# APPENDIX A

## Operational Assumptions

# 1. Introduction

To develop potential service options and to provide operational inputs to the cost model, a variety of assumptions were made. This appendix details the key assumptions that went into this phase of analysis. As route planning and implementation progresses, alterations to these assumptions may be needed and could result in different costs and relative performance of route options.

# 2. Schedule and Operating Assumptions:

- Start-up operations include time for fueling at the starting terminal in the morning and midday.
    - Fueling is done by truck.
- Vessels are assumed to be moored at starting terminals (Woodbridge, Charles County, and Poplar Point), with no deadhead time assumed.
- A minimum of three departures is needed within each commute window. To meet this level of service, three vessels would be required for the Woodbridge route and two vessels for the Charles County route.
- The Woodbridge – JBAB – SE/SW Waterfront routes include a stop at JBAB in *both* travel directions.
- Speed:
    - DC slowdown zone waiver is assumed to be obtained.
    - 5.21 knots (6 mph) at Woodbridge slowdown zone
    - Slower cruising speed is 28 knots.
    - Faster cruising speed is 38 knots.
- Operating hours include time for the following:
    - 1.5 minutes for first 0.15-mile maneuvering
    - 2.5 minutes for last 0.15-mile maneuvering
    - Dwell times for a total of 8 minutes
        - 4 minutes for loading
        - 4 minutes for unloading of passengers
        - A 7-minute dwell time was deemed potentially feasible for the Poplar Point route due to demand values and a desire to keep the trip time to 15 minutes.
        - Dwell time could be decreased with certain efficiencies that could be explored in future phases if desired.
    - 30 minutes for startup time
    - 30 minutes for shutdown time
    - 45 minutes for fueling at midday

**Expanded Service Schedule (Approximate Windows):**

| | **Mon – Thu** | **Friday** | **Saturday** | **Sunday** |
|---|---|---|---|---|
| **Start** | 6 am | 6 am | 9 am | 9 am |
| **End** | 7 - 8 pm | 10 - 11 pm | 10 - 11 pm | 7 - 8 pm |

**Commute Schedule (Approximate Windows):**

| **Mon – Friday** | |
|---|---|
| **Start** | **End** |
| 6 am | 9 am |
| 4 pm | 7 pm |

# 3. Terminal Assumptions:

- A float width of at least 15ft is recommended for safe and efficient operations.
    - As a result, a new operating float will be needed at JBAB, Woodbridge, Poplar Point, and Charles County.
- Ticketing infrastructure is not included at this time, due to the high variability in costs and infrastructure that results from the various ticketing options available. Additionally, technology is moving toward mobile ticketing.
- The following categories of terminal infrastructure were identified with the following capital costs, based upon previous example costs and current market factors. These costs do not include dredging.

| Terminal Type | Infrastructure Needed | Capital Cost Estimate w/o Dredging |
|---|---|---|
| Low-Level Improvements<br><br>SW Waterfront | • Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br><br>**Assumes existing freeboard and fendering are compatible with new vessels** | <$500,000 |
| Medium-Level Improvements<br><br>JBAB | • Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br>• New wingwalls/dolphins to support bow-loading<br>• Upgraded fendering<br>• A float fire system | $4M to $5M |
| High-Level Improvements<br><br>Woodbridge<br>&<br>Poplar Point | • Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.)<br>• Upgraded fendering<br>• A float fire system | $6M to $10M |

| | | |
|---|---|---|
| Highest-Level Improvements<br><br>Charles County | *Option 1: Additional Dredging*<br>• Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.)<br>• Upgraded fendering<br>• A float fire system<br>• Replacement of existing pier (80' by 12')<br><br>*Option 2: Longer Pier*<br>• Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.)<br>• Upgraded fendering<br>• A float fire system<br>• Pier replacement and extension (240' by 12') | *Option 1*<br>$8.1M to $12.1M<br><br>*Option 2*<br>$11.2M to $15.2M |

The above consider basic operational needs only and do not include passenger shelters, bike racks/lockers, or uplands connectivity improvements to parking lots or roadways.

# 4. Dredging Assumptions:

A bathymetric survey would be needed prior to terminal design and construction. The numbers below are conservative estimates based upon available benthic data and comments from stakeholders about siltation.

| Level of Dredging | Terminals | Capital Cost |
|---|---|---|
| None | • SW Waterfront | $0 |
| Maintenance Dredging/ Minimal Dredge | • JBAB<br>• Poplar Point<br>• Woodbridge | $1M |
| Significant Dredging | *Charles County Option 1:*<br>• 40,000 CY of dredging<br>• Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.) | *Option 1*<br>$1.15M<br><br>*Option 2*<br>$5.05M |

| | | |
|---|---|---|
| | • Upgraded fendering<br>• A float fire system<br>• Replacement of existing pier (80' by 12')<br><br>*Charles County Option 2:*<br>• 7,500 CY of dredging<br>• Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• Signage/wayfinding<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.)<br>• Upgraded fendering<br>• A float fire system<br>• Pier replacement and extension (240' by 12') | |

# 5. Vessel Assumptions:

- Three vessel sizes were evaluated.
  - Small Catamaran- 99 pax, operated by a crew of 2
  - Medium Catamaran- 150 pax, operated by a crew of 3
  - Large Catamaran- 250 pax, operated by a crew of 4
- All vessels were assumed to be aluminum hulled catamarans.
- All vessels are assumed to be bow and side loading capable.
- The assumed service life of all vessels was deemed to be 25 years, with one vessel refurbishment conducted halfway through the vessel's' service life.
- Vessels were assumed to only fuel once a day, with the option for morning or midday fueling depending on operator preference.

| **Vessel Capital Cost Assumptions** | | |
|---|---|---|
| Annual Vessel Depreciation | 3.6% of vessel purchase price, per year | Straight line depreciation assumed. |
| Salvage Value Available at End of Vessel Life | 10% of acquisition costs | Based upon previous studies |
| Vessel Refurbishment Cost | 30% of acquisition costs | Based upon previous studies |
| Small Catamaran Build Cost | $5.5M to $8M per vessel | Vessels that need to travel 38 knots will generally be more expensive than those that only need to travel 28 knots. |
| Medium Catamaran Build Cost | $7M to $9.5M per vessel | |
| Large Catamaran Build Cost | $11M to $14M per vessel | |

# 6. Maintenance Assumptions:

- Routine, annual, and unplanned maintenance costs were estimated by operating hour and were based upon maintenance capital costs.
- Maintenance labor was assumed to include two, full-time 2-person crews, each with one engineer and one oiler.

| **Maintenance Capital Cost Assumptions** | |
|---|---|
| Routine Maintenance (99 pax) | $68.75 to $100.00 per operating hour, based upon range in vessel capital costs |
| Routine Maintenance (150 pax) | $87.50 to $118.75 per operating hour, based upon range in vessel capital costs |
| Routine Maintenance (250 pax) | $137.50 to $175.00 per operating hour, based upon range in vessel capital costs |
| Annual Maintenance for All Vessel Sizes | 2.00% of vessel capital cost |
| Unplanned Maintenance | 10.00% of total maintenance costs |
| Oiler Wage Rate | $30.00 per maintenance hour |
| Engineer Wage Rate | $42.00 per maintenance hour |
| Maintenance Overhead Value | 30% Same as general labor overhead |
| Maintenance Hours | 2080 hours annually per person (40 hours a week for 52 weeks) |

# APPENDIX B

## Route Distance and Travel Speeds

# 1. Introduction

This appendix details the variety of factors that went into crossing times based on different assumptions to meet target trip times. The times have been presented by route options and variable speeds accounting for factors like route lengths with consideration for cruising and reduced speeds, maneuvering distances and speeds, and dwell times. These calculations contributed to cost estimates for operations and the resulting financial models through informing possible route schedules and estimated operating hours.

