

MEMORANDUM



TO: The Honorable Mayor John Tecklenburg, Mark Wilbert, Amy Wharton, Chief Curia, Chief Reynolds, Keith Benjamin, Matt Fountain, Robert Hauck, Jason Kronsberg, Jacob Lindsey, Geona Shaw-Johnson

FROM: Tracy McKee, Chief Innovation Officer; Susan Poteat, Director of Process & Service Improvement

CC: Naomi Broughton, Dennis Dowd, Daniel Flessas, Matt Frohlich, Mandi Herring, Andrea Jones, Rick Jerue, Stephen Julka, Jason Krusen, Katie McKain, Christopher Morgan, Shannon Scaff, Chip Searson, Robbie Sommerville

SUBJECT: FloodStat Meeting Report

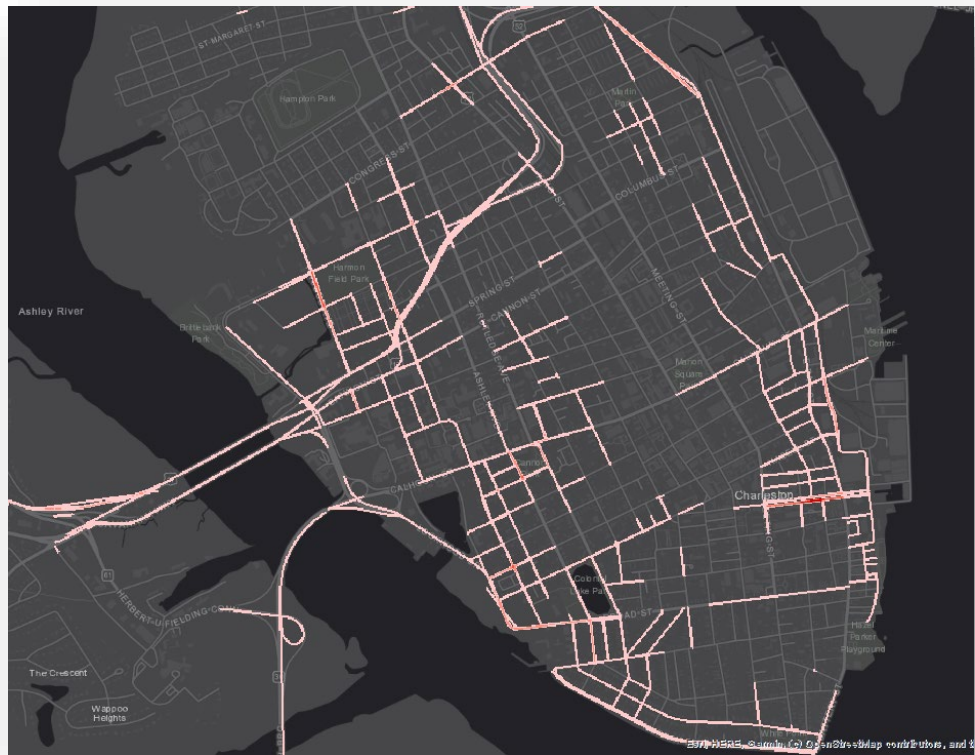
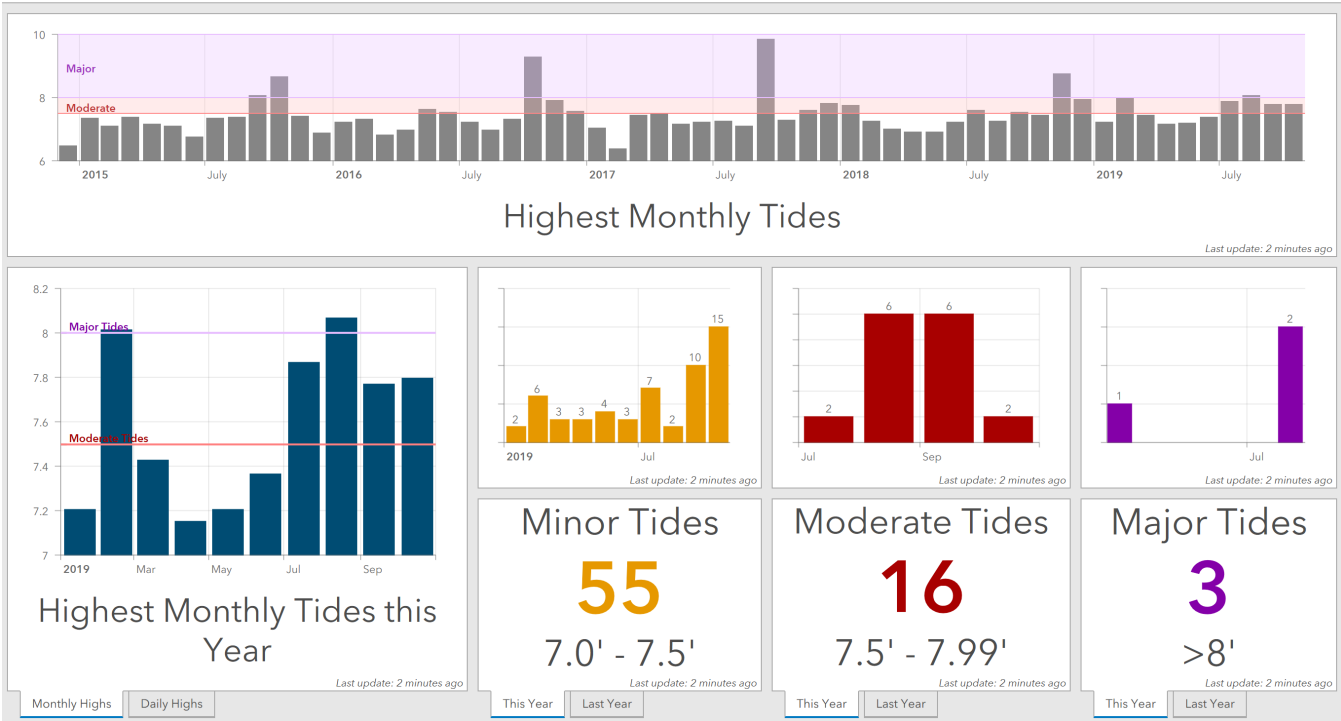
November 15, 2019

