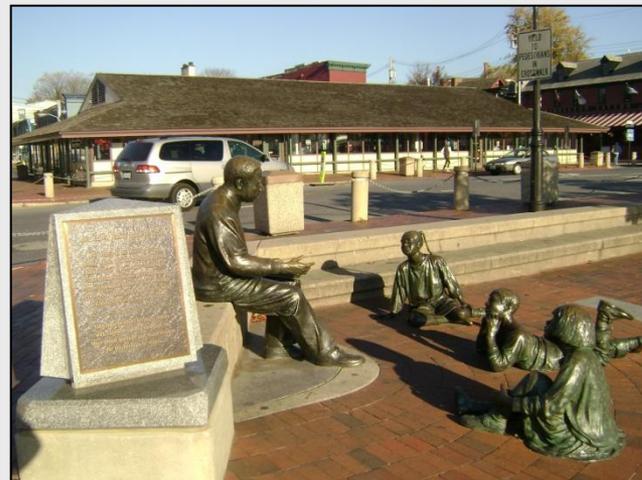
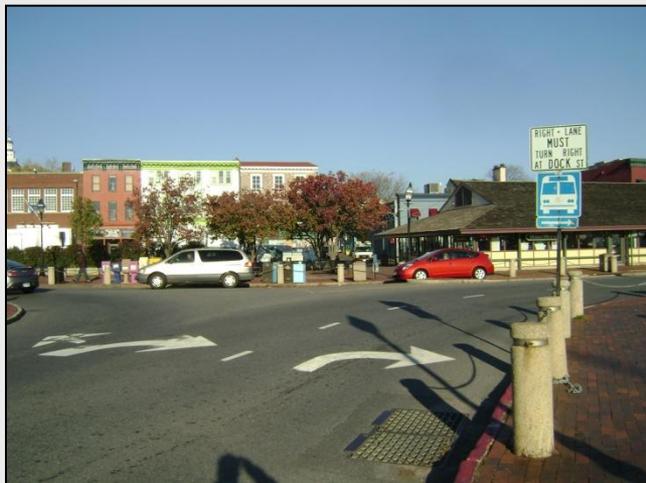
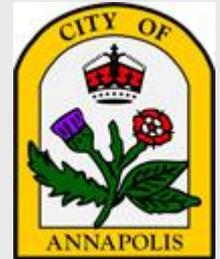


City of Annapolis



City Dock Concept Refinement & Traffic Analysis

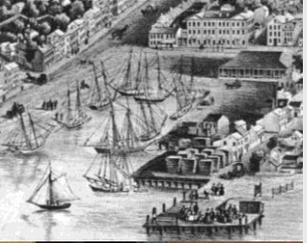
January 19, 2012

Outline

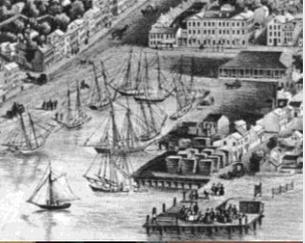
- Study Goals & Objectives
- Existing Conditions
- Alternatives
 - Refinement
 - Evaluation
 - Simulation
- Findings
- Summary of next steps



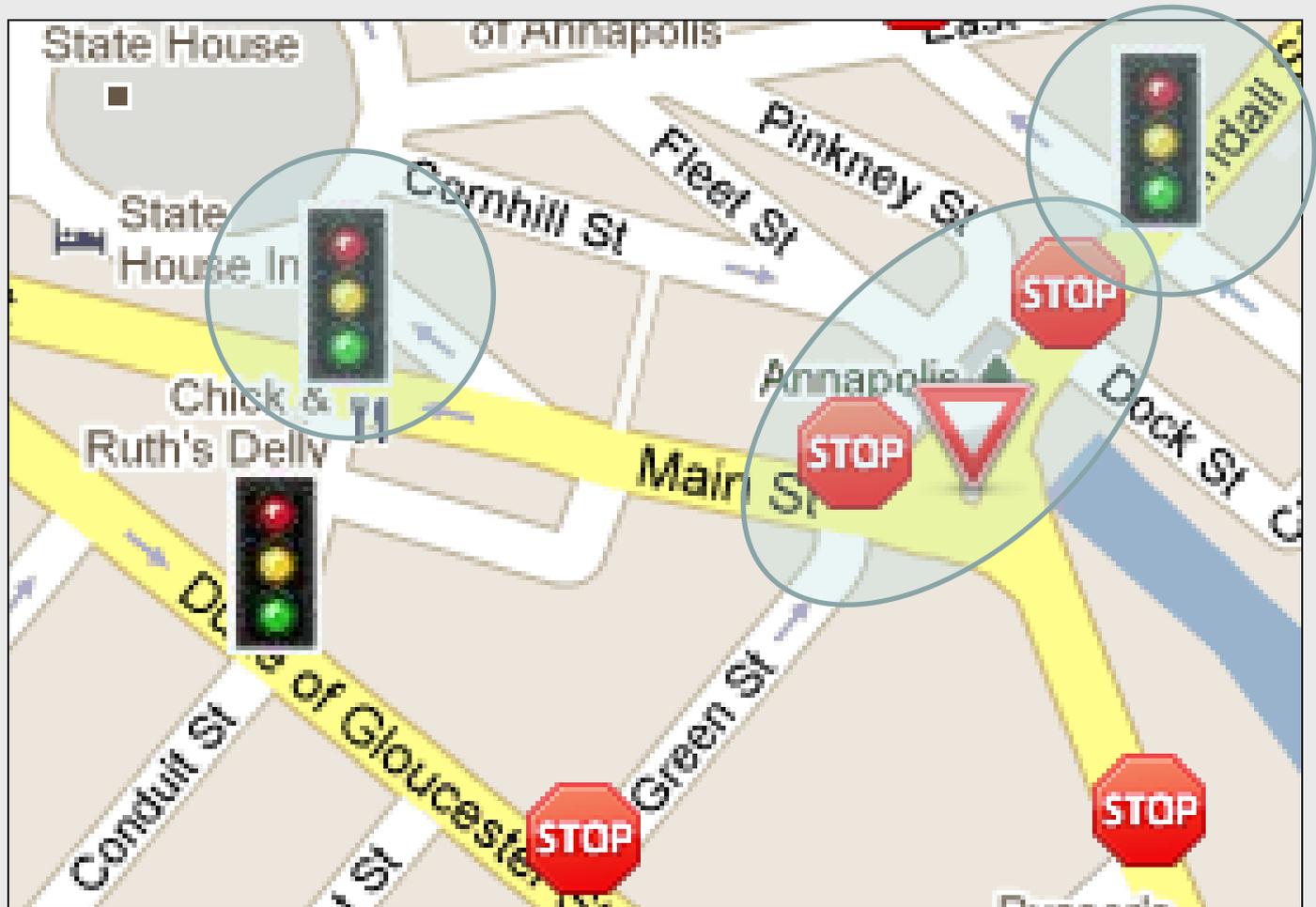
City Dock Concept Refinement & Traffic Analysis



Study Area & Intersections



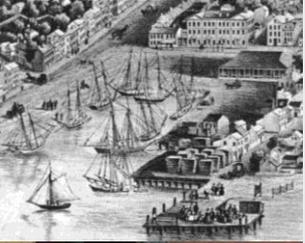
City Dock Concept Refinement & Traffic Analysis



