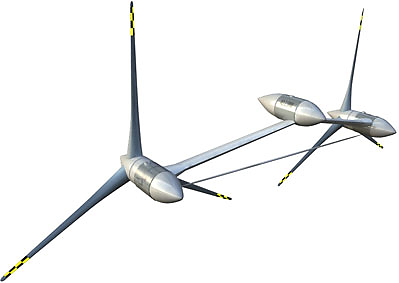
*Mooring Analysis: for Aquantis PDR*

*Report Date: October 18, 2012*

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# Mooring Design & Analysis for PDR

This document provides a general overview of the modeling efforts of the Aquantis C-Plane mooring, performed for the Preliminary Design Review (PDR) meeting held October 18th and 19th 2011. The design effort described here-in is for the four rotor, 3.2 MW C-Plane.

# Configuration

The C-Plane configuration analyzed consisted of four rotors. The two outermost rotors were positioned forward (upwind) of the truss structure, and the two inner rotors positioned aft (downwind) of the truss. All four rotors were joined by a truss structure. The truss structure had a small contribution of drag however did not add lift to the system. The general dimensions are listed in Table 1‑1, and an angled view of the C-Plane as modeled in Orcaflex, is provided in Figure 1‑1. Figure 1‑2 provides plan view layout of the C-plane depicting the coordinate system, with its origin at the aft rotor axis of the C-Plane.

Table 1‑1 – General C-Plane Dimensions

|  |  |  |
| --- | --- | --- |
| Number of Rotors | 4 | ea |
| Rotor Diameter | 40 | m |
| Distance between Blade Tips | 5 | m |
| Nacelle Diameter | 4.3 | m |
| Nacelle Length | 12 | m |

Figure 1‑1 – C-Plane Model

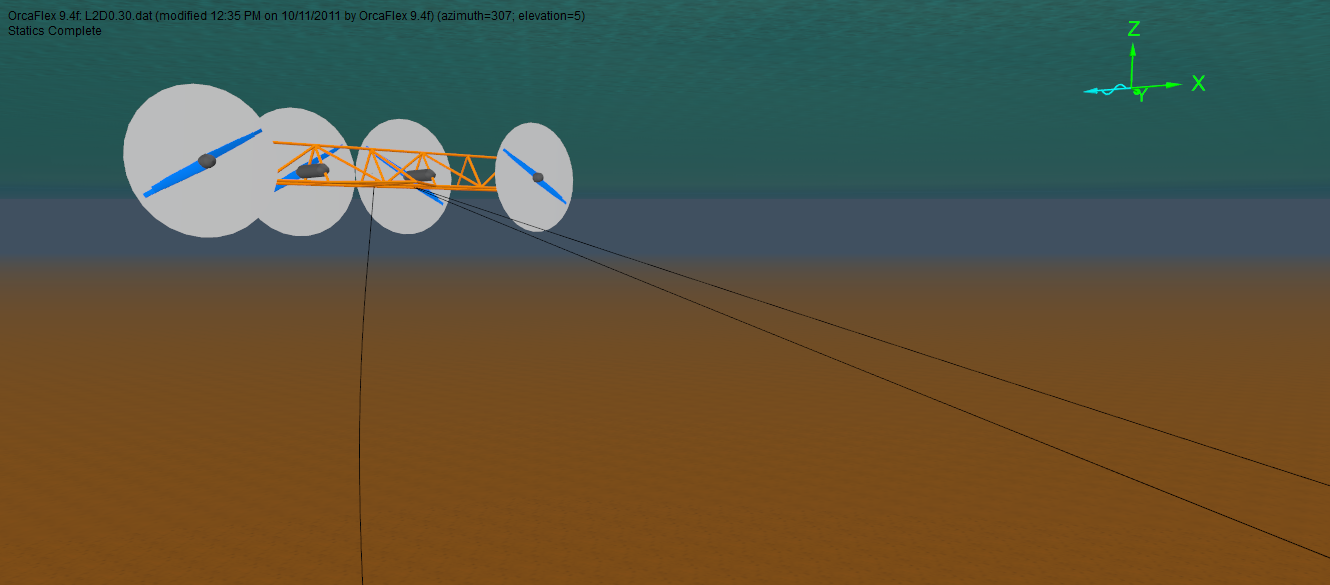


Figure 1‑2 – Plan View of C-Plane with Coordinate System



# Weights and Centers

The weight and center of gravity of the C-Plane components used in the analysis were obtained from the Excel spreadsheet “Weight and Center master 9\_14\_2011.xls” developed by Dehslen, and are included in Appendix \_. The weights and centers of gravity contained within this spreadsheet were used for generating the Orcaflex Model, with exception to the truss structure. The weight of the truss structure was 8965 kN, based on information provided by NSWC, 10/6/2011.

The net vertical force acting on the submerged C-Plane due to buoyancy was 1750 kN. The weights, centers of gravity and center of buoyancy of the main system components are provided in Table 2‑1 and Table 2‑2.

Table 2‑1 – Weight of Components in Air

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Item | Component | Qty | Component Wt in air | | Component CG location  (from aft rotor axis) | | |
| kN | lb | X (m) | Y (m) | Z (m) |
| 1 | Rotor Blade Set - DW | 2 | 289 | 65,043 | -0.8 | 0.0 | 0.0 |
| 2 | Rotor Blade Set - UW | 2 | 289 | 65,043 | 25.2 | 0.0 | 0.0 |
| 3 | Rotor Hub/Brng/Seal - DW | 2 | 1,404 | 315,555 | 0.1 | 0.0 | 0.0 |
| 4 | Rotor Hub/Brng/Seal - UW | 2 | 1,404 | 315,555 | 25.9 | 0.0 | 0.0 |
| 5 | Hydraulics/Elect - DW | 2 | 245 | 55,096 | 8.8 | 0.2 | 0.2 |
| 6 | Hydraulics/Elect - UW | 2 | 245 | 55,096 | 17.2 | -0.2 | 0.2 |
| 7 | Nacelle - DW | 2 | 528 | 118,590 | 7.3 | 0.0 | 0.0 |
| 8 | Nacelle - UW | 2 | 528 | 118,590 | 18.7 | 0.0 | 0.0 |
| 9 | Hub Spinner - DW | 2 | 57 | 12,819 | -2.6 | 0.0 | 0.0 |
| 10 | Hub Spinner - UW | 2 | 57 | 12,819 | 28.6 | 0.0 | 0.0 |
| 11 | Truss | 1 | 8,965 | 2,016,888 | 10.4 | 0.0 | -1.0 |
|  |  |  |  |  |  |  |  |
| Platform Totals | | | 19,056 | 4,285,297 | 11.7 | 0.0 | -0.5 |

Table 2‑2 – Weight of Components in Sea Water

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Item | Component | Qty | Component Wt in SW (+ heavy, - buoyant) | | CB location  (from aft rotor axis) | | |
| kN | lb | X (m) | Y (m) | Z (m) |
| 1 | Rotor Blade Set - DW | 2 | -1 | -330 | -0.8 | 0.0 | 0.0 |
| 2 | Rotor Blade Set - UW | 2 | -1 | -330 | 25.2 | 0.0 | 0.0 |
| 3 | Rotor Hub/Brng/Seal - DW | 2 | 1,248 | 280,509 | 0.1 | 0.0 | 0.0 |
| 4 | Rotor Hub/Brng/Seal - UW | 2 | 1,248 | 280,509 | 25.9 | 0.0 | 0.0 |
| 5 | Hydraulics/Elect - DW | 2 | 245 | 55,096 | 0.0 | 0.0 | 0.0 |
| 6 | Hydraulics/Elect - UW | 2 | 245 | 55,096 | 0.0 | 0.0 | 0.0 |
| 7 | Nacelle - DW | 2 | -1,553 | -349,127 | 9.0 | 0.0 | 0.0 |
| 8 | Nacelle - UW | 2 | -1,553 | -349,127 | 17.0 | 0.0 | 0.0 |
| 9 | Hub Spinner - DW | 2 | -90 | -20,204 | -2.6 | 0.0 | 0.0 |
| 10 | Hub Spinner - UW | 2 | -90 | -20,204 | 28.6 | 0.0 | 0.0 |
| 11 | Truss | 1 | -1,144 | -255,657 | 10.4 | 0.0 | -1.0 |
|  |  |  |  |  |  |  |  |
| Platform Totals | | | -1,750 | -391,884 | 11.7 | 0.0 | -0.5 |

# Mooring System

The mooring system consisted of two forward mooring legs and one vertical leg, referred to as the “aft” leg in this report. Each mooring leg was assumed to be polyester. The length of each forward line is 1050 m, and the length of the aft mooring line was 250 m.

The polyester mooring lines were modeled with a stiffness of 35 times the breaking strength of the lines.

The mooring attachment points for the moorings were selected such that the rotations about the x, y, and z axes (roll, pitch and yaw) were close to zero when the C-Plane was exposed to the base condition of a head on, 1.6 m/s flow at 70 meters water depth. The resulting connection points for the mooring are shown in Table 3‑1.

Table 3‑1 – Mooring Attachment Point Referenced To Aft Rotor Axis

|  |  |  |  |
| --- | --- | --- | --- |
| **Leg** | x | Y | Z |
| (m) | (m) | (m) |
| **Port Forward** | 35 | 0.5 | -6.3 |
| **Starboard Forward** | 35 | -0.5 | -6.3 |
| **Vertical** | 11.3 | 0 | -4.3 |

# Environmental Conditions

Two sets of current loading cases were evaluated. The first was based on the maximum loading conditions for Aquantis 1.6-1.8m/s at 70m depths. These profiles are constructed from the mean profile over the 2000-2002 ADCP data set, and a scaling factor is applied to achieve 1.6-1.8m/s speeds at 70m. The current profiles were applied in the direction of the flow for each case.

For the second set of load cases, Dehlsen Associates selected a series of individual events extracted from a time series of data provided from the Versa-Bar report "Extreme Ocean Current Event Assessment, Florida Straits," April 22, 2011. The events selected represent instances of high current speeds observed outside of the standard flow direction. The data provided included current speed and direction throughout the depth of the water column.

|  |  |  |
| --- | --- | --- |
| Event # | Heading @ 70 m | Speed @ 70 m |
| - | (deg) | (m/s) |
| Case 1 | 0 | 1.60 |
| Case 2 | 10 | 1.60 |
| Case 3 | 25 | 1.60 |
| Case 4 | 30 | 1.60 |
| Case 5 | 0 | 1.80 |
| Case 6 | 10 | 1.80 |
| Case 7 | 25 | 1.80 |
| Case 8 | 30 | 1.70 |

## Initial Cases – 1.6 & 1.8m/s Variations

For the initial cases the current heading is varied from 0 to 30 degrees from the mean, the max design speed is 1.8m/s, and a unidirectional profile is used for these cases. The predominant current direction is 14°N. However, since the C-Plane will be installed to be aligned with the predominant current direction, this case is modeled as a 0 degree heading. These profiles were constructed from the mean current profile over the 2000-2002 ADCP data set, and were scaled to achieve 1.6-1.8m/s speeds at 70m.

## Event Cases – V-Bar Data Events

These cases were run based on the worst case events documented in the V-Bar Excel report: Dehlsen-Florida Straits Extreme Events.xls from the Raye ADCP Data set from 2000-2002. These events were each isolated into two to three profiles and were applied to the C-Plane to evaluate the heading, mooring line tensions, position, and platform rotation. The five extreme current events are outlined in Appendix C.

The events were selected for the study based on extreme values at 70m for heading and greatest velocity fluctuations at 70m, or having the greatest velocity decrease at 70m. The current heading and magnitude at a depth for 70 m is provided in Table 4‑1.