# 2. Observations

- Crossing time of the shorter Poplar Point route to SW Waterfront using slower estimate is already close to the target time and there is not much change when speeding up to 38 knots.
- For the Woodbridge to JBAB route, adding a second connection to the SE or SW Waterfront significantly increases crossing times and providing trip times closer to the targeted 60 minutes.
- Charles County to JBAB can meet crossing time targets at all speeds without the DC waterfront connections.
- The 38 knots travel speed was ultimately selected for the Charles County to JBAB route to be even more time competitive for commuters.

# 3. Crossing Time Assumptions

- Speed:
    - DC slowdown zone waiver is assumed to be obtained.
    - 5.21 knots (6 mph) at Woodbridge slowdown zone
    - Slower cruising speed is 28 knots.
    - Faster cruising speed is 38 knots.
    - A baseline of 30 knots and a medium speed of 35 knots was provided as comparison to average ferry speeds and times.
- Operating times:
    - 1.5 minutes for first 0.15-mile maneuvering
    - 2.5 minutes for last 0.15-mile maneuvering
    - Dwell times for a total of 8 minutes
        - 4 minutes for loading
        - 4 minutes for unloading of passengers
        - A 7-minute dwell time was deemed potentially feasible for the Poplar Point route due to demand values and a desire to keep the trip time to 15 minutes.
- Target trip times provided by Nelson Nygaard:
    - 60 minutes for Woodbridge and Charles County routes
    - 15 minutes for Poplar Point route

# Crossing Times Model

*Note: For all variables with a base assumption, conditional formatting is set up to highlight assumptions that differ from the base value*

| With Slowdown Waiver | | Woodbridge-JBAB | | | Charles County - JBAB | | | Poplar Point - DC Waterfront | |
|---|---|---|---|---|---|---|---|---|---|
| **SLOW ESTIMATE (assumes 28 Kn)** | **Base Assumption** | **Woodbridge to JBAB** | **Woodbridge to JBAB to SE Waterfront** | **Woodbridge to JBAB to SW Waterfront** | **Charles County to JBAB** | **Charles Couty to JBAB to SE Waterfront** | **Charles County to JBAB to SW Waterfront** | **Poplar Point - SE Waterfront** | **Poplar Point - SW Waterfront** |
| Total Route length (nautical miles) | | 23.34 | 25.97 | 26.32 | 17.16 | 19.79 | 20.14 | 0.27 | 2.26 |
| Route length at max speed | | 21.59 | 24.10 | 24.42 | 16.86 | 19.19 | 19.54 | 0.00 | 1.96 |
| Route length at reduced speed | 0.00 | 1.61 | 1.61 | 1.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max Speed (knots) | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 |
| Reduced Speed (knots) | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 |
| Time allowed for passenger loading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Time allowed for maneuvers over first .15 mile (min) | 1.50 | 1.50 | 3.00 | 3.00 | 1.50 | 3.00 | 3.00 | 1.68 | 1.50 |
| Crossing time at max speed (min) | | 46.26 | 51.64 | 52.33 | 36.13 | 41.12 | 41.87 | 0.00 | 4.20 |
| Crossing time at reduced speed (min) | | 18.53 | 18.53 | 18.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time allowed for maneuvers over last .15 mile (min) | 2.50 | 2.50 | 5.00 | 5.00 | 2.50 | 5.00 | 5.00 | 1.56 | 2.50 |
| Time allowed for passenger unloading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Total Crossing Time | | 76.79 | 94.17 | 94.86 | 48.13 | 65.12 | 65.87 | 11.24 | 16.20 |
| Time differential from target trip time | 15 | | | | | | | 0:03:46 | -0:01:12 |
| | 60 | -0:16:48 | -0:34:10 | -0:34:51 | 0:11:52 | -0:05:07 | -0:05:52 | | |
| Margin for delay en route (% of crossing time) | 0% | 0.00 | 0.00 | 0.00 | | | | | |
| **Margin for Delay Crossing Time** | | **76.79** | **94.17** | **94.86** | **48.13** | **65.12** | **65.87** | **11.24** | **16.20** |
| **Number of Crossings in 4 hr Window** | 210 | **2.73** | **2.23** | **2.21** | **4.36** | **3.22** | **3.19** | **18.68** | **12.96** |

| **BASELINE ESTIMATE (assumes 30 Kn)** | **Base Assumption** | **Woodbridge to JBAB** | **Woodbridge to JBAB to SE Waterfront** | **Woodbridge to JBAB to SW Waterfront** | **Charles County to JBAB** | **Charles Couty to JBAB to SE Waterfront** | **Charles County to JBAB to SW Waterfront** | **Poplar Point - SE Waterfront** | **Poplar Point - SW Waterfront** |
|---|---|---|---|---|---|---|---|---|---|
| Total Route length (nautical miles) | | 23.34 | 25.97 | 26.32 | 17.16 | 19.79 | 20.14 | 0.27 | 2.26 |
| Route length at max speed | | 21.59 | 24.10 | 24.42 | 16.86 | 19.19 | 19.54 | 0.00 | 1.96 |
| Route length at reduced speed | 0.00 | 1.61 | 1.61 | 1.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max Speed (knots) | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 |
| Reduced Speed (knots) | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 |
| Time allowed for passenger loading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Time allowed for maneuvers over first .15 mile (min) | 1.50 | 1.50 | 3.00 | 3.00 | 1.50 | 3.00 | 3.00 | 1.68 | 1.50 |
| Crossing time at max speed (min) | | 43.18 | 48.20 | 48.84 | 33.72 | 38.38 | 39.08 | 0.00 | 3.92 |
| Crossing time at reduced speed (min) | | 18.53 | 18.53 | 18.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time allowed for maneuvers over last .15 mile (min) | 2.50 | 2.50 | 5.00 | 5.00 | 2.50 | 5.00 | 5.00 | 1.56 | 2.50 |
| Time allowed for passenger unloading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Total Crossing Time | | 73.71 | 90.73 | 91.37 | 45.72 | 62.38 | 63.08 | 11.24 | 15.92 |
| Time differential from target trip time | 15 | | | | | | | 0:03:46 | -0:00:55 |
| | 60 | -0:13:42 | -0:30:44 | -0:31:22 | 0:14:17 | -0:02:23 | -0:03:05 | | |
| Margin for delay en route (% of crossing time) | 0% | 0.00 | 0.00 | 0.00 | | | | | |
| **Margin for Delay Crossing Time** | | **73.71** | **90.73** | **91.37** | **45.72** | **62.38** | **63.08** | **11.24** | **15.92** |
| **Number of Crossings in 4 hr Window** | 210 | **2.85** | **2.31** | **2.30** | **4.59** | **3.37** | **3.33** | **18.68** | **13.19** |