Study Goals & Objectives

- **Public Space & Access:** Create larger, more flexible open spaces and provide improved access to the City Dock waterfront
- **Safety:** Improve transportation safety for pedestrians, bicyclists, and motorists in the City Dock area
- **Aesthetics:** Preserve and enhance the historic character and vistas of City Dock
- **Business Access:** Preserve parking and loading zones as close to existing levels as possible
- **Traffic Operations:** Manage traffic congestion to within acceptable levels

City Dock Concept Refinement & Traffic Analysis



Existing Conditions

- **Public Space & Access:**

- Large roundabout is visual barrier
- Wide crossings can be challenge for pedestrians
- Narrow sidewalks near waterfront due to large footprint

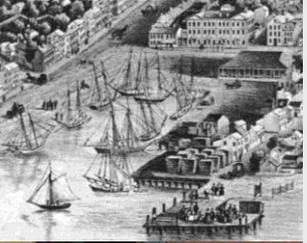
- **Safety:** Low crash rate (2 per year, none serious)

- **Aesthetics:** “the real thing”

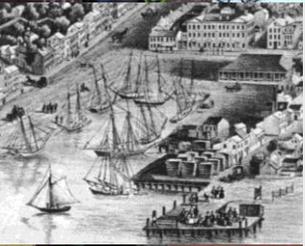
- **Business Access:** Parking and loading at or near capacity much of the time

- **Traffic Operations:** Works well on weekdays, but heavy congestion on many weekends

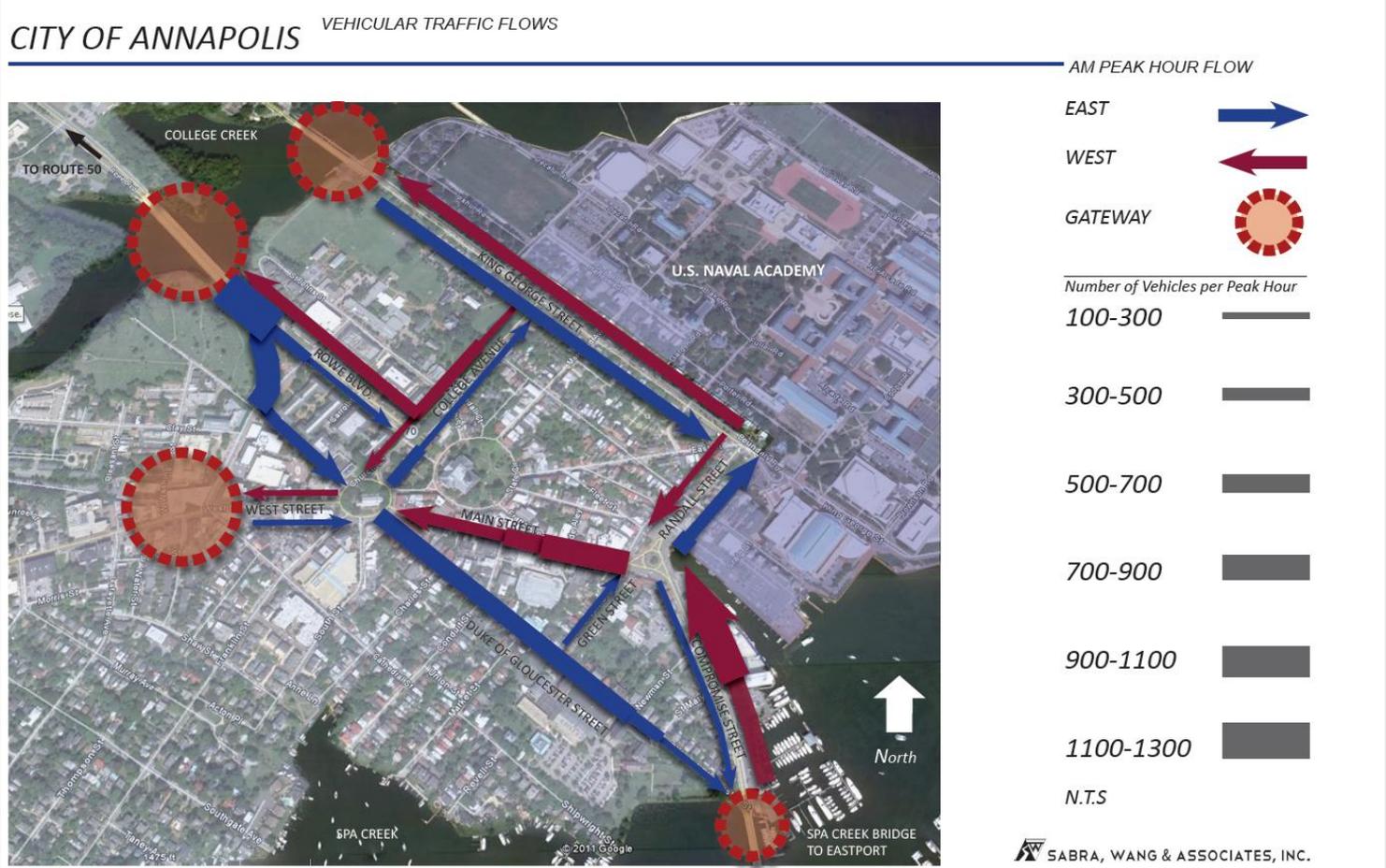
City Dock Concept Refinement & Traffic Analysis