A FloodStat meeting was held Thursday, November 7th at 8:30 AM in the Municipal Emergency Operations Center (MEOC). The overall objective of the FloodStat program is to ***Increase the City's Resilience to Flooding, SLR, and Storm Surge.***

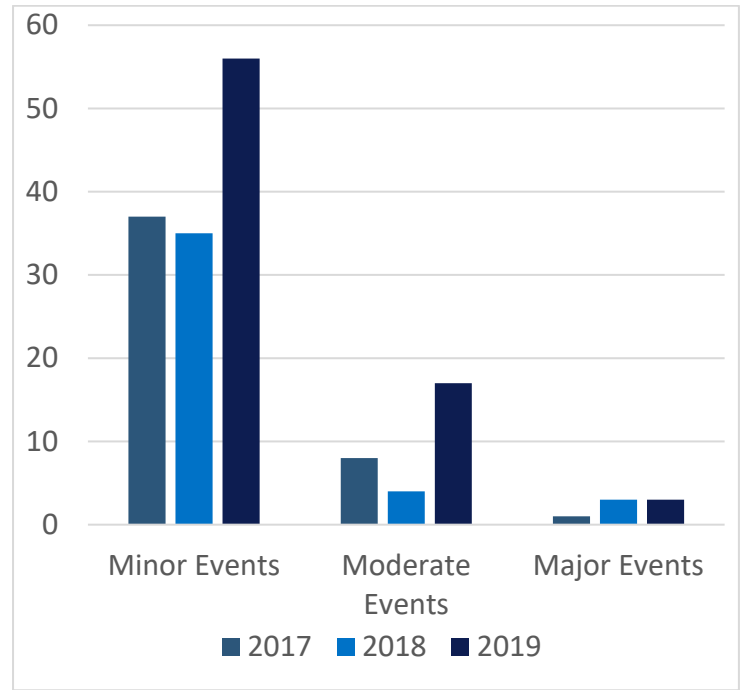
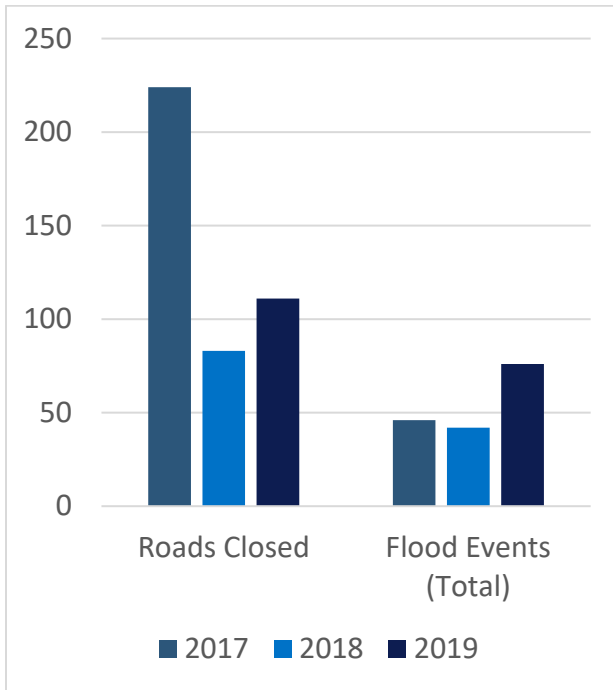
We kicked off the meeting reviewing some basic flood related statistics and highlighted a new [Local Tide Trends Dashboard](#) created by the GIS team (screenshot below). As well as a map that highlights road closures since 2015 when the GIS team began collecting that data.