Table 4‑1 – V-Bar Time Event Cases

|  |  |  |
| --- | --- | --- |
| **Event #** | **Heading @ 70 m** | **Speed @ 70 m** |
|
| - | **(deg)** | **(m/s)** |
| E0A | 27 | 1.54 |
| E0B | 29 | 1.60 |
| E0C | 25 | 1.68 |
| E1A | 57 | 0.59 |
| E1B | 40 | 0.80 |
| E1C | 23 | 0.52 |
| E2A | 23 | 0.60 |
| E2B | 32 | 0.53 |
| E2C | 23 | 0.17 |
| E3A | 65 | 1.06 |
| E3B | 32 | 0.63 |
| E4A | 54 | 0.49 |
| E4B | 46 | 1.18 |
| E4C | 49 | 0.98 |
| E5A | 24 | 0.72 |
| E5B | 22 | 0.72 |
| E5C | 25 | 1.31 |

# Modeling of Rotor Drag

The dominant forces acting on the C-Plane are the drag/thrust forces acting on the rotor, the buoyancy force, and the reaction forces of the mooring lines. The drag forces acting on the rotor vary with current speed and angle of attack

In an earlier stage of the project, Penn State ARL performed CFD modeling of a 1.6 MW rotor, producing forces in the x, y, and z directions for various angles of attack and current speeds. Using the results from this analysis (presented in the excel file ECM\_unsteady\_means-NSWC(05.12.2011).xlsx) a series of drag and lift coefficients were calculated for capturing the drag force in the Orcaflex model.

Penn State ARL later provided thrust loads for the 950 kW rotor (the rotor used in this study) for a 0 degree angle of attack. The lift and drag coefficients previously calculated were scaled to match the thrust loads of the 950 kW rotor.

To model the lift and drag acting on the rotor, the lift and drag coefficients are applied to components referred to as “wings” within Orcaflex. A detailed description of “wings” can be found in the Orcaflex user manual. Modeling the drag and lift using wing components in

A comparison of the thrust loads provided by ARL and those modeled in Orcaflex for the zero degree pitch case, is shown in the graph below. For the 950 kW rotor, the drag at the design operating speed of 1.6 m/s is 1342 kN per rotor.

Figure 5‑1 -

# Mooring Leg Factors of Safety

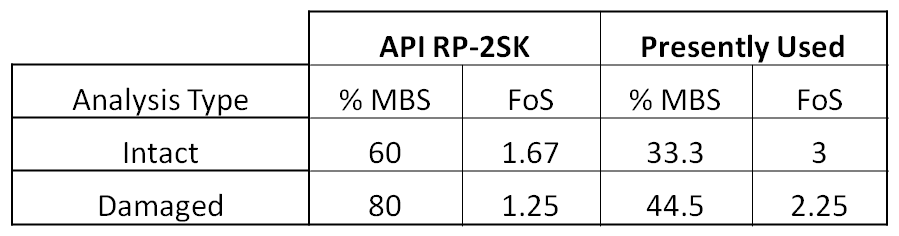
Design standards for offshore renewable energy devices are still in development. However, there are numerous standards available from classification societies and associations for the design of offshore oil and gas structures. For determination of an adequate factor of safety for design of the C-Plane mooring system the American Petroleum Institute (API) standards are referenced.

The recommended factor of safety for offshore moorings per API-RP2SK is 1.67 for the intact case, and 1.25 when analyzing a mooring system with a damaged line.

Due to the multiple unknowns at the time of the analysis utilizing a standard safety factor, such as that recommended by API-RP2SK, would not be conservative, therefore it was recommended that a higher factor of safety be utilized at this stage in the design. During a weekly telephone conference involving Dehlsen, NSWC, PCCI, and ARL, the decision was made to utilize a factor of safety of 3.0 for the intact mooring line tension.

To determine an appropriate factor of safety for the damaged line analysis, the ratio of the agreed upon intact factor of safety (3.0) to the API intact FoS (1.67) was taken and multiplied by the API factor of safety for the damaged line analysis. The factors of safety are summarized in Table 6‑1.

Table 6‑1 Factors of Safety



# Analysis

The analysis was performed utilizing OrcaFlex a non-linear, time domain, finite element software program widely used in the marine industry for dynamic modeling of offshore systems. It is used to determine the mooring loads, mooring lengths, line clashing, anchor loading, and C-Plane offsets. The C-Plane moorings permit the system to weathervane with the prevailing current direction.

The mooring system was analyzed for both the intact and 1 line damaged cases. For analysis of the intact mooring system the cases described in Section 4 were solved and the results extracted.

The mooring system was also analyzed for the case of a damaged mooring line. For this analysis two cases were analyzed, the intact case which resulted in the highest tension for a forward line, and the intact case which resulted in the highest tension for the aft line. The second most loaded line in each case was broken during the analysis, and the maximum tension after the break was recorded. It should be noted that this analysis did not consider dynamics. For each of the cases analyzed, the damaged line was disconnected from the C-Plane and the static solution was solved.

# Results

The 26 environmental conditions described in Section 4 were evaluated for their impact on the C-Plane position, orientation, and maximum line tension. The maximum mooring line tension and offset positions of the C-Plane for each of the environmental cases are shown in Table 8‑1. The position offsets are referenced from the position of case #1, which is the base operating case. The Z offset position is referenced from 0 at the water surface, negative downward.

The C-Plane is observed to have up to 23 degrees of roll and 31 degrees of yaw for the cases analyzed. The larger roll and yaw angles are observed in the event cases 10 through 27, which have three dimensional current profiles, some of which have steep gradients in flow speed and direction. Case 12, Event E0C, had the greatest pitch rotation by the platform. The current at 70m had a 25° heading from the mean with a speed of 1.6m/s. The greatest roll rotation of 23° occurred during Case 19, event E3A. The current at 70m is 65° from the mean, while the speed is 1.06m/s. The greatest yaw rotation and x-position variation occurred during Case 20, event E3B. The current at 70m is 32° from the mean, while the speed is 0.64m/s.

Table 8‑1 – Intact Mooring Analysis Results



The maximum mooring line tension for both the intact and damaged cases is shown in Table 8‑2, along with the required Minimum Breaking Strength for the mooring legs based on the factor of safety. The results of the analysis show that the highest tension observed in the forward lines results from the one line damaged case. However, the intact mooring case is the limiting case for the aft line.

Table 8‑2 – Maximum Mooring Line Tension

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Maximum Tension** | | | **Environment** | **Speed at C-Plane (m/s)** | **Intact or Damage** | **FoS** | **Required MBS (kN)** |
|
| Forward Line | 3769 | kN | 10 Deg, 1.8 m/s @ 70m | 1.62 | Intact | 3 | 11306 |
| Forward Line | 6523 | kN | 10 Deg, 1.8 m/s @ 70m | 1.68 | Damaged | 2.25 | **14677** |
| Aft Line | 1597 | kN | No Flow Condition | 0 | Intact | 3 | **4791** |
| Aft Line | 1648 | kN | No Flow Condition | 0 | Damaged | 2.25 | 3708 |

The required mooring leg diameters based on Lankhorst GAMA 98 Polyester rope properties are shown in Table 8‑3. The minimum diameter required for the forward polyester lines based on the damaged line tension of 14,677kN falls within the specifications for the Lankhorst 232mm polyester line. The minimum breaking load for this line is 15,691kN (1600TF). These lines were also conservatively sized in length to be 1050m. Further work will investigate shorter forward lines that comply with anchor requirements to minimize spacing between C-Planes.

The minimum diameter required for the aft polyester line based on the no flow condition for 4,791kN falls within the specifications for the Lankhorst 132mm polyester line. The MBS for this line is 4,903kN (500TF). The line length required for this line is 250m for 325m depths.

Table 8‑3 – Required Polyester Leg Size

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Leg** | **Diameter** | **Length (m)** | **MBL (kN)** | **FoS Intact** | **FoS Damaged** |
| **Port Forward** | 232 mm | 1050 | 15696 | 4.16 | 2.41 |
| **Starboard Forward** | 232 mm | 1050 | 15696 | 4.16 | 2.41 |
| **Vertical** | 132 mm | 250 | 4905 | 3.07 | 2.98 |

Appendix A:

Next Steps

Next efforts will evaluate the mooring requirements and installation concepts for the 2.4MW twin rotor Aquantis C-Plane, ocean-current device. The 2.4MW C-Plane is described in the included table “Aquantis Rollup”. The values listed in the table are based on one rotor of two. The objectives are to:

* Perform a feasibility study on reducing the forward mooring lines from two lines to one
* Update the OrcaFlex model to reflect new hydrodynamic loads for wing/truss structure, and C-Plane platform and rotors based on ARL/NSWC loads and coefficients
* Perform OrcaFlex modeling to define mooring forces and dynamics of the 2.4MW C-Plane
* Compile associated mooring components and vendor costs for new mooring design
* Arrive at installation methods and vessels, equipment, and sinkable barges required for three bladed rotors
* Compile associated costs and day rates for the installation concept

In addition the objectives listed above, the feasibility of using an external function for modeling the rotor using blade element momentum theory. This can be done using externally calculated rotor dynamics using MatLab or Python codes will be evaluated. Florida Atlantic University’s Jim VanZwieten and Basil Hacker are developing such a code in MatLab for an ocean current turbine. Orcina has performed this analysis using Python scripts for wind turbines.