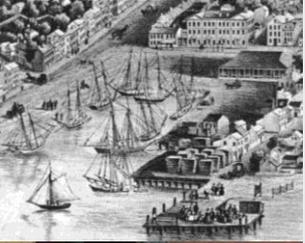
Vehicle Flow Diagram – Morning Peak



City Dock Concept Refinement & Traffic Analysis

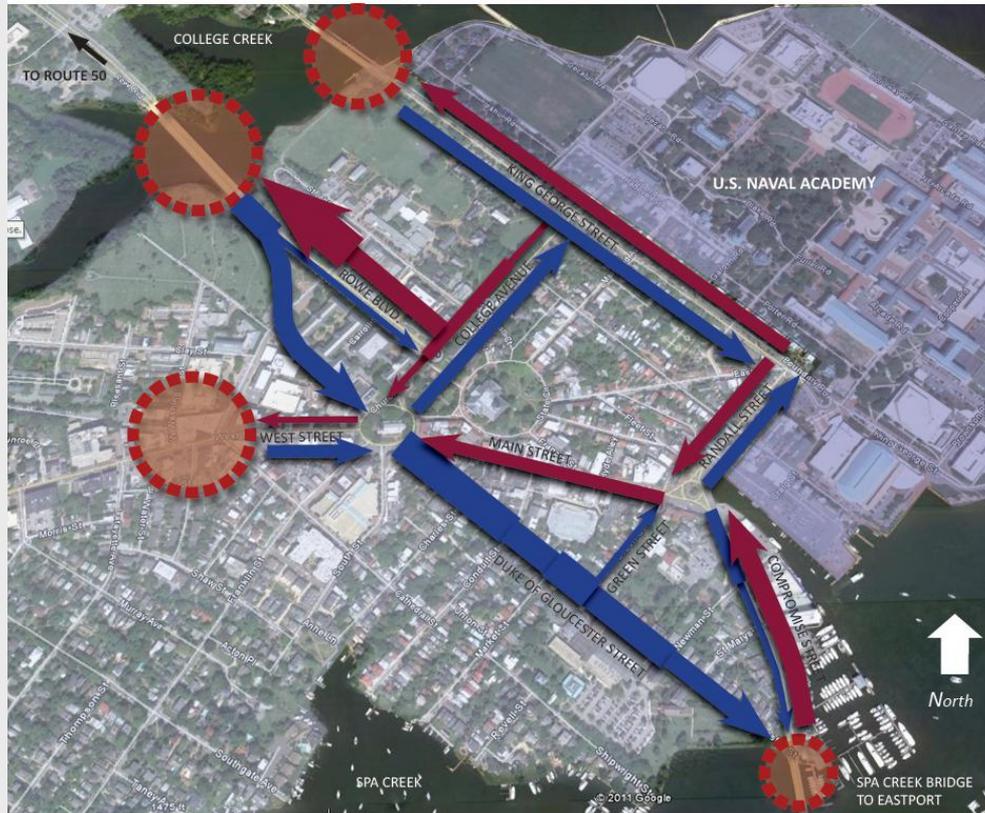


Vehicle Flow Diagram – Evening Peak



City Dock Concept Refinement & Traffic Analysis

CITY OF ANNAPOLIS VEHICULAR TRAFFIC FLOWS



PM PEAK HOUR FLOW

EAST 

WEST 

GATEWAY 

Number of Vehicles per Peak Hour

100-300 

300-500 

500-700 

700-900 

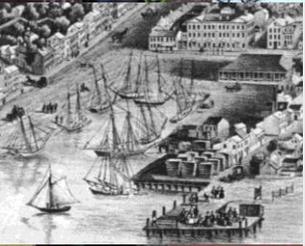
900-1100 

1100-1300 

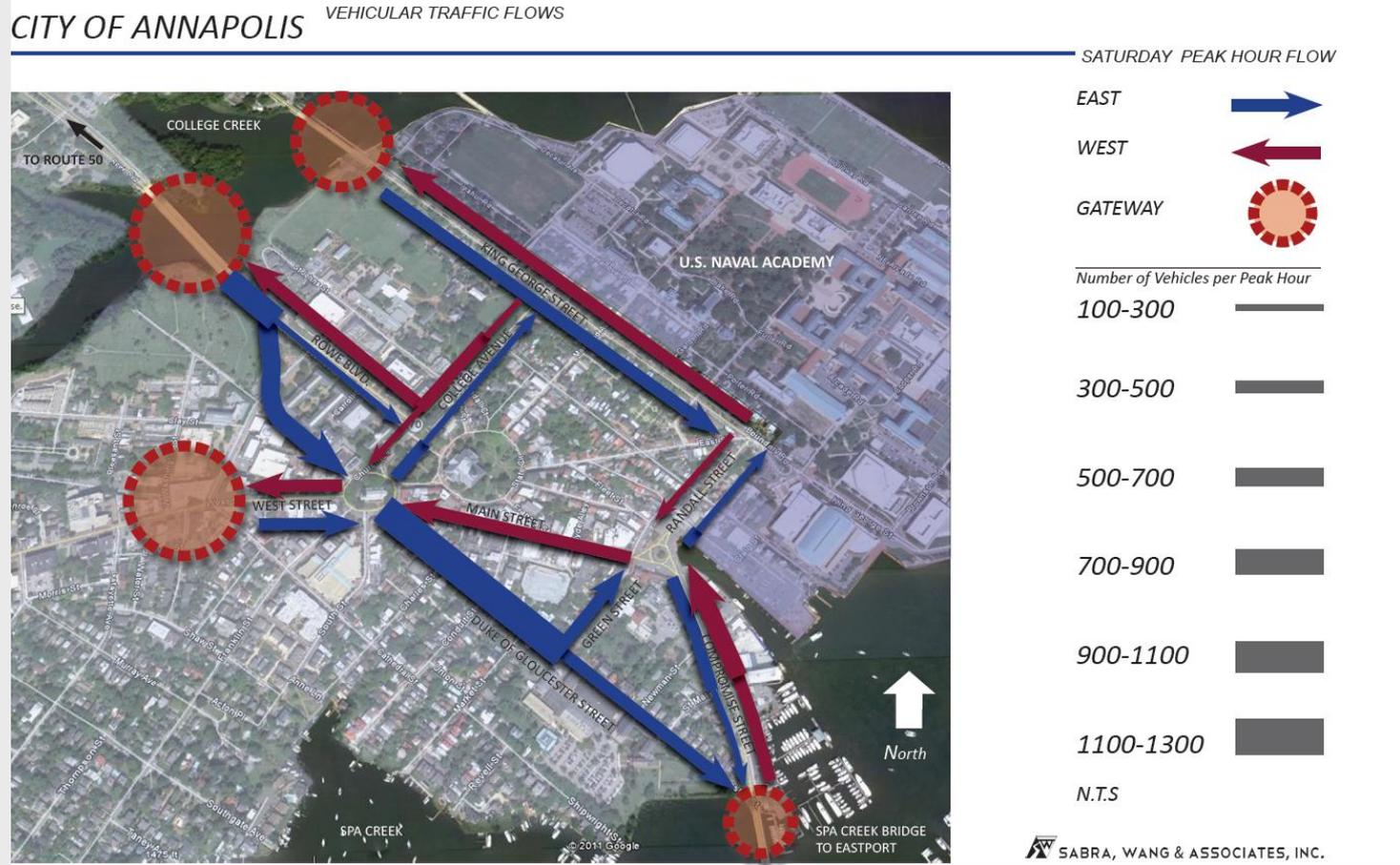
N.T.S

 SABRA, WANG & ASSOCIATES, INC.