The primary focus of this meeting was for metric owners to report on their final accepted metrics and associated baselines and goals. Metrics for Sustainability, Emergency Management, Stormwater, and Planning were covered. At the December 5th meeting metrics for Traffic & Transportation, Housing, and Parks will be reviewed.

Local Tide Trends - NOAA Station 8665530 - Charleston, SC



MAP: Density of road closures due to flooding since 2015



Sustainability

| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|---|---------------------|-------------------------------|-------------------------|
| 5 | Increase the number of storm drains adopted in the City. | Quarterly | Storm drain adoption database | Sustainability Director |
| 5 | Reduce carbon emissions 80% by 2050. | Annually | Greenhouse Gas Audits | Sustainability Director |
| 5 | Increase the number of businesses and homeowners that participate in voluntary stormwater detention programs. | Quarterly | Rainproof Charleston | Sustainability Director |

| | | | | |
|---|---|-----------|----------------------|-------------------------|
| 5 | Increase the number of gallons of stormwater diverted from the central stormwater system through voluntary detention efforts. | Quarterly | Rainproof Charleston | Sustainability Director |
|---|---|-----------|----------------------|-------------------------|

Discussion:

153 storm drains are currently adopted with thousands available for adoption so there is a lot of opportunity to increase participation in this program.

Emissions:

Citywide Emissions: Our citywide baseline of carbon emissions aims to capture all buildings, transportation, and waste in City limits (with some exceptions, such as boats and rail), and the baseline of 2.17 mmt CO₂e (million metric tons of CO₂e) was established in 2002 and our goal is to decrease to 0.48 mmt CO₂e by 2050.

Municipal Emissions: Greenhouse gas audits also report on City government emissions, aiming to capture specifically City buildings and streetlights, City fleet, and City employee commute. Our government goal is the same, 80% reduction by 2050, and our municipal baseline of 38,046 mt CO₂e (metric tons of CO₂e) emissions was also established in 2002, and our goal is to decrease emissions to 7,609 mt CO₂e by 2050.

It was suggested that we put a team together from Sustainability, Finance, Stormwater, and Capital Projects to evaluate our ability and capacity to reduce emissions as well as be a leader in participating in the City’s stormwater detention programs.

There is a current Rainproof Charleston pilot that is underway to help develop the data collection and reporting structure. Baseline: 0 ppl (about 8ppl are interested, but nothing installed yet)

Consider adding an EV station goal, and Fleet goal- transitioning City Fleet to electric vehicles or hybrid- Mayor suggested at RSAC mtg 11/14

Emergency Management

| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|---|-------------------------------|----------------------|-----------------------|
| 1 | Develop the City’s proactive traffic management and communications plan by TBD | Quarterly until complete | | Emergency Manager |
| 1 | 100% implementation of the City’s traffic management and communications plan. (Future) | Quarterly (plans); Post event | | Emergency Manager |
| 5 | Increase the number of city residents that subscribe to the Charleston County Alert System. | Quarterly | Charleston County EM | Emergency Manager |

Discussion:

The Emergency Management (EM) Team has sent out 26 notifications to staff since May related to flooding, not including communications related to Hurricane Dorian. While EM staff are the initial “owners” of the traffic management and communications plan, there will be a team associated with reporting on the achievement of plan implementation once the plan is established. The jumping off point for the plan are the Functional Checksheets for Flooding (Attachment A) already developed by the EM team. A technical solution for notifying and tracking notification acknowledgments should be developed while the plan is being finalized. Discussing using the County’s Everbridge system as a solution or part of the solution should be investigated.