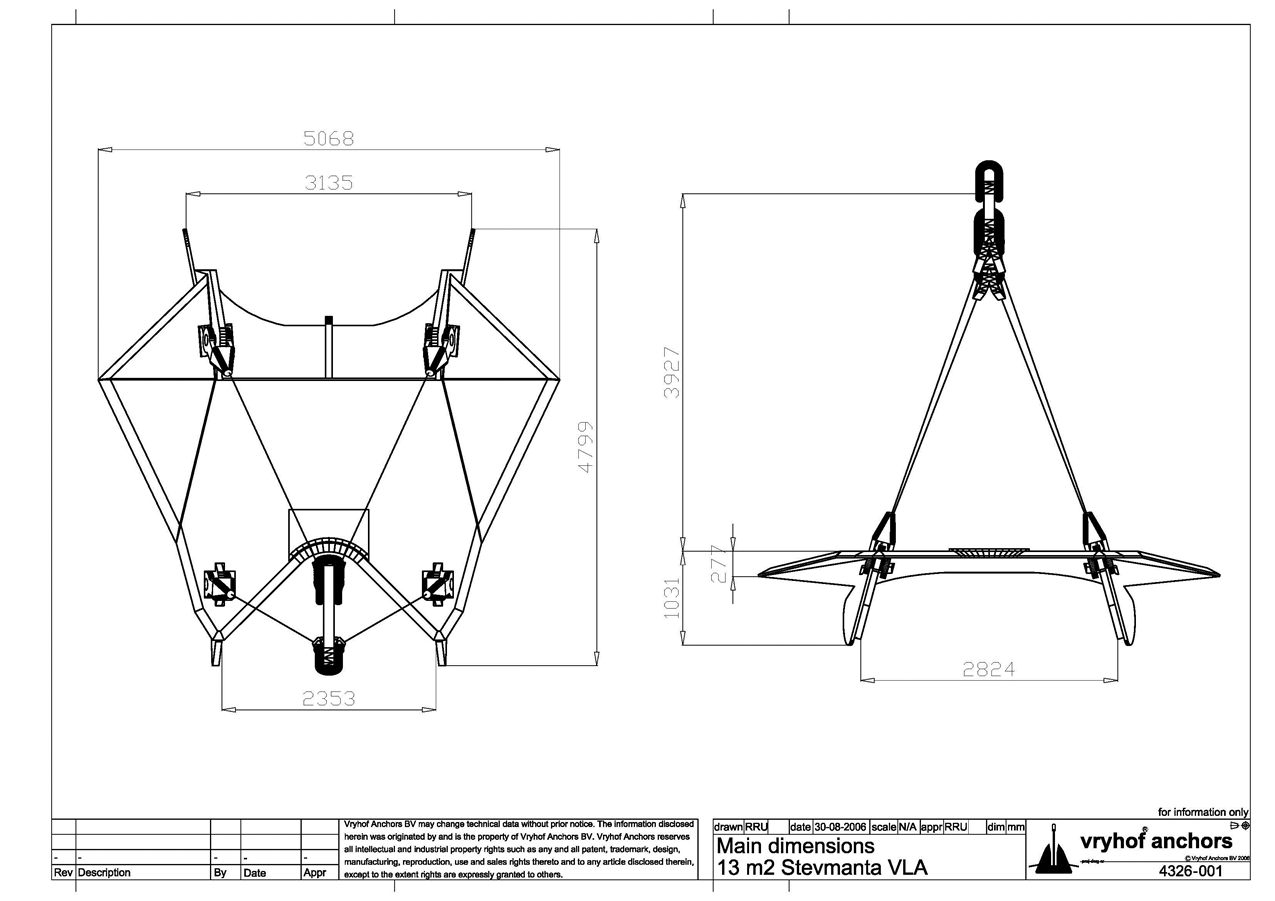
Summary of Tasks

1. Modeling of the 2.4MW twin rotor C-Plane and feasibility study of using a single forward mooring line instead of two forward lines.
   1. Feasibility for concept of using one forward mooring line instead of two lines, with the goal of reducing cost.
   2. Develop OrcaFlex model of 2.4MW C-Plane for mooring design and to analyze the minimum C-Plane spacing required for units with only one forward mooring line.
   3. Mooring component breakdown including budgetary component costs and estimated replacement intervals.
2. Investigate launch concepts for C-Plane with 3-blade rotors.
   1. Develop concept plans for launch and tow-out of a 3-blade/turbine C-plane variant
   2. Develop budgetary installation costs for required vessels, sinkable barges, and day rates based on 2011/2012 estimates

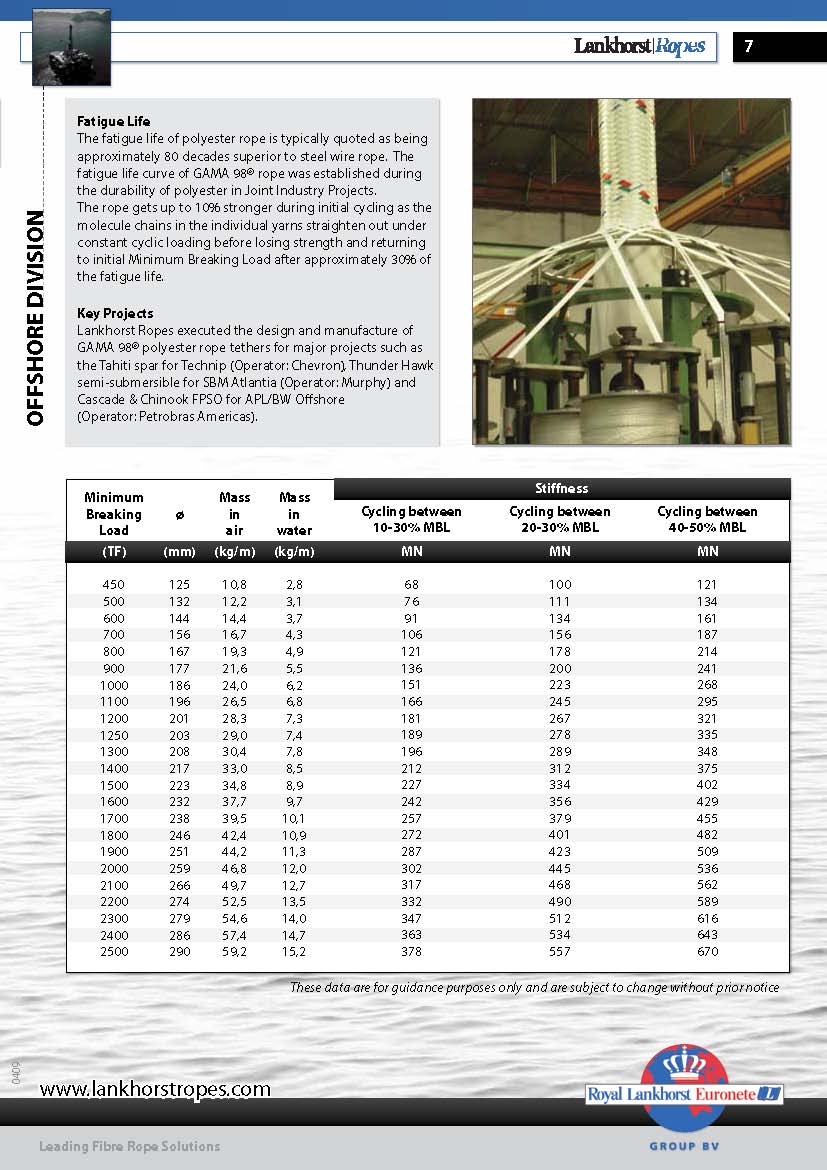
Aquantis: Roll-Up

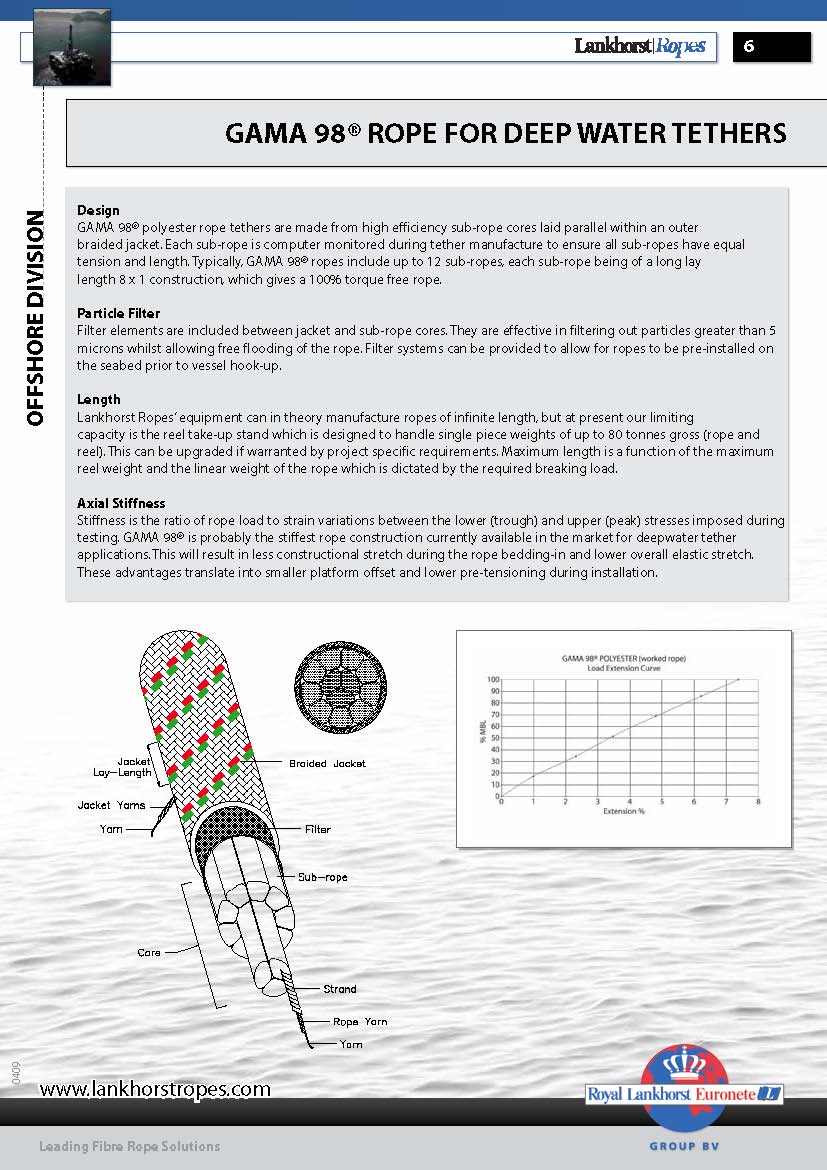
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Full FEA** | **Full FEA (baseline)** |  |  |
| **Parameters** | **2 Blade** | **2 Blade** | **2 Blade** | **3 Blade** |
| **Clamped Hub** | **Through Hub** | **Through Hub** | **Circular** |
| **Number of Blades** | **2** | **2** | **2** | **3** |
| **Diameter (m)** | **40** | **41.5** | **45.5** | **47.5** |
| **Actual Shaft Power (kW)** | **950** | **1224** | **1427** | **1433** |
| **Target Grid Power (kW)** | **800** | **1000** | **1200** | **1300** |
| **Actual Grid Power (kW)** | **789** | **1016** | **1184** | **1189** |
| **RPM** | **8.7** | **5.3** | **5.4** | **5.6** |
| **TSR** | **11.4** | **7.2** | **8.0** | **8.7** |
| ***CP*** | **0.35** | **0.44** | **0.43** | **0.40** |
| **AEP (MW-hrs/yr)** | **4,800** | **6,600** | **7,510** | **7,544** |
| **Blade Surface Area (m2)** |  | **102.66** | **123.35** | **112.38** |
| **Displacement Volume (m3)** |  | **16.84** | **22.14** | **27.78** |
| **Dry Weight (kG)** | **145,740** | **73,580** | **88,794** | **135,277** |
| **Wet Weight (kG)** | **104,000** | **21,450** | **17,120** | **10,753** |
| **Prototype Turbine Cost (USD) - with foamed hub** | **$3,022,000** | **$1,416,000** | **$1,512,054** | **$2,160,469** |
| **Production Turbine Cost (USD) - with foamed hub** |  | **$843,600** | **$918,883** | **$1,392,197** |
| **Root-Chord (m)** |  | **3.82** | **4.18** | **2.38** |
| **Root-Twist (deg)** |  | **11.1** | **10.2** | **0.0** |
| **Root Flap Moment (kN-m)** |  | **8,353** | **10,964** | **8,613** |
| **Root Stress (kN/m2)** |  | **22276** | **26721** | **8867** |
| **Specific Torque (N-m/bar)** | **4,965** | **10,501** | **12,016** | **11,589** |
| **Torque (kN-m)** |  |  | **2,523** | **2,434** |
| **Braking Torque (kN-m)** |  |  | **6,309** | **6,084** |
| **Thrust (kN)** | **1,342** | **1,424** | **1,697** | **1,863** |
| **Pump** | **CBM4000** | **CBM4000+6000** | **2xCBM6000** | **2XCBM6000** |
| **Motors** | **2X A4VSO500 + 2X A4FM500** | **2X A4VSO750 + 2X A4FM750** |  | **2X A4VSO750+ 2X A4FM750 + 1X A4VSO502** |
| **Flex-Coupling** | **Dura-Flex** | **DuraFlex** | **DuraFlex** | **Kop-Flex** |
| **Brake** |  |  | **Witchita** | **Witchita** |
| **Torque Spike** |  |  |  |  |
| **Deployment** |  |  |  | **PCCI** |
| **Manufacturability** |  |  |  | **Walter Keller** |
| **Capacity Factor\*** |  | **72.4%** | **72.4%** | **72.4%** |
| **Capacity Factor\*\*** | **58%** | **75.3%** | **71.5%** | **66.2%** |
| **COE -¢/kW-hr** | **17.7** | **10.47** |  |  |