| **MEDIUM ESTIMATE (assumes 35 Kn)** | **Base Assumption** | **Woodbridge to JBAB** | **Woodbridge to JBAB to SE Waterfront** | **Woodbridge to JBAB to SW Waterfront** | **Charles County to JBAB** | **Charles Couty to JBAB to SE Waterfront** | **Charles County to JBAB to SW Waterfront** | **Poplar Point - SE Waterfront** | **Poplar Point - SW Waterfront** |
|---|---|---|---|---|---|---|---|---|---|
| Route length (nautical miles) | | 23.34 | 25.97 | 26.32 | 17.16 | 19.79 | 20.14 | 0.27 | 2.26 |
| Route length at max speed | | 21.59 | 24.10 | 24.42 | 16.86 | 19.19 | 19.54 | 0.00 | 1.96 |
| Route length at reduced speed | 0.00 | 1.61 | 1.61 | 1.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max Speed (knots) | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 | 35.00 |
| Reduced Speed (knots) | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 |
| Time allowed for passenger loading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Time allowed for maneuvers over first .15 mile (min) | 1.50 | 1.50 | 3.00 | 3.00 | 1.50 | 3.00 | 3.00 | 1.68 | 1.50 |
| Crossing time at max speed (min) | | 37.01 | 41.31 | 41.86 | 28.90 | 32.90 | 33.50 | 0.00 | 3.36 |
| Crossing time at reduced speed (min) | | 18.53 | 18.53 | 18.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time allowed for maneuvers over last .15 mile (min) | 2.50 | 2.50 | 5.00 | 5.00 | 2.50 | 5.00 | 5.00 | 1.56 | 2.50 |
| Time allowed for passenger unloading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Total Crossing Time | | 67.54 | 83.84 | 84.39 | 40.90 | 56.90 | 57.50 | 11.24 | 15.36 |
| Time differential from target trip time | 15 | | | | | | | 0:03:46 | -0:00:22 |
| | 60 | -0:07:32 | -0:23:51 | -0:24:23 | 0:19:06 | 0:03:06 | 0:02:30 | | |
| Margin for delay en route (% of crossing time) | 0% | 0.00 | 0.00 | 0.00 | | | | | |
| **Margin for Delay Crossing Time** | | **67.54** | **83.84** | **84.39** | **40.90** | **56.90** | **57.50** | **11.24** | **15.36** |
| **Number of Crossings in 4 hr Window** | 210 | **3.11** | **2.50** | **2.49** | **5.13** | **3.69** | **3.65** | **18.68** | **13.67** |

| **FAST ESTIMATE (assumes 38 Kn)** | **Base Assumption** | **Woodbridge to JBAB** | **Woodbridge to JBAB to SE Waterfront** | **Woodbridge to JBAB to SW Waterfront** | **Charles County to JBAB** | **Charles Couty to JBAB to SE Waterfront** | **Charles County to JBAB to SW Waterfront** | **Poplar Point - SE Waterfront** | **Poplar Point - SW Waterfront** |
|---|---|---|---|---|---|---|---|---|---|
| Route length (nautical miles) | | 23.34 | 25.97 | 26.32 | 17.16 | 19.79 | 20.14 | 0.27 | 2.26 |
| Route length at max speed | | 21.59 | 24.10 | 24.42 | 16.86 | 19.19 | 19.54 | 0.00 | 1.96 |
| Route length at reduced speed | 0.00 | 1.61 | 1.61 | 1.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Max Speed (knots) | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 | 38.00 |
| Reduced Speed (knots) | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 | 5.21 |
| Time allowed for passenger loading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Time allowed for maneuvers over first .15 mile (min) | 1.50 | 1.50 | 3.00 | 3.00 | 1.50 | 3.00 | 3.00 | 1.68 | 1.50 |
| Crossing time at max speed (min) | | 34.09 | 38.05 | 38.56 | 26.62 | 30.30 | 30.85 | 0.00 | 3.09 |
| Crossing time at reduced speed (min) | | 18.53 | 18.53 | 18.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Time allowed for maneuvers over last .15 mile (min) | 2.50 | 2.50 | 5.00 | 5.00 | 2.50 | 5.00 | 5.00 | 1.56 | 2.50 |
| Time allowed for passenger unloading (min) | 4.00 | 4.00 | 8.00 | 8.00 | 4.00 | 8.00 | 8.00 | 4.00 | 4.00 |
| Total Crossing Time | | 64.62 | 80.58 | 81.09 | 38.62 | 54.30 | 54.85 | 11.24 | 15.09 |
| Time differential from target trip time | 15 | | | | | | | 0:03:46 | -0:00:06 |
| | 60 | -0:04:37 | -0:20:35 | -0:21:05 | 0:21:23 | 0:05:42 | 0:05:09 | | |
| Margin for delay en route (% of crossing time) | 0% | 0.00 | 0.00 | 0.00 | | | | | |
| **Margin for Delay Crossing Time** | | **64.62** | **80.58** | **81.09** | **38.62** | **54.30** | **54.85** | **11.24** | **15.09** |
| **Number of Crossings in 4 hr Window** | 210 | **3.25** | **2.61** | **2.59** | **5.44** | **3.87** | **3.83** | **18.68** | **13.91** |

Route and slowdown zone distances were measure from Google Earth.

# APPENDIX C

## Example Schedules

# 1. Introduction

This appendix provides an example schedule for the Woodbridge to JBAB route assuming the use of 3 vessels with the faster operating speeds of 38 knots. These time tables take into consideration the maneuvering, dwell, travel, startup, shutdown, and fueling times to estimate what a schedule could look like for operations of commute service or expanded service for weekdays and weekend. Schedules of this kind were developed for all routes at the 28 knots speed and the 38 knots speed.

# 2. Scheduling Assumptions

- Start-up operations include fueling at the starting terminal in the morning and midday.
    - Fueling is done by truck.
- Vessels are assumed to be moored at starting terminals (Woodbridge, Charles County, and Poplar Point), with no deadhead time assumed.
- A minimum of three departures is needed within each commute window. To meet this level of service, three vessels would be required for the Woodbridge route.
- Speed:
    - DC slowdown zone waiver is assumed to be obtained.
    - 5.21 knots (6 mph) at Woodbridge slowdown zone
    - Slower cruising speed is 28 knots.
    - Faster cruising speed is 38 knots.
- Operating times:
    - 1.5 minutes for first 0.15-mile maneuvering
    - 2.5 minutes for last 0.15-mile maneuvering
    - Dwell times for a total of 8 minutes
        - 4 minutes for loading
        - 4 minutes for unloading of passengers
    - 30 minutes for startup time
    - 30 minutes for shutdown time
    - 45 minutes for fueling at midday

**Expanded Service Schedule (Approximate Windows):**

| | Mon – Thu | Friday | Saturday | Sunday |
|---|---|---|---|---|
| **Start** | 6 am | 6 am | 9 am | 9 am |
| **End** | 7 - 8 pm | 10 - 11 pm | 10 - 11 pm | 7 - 8 pm |

**Commute Schedule (Approximate Windows):**

| Mon – Friday | |
|---|---|
| **Start** | **End** |
| 6 am | 9 am |
| 4 pm | 7 pm |

Example Schedules: Woodbridge 3 Vessel Fleet

**Commute Only (M-F)**

| | Wood - JBAB (Fast) | |
|---|---|---|
| | Weekday Peak | |
| | Depart Alex | Depart JBAB |
| | AM | |
| V1 | 6:00 | 7:04 |
| V2 | 6:43 | 7:47 |
| V3 | 7:26 | 8:30 |
| V1 | 8:09 | 9:13 |
| V2 | 8:52 | 9:56 |
| V3 | 9:35 | - |
| V1 | 10:18 | - |
| V2 | 11:01 | - |
| | PM | |
| V1 | 4:00 | 5:04 |
| V2 | 4:43 | 5:47 |
| V3 | 5:26 | 6:30 |
| V1 | 6:09 | 7:13 |
| V2 | 6:52 | 7:56 |
| V3 | 7:35 | - |
| V1 | 8:18 | - |
| V2 | 9:01 | - |