The EM team has reached out the Charleston County EM to get a baseline number of citizens that have already signed up for the County Alert System. EM should also reach out to Dominion to help get our most vulnerable populations registered and cell phone providers to help with outreach.

Housing

| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|---|---------------------|--------------------------|---|
| 3 | Zero affordable housing units vulnerable to SLR and flooding. | Quarterly | Vulnerability Assessment | Community Development Coordinator / Community Outreach and Homelessness Coordinator |

Discussion:

Housing and Planning are collaborating on affordable housing in preparation for the City’s Comprehensive Plan and are working on the analysis to establish a baseline, goals, and tools to mitigate. More discussion about this metric will be forthcoming in the December meeting.

Stormwater Director

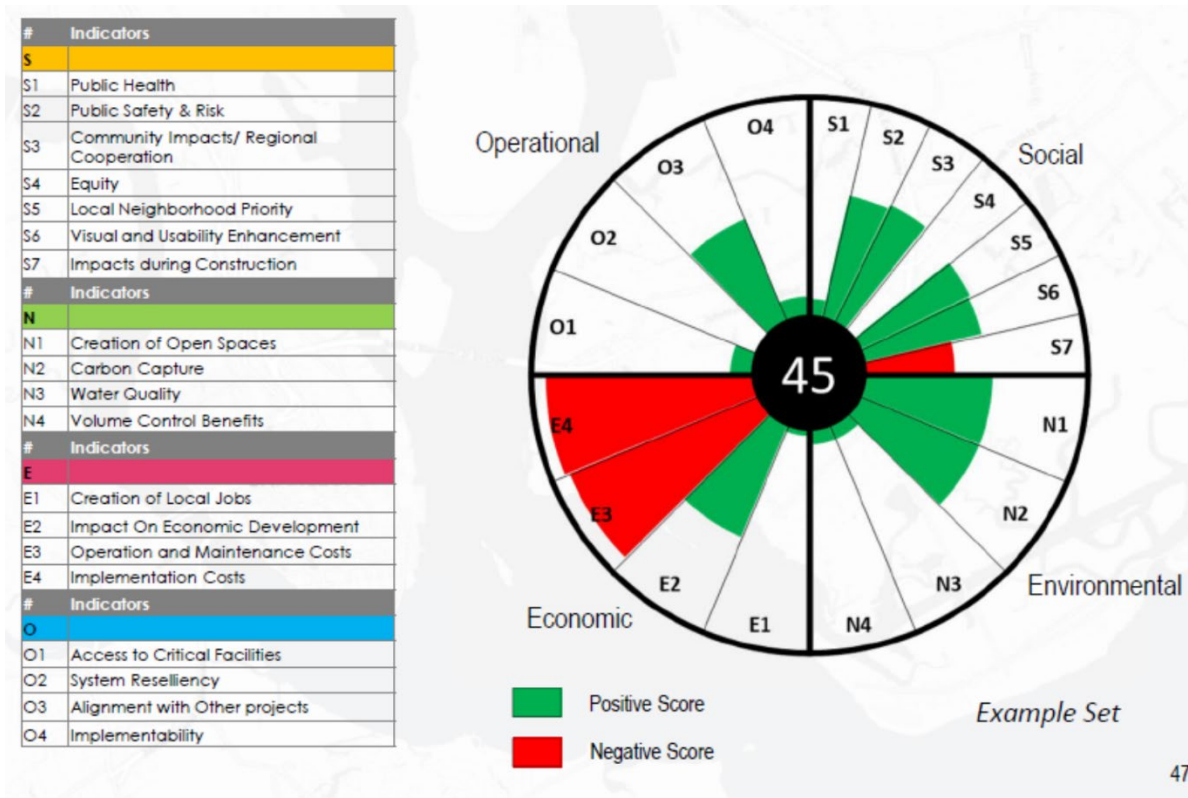
| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|--|---------------------|---------------------------------|-----------------------|
| 3 | Keep the major life corridors operational during a flood event. | Quarterly | Road closures; Waze | SW Director |
| 4 | 100% of CP using stormwater funds are prioritized through accepted, standardized stormwater and sustainability criteria. | Quarterly | Annual Capital Improvement Plan | SW Director |

Discussion:

Not unlike the EM traffic management & communications plan, keeping our major life corridors operational during a flood event will require cross-department collaboration. Data on road closures is already being

collected, we will just need to have the major life corridors identified in GIS to make the analysis simple after an event.