Anchoring and Mooring Selection

Potential Anchoring Option – Vryhof Stevmanta Vertical Lift Anchor

Lankhorst GAMA 98 Polyester Rope





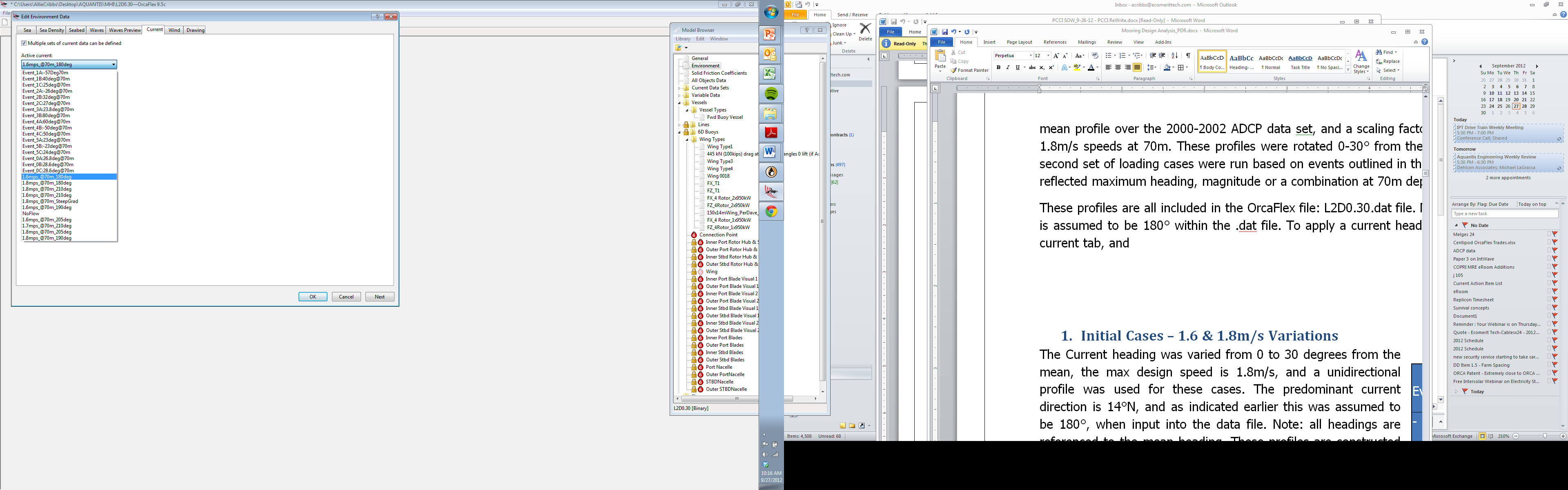
Appendix B: ORCAFLEX MODEL DESCRIPTION

# Boundary Conditions

The inputs include environmental parameters (current, wind, wave), hydrodynamic coefficients (added mass, drag, damping), inertial and buoyancy characteristics.

|  |  |
| --- | --- |
| C-Plane Minimum Operating Depth | 70m |
| Water Depth | 325m |
| Weight & Centers of Gravity | Mike LaGrassa 09/14/2011 |
| Vertical/Horizontal Force Ratio (Net Lift/Drag) | 0.3 |
| C-Plane dimensions | Summarized in C-Plane Inputs, Rotor Inputs, Mooring Inputs |
| Environment: Current | Mean current heading (14°N) is assumed 180 degrees within simulations  Initial Cases: Horizontal Current for 0 to 30 degrees offset (summarized in Initial Cases)  Event Cases: Significant current events outlined within the V-Bar’s report from the 2000-2002 data: “Dehlsen-Florida Straits Extreme Events.xlsx” (summarized in Event Cases) |
| Environment: Waves | The effect of surface waves was not considered for this analysis. |

# Environmental Conditions

Two sets of current loading cases were evaluated. The first was based on the maximum loading conditions for Aquantis 1.6-1.8m/s at 70m depths. These profiles are constructed from the mean profile over the 2000-2002 ADCP data set, and a scaling factor is applied to achieve 1.6-1.8m/s speeds at 70m. The current profiles were applied in the direction of the flow for each case. A second set of loading cases were run based on events outlined in the V-Bar report. These cases reflected the maximum heading, magnitude or a combination at 70m depths.

The profiles are all included in the OrcaFlex file: L2D0.30.dat file. Note that the mean heading is assumed to be 180° within the .dat file. To apply a current heading select Environment, the current tab, and current profile name.

|  |  |  |
| --- | --- | --- |
| Event # | Heading @ 70 m | Speed @ 70 m |
| - | (deg) | (m/s) |
| Case 1 | 0 | 1.60 |
| Case 2 | 10 | 1.60 |
| Case 3 | 25 | 1.60 |
| Case 4 | 30 | 1.60 |
| Case 5 | 0 | 1.80 |
| Case 6 | 10 | 1.80 |
| Case 7 | 25 | 1.80 |
| Case 8 | 30 | 1.70 |

## Initial Cases – 1.6 & 1.8m/s Variations

The Current heading is varied from 0 to 30 degrees from the mean, the max design speed is 1.8m/s, and a unidirectional profile is used for these cases. The predominant current direction is 14°N, and as indicated earlier this is assumed to be 180°, when input into the data file. All offsets are referenced to the mean heading. These profiles are constructed from the mean current profile over the 2000-2002 ADCP data set, and are scaled to achieve 1.6-1.8m/s speeds at 70m.

## Event Cases – V-Bar Data Events

These cases were run based on the worst case events documented in the V-Bar Excel report: Dehlsen-Florida Straits Extreme Events.xls from the Raye ADCP Data set from 2000-2002. These events were each isolated into two to three profiles and were applied to the C-Plane to evaluate the heading, mooring line tensions, position, and platform rotation. The five extreme current events are outlined in Appendix C.

The events were selected for the study based on extreme values at 70m for heading and greatest velocity fluctuations at 70m, or having the greatest velocity decrease at 70m. The current rotation and magnitude as a function of depth for each of the events are represented in the following tables. Note: for implementation into OrcaFlex a scaling factor is used that references the surface current speed. For implementation into OrcaFlex holes within the ADCP data that result from high error between beams must be neglected. High error includes beam error greater than 10%. Rather than using zero values for these depths, the bin is neglected and OrcaFlex determines the slope between the other bins. The shaded gray row indicates the ~70m depth.

Coordinate System

Orcaflex utilizes both global coordinate systems and a body coordinate system. The origin of the global coordinate system is on the sea surface. The global and the local coordinate systems are right handed, with the positive local x-axis pointing towards the C-Plane’s bow or nose, the local y-axis is positive towards the C-Plane’s port side and the local z-axis is positive vertically upwards. The origin of the body coordinate system is located at the aft rotor axis, as displayed in Figure 1‑2.

## 

## C-Plane Inputs

A connection point is used to reference and connect the C-Plane components; this point is given negligible mass. For the purpose of these simulations towed fish are used for horizontal cylindrical bodies, while lumped buoys are used for the connection point and wing. Both buoys have six degrees of freedom and may have wing attachments. Wing attachments are used to model the rotor and the nacelle connective structure (wing or truss). The hydrodynamic loads for the truss/wing were determined by NSWC, while the rotor hydrodynamic loading is determined from ARL 950kW tables. The rotors within the model do not rotate axially, but distribute the loading across twelve wings. The lift and drag coefficients for the stationary wings reflect the thrust loadings provided by ARL. These loadings were calculated using WT\_Perf and provide the rotor thrust loading as a function of current speed.

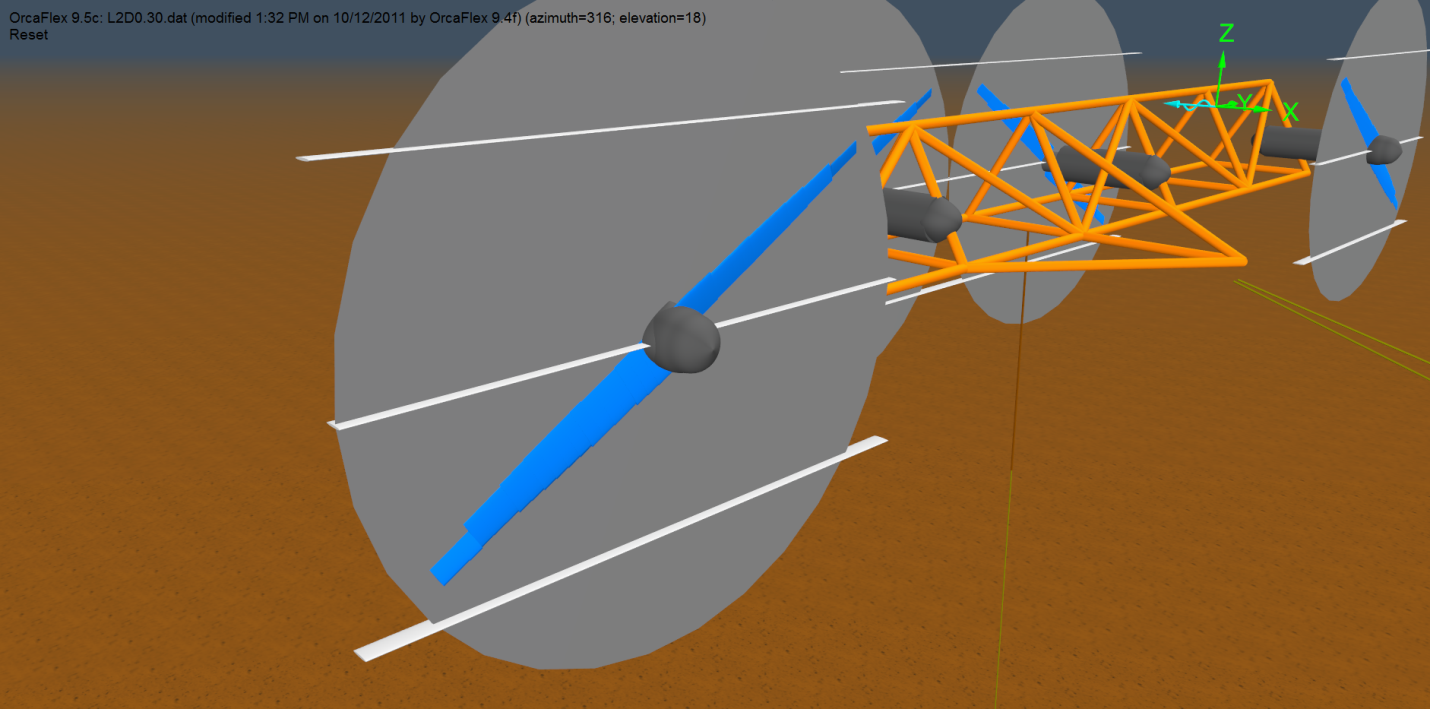
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Component | Buoy Type | Connection | | | |
|  |  | Object | Position (m) | | |
|  |  |  | x | y | z |
| Connection Point | Lumped Buoy | Free | 0 | 0 | -70 |
| Inner Port Rotor Hub & Shaft | Towed Fish | Connection Point | 0 | 22.5 | 0 |
| Outer Port Rotor Hub & Shaft | Towed Fish | Connection Point | 26 | 67.5 | 0 |
| Inner Stbd Rotor Hub & Shaft | Towed Fish | Connection Point | 0 | -22.5 | 0 |
| Outer Stbd Rotor Hub & Shaft | Towed Fish | Connection Point | 26 | -67.5 | 0 |
| Wing | Lumped Buoy | Connection Point | 10.4 | 0 | 0 |
| Inner Port Blades | Towed Fish | Connection Point | 0 | 22.5 | 0 |
| Outer Port Blades | Towed Fish | Connection Point | 26 | 67.5 | 0 |
| Inner Stbd Blades | Towed Fish | Connection Point | 0 | -22.5 | 0 |
| Outer Stbd Blades | Towed Fish | Connection Point | 26 | -67.5 | 0 |
| Port Nacelle | Towed Fish | Connection Point | 8.5 | 22.5 | 0 |
| Outer PortNacelle | Towed Fish | Connection Point | 17.5 | 67.5 | 0 |
| STBDNacelle | Towed Fish | Connection Point | 8.5 | -22.5 | 0 |
| Outer STBDNacelle | Towed Fish | Connection Point | 17.5 | -67.5 | 0 |