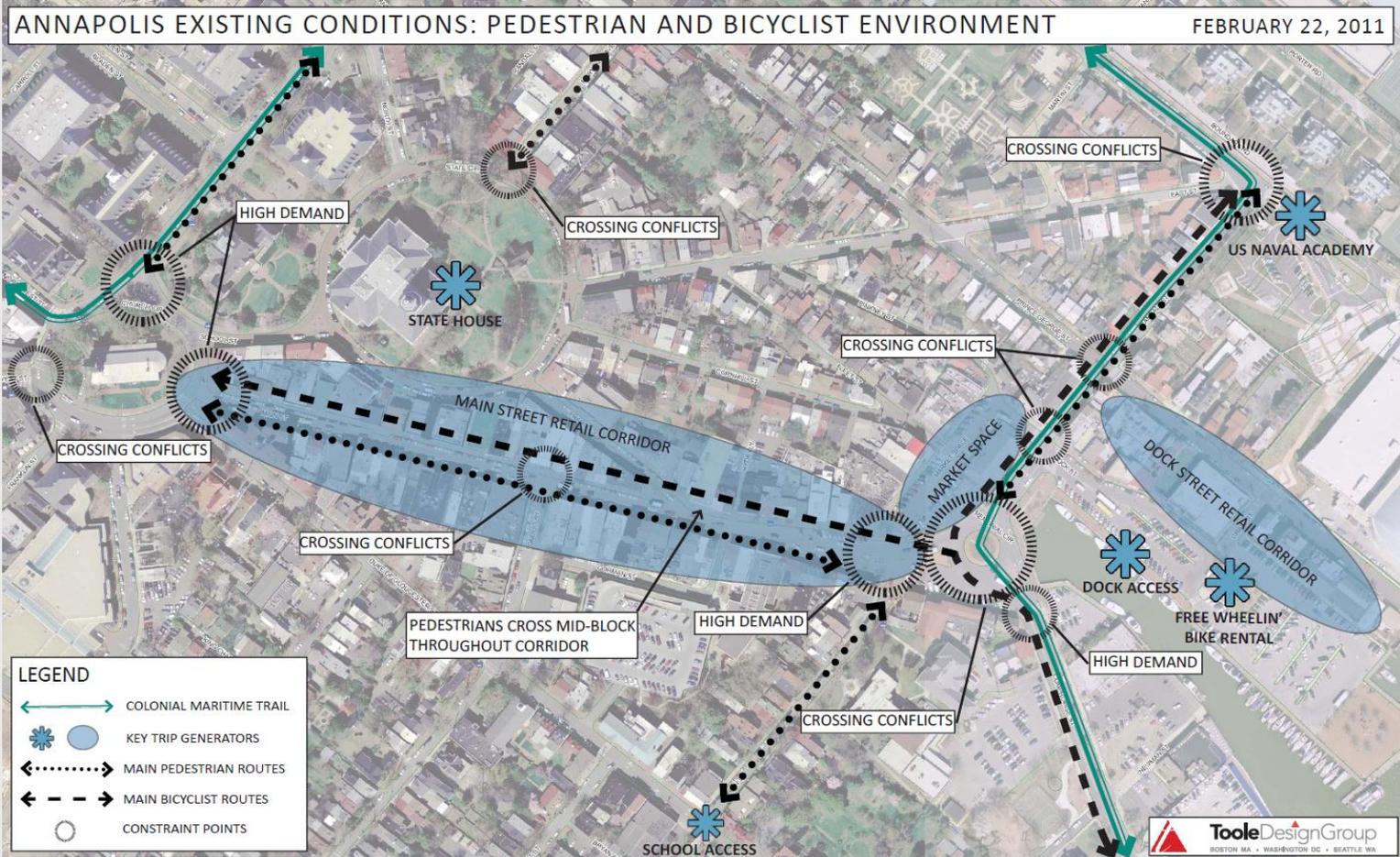
Vehicle Flow Diagram – Saturday Peak



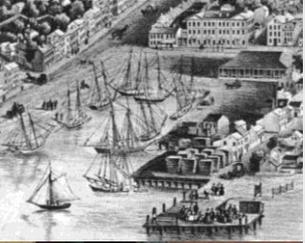
City Dock Concept Refinement & Traffic Analysis



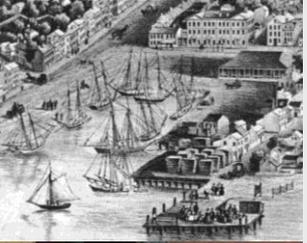
Pedestrian and Bicycle Environment



City Dock Concept Refinement & Traffic Analysis



Existing On-Street Parking Zones



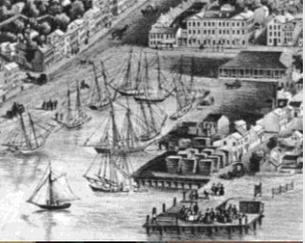
City Dock Concept Refinement & Traffic Analysis



Parking Utilization

- Harder to find parking on Saturday than weekdays
- 30-minute parking is less utilized than 2-hour parking
- Probably less demand for parking mid-afternoon than at lunch on weekdays

City Dock Concept Refinement & Traffic Analysis



Weekday

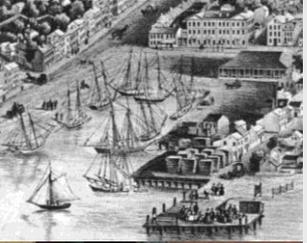


Saturday



- Angled parking spaces near Memorial Circle are last to fill

Existing Loading Areas



City Dock Concept Refinement & Traffic Analysis



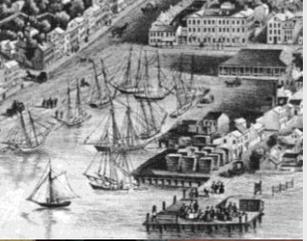
Signed Loading Zones



Unofficial Loading Areas



Existing Loading Activity

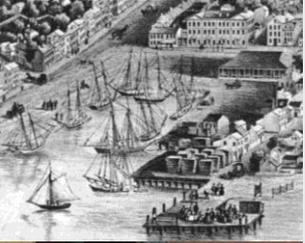


City Dock Concept Refinement & Traffic Analysis

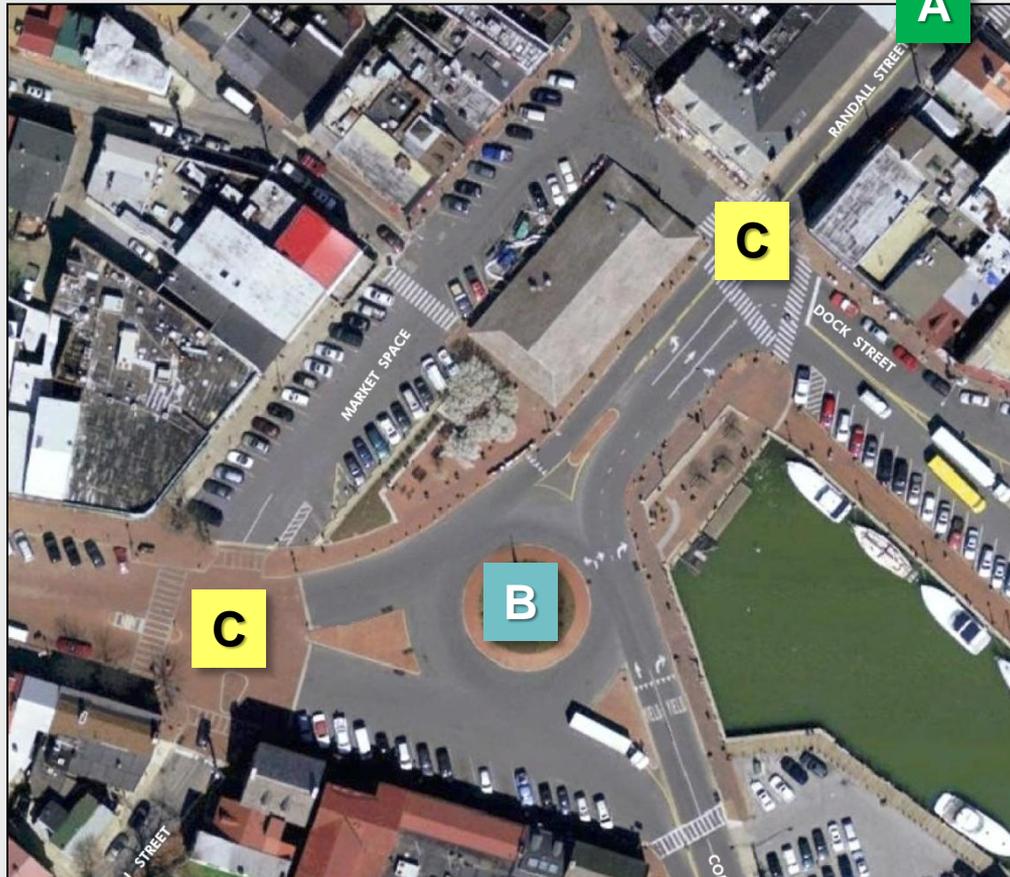


Operational Analysis

Existing – AM



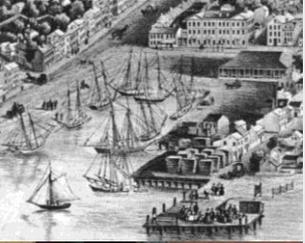
City Dock Concept Refinement & Traffic Analysis