The Stormwater (SW) department led an exercise with department heads to prioritize stormwater projects and communicate these priorities in a simple and meaningful way to City Council and citizens. An example infographic is provided below:



SW Management Superintendent

| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|--|---------------------|----------------|------------------------------|
| 3 | 100% implementation of stormwater preventative maintenance plan. | Quarterly | WOMS | SW Management Superintendent |

Discussion:

Stormwater implemented the work order management system (WOMS) since earlier this year and has been tracking maintenance work. They are still working through an initial pass of all the existing ditches to clean, improve, or reopen. The initial pass of rear yard ditches should be completed in the first quarter of 2020 and front ditches will take another two years. Once initial passes are complete, regular maintenance should be much more efficient. An important note, the City SW team is coordinating with Charleston County to ensure that entire neighborhoods are being addressed instead of only by jurisdiction which is often not effective.

Floodplain Manager

| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|--|---------------------|-----------------|-----------------------|
| 2 | Improve the City’s CRS Rating to #4 by 2023. | Quarterly | CRS point audit | Floodplain Manager |
| 2 | Actively reduce the number of repetitive loss properties. | Quarterly | NFIP | Floodplain Manager |
| 5 | Annually increase the percentage of properties in the City that carry flood insurance. | Quarterly | NFIP | Floodplain Manager |

Discussion:

The FEMA Community Rating System (CRS) is a prime indicator in our ability to address our goal of reducing flood damage to private property. It not only is a direct reflection of this, but it also results in reduced flood insurance premiums for our citizens. The City of Charleston currently has a CRS rating of 6 and we are on schedule for an evaluation in 2020 where we should be able to meet the criteria to increase our rating to a 5. The Floodplain Manager has already created the CRS point audit and will present quarterly on our opportunities and progress.

The City of Charleston not only has the highest number of repetitive loss properties of any community in the state, but also the highest percentage of repetitive loss properties in the state. However, the metric regarding repetitive loss properties may need some adjusting due to how repetitive loss properties are defined. Per the NFIP program, it is a rolling 10 year window so if we do nothing and have no events in 10 years our number of repetitive losses would reduce to zero creating a false positive.

Most homeowners are required to carry flood insurance by their mortgage lender. Those homeowners that do not have a mortgage, are not required to carry flood insurance and will be the primary target of this outreach.

Planning

| KEY INDICATOR | METRIC | REPORTING FREQUENCY | DATA SOURCE(S) | POSITION(S) REPORTING |
|---------------|--|---------------------|--|-----------------------|
| 2 | Decrease the number of high risk acres that can be developed. | Quarterly | Vulnerability Assessment, Comprehensive Plan | Planning Manager |
| 2 | Increase the number of historic properties in the BAR district that apply for, receive approval and elevate. | Quarterly | Energov | City Architect |

Discussion:

While working to identify and classify high risk areas, the Planning Department is also investigating a variety of tools that can be leveraged such as zoning changes or TDR/PDR policies to ensure future development appropriately reflects a property’s level of flood risk. This metric will gain clarity as Planning navigates the update of the City’s Comprehensive Plan.

29 structures in the BAR district have been approved for elevation and an additional 35 are at various stages in the approval process. Planning staff are working on ways to streamline the process for homeowners. Establishing a good baseline, is going to take coordination with GIS and the building department. Discussion also highlighted an opportunity to create additional awareness to homeowners and applicants during the permit process. A small team will be meeting soon to implement the idea.

ATTACHMENT A

Functional Checklist for Level 3 Flooding

Level 3 flooding may involve heavy and/or prolonged periods of rainfall, excessive high tides, or a combination of factors that present a nuisance to motorists and/or require a few road or partial lane closures. These are non-tropical cyclone and non-life-threatening events.

1) City of Charleston Emergency Management staff:

- **Monitor forecasts, communicate with NWS, and notify key departments.** Monitor weather forecasts, communicate with National Weather Service (NWS) Charleston as necessary, and notify via e-mail key City departments about Level 3 flooding as far in advance as possible.

2) City departments. City departments noted below will consider the following actions and implement them as appropriate depending upon specific weather guidance and in accordance with departmental policies and guidance. Departments shall refer to Emergency Operations Plan standards in their preparations. To maximize coordination, departmental points of contact will promptly report to City of Charleston Emergency Management staff all actions implemented as well as decisions not to act involving resources and personnel.