The inertial properties are summarized in the following table including the mass, mass moments, buoy’s center of mass. Additionally the geometric properties are included. Lumped buoys apply volumetric buoyancy to the center of volume – therefore “N/A” is indicated for these buoys for the diameter and length. Only known values were used for the hydrodynamic properties, all other values were given zero-values. The wing hydrodynamic mass is 2.4231E6 kg with added mass coefficients of: Ca(x) =1.957, Ca(y) =0.1, Ca(z) =1.957. The wing drag coefficients were set to 0.151 for all incidence angles, this value is equivalent to a total drag of 445kN for all angles of lift. The wing is divided into 10 sections with 15m spans and 15m chord lengths. These 10 wings are attached to the “Wing” 6D buoy, and their centers are positioned with x=0m.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Component | Inertia | | | | | | | Geometric Properties | | |
|  | Mass (kg) | Mass Moments of Inertia (kg.m2) | | | Center of Mass (m) | | | D | L | V |
|  |  | Ix | Iy | Iz | x | y | z | m | m | m3 |
| Connection Point | 1 | 0 | 0 | 0 | 0 | 0 | 0 | N/A | N/A | 0.001 |
| Inner Port Rotor Hub & Shaft | 149,055 | 0 | 0 | 0 | -0.13 | 0 | 0 | 2.76 | 5 | 30.00 |
| Outer Port Rotor Hub & Shaft | 149,055 | 0 | 0 | 0 | -0.13 | 0 | 0 | 2.76 | 5 | 30.00 |
| Inner Stbd Rotor Hub & Shaft | 149,055 | 0 | 0 | 0 | -0.13 | 0 | 0 | 2.76 | 5 | 30.00 |
| Outer Stbd Rotor Hub & Shaft | 149,055 | 0 | 0 | 0 | -0.13 | 0 | 0 | 2.76 | 5 | 30.00 |
| Wing | 914,815 | 2.2E+07 | 2.2E+09 | 1.6E+06 | 0 | 0 | -1 | N/A | N/A | 1006.27 |
| Inner Port Blades | 100 | 0 | 1.3E+06 | 1.3E+06 | 0 | 0 | 0 | 44.8 | 1E-04 | 0.16 |
| Outer Port Blades | 100 | 0 | 1.3E+06 | 1.3E+06 | 0 | 0 | 0 | 44.8 | 1E-04 | 0.16 |
| Inner Stbd Blades | 100 | 0 | 1.3E+06 | 1.3E+06 | 0 | 0 | 0 | 44.8 | 1E-04 | 0.16 |
| Outer Stbd Blades | 100 | 0 | 1.3E+06 | 1.3E+06 | 0 | 0 | 0 | 44.8 | 1E-04 | 0.16 |
| Port Nacelle | 78,839 | 0 | 0 | 0 | 0 | 0 | 0 | 4.69 | 12 | 207.12 |
| Outer PortNacelle | 78,839 | 0 | 0 | 0 | 0 | 0 | 0 | 4.69 | 12 | 207.12 |
| STBDNacelle | 78,839 | 0 | 0 | 0 | 0 | 0 | 0 | 4.69 | 12 | 207.12 |
| Outer STBDNacelle | 78,839 | 0 | 0 | 0 | 0 | 0 | 0 | 4.69 | 12 | 207.12 |

Rotors

To model the rotor thrust loading, multiple wings were used to represent the loading on all four rotors. These coefficients are derived from the 950kW estimates provided by ARL and are divided into x (FX\_4Rotor\_1x950kW) and z loads (FZ\_4Rotor\_1x950kW). The twelve wings distribute the loads around the 40m rotor. Note that the truss shown in the figure is modeled as shapes, and that forces are generated by the hidden “Wing” component.



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Size (m) | | Wing Center (m) | | | Wing Orientation (°) | | | Wing Type |
| Inner Port Blades | Span | Chord | x | y | z | Azimuth | Declination | Gamma |  |
| Center Port FX | 22.5 | 1.5 | 0 | 11.25 | 0 | 90 | 90 | 90 | FX\_4 Rotor\_1x950kW |
| Center STBD FX | 22.5 | 1.5 | 0 | -11.25 | 0 | 90 | 90 | 90 | FX\_4 Rotor\_1x950kW |
| Top Port FX | 22.5 | 1.5 | 0 | 11.25 | 13.333 | 90 | 90 | 90 | FX\_4 Rotor\_1x950kW |
| Top STBD FX | 22.5 | 1.5 | 0 | -11.25 | 13.333 | 90 | 90 | 90 | FX\_4 Rotor\_1x950kW |
| Bottm Port FX | 22.5 | 1.5 | 0 | 11.25 | -13.333 | 90 | 90 | 90 | FX\_4 Rotor\_1x950kW |
| Bottom STBD FX | 22.5 | 1.5 | 0 | -11.25 | -13.333 | 90 | 90 | 90 | FX\_4 Rotor\_1x950kW |
| Center Port FZ | 22.5 | 1.5 | 0 | 11.25 | 0 | 90 | 90 | 90 | FZ\_4Rotor\_1x950kW |
| Center STBD FZ | 22.5 | 1.5 | 0 | -11.25 | 0 | 90 | 90 | 90 | FZ\_4Rotor\_1x950kW |
| Top Port FZ | 22.5 | 1.5 | 0 | 11.25 | 13.333 | 90 | 90 | 90 | FZ\_4Rotor\_1x950kW |
| Top STBD FZ | 22.5 | 1.5 | 0 | -11.25 | 13.333 | 90 | 90 | 90 | FZ\_4Rotor\_1x950kW |
| Bottom Port FZ | 22.5 | 1.5 | 0 | 11.25 | -13.333 | 90 | 90 | 90 | FZ\_4Rotor\_1x950kW |
| Bottom STBD FZ | 22.5 | 1.5 | 0 | -11.25 | -13.333 | 90 | 90 | 90 | FZ\_4Rotor\_1x950kW |

Mooring Inputs

The three moorings include an aft/vertical mooring for restricting the depth of the C-Plane to 70m (Aft), and a starboard forward mooring line (SF) and a port forward mooring line (PF). The normal drag coefficients for these lines are 1.2, and 0.008 for the axial drag. This normal coefficient is conservative according to [1] in which normal 0.8-1.2. The normal added mass coefficient is 1 and 0 is used for the axial coefficient.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mooring Line and End Point | Attachment | x (m) | y (m) | z (m) |
| Aft, End A | Connection Point | 11.3 | 0.0 | -4.3 |
| Aft, End B | Anchored | 17.5 | 0.0 | 0.0 |
| SF, End A | Connection Point | 35.0 | -0.5 | -6.3 |
| SF, End B | Anchored | 1120.9 | -95.5 | -0.4 |
| PF, End A | Connection Point | 35.0 | 0.5 | -6.3 |
| PF, End B | Anchored | 1120.9 | 95.5 | -0.4 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mooring line | Line Type: Top Down | Bar Diameter or Line Diameter | Length (m) | Segment Length (m) | No. of Segments |
| Aft Line | Studless Chain, R4 Grade | 100 mm | 30 | 10 | 3 |
| Polyester | 232mm | 200 | 10 | 20 |
| Studless Chain, R4 Grade | 100 mm | 20 | 10 | 2 |
| Port Forward Line | Polyester | 232mm | 1050 | 5 | 210 |
| Starboard Forward Line | Polyester | 232mm | 1050 | 5 | 210 |

Appendix B References

[1] Wilson, James F. *Dynamics of Offshore Structures*. New York: Wiley, 2003. Print.