**Commute Only (M-F)**

| Key | |
|---|---|
| | Vessel Shutdown |
| - | No Departure |
| | Vessel 1 Times |
| | Vessel 2 Times |
| | Vessel 3 Times |

**Extended**

| | Monday - Thursday Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Woodbridge | | | | JBAB | | | |
| | Arrive Wood | Dwell Time | Depart Wood | Transit Time | Arrive JBAB | Dwell Time | Depart JBAB | Transit Time |
| | AM | | | | | | | |
| V1 Start-up | 5:30 | 0:30 | | | | | | |
| V1 | 6:00 | 0:04 | **6:04** | 0:56 | 7:00 | 0:08 | **7:08** | 0:56 |
| V2 Start-up | 6:11 | 0:30 | | | | | | |
| V2 | 6:41 | 0:04 | **6:45** | 0:56 | 7:42 | 0:08 | **7:50** | 0:56 |
| V3 Start-up | 6:53 | 0:30 | | | | | | |
| V3 | 7:23 | 0:04 | **7:27** | 0:56 | 8:24 | 0:08 | **8:32** | 0:56 |
| V1 | 8:05 | 0:08 | **8:13** | 0:56 | 9:09 | 0:08 | **9:17** | 0:56 |
| V2 | 8:46 | 0:08 | **8:54** | 0:56 | 9:51 | 0:08 | **9:59** | 0:56 |
| V3 | 9:28 | 0:08 | **9:36** | 0:56 | 10:33 | 0:08 | **10:41** | 0:56 |
| V1 | 10:14 | 0:08 | **10:22** | 0:56 | 11:19 | 0:08 | **11:27** | 0:56 |
| V2 | 10:56 | 0:08 | **11:04** | 0:56 | 12:00 | 0:08 | **12:08** | 0:56 |
| V3 | 11:37 | 0:08 | **11:45** | 0:56 | 12:42 | 0:08 | **12:50** | 0:56 |
| | PM | | | | | | | |
| V1 | 12:23 | 0:04 | | | | | | |
| V1 Fueling | 12:27 | 0:45 | | | | | | |
| V1 | 13:12 | 0:04 | **13:16** | 0:56 | 14:13 | 0:08 | **14:21** | 0:56 |
| V2 | 13:05 | 0:04 | | | | | | |
| V2 Fueling | 13:09 | 0:45 | | | | | | |
| V2 | 13:54 | 0:04 | **13:58** | 0:56 | 14:55 | 0:08 | **15:03** | 0:56 |
| V3 | 13:47 | 0:04 | | | | | | |
| V3 Fueling | 13:51 | 0:45 | | | | | | |
| V3 | 14:36 | 0:04 | **14:40** | 0:56 | 15:36 | 0:08 | **15:44** | 0:56 |
| V1 | 15:17 | 0:08 | **15:25** | 0:56 | 16:22 | 0:08 | **16:30** | 0:56 |
| V2 | 15:59 | 0:08 | **16:07** | 0:56 | 17:04 | 0:08 | **17:12** | 0:56 |
| V3 | 16:41 | 0:08 | **16:49** | 0:56 | 17:46 | 0:08 | **17:54** | 0:56 |
| V1 | 17:27 | 0:08 | **17:35** | 0:56 | 18:31 | 0:08 | **18:39** | 0:56 |
| V2 | 18:08 | 0:08 | **18:16** | 0:56 | 19:13 | 0:08 | **19:21** | 0:56 |
| V3 | 18:50 | 0:08 | **18:58** | 0:56 | 19:55 | 0:08 | **20:03** | 0:56 |
| V1 | 19:36 | 0:08 | **19:44** | 0:00 | 19:44 | 0:08 | **19:52** | 0:00 |
| V1 | 19:52 | 0:04 | | | | | | |
| V1 Shutdown | 19:56 | 0:30 | | | | | | |
| V2 | 20:18 | 0:04 | | | | | | |
| V2 Shutdown | 20:22 | 0:30 | | | | | | |
| V3 | 20:59 | 0:04 | | | | | | |
| V3 Shutdown | 21:03 | 0:30 | | | | | | |

**Extended**

| Key | |
|---|---|
| | Vessel Startup, Fueling, & Shutdown |
| | Vessel 1 Times |
| | Vessel 2 Times |
| | Vessel 3 Times |

Example Schedules: Woodbridge 3 Vessel Fleet

**Extended**

| | Friday Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Woodbridge | | | | JBAB | | | |
| | Arrive Wood | Dwell Time | Depart Wood | Transit Time | Arrive JBAB | Dwell Time | Depart JBAB | Transit Time |
| | AM | | | | | | | |
| V1 Start-up | 5:30 | 0:30 | | | | | | |
| V1 | 6:00 | 0:04 | **6:04** | 0:56 | 7:00 | 0:08 | **7:08** | 0:56 |
| V2 Start-up | 6:11 | 0:30 | | | | | | |
| V2 | 6:41 | 0:04 | **6:45** | 0:56 | 7:42 | 0:08 | **7:50** | 0:56 |
| V3 Start-up | 6:53 | 0:30 | | | | | | |
| V3 | 7:23 | 0:04 | **7:27** | 0:56 | 8:24 | 0:08 | **8:32** | 0:56 |
| V1 | 8:05 | 0:08 | **8:13** | 0:56 | 9:09 | 0:08 | **9:17** | 0:56 |
| V2 | 8:46 | 0:08 | **8:54** | 0:56 | 9:51 | 0:08 | **9:59** | 0:56 |
| V3 | 9:28 | 0:08 | **9:36** | 0:56 | 10:33 | 0:08 | **10:41** | 0:56 |
| V1 | 10:14 | 0:08 | **10:22** | 0:56 | 11:19 | 0:08 | **11:27** | 0:56 |
| V2 | 10:56 | 0:08 | **11:04** | 0:56 | 12:00 | 0:08 | **12:08** | 0:56 |
| V3 | 11:37 | 0:08 | **11:45** | 0:56 | 12:42 | 0:08 | **12:50** | 0:56 |
| | PM | | | | | | | |
| V1 | 12:23 | 0:04 | | | | | | |
| V1 Fueling | 12:27 | 0:45 | | | | | | |
| V1 | 13:12 | 0:04 | **13:16** | 0:56 | 14:13 | 0:08 | **14:21** | 0:56 |
| V2 | 13:05 | 0:04 | | | | | | |
| V2 Fueling | 13:09 | 0:45 | | | | | | |
| V2 | 13:54 | 0:04 | **13:58** | 0:56 | 14:55 | 0:08 | **15:03** | 0:56 |
| V3 | 13:47 | 0:04 | | | | | | |
| V3 Fueling | 13:51 | 0:45 | | | | | | |
| V3 | 14:36 | 0:04 | **14:40** | 0:56 | 15:36 | 0:08 | **15:44** | 0:56 |
| V1 | 15:17 | 0:08 | **15:25** | 0:56 | 16:22 | 0:08 | **16:30** | 0:56 |
| V2 | 15:59 | 0:08 | **16:07** | 0:56 | 17:04 | 0:08 | **17:12** | 0:56 |
| V3 | 16:41 | 0:08 | **16:49** | 0:56 | 17:46 | 0:08 | **17:54** | 0:56 |
| V1 | 17:27 | 0:08 | **17:35** | 0:56 | 18:31 | 0:08 | **18:39** | 0:56 |
| V2 | 18:08 | 0:08 | **18:16** | 0:56 | 19:13 | 0:08 | **19:21** | 0:56 |
| V3 | 18:50 | 0:08 | **18:58** | 0:56 | 19:55 | 0:08 | **20:03** | 0:56 |
| V1 | 19:36 | 0:08 | **19:44** | 0:56 | 20:41 | 0:08 | **20:49** | 0:56 |
| V2 | 20:18 | 0:08 | **20:26** | 0:56 | 21:22 | 0:08 | **21:30** | 0:56 |
| V3 | 20:59 | 0:08 | **21:07** | 0:56 | 22:04 | 0:08 | **22:12** | 0:56 |
| V1 | 21:45 | 0:04 | | | | | | |
| V1 Shutdown | 21:49 | 0:30 | | | | | | |
| V2 | 22:27 | 0:04 | | | | | | |
| V2 Shutdown | 22:31 | 0:30 | | | | | | |
| V3 | 23:09 | 0:04 | | | | | | |
| V3 Shutdown | 23:13 | 0:30 | | | | | | |