2a) GIS:

- **Publish flood-prone streets.** Pre-populate flood-prone streets for “possible flooding” in GIS database at least one hour before high tide.
- **Ensure road closures and re-openings appear for public viewing.** Ensure road or partial lane closures and re-openings appear for public viewing in <https://gis.charleston-sc.gov/road-closures/>.

2b) Charleston Police Department:

- **Observe and report flooding and road conditions; oversee barricade deployments.** Observe and report flood levels, especially in flood-prone areas. Monitor and report road conditions that require road or partial lane closures. Provide oversight of barricade deployments.
- **Coordinate with GIS to report road closures and openings.** Coordinate with GIS to report road and partial lane closures and re-openings to ensure 24/7 real-time information is being populated into <https://gis.charleston-sc.gov/road-closures/>. Ensure that the City’s road closure website is current, and that media reported road closure information is accurate.
- **Tweet road closures as they occur (Police PIO).**

2c) Charleston Police Department and Traffic & Transportation:

- **Coordinate traffic management.** Coordinate traffic management using synthesized data from NWS Charleston, the City’s GIS website, response agency observations, publicly-generated social media, and cameras and sensors where available.

2d) Public Information Office:

- **Warn and instruct motorists if needed.** Warn and instruct motorists and residents well in advance of, during, and after an event regarding flooding severity, potential traffic disruption, and alternative travel options if needed.
- **Coordinate with Emergency Management and the Police Department if needed.** Coordinate with City of Charleston Emergency Management and the Charleston Police Department regarding situational updates if needed.
- **Provide messaging to Citizen Services Desk if needed.** Provide to the Citizen Services Desk flood-related messaging for the public if needed.

2e) Stormwater Management Department:

- **As warranted, initiate pre-flood and flooding plan as appropriate.** Clear and vacuum drains as needed.
- **Prepare for “day of” flooding.** If conditions warrant, prepare for “day of” flooding actions.

2f) Citizen Services Desk:

- **Prepare for citizen questions and adjust staffing if needed.** Coordinate with City departments to answer citizen questions if needed. Extend staffing hours appropriate to severity of forecast flooding if needed.

Functional Checklist for Level 2 Flooding

Level 2 flooding may involve heavy and/or prolonged periods of rainfall, excessive high tides, or a combination of factors that disrupt motorists' travel, may stall and damage vehicles, and will likely result in more than a few road or partial lane closures. These are non-tropical cyclone and non-life-threatening events.

1) City of Charleston Emergency Management staff:

- **Monitor forecasts, communicate with NWS, and notify key departments.** Monitor weather forecasts, communicate with National Weather Service (NWS) Charleston as necessary, and notify via e-mail key City departments about Level 2 flooding as far in advance as possible.
- **Coordinate messaging.** Coordinate with PIO on pre-event public messaging and planned city-wide actions if needed. Update as appropriate.
- **Notify external partners.** Notify external partners of potential flood- or storm-related concerns.
- **Maintain awareness and update departments on actions taken.** Maintain situational awareness of all planned actions as reported and update City departments on changing conditions including weather, flooding, and business and neighborhood concerns.
- **Consider PSOC opening.** If needed, collaborate with Police Department leadership on opening the Public Safety Operations Center (PSOC), for which the Police Department would have the final decision.
- **Seek department head recommendations for Mayor's consideration.** If needed, facilitate discussion among department heads on recommendations regarding City employees, offices, and businesses prior to presenting them to the Mayor for approval.

2) City departments. City departments noted below will consider the following actions and implement them as appropriate depending upon specific weather guidance and in accordance with departmental policies and guidance. Departments shall refer to Emergency Operations Plan standards in their preparations. To maximize coordination, departmental points of contact will promptly report to City of Charleston Emergency Management staff all actions implemented as well as decisions not to act involving resources and personnel.

2a) GIS:

- **Publish flood-prone streets.** Pre-populate flood-prone streets for "possible flooding" in GIS database at least one hour before high tide.
- **Ensure road closures and re-openings appear for public viewing.** Ensure road or partial lane closures and re-openings appear for public viewing in <https://gis.charleston-sc.gov/road-closures/>.

2b) Charleston Police Department:

- **Observe and report flooding and road conditions; oversee barricade deployments.** Observe and report flood levels, especially in flood-prone areas. Monitor and report road conditions that require road or partial lane closures. Provide oversight of barricade deployments.
- **Coordinate with GIS to report road closures and openings.** Coordinate with GIS to report road and partial lane closures and re-openings to ensure 24/7 real-time information is being populated into <https://gis.charleston-sc.gov/road-closures/>. Ensure that the City's road closure website is current, and that media reported road closure information is accurate.