Appendix C: Event Current Profiles

Events E0A, E0B, E0C

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event: 0A | | | | Event: 0B | | | | Event: 0C | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Referenced Surface Current Speed: | | 0.787 | m/s | Referenced Surface Current Speed: | | 0.843 | m/s | Referenced Surface Current Speed: | | 0.820 | m/s |
| Depth | OrcaFlex Factor\* | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor\* | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 0.00 | 1.000 | -88.5 | 0.787 | 0.00 | 1.000 | -73.4 | 0.843 | 0.00 | 1.000 | -80.8 | 0.820 |
| 3.25 | 0.897 | -80.9 | 0.706 | 3.25 | 0.937 | -72.9 | 0.790 | 3.25 | 0.926 | -76.7 | 0.759 |
| 6.50 | 0.794 | -89.4 | 0.625 | 6.50 | 0.898 | -71.4 | 0.757 | 6.50 | 0.855 | -85.6 | 0.701 |
| 9.75 | 0.790 | -93.7 | 0.622 | 9.75 | 0.836 | -78.9 | 0.705 | 9.75 | 0.841 | -88.5 | 0.690 |
| 13.00 | 0.469 | -87.0 | 0.369 | 13.00 | 0.568 | -81.8 | 0.479 | 13.00 | 0.555 | -87.3 | 0.455 |
| 29.25 | 1.624 | 23.8 | 1.278 | 29.25 | 1.555 | 24.0 | 1.311 | 29.25 | 1.534 | 24.2 | 1.258 |
| 32.50 | 1.661 | 24.0 | 1.307 | 32.50 | 1.520 | 25.9 | 1.281 | 32.50 | 1.537 | 22.0 | 1.260 |
| 35.75 | 1.648 | 25.2 | 1.297 | 35.75 | 1.456 | 22.5 | 1.227 | 35.75 | 1.582 | 22.7 | 1.297 |
| 39.00 | 1.634 | 25.8 | 1.286 | 39.00 | 1.482 | 24.0 | 1.249 | 39.00 | 1.585 | 22.9 | 1.300 |
| 42.25 | 1.628 | 25.1 | 1.281 | 42.25 | 1.486 | 23.8 | 1.253 | 42.25 | 1.583 | 24.8 | 1.298 |
| 45.50 | 1.634 | 25.4 | 1.286 | 45.50 | 1.470 | 25.0 | 1.239 | 45.50 | 1.639 | 25.0 | 1.344 |
| 48.75 | 1.606 | 24.7 | 1.264 | 48.75 | 1.536 | 23.6 | 1.295 | 48.75 | 1.687 | 25.9 | 1.383 |
| 52.00 | 1.593 | 26.6 | 1.254 | 52.00 | 1.541 | 23.9 | 1.299 | 52.00 | 1.691 | 27.4 | 1.387 |
| 55.25 | 1.620 | 25.7 | 1.275 | 55.25 | 1.560 | 24.2 | 1.315 | 55.25 | 1.788 | 26.6 | 1.466 |
| 58.50 | 1.657 | 24.4 | 1.304 | 58.50 | 1.682 | 27.1 | 1.418 | 58.50 | 1.898 | 26.6 | 1.556 |
| 61.75 | 1.700 | 23.8 | 1.338 | 61.75 | 1.734 | 27.5 | 1.462 | 61.75 | 1.932 | 28.1 | 1.584 |
| 65.00 | 1.723 | 25.1 | 1.356 | 65.00 | 1.835 | 27.2 | 1.547 | 65.00 | 1.970 | 24.9 | 1.615 |
| 68.25 | 1.865 | 28.1 | 1.468 | 68.25 | 1.888 | 28.4 | 1.592 | 68.25 | 2.043 | 25.4 | 1.675 |
| 71.50 | 1.961 | 26.8 | 1.543 | 71.50 | 1.894 | 28.6 | 1.597 | 71.50 | 2.049 | 25.0 | 1.680 |
| 74.75 | 1.997 | 29.7 | 1.572 | 74.75 | 1.926 | 28.6 | 1.624 | 74.75 | 2.098 | 25.2 | 1.720 |
| 78.00 | 2.133 | 28.4 | 1.679 | 78.00 | 2.014 | 27.6 | 1.698 | 78.00 | 2.084 | 24.5 | 1.709 |
| 81.25 | 2.230 | 29.8 | 1.755 | 81.25 | 2.060 | 27.3 | 1.737 | 81.25 | 2.200 | 22.7 | 1.804 |
| 84.50 | 2.282 | 29.4 | 1.796 | 84.50 | 2.144 | 27.9 | 1.807 | 84.50 | 2.171 | 22.2 | 1.780 |
| 87.75 | 2.385 | 28.0 | 1.877 | 87.75 | 2.211 | 26.0 | 1.864 | 87.75 | 2.195 | 21.2 | 1.800 |
| 91.00 | 2.386 | 27.7 | 1.878 | 91.00 | 2.240 | 25.1 | 1.888 | 91.00 | 2.255 | 22.1 | 1.849 |
| 94.25 | 2.342 | 27.6 | 1.843 | 94.25 | 2.186 | 25.8 | 1.843 | 94.25 | 2.271 | 22.9 | 1.862 |
| 97.50 | 2.217 | 27.3 | 1.745 | 97.50 | 2.095 | 27.1 | 1.766 | 97.50 | 2.213 | 23.1 | 1.815 |
| 100.75 | 2.088 | 29.9 | 1.643 | 100.75 | 1.982 | 27.1 | 1.671 | 100.75 | 2.182 | 22.8 | 1.789 |
| 104.00 | 1.983 | 29.9 | 1.561 | 104.00 | 1.898 | 28.6 | 1.600 | 104.00 | 2.041 | 24.4 | 1.674 |
| 107.25 | 1.830 | 27.1 | 1.440 | 107.25 | 1.733 | 28.6 | 1.461 | 107.25 | 1.917 | 26.5 | 1.572 |
| 110.50 | 1.647 | 26.6 | 1.296 | 110.50 | 1.616 | 26.6 | 1.362 | 110.50 | 1.810 | 24.8 | 1.484 |
| 113.75 | 1.436 | 23.0 | 1.130 | 113.75 | 1.444 | 24.5 | 1.217 | 113.75 | 1.621 | 24.3 | 1.329 |
| 117.00 | 1.260 | 16.6 | 0.992 | 117.00 | 1.326 | 18.6 | 1.118 | 117.00 | 1.509 | 21.8 | 1.237 |
| 123.50 | 1.058 | 6.5 | 0.833 | 120.25 | 1.167 | 12.5 | 0.984 | 120.25 | 1.300 | 16.7 | 1.066 |
| 126.75 | 1.066 | 3.0 | 0.839 | 123.50 | 1.051 | 6.6 | 0.886 | 123.50 | 1.205 | 12.6 | 0.988 |
| 130.00 | 1.061 | 4.0 | 0.835 | 126.75 | 1.052 | 4.6 | 0.887 | 126.75 | 1.132 | 9.6 | 0.928 |
| 133.25 | 1.081 | 1.2 | 0.851 | 130.00 | 1.036 | 3.2 | 0.873 | 130.00 | 1.113 | 6.2 | 0.913 |
| 136.50 | 1.047 | 4.3 | 0.824 | 133.25 | 1.032 | 2.1 | 0.870 | 133.25 | 1.072 | 4.7 | 0.879 |
| 139.75 | 1.029 | 3.7 | 0.810 | 136.50 | 1.008 | 3.8 | 0.850 | 136.50 | 1.090 | 3.9 | 0.894 |
| 143.00 | 1.030 | 4.7 | 0.811 | 139.75 | 0.979 | 2.7 | 0.825 | 139.75 | 1.015 | 7.2 | 0.832 |
| 146.25 | 1.019 | 4.1 | 0.802 | 143.00 | 0.960 | 1.5 | 0.809 | 143.00 | 0.954 | 8.9 | 0.782 |
| 149.50 | 0.996 | 1.0 | 0.784 | 146.25 | 0.937 | 2.2 | 0.790 | 146.25 | 1.006 | 3.6 | 0.825 |
| 152.75 | 1.013 | 1.5 | 0.797 | 149.50 | 0.975 | 3.9 | 0.822 | 149.50 | 0.977 | 4.6 | 0.801 |
| 156.00 | 0.986 | -0.9 | 0.776 | 152.75 | 0.995 | 6.7 | 0.839 | 152.75 | 1.015 | 6.3 | 0.832 |
| 159.25 | 1.042 | -1.0 | 0.820 | 156.00 | 0.983 | 1.4 | 0.829 | 156.00 | 0.960 | -1.4 | 0.787 |
| 162.50 | 1.076 | -5.6 | 0.847 | 159.25 | 0.977 | -0.1 | 0.824 | 159.25 | 0.932 | -0.3 | 0.764 |
| 165.75 | 1.090 | -4.5 | 0.858 | 162.50 | 0.907 | 0.0 | 0.765 | 162.50 | 0.982 | -0.4 | 0.805 |
| 169.00 | 1.104 | -3.9 | 0.869 | 165.75 | 0.953 | 1.3 | 0.803 | 165.75 | 0.999 | 1.8 | 0.819 |
| 172.25 | 1.123 | -2.7 | 0.884 | 169.00 | 1.039 | 1.5 | 0.876 | 169.00 | 1.023 | 3.5 | 0.839 |
| 175.50 | 1.172 | 0.0 | 0.922 | 172.25 | 0.966 | 0.0 | 0.814 | 172.25 | 0.990 | 0.7 | 0.812 |
| 178.75 | 1.184 | 1.7 | 0.932 | 175.50 | 1.011 | 0.1 | 0.852 | 175.50 | 1.118 | 3.8 | 0.917 |
| 182.00 | 1.136 | 2.4 | 0.894 | 178.75 | 1.094 | 3.4 | 0.922 | 178.75 | 1.180 | 4.1 | 0.968 |
| 185.25 | 1.037 | 3.1 | 0.816 | 182.00 | 1.089 | 6.5 | 0.918 | 182.00 | 1.094 | 6.3 | 0.897 |
| 188.50 | 1.047 | 3.9 | 0.824 | 185.25 | 0.986 | 6.7 | 0.831 | 185.25 | 0.943 | 7.1 | 0.773 |
| 191.75 | 0.954 | 1.4 | 0.751 | 188.50 | 0.890 | 3.9 | 0.750 | 188.50 | 0.962 | 6.7 | 0.789 |
| 195.00 | 0.917 | -2.9 | 0.722 | 191.75 | 0.885 | 4.7 | 0.746 | 191.75 | 0.893 | 5.8 | 0.732 |
| 198.25 | 0.986 | -4.2 | 0.776 | 195.00 | 0.896 | 0.6 | 0.755 | 195.00 | 0.909 | 0.4 | 0.745 |
| 201.50 | 0.928 | -5.9 | 0.730 | 198.25 | 0.884 | -6.0 | 0.745 | 198.25 | 0.851 | -1.5 | 0.698 |
| 204.75 | 0.931 | -11.7 | 0.733 | 201.50 | 0.824 | -7.0 | 0.695 | 201.50 | 0.813 | -2.8 | 0.667 |
| 208.00 | 0.848 | -9.1 | 0.667 | 204.75 | 0.814 | -6.1 | 0.686 | 204.75 | 0.795 | -1.6 | 0.652 |
| 211.25 | 0.865 | -9.2 | 0.681 | 208.00 | 0.785 | -8.9 | 0.662 | 208.00 | 0.810 | -0.1 | 0.664 |
| 214.50 | 0.861 | -6.3 | 0.678 | 211.25 | 0.771 | -8.1 | 0.650 | 211.25 | 0.784 | 1.9 | 0.643 |
| 217.75 | 0.848 | -3.6 | 0.667 | 214.50 | 0.789 | -6.1 | 0.665 | 214.50 | 0.776 | -0.4 | 0.636 |
| 221.00 | 0.793 | -2.8 | 0.624 | 217.75 | 0.741 | -2.8 | 0.625 | 217.75 | 0.761 | 2.9 | 0.624 |
| 224.25 | 0.802 | -1.3 | 0.631 | 221.00 | 0.753 | -1.8 | 0.635 | 221.00 | 0.812 | 0.3 | 0.666 |
| 227.50 | 0.828 | 3.3 | 0.652 | 224.25 | 0.731 | -1.8 | 0.616 | 224.25 | 0.780 | 0.6 | 0.640 |
| 230.75 | 0.842 | 3.6 | 0.663 | 227.50 | 0.750 | 1.6 | 0.632 | 227.50 | 0.777 | 0.4 | 0.637 |
| 234.00 | 0.765 | 0.5 | 0.602 | 234.00 | 0.771 | 0.9 | 0.650 | 234.00 | 0.704 | 4.0 | 0.577 |
| 237.25 | 0.761 | 5.1 | 0.599 | 237.25 | 0.822 | 2.7 | 0.693 | 237.25 | 0.721 | 6.9 | 0.591 |
| 240.50 | 0.826 | 9.1 | 0.650 | 240.50 | 0.707 | 6.9 | 0.596 | 240.50 | 0.744 | 8.4 | 0.610 |
| 243.75 | 0.802 | 10.2 | 0.631 | 247.00 | 0.698 | 5.4 | 0.588 | 247.00 | 0.672 | 11.6 | 0.551 |
| 247.00 | 0.803 | 9.6 | 0.632 | 250.25 | 0.656 | 3.6 | 0.553 | 250.25 | 0.529 | 15.8 | 0.434 |
| 250.25 | 0.789 | 9.5 | 0.621 | 253.50 | 0.644 | 7.0 | 0.543 | 253.50 | 0.440 | 9.6 | 0.361 |
| 253.50 | 0.718 | 10.0 | 0.565 | 256.75 | 0.571 | 7.9 | 0.481 | 256.75 | 0.545 | 6.6 | 0.447 |
| 256.75 | 0.593 | 5.0 | 0.467 | 260.00 | 0.522 | 7.5 | 0.440 | 260.00 | 0.451 | -0.4 | 0.370 |
| 260.00 | 0.596 | 8.6 | 0.469 | 263.25 | 0.507 | 3.8 | 0.427 | 263.25 | 0.218 | 10.3 | 0.179 |
| 263.25 | 0.529 | 11.1 | 0.416 | 266.50 | 0.546 | 0.8 | 0.460 | 266.50 | 0.394 | 10.3 | 0.323 |
| 266.50 | 0.530 | 1.9 | 0.417 | 269.75 | 0.484 | 7.2 | 0.408 | 269.75 | 0.254 | -0.9 | 0.208 |
| 269.75 | 0.535 | -3.0 | 0.421 | 279.50 | 0.381 | -1.8 | 0.321 | 279.50 | 0.167 | 23.4 | 0.137 |
| 273.00 | 0.405 | 1.4 | 0.319 | 289.25 | 0.257 | -5.3 | 0.217 | 289.25 |  |  |  |
| 276.25 | 0.388 | 2.6 | 0.305 | 295.75 | 0.409 | 2.6 | 0.345 | 295.75 |  |  |  |
| 282.75 | 0.271 | 15.4 | 0.213 | 299.00 | 0.442 | -3.7 | 0.373 | 299.00 |  |  |  |
| 286.00 | 0.343 | -5.4 | 0.270 | 302.25 | 0.394 | -2.8 | 0.332 | 302.25 |  |  |  |
| 289.25 | 0.390 | 2.8 | 0.307 | 305.50 | 0.386 | 10.9 | 0.325 | 305.50 |  |  |  |
| 295.75 | 0.449 | -3.5 | 0.353 | 308.75 | 0.329 | 10.0 | 0.277 | 308.75 |  |  |  |
| 299.00 | 0.408 | -1.7 | 0.321 | 312.00 | 0.307 | -5.5 | 0.259 | 312.00 |  |  |  |
| 305.50 | 0.355 | -0.9 | 0.279 | 321.75 | 0.261 | -20.3 | 0.220 | 321.75 |  |  |  |