| | Saturday Schedule | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Woodbridge | | | | JBAB | | | |
| | Arrive Wood | Dwell Time | Depart Wood | Transit Time | Arrive JBAB | Dwell Time | Depart JBAB | Transit Time |
| | AM | | | | | | | |
| V1 Start-up | 8:30 | 0:30 | | | | | | |
| V1 | 9:00 | 0:04 | **9:04** | 0:56 | 10:00 | 0:08 | **10:08** | 0:56 |
| V2 Start-up | 9:11 | 0:30 | | | | | | |
| V2 | 9:41 | 0:04 | **9:45** | 0:56 | 10:42 | 0:08 | **10:50** | 0:56 |
| V3 Start-up | 9:53 | 0:30 | | | | | | |
| V3 | 10:23 | 0:04 | **10:27** | 0:56 | 11:24 | 0:08 | **11:32** | 0:56 |
| V1 | 11:05 | 0:08 | **11:13** | 0:56 | 12:09 | 0:08 | **12:17** | 0:56 |
| V2 | 11:46 | 0:08 | **11:54** | 0:56 | 12:51 | 0:08 | **12:59** | 0:56 |
| V3 | 12:28 | 0:08 | **12:36** | 0:56 | 13:33 | 0:08 | **13:41** | 0:56 |
| | PM | | | | | | | |
| V1 | 13:14 | 0:04 | | | | | | |
| V1 Fueling | 13:18 | 0:45 | | | | | | |
| V1 | 14:03 | 0:04 | **14:07** | 0:56 | 15:04 | 0:08 | **15:12** | 0:56 |
| V2 | 13:56 | 0:04 | | | | | | |
| V2 Fueling | 14:00 | 0:45 | | | | | | |
| V2 | 14:45 | 0:04 | **14:49** | 0:56 | 15:45 | 0:08 | **15:53** | 0:56 |
| V3 | 14:37 | 0:04 | | | | | | |
| V3 Fueling | 14:41 | 0:45 | | | | | | |
| V3 | 15:26 | 0:04 | **15:30** | 0:56 | 16:27 | 0:08 | **16:35** | 0:56 |
| V1 | 16:08 | 0:08 | **16:16** | 0:56 | 17:13 | 0:08 | **17:21** | 0:56 |
| V2 | 16:50 | 0:08 | **16:58** | 0:56 | 17:55 | 0:08 | **18:03** | 0:56 |
| V3 | 17:32 | 0:08 | **17:40** | 0:56 | 18:36 | 0:08 | **18:44** | 0:56 |
| V1 | 18:17 | 0:08 | **18:25** | 0:56 | 19:22 | 0:08 | **19:30** | 0:56 |
| V2 | 18:59 | 0:08 | **19:07** | 0:56 | 20:04 | 0:08 | **20:12** | 0:56 |
| V3 | 19:41 | 0:08 | **19:49** | 0:56 | 20:46 | 0:08 | **20:54** | 0:56 |
| V1 | 20:27 | 0:08 | **20:35** | 0:56 | 21:31 | 0:08 | **21:39** | 0:56 |
| V2 | 21:08 | 0:08 | **21:16** | 0:56 | 22:13 | 0:08 | **22:21** | 0:56 |
| V3 | 21:50 | 0:08 | **21:58** | 0:56 | 22:55 | 0:08 | **23:03** | 0:56 |
| V1 | 22:36 | 0:04 | | | | | | |
| V1 Shutdown | 22:40 | 0:30 | | | | | | |
| V2 | 23:18 | 0:04 | | | | | | |
| V2 Shutdown | 23:22 | 0:30 | | | | | | |
| V3 | 23:59 | 0:04 | | | | | | |
| V3 Shutdown | 0:03 | 0:30 | | | | | | |

| Key | |
|---|---|
| | Vessel Startup, Fueling, & Shutdown |
| | Vessel 1 Times |
| | Vessel 2 Times |
| | Vessel 3 Times |

Example Schedules: Woodbridge 3 Vessel Fleet

**Extended**

| | Woodbridge - JBAB (Fast - 38Kn) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Sunday Schedule | | | | | | | |
| | Woodbridge | | | | JBAB | | | |
| | Arrive Wood | Dwell Time | Depart Wood | Transit Time | Arrive JBAB | Dwell Time | Depart JBAB | Transit Time |
| | AM | | | | | | | |
| V1 Start-up | 8:30 | 0:30 | | | | | | |
| V1 | 9:00 | 0:04 | **9:04** | 0:56 | 10:00 | 0:08 | **10:08** | 0:56 |
| V2 Start-up | 9:11 | 0:30 | | | | | | |
| V2 | 9:41 | 0:04 | **9:45** | 0:56 | 10:42 | 0:08 | **10:50** | 0:56 |
| V3 Start-up | 9:53 | 0:30 | | | | | | |
| V3 | 10:23 | 0:04 | **10:27** | 0:56 | 11:24 | 0:08 | **11:32** | 0:56 |
| V1 | 11:05 | 0:08 | **11:13** | 0:56 | 12:09 | 0:08 | **12:17** | 0:56 |
| V2 | 11:46 | 0:08 | **11:54** | 0:56 | 12:51 | 0:08 | **12:59** | 0:56 |
| V3 | 12:28 | 0:08 | **12:36** | 0:56 | 13:33 | 0:08 | **13:41** | 0:56 |
| | PM | | | | | | | |
| V1 | 13:14 | 0:04 | | | | | | |
| V1 Fueling | 13:18 | 0:45 | | | | | | |
| V1 | 14:03 | 0:04 | **14:07** | 0:56 | 15:04 | 0:08 | **15:12** | 0:56 |
| V2 | 13:56 | 0:04 | | | | | | |
| V2 Fueling | 14:00 | 0:45 | | | | | | |
| V2 | 14:45 | 0:04 | **14:49** | 0:56 | 15:45 | 0:08 | **15:53** | 0:56 |
| V3 | 14:37 | 0:04 | | | | | | |
| V3 Fueling | 14:41 | 0:45 | | | | | | |
| V3 | 15:26 | 0:04 | **15:30** | 0:56 | 16:27 | 0:08 | **16:35** | 0:56 |
| V1 | 16:08 | 0:08 | **16:16** | 0:56 | 17:13 | 0:08 | **17:21** | 0:56 |
| V2 | 16:50 | 0:08 | **16:58** | 0:56 | 17:55 | 0:08 | **18:03** | 0:56 |
| V3 | 17:32 | 0:08 | **17:40** | 0:56 | 18:36 | 0:08 | **18:44** | 0:56 |
| V1 | 18:17 | 0:08 | **18:25** | 0:56 | 19:22 | 0:08 | **19:30** | 0:56 |
| V2 | 18:59 | 0:08 | **19:07** | 0:56 | 20:04 | 0:08 | **20:12** | 0:56 |
| V3 | 19:41 | 0:08 | **19:49** | 0:56 | 20:46 | 0:08 | **20:54** | 0:56 |
| V1 | 20:27 | 0:04 | | | | | | |
| V1 Shutdown | 20:31 | 0:30 | | | | | | |
| V2 | 21:08 | 0:04 | | | | | | |
| V2 Shutdown | 21:12 | 0:30 | | | | | | |
| V3 | 21:50 | 0:04 | | | | | | |
| V3 Shutdown | 21:54 | 0:30 | | | | | | |

| Key | |
|---|---|
| | Vessel Startup, Fueling, & Shutdown |
| | Vessel 1 Times |
| | Vessel 2 Times |
| | Vessel 3 Times |