- **Tweet road closures as they occur (Police PIO).**
- **Consider pre-positioning resources.** If conditions warrant, pre-position resources for the possibility of worsening conditions that could lead to stranded motorists and rescues.
- **Consider pre-positioning tow trucks.** If conditions warrant, request tow truck assistance for stalled vehicles.
- **Liaise and coordinate with designated Barricade Team.**

2c) Charleston Police Department and Traffic & Transportation:

- **Coordinate traffic management.** Coordinate traffic management using synthesized data from NWS Charleston, the City’s GIS website, response agency observations, publicly-generated social media, and cameras and sensors where available.

2d) Public Information Office:

- **Warn and instruct motorists.** Warn and instruct motorists and residents well in advance of, during, and after an event regarding flooding severity, potential traffic disruption, and alternative travel options.
- **Coordinate with Emergency Management and the Police Department.** Coordinate with City of Charleston Emergency Management and the Charleston Police Department regarding situational updates.
- **Provide messaging to Citizen Services Desk.** Provide to the Citizen Services Desk flood-related messaging for the public if needed.

2e) Stormwater Management Department:

- **Initiate pre-flood and flooding plan as appropriate.** Clear and vacuum drains.
- **Prepare for “day of” flooding.** Prepare for “day of” flooding actions.

2f) Charleston Fire Department:

- **Consider pre-positioning resources.** If conditions warrant, pre-position resources for the possibility of worsening conditions that could lead to stranded motorists and rescues.

2g) Citizen Services Desk:

- **Prepare for citizen questions and adjust staffing if needed.** Coordinate with City departments to answer likely citizen questions if needed. Extend staffing hours appropriate to severity of forecast flooding if needed.

2h) Human Resources:

- **Warn and instruct city staff.** Warn and instruct city staff with advance notice and during and after a flood event.

Functional Checklist for Level 1 Flooding

Level 1 flooding may involve life-threatening and potentially property-damaging flooding. This type of flooding is designated as Level 1B flooding if a non-tropical cyclone event is involved and Level 1A flooding if a tropical cyclone event is involved, as described further below.

Level 1B flooding. Level 1B flooding may involve life-threatening and potentially property damaging flooding from heavy and/or prolonged periods of rainfall, excessively high tides, or a combination of factors not associated with a tropical cyclone. Such flooding will almost certainly cause road closures, stall and damage vehicles, threaten or actually damage homes, lead to rescues, and disrupt city business.

Level 1A flooding. Level 1A flooding may involve life-threatening and potentially property damaging flooding generated by tropical cyclones producing storm surge, excessively high tides, heavy or prolonged periods of rainfall, or a combination of factors. Such flooding will almost certainly cause road closures, stall and damage vehicles, threaten or actually damage homes, lead to rescues, and disrupt city business.

Whether for Level 1B or 1A flooding, response may require rescuing motorists, residents in their homes, or others. It also may require providing access for emergency vehicles, to critical facilities, or it may require diverting traffic. Road or partial lane closures and prolonged traffic disruptions are assumed. MEOC staff will use verbal briefs, Situation Reports and updates, and electronic communications to notify the Mayor; Police, Fire, and **Public Service** leadership; and other departments as necessary.

1) City of Charleston Emergency Management staff:

- **Monitor forecasts, communicate with National Weather Service Charleston, and notify key departments.** Monitor weather forecasts, communicate with National Weather Service (NWS) Charleston as necessary, and notify via e-mail key City departments about Level 1 flooding as far in advance as possible.
- **Coordinate messaging.** Coordinate with PIO on pre-event public messaging and planned city-wide actions if needed. Update as appropriate.
- **Notify external partners.** Notify external partners of potential flood- or storm-related concerns.

- **Maintain awareness and update departments on actions taken.** Maintain situational awareness of all planned actions as reported and update City departments on changing conditions including weather; life-threatening, property-damaging, or disruptive flooding; and business and neighborhood concerns.
- **Open the MEOC and initiate the Incident Action Plan.** When the Mayor or Emergency Management Director decides to activate the MEOC for life-threatening and property-damaging flooding, the Emergency Management Director will determine the beginning of the first MEOC operational period. The Incident Commander then will initiate the formation of the Incident Action Plan for the event and generate initial objectives. The Emergency Management Director also will call up persons from a pre-determined MEOC staffing roster to staff the MEOC. City departments will fill MEOC and field positions as required. The Emergency Management Director will coordinate with the Director of Human Resources and Organizational Development on staffing issues such as emergency pay, special pay codes, and leave.
- **Seek department head recommendations for Mayor’s consideration.** Facilitate discussion among department heads on recommendations regarding City employees, offices, and businesses prior to presenting them to the Mayor for approval.