Events E1A, E1B, E1C

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event: 1A | | | | Event: 1B | | | | Event: 1C | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Referenced Surface Current Speed: | | 1.3 | m/s | Referenced Surface Current Speed: | | 1.0 | m/s | Referenced Surface Current Speed: | | 1.5 | m/s |
| Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 0.00 | 1.000 | -145.1 | 1.298 | 0.00 | 1.000 | -135.3 | 0.952 | 0.00 | 1.000 | -114.1 | 1.511 |
| 3.25 | 0.899 | -150.7 | 1.167 | 3.25 | 0.917 | -143.8 | 0.873 | 3.25 | 0.943 | -115.9 | 1.425 |
| 6.50 | 0.832 | -148.4 | 1.080 | 6.50 | 0.821 | -140.2 | 0.782 | 6.50 | 0.866 | -116.0 | 1.308 |
| 9.75 | 0.753 | -152.6 | 0.977 | 9.75 | 0.739 | -138.8 | 0.704 | 9.75 | 0.758 | -116.8 | 1.145 |
| 16.25 | 0.476 | -162.7 | 0.618 | 29.25 | 0.688 | 41.3 | 0.655 | 26.00 | 0.323 | -23.6 | 0.488 |
| 26.00 | 0.405 | -47.6 | 0.526 | 32.50 | 0.671 | 41.8 | 0.639 | 29.25 | 0.328 | -23.6 | 0.496 |
| 29.25 | 0.403 | -58.7 | 0.523 | 35.75 | 0.654 | 44.7 | 0.623 | 32.50 | 0.328 | -26.1 | 0.496 |
| 32.50 | 0.423 | -56.0 | 0.549 | 39.00 | 0.667 | 41.9 | 0.635 | 35.75 | 0.316 | -22.0 | 0.477 |
| 35.75 | 0.403 | -59.8 | 0.523 | 42.25 | 0.714 | 40.8 | 0.680 | 39.00 | 0.307 | -22.7 | 0.464 |
| 39.00 | 0.422 | -61.5 | 0.548 | 45.50 | 0.721 | 43.7 | 0.686 | 42.25 | 0.347 | -19.9 | 0.524 |
| 42.25 | 0.398 | -57.7 | 0.517 | 48.75 | 0.675 | 46.6 | 0.643 | 45.50 | 0.316 | -18.3 | 0.477 |
| 45.50 | 0.431 | -57.8 | 0.559 | 52.00 | 0.712 | 44.7 | 0.678 | 48.75 | 0.300 | -23.9 | 0.453 |
| 48.75 | 0.455 | -57.0 | 0.591 | 55.25 | 0.723 | 41.7 | 0.688 | 52.00 | 0.332 | -22.1 | 0.502 |
| 52.00 | 0.431 | -60.7 | 0.560 | 58.50 | 0.748 | 40.1 | 0.712 | 55.25 | 0.336 | -25.8 | 0.507 |
| 55.25 | 0.428 | -58.6 | 0.555 | 61.75 | 0.665 | 41.6 | 0.633 | 58.50 | 0.334 | -19.5 | 0.505 |
| 58.50 | 0.441 | -58.6 | 0.573 | 65.00 | 0.724 | 41.2 | 0.689 | 61.75 | 0.321 | -20.2 | 0.485 |
| 61.75 | 0.455 | -57.1 | 0.591 | 68.25 | 0.742 | 39.3 | 0.706 | 65.00 | 0.340 | -20.0 | 0.514 |
| 65.00 | 0.459 | -54.4 | 0.596 | 71.50 | 0.788 | 40.4 | 0.750 | 68.25 | 0.316 | -21.9 | 0.478 |
| 68.25 | 0.465 | -54.8 | 0.603 | 74.75 | 0.789 | 41.4 | 0.751 | 71.50 | 0.342 | -25.9 | 0.517 |
| 71.50 | 0.455 | -57.1 | 0.591 | 78.00 | 0.837 | 40.1 | 0.797 | 74.75 | 0.346 | -22.5 | 0.523 |
| 74.75 | 0.435 | -54.0 | 0.564 | 81.25 | 0.869 | 41.5 | 0.827 | 81.25 | 0.348 | -23.1 | 0.526 |
| 78.00 | 0.434 | -50.8 | 0.563 | 84.50 | 0.863 | 40.2 | 0.822 | 84.50 | 0.363 | -20.8 | 0.549 |
| 81.25 | 0.471 | -47.5 | 0.612 | 87.75 | 0.973 | 40.3 | 0.926 | 87.75 | 0.421 | -18.5 | 0.636 |
| 84.50 | 0.475 | -48.8 | 0.617 | 91.00 | 1.030 | 37.9 | 0.981 | 91.00 | 0.400 | -15.5 | 0.604 |
| 87.75 | 0.515 | -50.9 | 0.669 | 94.25 | 1.001 | 34.1 | 0.953 | 94.25 | 0.396 | -18.3 | 0.599 |
| 91.00 | 0.532 | -48.6 | 0.690 | 97.50 | 1.075 | 33.2 | 1.023 | 97.50 | 0.379 | -18.0 | 0.572 |
| 94.25 | 0.508 | -43.5 | 0.660 | 100.75 | 1.061 | 31.2 | 1.010 | 100.75 | 0.373 | -22.7 | 0.564 |
| 97.50 | 0.476 | -42.0 | 0.618 | 104.00 | 1.027 | 32.3 | 0.978 | 104.00 | 0.375 | -22.7 | 0.567 |
| 100.75 | 0.515 | -32.8 | 0.669 | 107.25 | 0.967 | 33.3 | 0.921 | 107.25 | 0.394 | -21.2 | 0.595 |
| 104.00 | 0.505 | -28.6 | 0.655 | 110.50 | 0.962 | 33.1 | 0.916 | 110.50 | 0.413 | -19.5 | 0.624 |
| 107.25 | 0.555 | -18.8 | 0.721 | 113.75 | 0.882 | 29.5 | 0.840 | 113.75 | 0.426 | -16.6 | 0.644 |
| 110.50 | 0.549 | -12.3 | 0.713 | 117.00 | 0.872 | 24.6 | 0.830 | 117.00 | 0.427 | -10.4 | 0.645 |
| 113.75 | 0.539 | -9.7 | 0.700 | 120.25 | 0.860 | 23.2 | 0.819 | 120.25 | 0.441 | -10.2 | 0.667 |
| 117.00 | 0.584 | -2.1 | 0.758 | 123.50 | 0.828 | 18.7 | 0.788 | 123.50 | 0.471 | -5.9 | 0.711 |
| 120.25 | 0.617 | -4.4 | 0.801 | 126.75 | 0.872 | 14.5 | 0.830 | 126.75 | 0.454 | -5.5 | 0.686 |
| 123.50 | 0.641 | -1.4 | 0.832 | 130.00 | 0.815 | 12.6 | 0.776 | 130.00 | 0.454 | -5.4 | 0.686 |
| 126.75 | 0.642 | -2.9 | 0.833 | 133.25 | 0.791 | 11.3 | 0.753 | 133.25 | 0.467 | -3.3 | 0.705 |
| 130.00 | 0.684 | -7.4 | 0.888 | 136.50 | 0.762 | 12.0 | 0.725 | 136.50 | 0.477 | 1.1 | 0.721 |
| 133.25 | 0.741 | -6.4 | 0.962 | 139.75 | 0.694 | 10.5 | 0.661 | 139.75 | 0.471 | 6.2 | 0.712 |
| 136.50 | 0.786 | -6.6 | 1.020 | 143.00 | 0.731 | 0.6 | 0.696 | 143.00 | 0.513 | 11.4 | 0.775 |
| 139.75 | 0.797 | -8.4 | 1.034 | 146.25 | 0.758 | -3.3 | 0.722 | 146.25 | 0.525 | 14.6 | 0.794 |
| 143.00 | 0.787 | -6.0 | 1.022 | 149.50 | 0.801 | -7.2 | 0.763 | 149.50 | 0.515 | 17.0 | 0.778 |
| 146.25 | 0.773 | -7.7 | 1.004 | 152.75 | 0.785 | -7.9 | 0.747 | 152.75 | 0.514 | 16.5 | 0.777 |
| 149.50 | 0.777 | -7.9 | 1.008 | 156.00 | 0.767 | -4.0 | 0.730 | 156.00 | 0.540 | 17.6 | 0.816 |
| 152.75 | 0.806 | -6.0 | 1.046 | 159.25 | 0.743 | -5.0 | 0.707 | 159.25 | 0.557 | 12.0 | 0.841 |
| 156.00 | 0.774 | -5.5 | 1.005 | 162.50 | 0.753 | -0.2 | 0.717 | 162.50 | 0.510 | 10.2 | 0.771 |
| 159.25 | 0.786 | -1.0 | 1.020 | 165.75 | 0.790 | 1.5 | 0.752 | 165.75 | 0.507 | 9.2 | 0.766 |
| 162.50 | 0.792 | 2.6 | 1.028 | 169.00 | 0.766 | 1.9 | 0.729 | 169.00 | 0.494 | 9.3 | 0.747 |
| 165.75 | 0.773 | 4.7 | 1.004 | 172.25 | 0.747 | 5.6 | 0.711 | 172.25 | 0.490 | 9.8 | 0.741 |
| 169.00 | 0.806 | 5.1 | 1.046 | 175.50 | 0.748 | 9.6 | 0.712 | 175.50 | 0.470 | 8.3 | 0.710 |
| 172.25 | 0.827 | 3.5 | 1.074 | 178.75 | 0.758 | 8.8 | 0.722 | 178.75 | 0.473 | 5.5 | 0.715 |
| 175.50 | 0.838 | 5.6 | 1.088 | 182.00 | 0.813 | 7.3 | 0.774 | 182.00 | 0.477 | 3.3 | 0.720 |
| 178.75 | 0.865 | 5.6 | 1.123 | 185.25 | 0.808 | 10.8 | 0.769 | 185.25 | 0.457 | 4.5 | 0.691 |
| 182.00 | 0.846 | 6.0 | 1.098 | 188.50 | 0.796 | 10.6 | 0.758 | 188.50 | 0.487 | 2.7 | 0.736 |
| 185.25 | 0.844 | 6.2 | 1.096 | 191.75 | 0.813 | 9.7 | 0.774 | 191.75 | 0.500 | 0.5 | 0.756 |
| 188.50 | 0.874 | 9.5 | 1.134 | 195.00 | 0.822 | 10.8 | 0.783 | 195.00 | 0.502 | -0.4 | 0.759 |
| 191.75 | 0.890 | 10.9 | 1.155 | 198.25 | 0.842 | 13.6 | 0.802 | 198.25 | 0.471 | 1.6 | 0.712 |
| 195.00 | 0.886 | 11.7 | 1.150 | 201.50 | 0.825 | 11.8 | 0.785 | 201.50 | 0.470 | 1.3 | 0.710 |
| 198.25 | 0.884 | 10.3 | 1.148 | 204.75 | 0.774 | 12.0 | 0.737 | 204.75 | 0.467 | -0.7 | 0.706 |
| 201.50 | 0.866 | 13.6 | 1.124 | 208.00 | 0.789 | 7.9 | 0.751 | 208.00 | 0.459 | -4.6 | 0.694 |
| 204.75 | 0.878 | 12.1 | 1.139 | 211.25 | 0.734 | 6.4 | 0.699 | 211.25 | 0.475 | -4.9 | 0.717 |
| 208.00 | 0.851 | 13.5 | 1.104 | 214.50 | 0.791 | 8.2 | 0.753 | 214.50 | 0.463 | 0.1 | 0.699 |
| 211.25 | 0.829 | 12.4 | 1.076 | 217.75 | 0.794 | 4.8 | 0.756 | 217.75 | 0.451 | 1.7 | 0.681 |
| 214.50 | 0.827 | 14.9 | 1.074 | 221.00 | 0.801 | 5.0 | 0.763 | 221.00 | 0.447 | -0.3 | 0.675 |
| 217.75 | 0.789 | 13.1 | 1.024 | 224.25 | 0.713 | 4.5 | 0.679 | 224.25 | 0.446 | -0.3 | 0.674 |
| 221.00 | 0.747 | 14.4 | 0.970 | 227.50 | 0.695 | 4.2 | 0.662 | 227.50 | 0.430 | 1.8 | 0.649 |
| 224.25 | 0.673 | 12.7 | 0.873 | 230.75 | 0.650 | 4.0 | 0.619 | 230.75 | 0.442 | -0.6 | 0.668 |
| 227.50 | 0.628 | 11.1 | 0.815 | 234.00 | 0.667 | 0.6 | 0.635 | 234.00 | 0.437 | 0.4 | 0.660 |
| 230.75 | 0.643 | 8.4 | 0.834 | 237.25 | 0.600 | -1.4 | 0.571 | 237.25 | 0.414 | 2.3 | 0.625 |
| 234.00 | 0.633 | 6.1 | 0.822 | 240.50 | 0.639 | 1.5 | 0.608 | 240.50 | 0.363 | 1.2 | 0.549 |
| 237.25 | 0.548 | 6.1 | 0.711 | 243.75 | 0.630 | -1.7 | 0.600 | 243.75 | 0.398 | 2.5 | 0.602 |
| 240.50 | 0.529 | 5.4 | 0.686 | 247.00 | 0.546 | 0.1 | 0.520 | 247.00 | 0.412 | 7.8 | 0.622 |
| 243.75 | 0.529 | 2.8 | 0.686 | 250.25 | 0.542 | 2.2 | 0.516 | 250.25 | 0.380 | 5.5 | 0.574 |
| 247.00 | 0.494 | -1.0 | 0.641 | 253.50 | 0.604 | 2.2 | 0.575 | 253.50 | 0.373 | 6.2 | 0.564 |
| 250.25 | 0.462 | -6.6 | 0.600 | 260.00 | 0.557 | -0.1 | 0.530 | 256.75 | 0.385 | 12.7 | 0.581 |
| 253.50 | 0.454 | -4.1 | 0.589 | 263.25 | 0.504 | 0.1 | 0.480 | 260.00 | 0.341 | 15.2 | 0.515 |
| 256.75 | 0.404 | -6.2 | 0.524 | 266.50 | 0.555 | 1.0 | 0.528 | 266.50 | 0.388 | 27.6 | 0.586 |
| 260.00 | 0.377 | -3.7 | 0.489 | 269.75 | 0.512 | -2.4 | 0.487 | 269.75 | 0.382 | 33.4 | 0.577 |
| 263.25 | 0.401 | -3.4 | 0.520 | 273.00 | 0.486 | -1.0 | 0.463 | 273.00 | 0.351 | 37.7 | 0.530 |
| 266.50 | 0.354 | -6.5 | 0.459 | 276.25 | 0.463 | 3.3 | 0.441 | 276.25 | 0.336 | 42.3 | 0.508 |
| 269.75 | 0.334 | 1.1 | 0.433 | 279.50 | 0.433 | 2.4 | 0.412 | 282.75 | 0.310 | 47.5 | 0.468 |
| 273.00 | 0.330 | 2.1 | 0.428 | 282.75 | 0.446 | 7.3 | 0.425 | 286.00 | 0.254 | 46.7 | 0.384 |
| 276.25 | 0.394 | 8.3 | 0.512 | 286.00 | 0.422 | 7.0 | 0.402 | 289.25 | 0.283 | 48.4 | 0.428 |
| 279.50 | 0.337 | 17.2 | 0.438 | 289.25 | 0.412 | 6.6 | 0.392 | 292.50 | 0.269 | 46.9 | 0.407 |
| 282.75 | 0.331 | 24.7 | 0.429 | 292.50 | 0.327 | 9.7 | 0.311 | 302.25 | 0.183 | 46.6 | 0.277 |
| 286.00 | 0.334 | 21.7 | 0.433 | 295.75 | 0.343 | 9.3 | 0.327 | 305.50 | 0.152 | 35.2 | 0.230 |
| 289.25 | 0.317 | 24.1 | 0.412 | 305.50 | 0.351 | 18.8 | 0.334 | 318.50 | 0.062 | 12.8 | 0.093 |
| 295.75 | 0.216 | 22.7 | 0.281 | 308.75 | 0.345 | 34.3 | 0.328 | 321.75 | 0.139 | 43.4 | 0.210 |
| 302.25 | 0.203 | 28.2 | 0.263 | 312.00 | 0.346 | 35.9 | 0.329 | 312.00 | 0.346 | 35.9 | 0.522 |
| 305.50 | 0.227 | 24.8 | 0.294 | 315.25 | 0.321 | 35.4 | 0.306 | 315.25 | 0.321 | 35.4 | 0.486 |
| 321.75 | 0.254237 | 48.6 | 0.33 | 318.50 | 0.349 | 41.7 | 0.332 | 318.50 | 0.349 | 41.7 | 0.527 |
|  |  |  |  | 321.75 | 0.418 | 45.8 | 0.398 | 321.75 | 0.418 | 45.8 | 0.632 |

