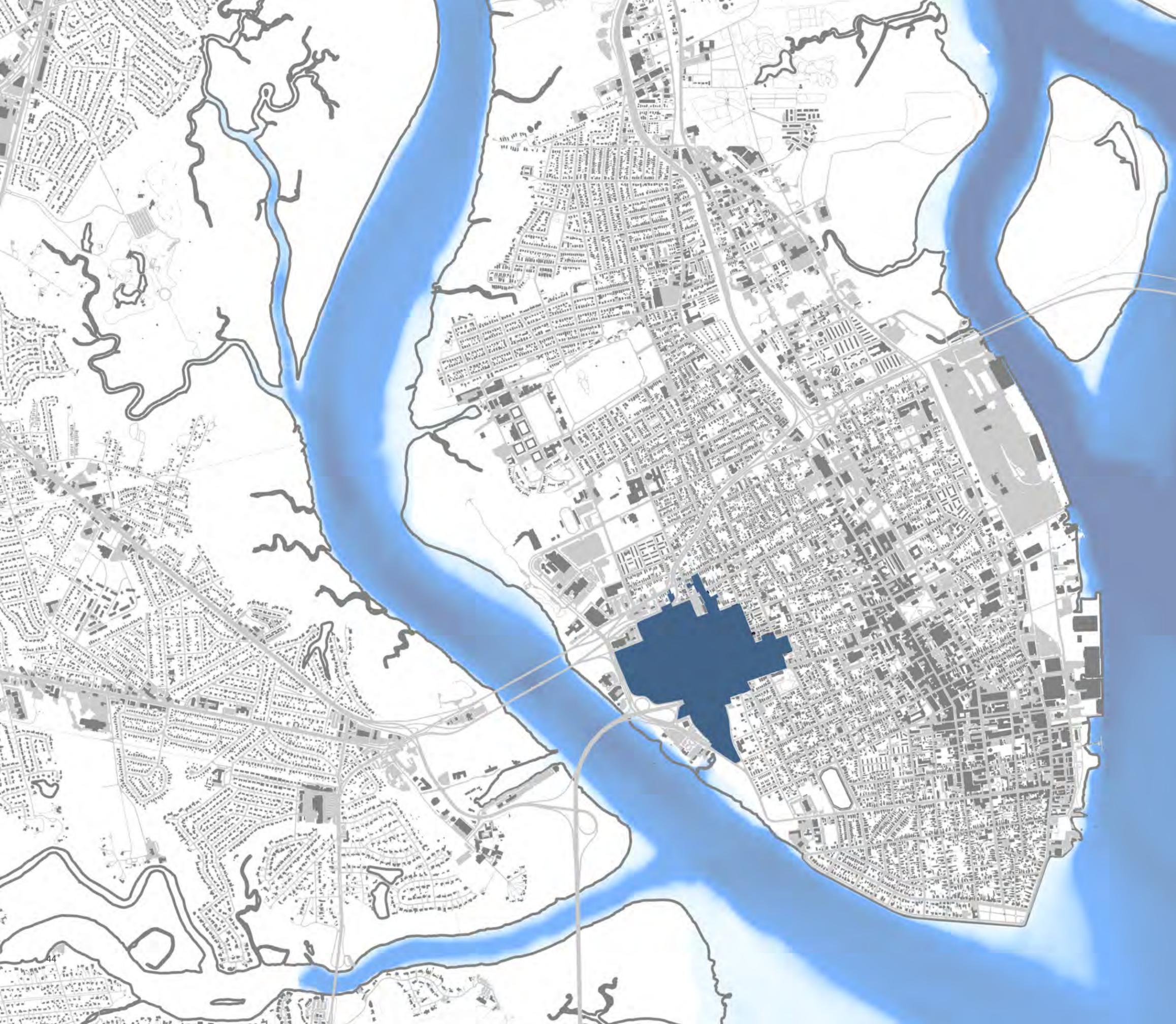
R2 CMD Resilient Health District Plan: Develop CMD Governance Approach, Communications Protocols and Masterplan integration Approach inclusive of service life expectations.

Resilience Guideline Recommendations

Proposed CMD investments (whether renovation or new construction) should:

Require resilience performance in all scopes as part of the base contract. Develop boiler plate language for consistency across institutions.

Develop evaluation and monitoring approaches to understand efficacies of investments and establish continuous improvement processes.



Appendices

For each virtual charrette,
available resources include:

Meeting Recording

Meeting Presentation Materials

These are archived with CMDAG
and available as needed.





climate adaptation partners
resilience through collaborative partnerships