	<u>Avg. Delay</u>
A	≤ 10 sec
B	≤ 20 sec
C	≤ 35 sec
D	≤ 55 sec
E	≤ 80 sec
F	> 80 sec

Operational Analysis

Existing – PM



City Dock Concept Refinement & Traffic Analysis



Avg. Delay

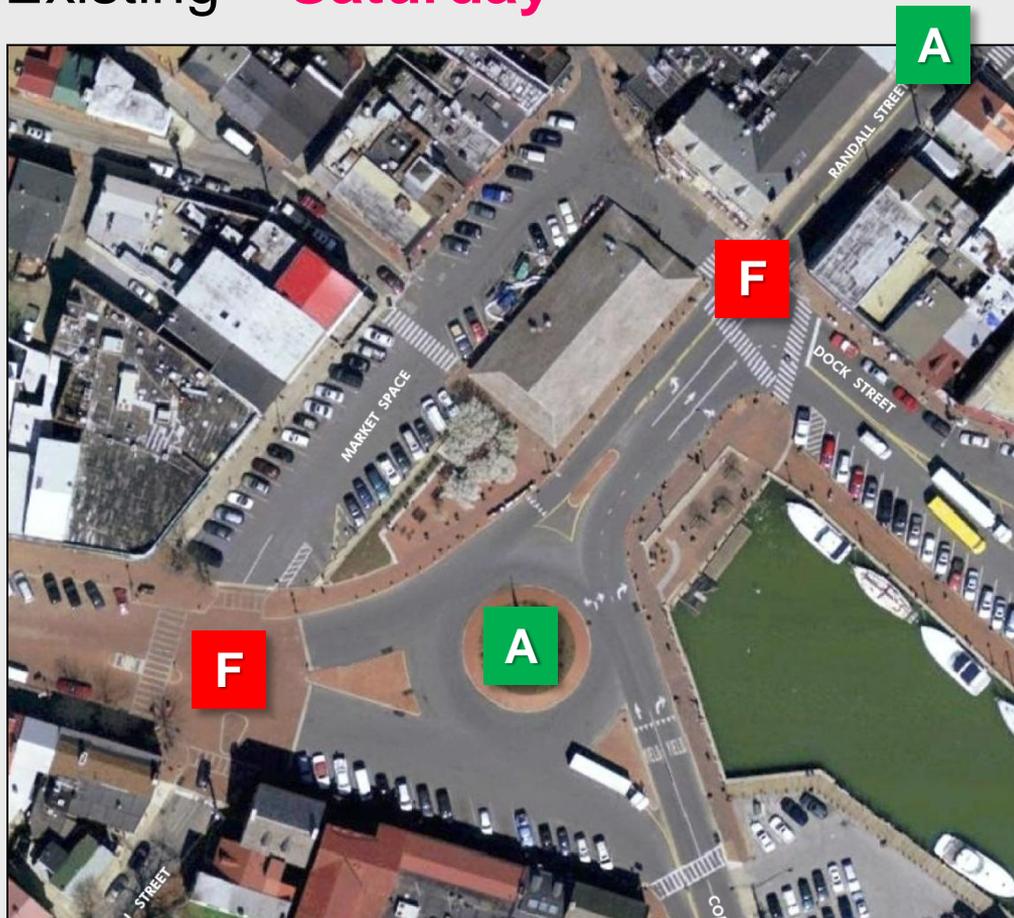
A	≤ 10 sec
B	≤ 20 sec
C	≤ 35 sec
D	≤ 55 sec
E	≤ 80 sec
F	> 80 sec



Operational Analysis

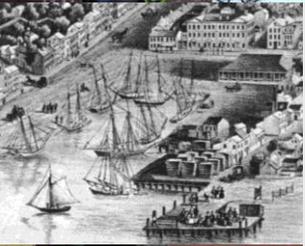
Existing – Saturday

City Dock Concept Refinement & Traffic Analysis

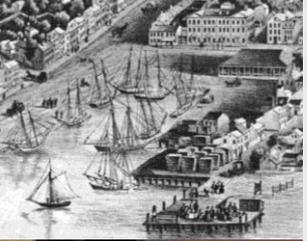


Avg. Delay

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B	≤ 20 sec
C	≤ 35 sec
D	≤ 55 sec
E	≤ 80 sec
F	> 80 sec



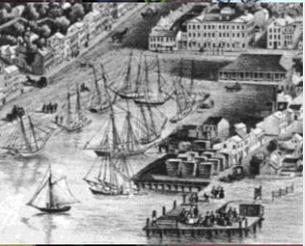
VISSIM Simulation – Existing Saturday



City Dock Concept Refinement & Traffic Analysis



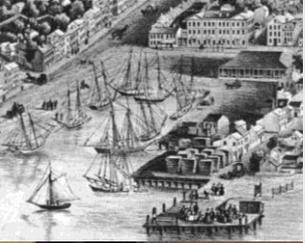
Memorial Circle – Option 1



City Dock Concept Refinement & Traffic Analysis



Option 1 – Public Space & Access

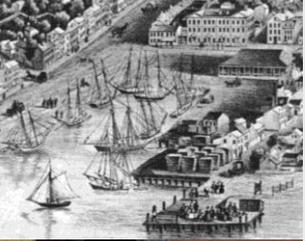


City Dock Concept Refinement & Traffic Analysis



Option 1 – Safety

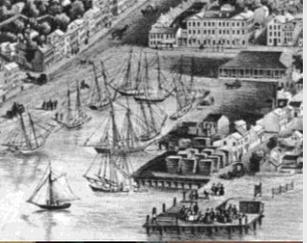
- + Similar to existing Memorial Circle, which has **excellent safety record** (0 reported crashes 2007-2009)
- + Circle made into somewhat safer roundabout by **narrowing lanes** and **deflecting traffic** on all approaches to reduce speeds
- **Pedestrian concern** that drivers will continue to not yield the right of way.



City Dock Concept Refinement & Traffic Analysis



Option 1 – Aesthetics



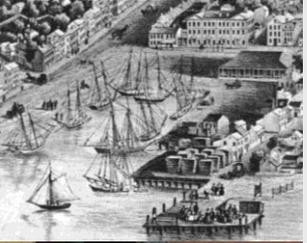
City Dock Concept Refinement & Traffic Analysis