# APPENDIX D

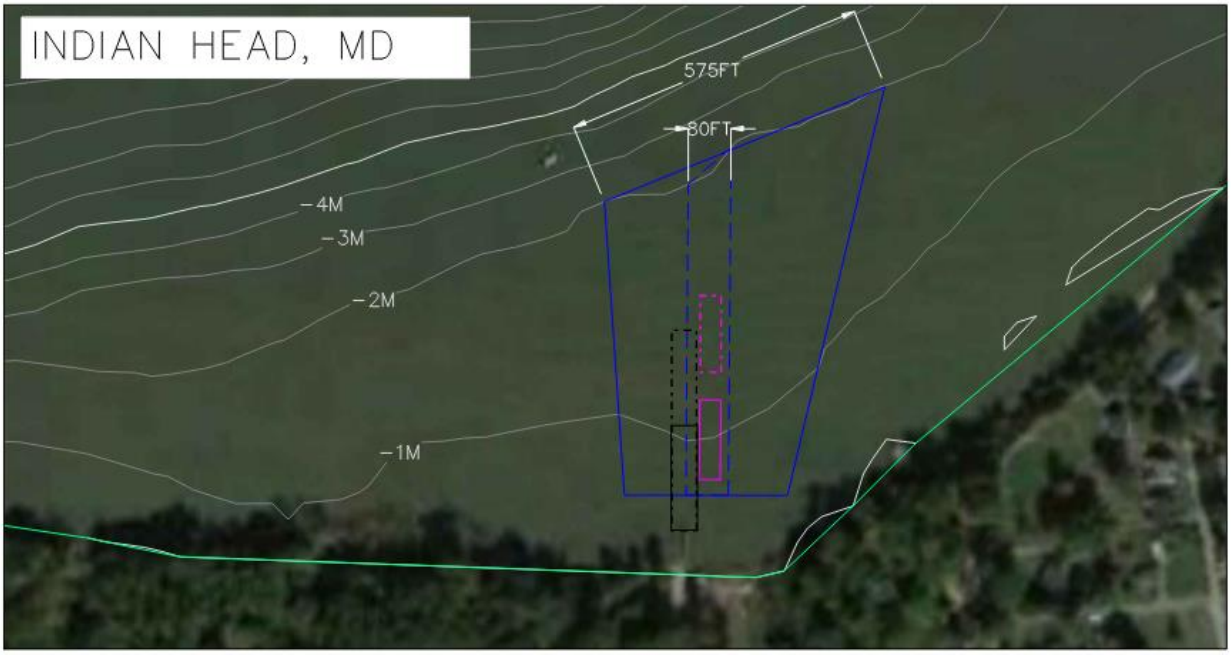
## Dredging Analysis

# 1. Introduction

To better evaluate the potential dredging needed to support ferry operations at the selected terminal locations, available bathymetric data was evaluated. This data, sourced from a survey conducted by the State of Maryland in 1993, would need to be verified with a new benthic/bathymetric survey prior to terminal design and construction.

# 2. Observations

Based upon available data, only the Charles County location faced significant water depth challenges to accommodate vessels proposed for ferry service. An approximate minimum and maximum dredging quantities were identified, and two in-water infrastructure options were pursued to address the water depth challenge. The approximate dredge areas are shown below.




A DEPTH OF AT LEAST 6FT IS REQUIRED TO ACCOMMODATE FERRIES AT THE LANDING SITE, THEREFORE IT IS LIKELY THAT DREDGING WILL BE REQUIRED.

NOTE: BATHYMETRIC SURVEY DATA IS LIMITED IN THIS LOCATION. SURVEY BY THE STATE OF MARYLAND HAS DATA UPDATED AS RECENTLY AS 1993, BUT INCLUDES DATA AS OLD AS 1853, SO RELIABILITY OF DATA IN THIS LOCATION IS UNCLEAR. NEW BATHYMETRIC SURVEY WILL BE REQUIRED TO PROGRESS DESIGN BEYOND CONCEPTUAL LEVEL.

DEPTH NEAR PROPOSED BERTH:
0-1 METERS (0-3.2 FT)

ESTIMATED MINIMUM DREDGE: 7,500 CY
(-6FT + 2FT OVERDREDGE. NO SLOUGH)

ESTIMATED MAXIMUM DREDGE: 40,000 CY
(-6FT + 2FT OVERDREDGE, NO SLOUGH)

LEGEND
- POSSIBLE DREDGING AREA (MIN)
- POSSIBLE DREDGING AREA (MAX)
- ASSUMED BERTH LOCATION OF VESSEL
- PROPOSED FERRY LANDING FLOAT
- ALTERNATE BERTH LOCATION
- ALTERNATE FERRY LANDING & PIER LOCATION

# 3. Approximate Dredging Costs

Though the existing data showed limited dredging beyond current maintenance needs for many of the sites, it was unclear how financially responsible an operator would be for dredging, and feedback from local stakeholders indicated that siltation could be a challenge at some of the sites where bathymetric data indicated no water depth issues. As a result, the approximately $1M of dredging costs were estimated for the JBAB, Poplar Point, and Woodbridge terminal locations in effort to be conservative about potential capital costs. As ferry vessels for other local operators of a similar type currently operate out of the SW Waterfront site, dredging was not assumed necessary for this location. Please see the table below for the summary of the level dredging and associated capital costs for the terminals evaluated in this study.

**Table D1- Dredging Summary**

| Level of Dredging | Terminals | Capital Cost |
|---|---|---|
| None | • SW Waterfront | $0 |
| Maintenance Dredging/ Minimal Dredge | • JBAB<br>• Poplar Point<br>• Woodbridge | $1M |
| Significant Dredging | *Charles County Option 1:*<br>• 40,000 CY of dredging<br>• Replacement of existing pier (80' by 12')<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.)<br>• Upgraded fendering<br>• Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• A float fire system<br>• Signage/wayfinding<br><br>*Charles County Option 2:*<br>• 7,500 CY of dredging<br>• Pier replacement and extension (240' by 12')<br>• New operating float approx. 85' by 20' (including piles, pile hoops, cleats, ballasting, installation, etc.)<br>• Upgraded fendering<br>• Gangway<br>• Electrical lighting<br>• Guardrail along the float perimeter<br>• A float fire system<br>• Signage/wayfinding | *Option 1*<br>$1.15M<br><br>*Option 2*<br>$5.05M |