2) Under the Incident Command System:

2a) The Logistics Section:

- **Initiate Logistics support.** Assume responsibility for berthing and providing food for persons in the field and for MEOC staff, subject to any guidelines about sustaining one’s self for certain periods.

2b) The Operations Section:

- **As warranted, initiate pre-flood and flooding plan as appropriate.** Additional areas to consider include:
 - **Mitigate flooding.**
 - Clear and vacuum drains ahead of an event.
 - As needed, lower City-owned lake levels and use special equipment to direct water away from areas known to flood.
 - As able, provide sand and sand bags to residents.
 - Protect city vehicles.
 - Consider public transit implications due to potential flooding.
 - **Consider public messaging using variable message signs, both static and deployable.**
- **Request resources.** Request resources from external partners ahead of the event and pre-position them as necessary to protect life and property. As necessary, request high water vehicles and swift water teams. This will require initiating requests to Charleston and/or Berkeley County through the “Palmetto” resource request system, via mutual aid, and through other official means.
- **Facilitate evacuation, transportation, and sheltering.** Facilitate evacuation, whether ordered by the Governor or a local evacuation of low-lying areas, such as occurred during Hurricane Irma.

Persuade and instruct people about evacuating, provide guidance about transportation to shelters, and inform them about shelter provisions and what they should bring.

- **Observe and report flooding and road conditions; oversee barricade deployments.** Observe and report flood levels, especially in flood-prone areas. Monitor and report road conditions that require road or partial lane closures. Provide oversight of barricade deployments.
- **Prepare for stalled cars, rescuing endangered persons, and moving critical personnel.** Prepare for stalled cars. Prepare for rescuing endangered motorists, people in their homes, and others threatened by flood water, prioritizing according to the most life-threatening situations. As resources permit, move medical and other critical personnel to and from hospitals and other critical facilities. Implement departmental directives in response to flooding. Observe safety limitations for response personnel.
- **Consider pre-positioning resources.** If conditions warrant, pre-position resources for the possibility of rescues.
- **Consider pre-positioning tow trucks.** If conditions warrant, request tow truck assistance for stalled vehicles.
- **Protect City vehicles within the Police Department.**
- **Coordinate traffic management and associated public messaging.** Coordinate traffic management using synthesized data from the NWS Charleston, the City's GIS website, response agency observations of areas that frequently flood, publicly-generated social media, and cameras and sensors where available to manage traffic and message the public. In conjunction with public messaging, anticipate and manage traffic issues, redirect traffic, and erect road closure barricades. Request tow truck assistance for stalled vehicles.
- **Publish flood-prone streets.** Pre-populate flood-prone streets for "possible flooding" in GIS database at least one hour before high tide.
- **Ensure road closures and re-openings appear for public viewing.** Ensure road or partial lane closures and re-openings appear for public viewing in <https://gis.charleston-sc.gov/road-closures/>.
- **Prepare for recovery.** Assist in readying recovery personnel to perform post-storm actions noted in the Recovery Appendix.

2c) The PIO/Joint Information Center:

- **Warn and instruct motorists.** Warn and instruct motorists and residents well in advance of, during, and after an event regarding flooding severity, potential traffic disruption, and alternative travel options.
- **Coordinate with Emergency Management and the Police Department.** Coordinate with City of Charleston Emergency Management and the Charleston Police Department regarding situational updates.
- **Provide messaging to Citizen Services Desk.** Provide to the Citizen Services Desk flood-related messaging for the public.

- **Prepare for citizen questions and adjust Citizen Services Desk staffing.** Coordinate with City departments to answer citizen questions. Extend staffing hours appropriate to severity of forecast flooding.

2d) The Planning Section:

- **Announce flood-prone streets.** Pre-populate flood-prone streets for “possible flooding” in GIS database at least one hour before high tide.
- **Ensure road closures appear for public viewing.** Ensure road or partial lane closures appear for public viewing in <https://gis.charleston-sc.gov/road-closures/>.