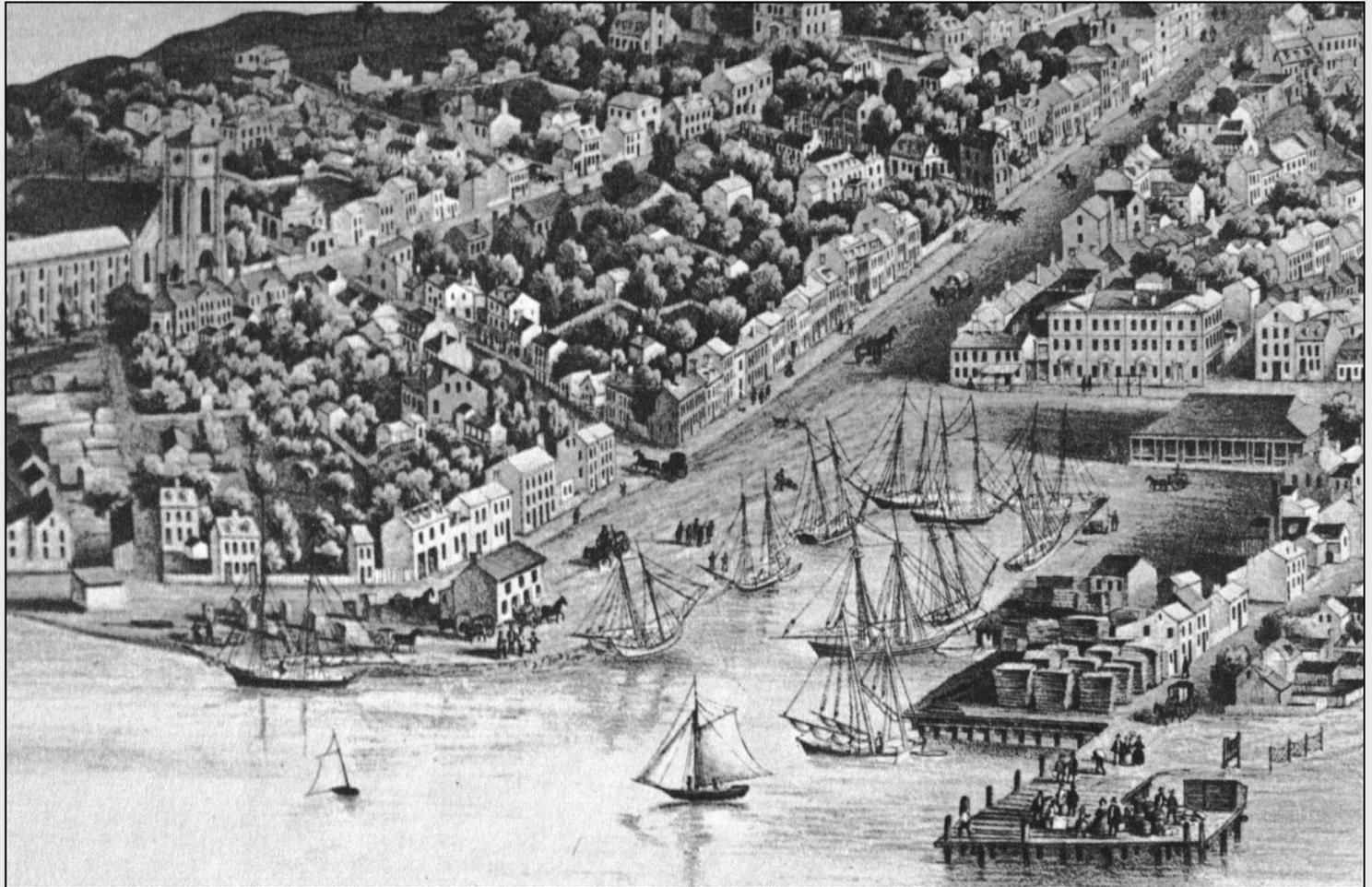
Needs more study by the experts, but...

- + **No signal heads** to impact Main St **viewshed** toward water
- + Retains **late 20th century form** of Memorial Circle
- Smaller roundabout **shifted south**, partially into Main St viewshed
- Roundabout not consistent with **earlier 18th and 19th century history** of the intersection

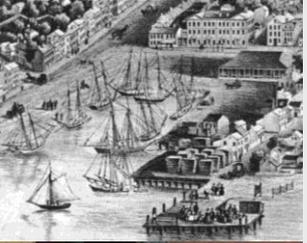
City Dock – early street layout



City Dock Concept Refinement & Traffic Analysis



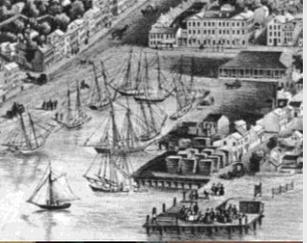
Main St. at Randall St. – early 1800's



City Dock Concept Refinement & Traffic Analysis



Main St. at Randall St. – circa 1880



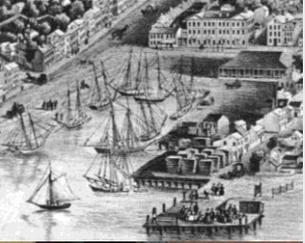
City Dock Concept Refinement & Traffic Analysis



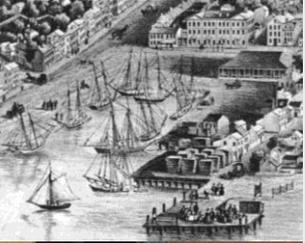
Option 1 – Business Access

- + Enhanced pedestrian access **invites more customers** to area
- + Mostly maintains **existing truck circulation** patterns for loading
- **Reduction in loading space** from approx. 725' to 480'
- **Parking shifted away** from businesses at foot of Main St between Green St and Compromise St
- + Net loss of **only 1 parking space**

City Dock Concept Refinement & Traffic Analysis



Option 1 – Traffic Operations



City Dock Concept Refinement & Traffic Analysis



+ **Reduces congestion during weekend peak periods while preserving roadway capacity for weekday peak flows**

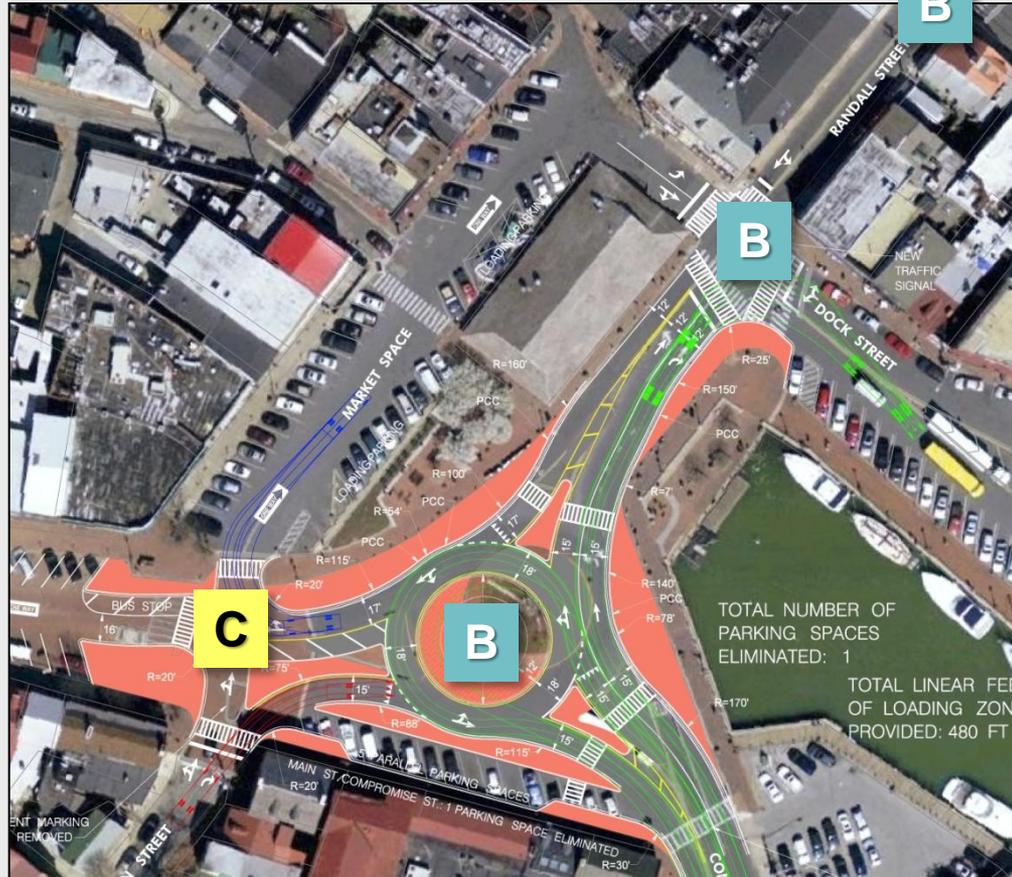
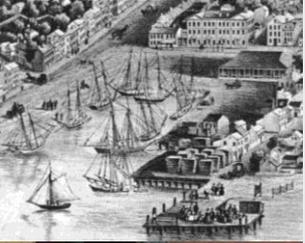
– **Pedestrian / motorist interactions on roundabout crosswalks still have potential to create **significant delays during weekend peak** periods**