# APPENDIX E

## Financial Model

## Phoenix Infrastructure Group

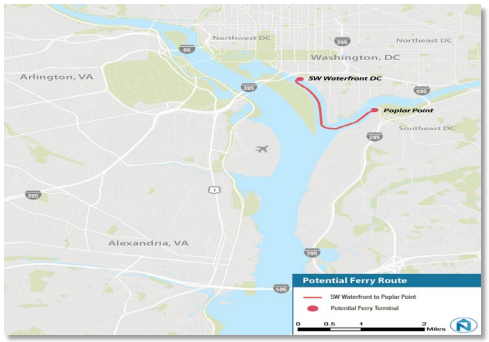
## Poplar Point to SW Waterfront

**OP Hours**

| **Weekly Hours Used Per Vessel** | **Commute-only (Slow/28 knots)** | **Commute-only (Fast/38 knots)** | **EXPANDED OPERATING HOURS (SLOW/28 knots)** | **EXPANDED OPERATING HOURS (Fast/38 knots)** |
|---|---|---|---|---|
| Poplar Point to SW Waterfront | 43.65 | 41.44 | 106.21 | 107.35 |

| **Annual Hours Used per Vessel** | | | | |
|---|---|---|---|---|
| Poplar Point to SW Waterfront | 1047.60 | 994.55 | 3717.35 | 3757.14 |

| | |
|---|---|
| Pick Route | Poplar Point to SW Waterfront |
| Pick Vessel | MEDIUM CATAMARAN, <150 PAX |
| # of Vessels | 1 |
| Commute-Only Speed | Commute-only (Slow/28 knots) |
| Expanded Service Speed | EXPANDED OPERATING HOURS (SLOW/28 knots) |
| **Total OP Hours Used (Annual) per Vessel** | |
| Commute-Only | 1,048 |
| Expanded Service | 3,717 |
| **Total** | **4,765** |
| **Total Gallons Used** | |
| Commute-Only | 40,646.9 |
| Expanded Service | 144,233.2 |
| Total Gallons Used (Annual) Per Vessel | **184,880.1** |




| **Average Revenue** | | 512,825 | 520,517 | 528,325 | 536,250 |
|---|---|---|---|---|---|
| **Cost Particulars** | 0 | 1 | 2 | 3 | 4 |
| | **Beginning of 2023** | **2023** | **2024** | **2025** | **2026** |
| Direct Labor | | $ 644,221.24 | $ 666,768.98 | $ 690,105.90 | $ 714,259.60 |
| Fuel Cost | | $ 978,015.52 | $ 1,012,246.06 | $ 1,047,674.67 | $ 1,084,343.29 |
| **Total Direct Cost** | **$ -** | **$ 1,622,236.76** | **$ 1,679,015.04** | **$ 1,737,780.57** | **$ 1,798,602.89** |
| **Operating Expenses** | | | | | |
| Maintenance | | | | | |
| Routine Maintenance (per hour) | | $ 491,385.47 | $ 508,583.96 | $ 526,384.40 | $ 544,807.85 |
| Annual Maintenance Cost (of Vessel cost) | | $ 165,000.00 | $ 170,775.00 | $ 176,752.13 | $ 182,938.45 |
| Unplanned Maintenance Cost ( of total maintenance costs) | | $ 65,638.55 | $ 67,935.90 | $ 70,313.65 | $ 72,774.63 |
| | | | $ - | $ - | $ - |
| Marketing, Admin & Overhead Cost | | $ 2,475,000.00 | $ 2,561,625.00 | $ 2,651,281.88 | $ 2,744,076.74 |
| **Total OPEX** | **$ -** | **$ 3,197,024.02** | **$ 3,308,919.86** | **$ 3,424,732.05** | **$ 3,544,597.67** |
| **Capex** | | | | | |
| Vessel Cost | $ 8,250,000.00 | | | | |
| Terminal Cost | | | | | |
| SW Waterfront | $ 500,000.00 | | | | |
| JBAB | $ 5,000,000.00 | | | | |
| **Total Capex** | **$ 13,750,000.00** | | | | |
| **Total Costs** | **$ 13,750,000.00** | **$ 4,819,260.77** | **$ 4,987,934.90** | **$ 5,162,512.62** | **$ 5,343,200.56** |
| **Cost of Capital** | **3.40%** | | | | |
| **PV of Costs** | **$ -13,750,000.00** | **$ -4,660,793.78** | **$ -4,665,301.32** | **$ -4,669,813.22** | **$ -4,674,329.48** |
| **Total PV** | **$ -131,632,185.85** | | | | |
| Net | $ -13,750,000.00 | (4,306,435.77) | (4,467,417.53) | (4,634,187.49) | (4,806,950.55) |
| **Subsidy Required** | | 4,306,435.77 | 4,467,417.53 | 4,634,187.49 | 4,806,950.55 |
| | | 10.6% | | | |

| | |
|---|---|
| Fare Price: | $2.50 |
| **Annual Rideship Required at Recovery of Operating Costs** | |
| **50%** | 963,852 |
| **75%** | 1,445,778 |
| **100%** | 1,927,704 |

## Phoenix Infrastructure Group

### Charles County to JBAB

**OP Hours**

| **Weekly Hours Used Per Vessel** | Commute-only (Slow/28 knots) | Commute-only (Fast/38 knots) | EXPANDED OPERATING HOURS (SLOW/28 knots) | EXPANDED OPERATING HOURS (Fast/38 knots) |
|---|---|---|---|---|
| Charles County to JBAB | 43.34 | 37.00 | 102.09 | 103.65 |
| Charles County to SW Waterfront | 55.16 | 47.82 | 104.47 | 103.94 |

**Annual Hours Used per Vessel**

| | | | | |
|---|---|---|---|---|
| Charles County to JBAB | 1040.06 | 887.94 | 3573.15 | 3627.86 |
| Charles County to SW Waterfront | 1323.94 | 1147.64 | 3656.45 | 3637.82 |

| | |
|---|---|
| Pick Route | Charles County to JBAB |
| Pick Vessel | MEDIUM CATAMARAN, <150 PAX |
| # of Vessels | 1 |
| Commute-Only Speed | Commute-only (Slow/28 knots) |
| Expanded Service Speed | EXPANDED OPERATING HOURS (SLOW/28 knots) |
| **Total OP Hours Used (Annual) per Vessel** | |
| Commute-Only | 1,040 |
| Expanded Service | 3,573 |
| **Total** | **4,613** |
| **Total Gallons Used** | |
| Commute-Only | 96,413 |
| Expanded Service | 331,231 |
| Total Gallons Used (Annual) Per Vessel | **427,644** |