Operational Analysis

Option 1 – AM

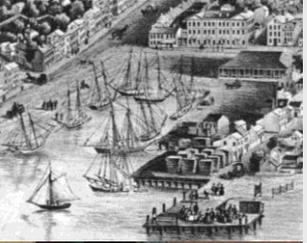
City Dock Concept Refinement & Traffic Analysis



Avg. Delay

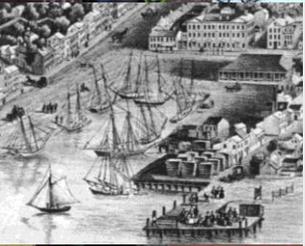
- A** ≤ 10 sec
- B** ≤ 20 sec
- C** ≤ 35 sec
- D** ≤ 55 sec
- E** ≤ 80 sec
- F** > 80 sec

VISSIM Simulation – Option 1 Saturday



City Dock Concept Refinement & Traffic Analysis





City Dock Concept Refinement & Traffic Analysis

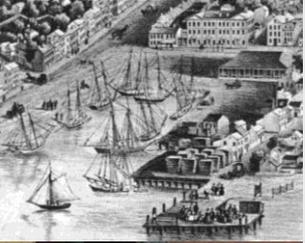
Option 2 – Public Space & Access

- + Maximizes creation of **public space** adjacent to the waterfront
- + Signals with **short cycle lengths** and **all-pedestrian phasing** provide gaps for vehicles & pedestrians to move
- + **Mid-block signal** near Market House
- + **Delay may be reduced** significantly on weekends for **careful pedestrians** who wait for gaps in traffic



- **Pedestrian delay could increase** somewhat on the weekend for **aggressive pedestrians**, “followers” & compliant pedestrians **during off-peak** when gaps are available

Option 2 – Public Space & Access



City Dock Concept Refinement & Traffic Analysis



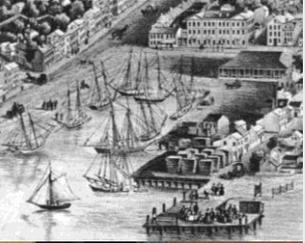
Option 2 – Safety

- + Signal control allows greater flexibility for managing **pedestrian/vehicular conflicts**
- + **All-pedestrian signal phases eliminate conflicts** for compliant pedestrians during peak pedestrian periods (PM & Sat)
- + **Advanced walk signals** improve safety at other times
- + Geometry requires **right turners to slow down** in advance of crosswalks



- Signals could **slightly reduce safety** since drivers don't always see signals & pedestrians don't always look both ways (Main at Conduit: 4 crashes 2007-2009)

City Dock Concept Refinement & Traffic Analysis

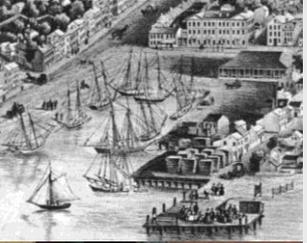


Option 2 – Aesthetics

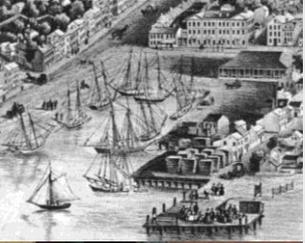


- + Consistent with **18th and 19th century** form of street network
- **Signals facing southbound Main St** (after right turn from Green St) could impact **viewshed** slightly

City Dock Concept Refinement & Traffic Analysis



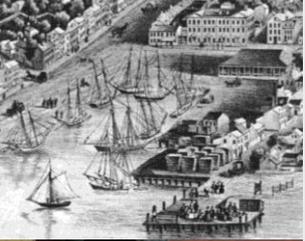
Option 2 – View from above Conduit St



City Dock Concept Refinement & Traffic Analysis



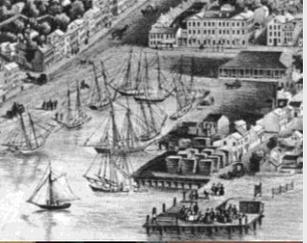
Option 2 – View from above Conduit St



City Dock Concept Refinement & Traffic Analysis



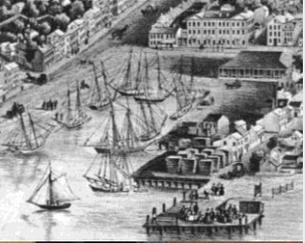
Option 2 – View at Conduit St



City Dock Concept Refinement & Traffic Analysis



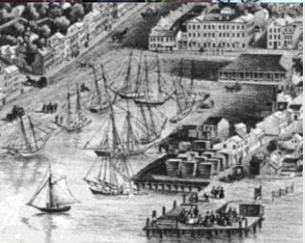
Option 2 – View from near Green St



City Dock Concept Refinement & Traffic Analysis



Option 2 – View from near Green St



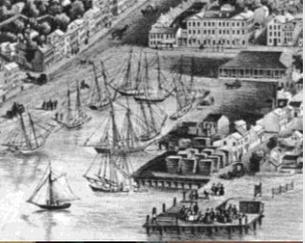
City Dock Concept Refinement & Traffic Analysis



Option 2 – View from foot of Main St



City Dock Concept Refinement & Traffic Analysis



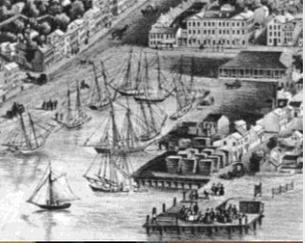
Option 2 – Business Access

City Dock Concept Refinement & Traffic Analysis

- + **Enhanced public space & less traffic congestion** invites more potential customers to area & increases duration of visits
- **Reduction in loading space** from approx. 725' to 500'
- 6 parking spaces **eliminated**
- **Trucks** entering via Compromise St **would have to exit via Main St** instead of U-turning



- Additional delay during weekday peak hours could harm a few businesses that rely on “**pass-by**” trips if cut-through commuters divert to other routes



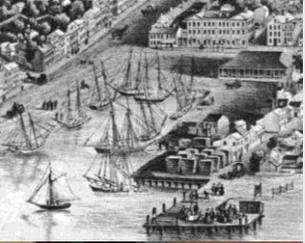
Option 2 – Traffic Operations

- + **Reduces congestion significantly during peak weekend periods**
- + **Preserving space for left turn lane to Compromise St results in less congestion and/or more opportunity for all-pedestrian phasing**



- **Right turn lane to Dock St is removed**
- **Delay would increase slightly during off-peak hours and significantly during weekday peak hours, but not to extreme levels**

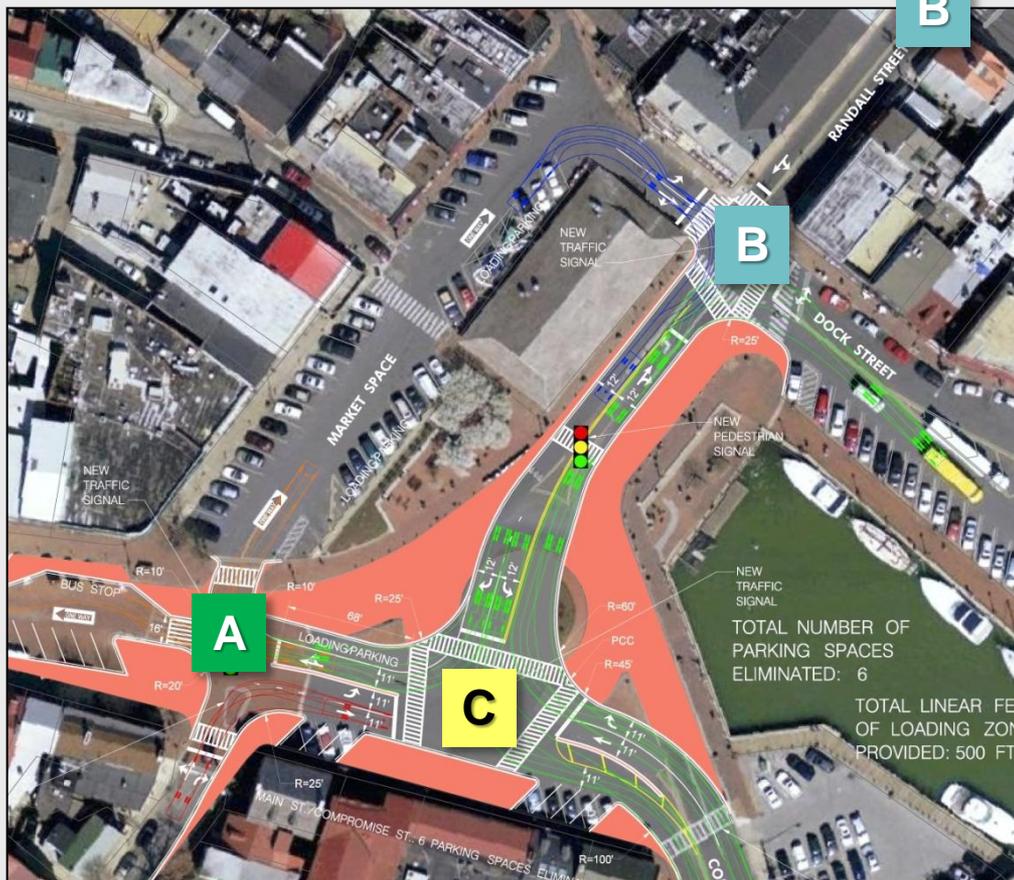
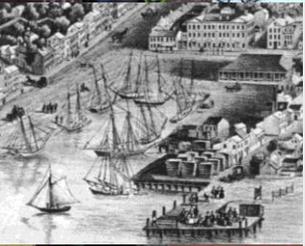
City Dock Concept Refinement & Traffic Analysis



Operational Analysis

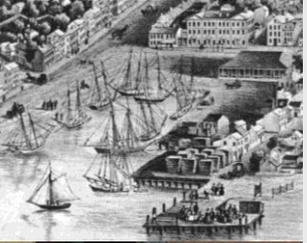
Option 2 – AM

City Dock Concept Refinement & Traffic Analysis



	<u>Avg. Delay</u>
A	≤ 10 sec
B	≤ 20 sec
C	≤ 35 sec
D	≤ 55 sec
E	≤ 80 sec
F	> 80 sec

VISSIM Simulation – Option 2 Saturday

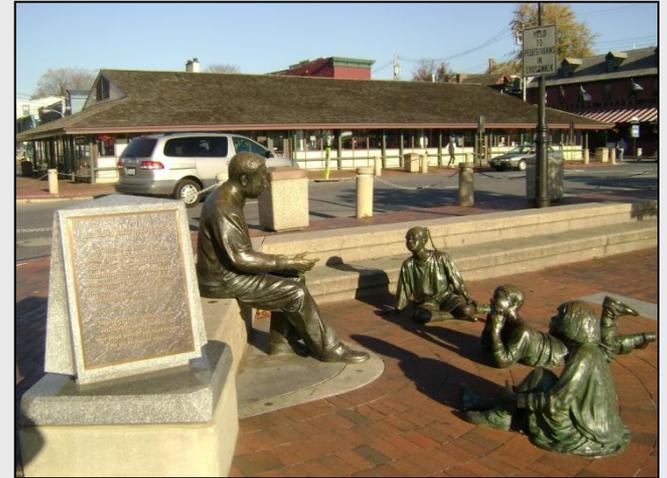


City Dock Concept Refinement & Traffic Analysis

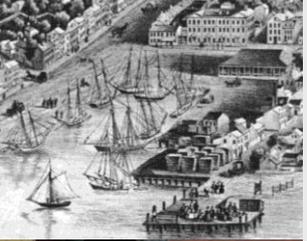


Findings

- **Competing objectives:** different “best” option depending on which criteria considered most important
- **Mix & Match** possible
- **Public Space & Access:** Option 2 best
- **Safety:** Options similar in terms of safety, but Option 1 slightly better even if it might not feel like a safety improvement
- **Aesthetics:** “...in the eye of the beholder...”
 - Option 1 matches 20th Century form
 - Option 2 matches 18th & early 19th century



City Dock Concept Refinement & Traffic Analysis



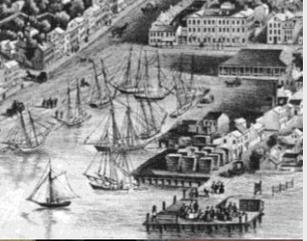
Findings



– Business Access:

- Options 1 and 2 have similar minor reductions in on-street parking (1 vs. 6)
- Options 1 and 2 have similar changes to loading zone space that could be mitigated by adding loading zone hours in afternoon

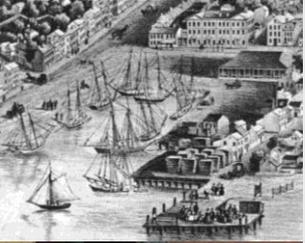
City Dock Concept Refinement & Traffic Analysis



Findings

– Traffic Operations:

- Option 1 – best letter grades for main intersection of Main, Randall & Dock
- Option 2 – eliminates F grades at all intersections in all peak hours
- Option 2 – shortest backups (longer backups in Option 1 due to continued lack of driver & pedestrian discipline)
 - Pedestrians – short crossing distances & signal control provide more comfortable pedestrian experience
 - Bicycles – Intersection design more compatible with safe bicycle operation

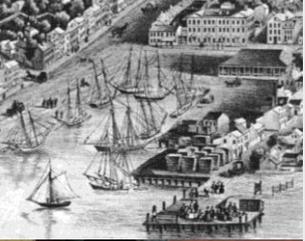


City Dock Concept Refinement & Traffic Analysis

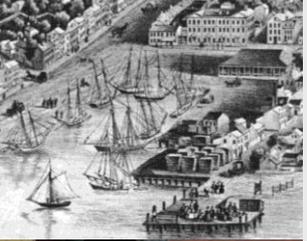
Summary of Next Steps

- Preferred alternative selection
- More detailed (afternoon) parking inventories
- Lighting
- Public Art
- Permitting/ Stormwater Management
- Detailed Landscaping/ Streetscaping/ Bioretention
- Construction Cost
- Construction Sequencing

City Dock Concept Refinement & Traffic Analysis



Questions & Answers



City Dock Concept Refinement & Traffic Analysis



Thank You!