| **Average Revenue** | | $ 87,600.00 | $ 88,914.00 | $ 90,247.71 | $ 91,601.43 |
|---|---|---|---|---|---|
| **Cost Particulars** | 0 | 1 | 2 | 3 | 4 |
| | **Beginning of 2023** | **2023** | **2024** | **2025** | **2026** |
| Direct Labor | | $ 623,705.61 | $ 645,535.30 | $ 668,129.04 | $ 691,513.55 |
| Fuel Cost | | $ 2,262,238.36 | $ 2,341,416.70 | $ 2,423,366.29 | $ 2,508,184.11 |
| **Total Direct Cost** | **$ -** | **$ 2,885,943.96** | **$ 2,986,952.00** | **$ 3,091,495.32** | **$ 3,199,697.66** |
| **Operating Expenses** | | | | | |
| Maintenance | | | | | |
| Routine Maintenance (per hour) | | $ 475,736.99 | $ 492,387.78 | $ 509,621.35 | $ 527,458.10 |
| Annual Maintenance Cost (of Vessel cost) | | $ 165,000.00 | $ 170,775.00 | $ 176,752.13 | $ 182,938.45 |
| Unplanned Maintenance Cost ( of total maintenance costs) | | $ 64,073.70 | $ 66,316.28 | $ 68,637.35 | $ 71,039.66 |
| | | $ - | $ - | $ - | $ - |
| Marketing, Admin & Overhead Cost | | $ 2,475,000.00 | $ 2,561,625.00 | $ 2,651,281.88 | $ 2,744,076.74 |
| **Total OPEX** | **$ -** | **$ 3,179,810.69** | **$ 3,291,104.06** | **$ 3,406,292.70** | **$ 3,525,512.95** |
| **Capex** | | | | | |
| Vessel Cost | $ 8,250,000.00 | | | | |
| Terminal Cost | | | | | |
| SW Waterfront | $ - | | | | |
| JBAB | $ 5,000,000.00 | | | | |
| **Total Capex** | **$ 13,250,000.00** | | | | |
| **Total Costs** | **$ 13,250,000.00** | **$ 6,065,754.65** | **$ 6,278,056.06** | **$ 6,497,788.02** | **$ 6,725,210.61** |
| **Cost of Capital** | **3.40%** | | | | |
| **PV of Costs** | **$ -13,250,000.00** | **$ -5,866,300.43** | **$ -5,871,973.84** | **$ -5,877,652.73** | **$ -5,883,337.11** |
| Total PV | $ -161,622,219.43 | | | | |
| Net | | (5,978,154.65) | (6,189,142.06) | (6,407,540.31) | (6,633,609.18) |
| Subsidy Required | | 5,978,154.65 | 6,189,142.06 | 6,407,540.31 | 6,633,609.18 |
| Fare Price: | $5.00 | 1.44% | | | |
| **Annual Rideship Required at Recovery of Operating Costs** | | | | | |
| **50%** | 606,575 | | | | |
| **75%** | 909,863 | | | | |
| **100%** | 1,213,151 | | | | |

## Phoenix Infrastructure Group

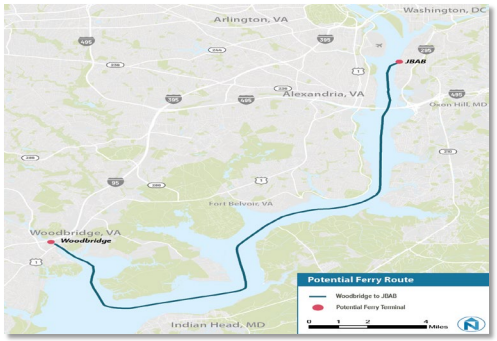
### Woodbridge to JBAB

**OP Hours**

| **Weekly Hours Used Per Vessel** | **Commute-only (Slow/28 knots)** | **Commute-only (Fast/38 knots)** | **EXPANDED OPERATING HOURS (SLOW/28 knots)** | **EXPANDED OPERATING HOURS (Fast/38 knots)** |
|---|---|---|---|---|
| Woodbridge to JBAB | 62.44 | 54.33 | 101.84 | 102.65 |
| Woodbridge to JBAB to SW Waterfront | 74.49 | 65.31 | 100.78 | 106.85 |

| **Annual Hours Used per Vessel** | | | | |
|---|---|---|---|---|
| Woodbridge to JBAB | 1498.67 | 1303.87 | 3564.42 | 3592.65 |
| Woodbridge to JBAB to SW Waterfront | 1787.70 | 1567.37 | 3527.38 | 3739.74 |

| | |
|---|---|
| Pick Route | Woodbridge to JBAB |
| Pick Vessel | LARGE CATAMARAN, <270 PAX |
| # of Vessels | 3 |
| Commute-Only Speed | Commute-only (Fast/38 knots) |
| Expanded Service Speed | EXPANDED OPERATING HOURS (Fast/38 knots) |
| **Total OP Hours Used (Annual) per Vessel** | |
| Commute-Only | 1,304 |
| Expanded Service | 3,593 |
| **Total** | **4,897** |
| | |
| **Total Gallons Used** | |
| Commute-Only | 250,461 |
| Expanded Service | 690,112 |
| Total Gallons Used (Annual) Per Vessel | **940,573** |




| **Average Revenue** | | | 7,701,500.0 | 7,817,022.5 | 7,934,277.8 | 8,053,292.0 |
|---|---|---|---|---|---|---|
| **Cost Particulars** | 0 | | 1 | 2 | 3 | 4 |
| | **Beginning of 2023** | | **2023** | **2024** | **2025** | **2026** |
| Direct Labor | | | $ 2,558,923 | $ 2,648,485 | $ 2,741,182 | $ 2,837,123 |
| Fuel Cost | | | $ 14,926,894 | $ 15,374,701 | $ 15,835,942 | $ 16,311,020 |
| **Total Direct Cost** | **$** | - | **$ 17,485,816.49** | **$ 18,023,185.60** | **$ 18,577,123.59** | **$ 19,148,143** |
| | | | | | | |
| **Operating Expenses** | | | | | | |
| Maintenance | | | | | | |
| Routine Maintenance (per hour) | | | $ 765,082 | $ 791,860 | $ 819,575 | $ 848,260 |
| Annual Maintenance Cost (of Vessel cost) | | | $ 750,000 | $ 776,250 | $ 803,419 | $ 831,538 |
| Unplanned Maintenance Cost ( of total maintenance costs) | | | $ 151,508 | $ 156,811 | $ 162,299 | $ 167,980 |
| | | | | $ - | $ - | $ - |
| Marketing, Admin & Overhead Cost | | | $ 11,250,000 | $ 11,643,750 | $ 12,051,281 | $ 12,473,076 |
| | | | | | | |
| **Total OPEX** | **$** | - | **$ 12,916,590** | **$ 13,368,670** | **$ 13,836,574** | **$ 14,320,854** |
| **Capex** | | | | | | |
| Vessel Cost | $ | 37,500,000 | | | | |
| Terminal Cost | | | | | | |
| Woodbridge | $ | 500,000 | | | | |
| JBAB | $ | 5,000,000 | | | | |
| SW Waterfront | $ | - | | | | |
| **Total Capex** | **$** | **43,000,000** | | | | |
| | | | | | | |
| **Total Costs** | **$** | **43,000,000** | **$ 30,402,406** | **$ 31,391,856** | **$ 32,413,698** | **$ 33,468,997** |
| | | | | | | |
| **Cost of Capital** | | **3.40%** | | | | |
| **PV of Costs** | **$** | **-43,000,000** | **$ -29,402,714** | **$ -29,361,343** | **$ -29,320,202** | **$ -29,279,290** |
| **Total PV** | **$** | **-766,175,399** | | | | |
| | | | | | | |
| | $ | -43,000,000 | $ (22,700,906.31) | $ (23,574,833.56) | $ (24,479,419.68) | $ (25,415,705) |
| **Net Operating Subsidy Required** | | | $ 22,700,906.31 | $ 23,574,833.56 | $ 24,479,419.68 | $ 25,415,705 |
| Farebox Recovery | | | 25% | 25% | 24% | 24% |
| | | | | | | |
| Fare Price: | | $10.00 | | | | |
| **Annual Rideship Required at Recovery of Operating Costs** | | | | | | |
| **50%** | | 1,520,120 | 4,165 | | | |
| **75%** | | 2,280,180 | 6,247 | | | |
| **100%** | | 3,040,241 | 8,329 | | | |

## Notes:

- Crew hourly wages were based upon the 2022 rates from a similar operator, adjusted for geographic wage differences and private operator discount.
- Labor overhead rates were based upon comparable operators and previous feasibility studies.
- Fuel costs were estimated based on the 2022 rates from a similar operator, assuming fueling to be done by truck. Fuel inputs were estimated based on route profile, speeds, and vessel fuel curve assumption.
- Ridership estimates were based on the previously mentioned 2019 MWCOG data.
- The useful life of the vessel is estimated based upon other operators.