Events E2A, E2B, E2C

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event: 2A | | | | Event: 2B | | | | Event: 2C | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Referenced Surface Current Speed: | | 1.5 | m/s | Referenced Surface Current Speed: | | 0.6 | m/s | Referenced Surface Current Speed: | | 0.5 | m/s |
| Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex  Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 0.00 | 1.000 | -74.4 | 1.539 | 0.00 | 1.000 | -78.1 | 0.574 | 0.00 | 1.000 | -114.1 | 0.494 |
| 3.25 | 0.981 | -75.4 | 1.509 | 3.25 | 0.916 | -77.3 | 0.526 | 3.25 | 0.943 | -115.9 | 0.466 |
| 6.50 | 0.934 | -77.0 | 1.437 | 6.50 | 0.927 | -81.1 | 0.532 | 6.50 | 0.866 | -116.0 | 0.428 |
| 9.75 | 0.809 | -77.7 | 1.245 | 9.75 | 0.772 | -88.0 | 0.443 | 9.75 | 0.758 | -116.8 | 0.374 |
| 29.25 | 0.994 | -20.3 | 1.530 | 13.00 | 0.726 | -88.4 | 0.417 | 26.00 | 0.323 | -23.6 | 0.160 |
| 32.50 | 0.919 | -18.5 | 1.414 | 16.25 | 0.484 | -99.3 | 0.278 | 29.25 | 0.328 | -23.6 | 0.162 |
| 35.75 | 0.901 | -16.6 | 1.387 | 29.25 | 1.699 | 17.5 | 0.975 | 32.50 | 0.328 | -26.1 | 0.162 |
| 39.00 | 0.883 | -16.4 | 1.359 | 32.50 | 1.578 | 19.1 | 0.906 | 35.75 | 0.316 | -22.0 | 0.156 |
| 42.25 | 0.841 | -16.1 | 1.294 | 35.75 | 1.594 | 20.4 | 0.915 | 39.00 | 0.307 | -22.7 | 0.152 |
| 45.50 | 0.765 | -13.9 | 1.178 | 39.00 | 1.556 | 20.9 | 0.893 | 42.25 | 0.347 | -19.9 | 0.171 |
| 48.75 | 0.702 | -13.6 | 1.081 | 42.25 | 1.441 | 17.6 | 0.827 | 45.50 | 0.316 | -18.3 | 0.156 |
| 52.00 | 0.626 | -13.0 | 0.964 | 45.50 | 1.366 | 17.4 | 0.784 | 48.75 | 0.300 | -23.9 | 0.148 |
| 55.25 | 0.576 | -13.8 | 0.886 | 48.75 | 1.287 | 14.2 | 0.739 | 52.00 | 0.332 | -22.1 | 0.164 |
| 58.50 | 0.515 | -13.9 | 0.793 | 52.00 | 1.129 | 13.7 | 0.648 | 55.25 | 0.336 | -25.8 | 0.166 |
| 61.75 | 0.467 | -11.6 | 0.719 | 55.25 | 0.974 | 18.1 | 0.559 | 58.50 | 0.334 | -19.5 | 0.165 |
| 65.00 | 0.429 | -16.3 | 0.660 | 58.50 | 0.916 | 20.1 | 0.526 | 61.75 | 0.321 | -20.2 | 0.159 |
| 68.25 | 0.418 | -23.5 | 0.644 | 61.75 | 0.841 | 19.4 | 0.483 | 65.00 | 0.340 | -20.0 | 0.168 |
| 71.50 | 0.404 | -25.9 | 0.622 | 65.00 | 0.753 | 17.6 | 0.432 | 68.25 | 0.316 | -21.9 | 0.156 |
| 74.75 | 0.394 | -25.3 | 0.606 | 68.25 | 0.812 | 28.7 | 0.466 | 71.50 | 0.342 | -25.9 | 0.169 |
| 78.00 | 0.390 | -23.2 | 0.600 | 71.50 | 0.920 | 32.2 | 0.528 | 74.75 | 0.346 | -22.5 | 0.171 |
| 81.25 | 0.353 | -21.8 | 0.544 | 74.75 | 0.855 | 33.3 | 0.491 | 81.25 | 0.348 | -23.1 | 0.172 |
| 84.50 | 0.310 | -16.5 | 0.477 | 78.00 | 0.760 | 35.6 | 0.436 | 84.50 | 0.363 | -20.8 | 0.179 |
| 87.75 | 0.301 | -15.1 | 0.464 | 81.25 | 0.791 | 30.8 | 0.454 | 87.75 | 0.421 | -18.5 | 0.208 |
| 91.00 | 0.241 | -16.5 | 0.371 | 84.50 | 0.793 | 37.2 | 0.455 | 91.00 | 0.400 | -15.5 | 0.197 |
| 100.75 | 0.238 | -21.5 | 0.366 | 87.75 | 0.751 | 34.4 | 0.431 | 94.25 | 0.396 | -18.3 | 0.196 |
| 104.00 | 0.239 | -22.1 | 0.368 | 91.00 | 0.794 | 35.2 | 0.456 | 97.50 | 0.379 | -18.0 | 0.187 |
| 107.25 | 0.226 | -23.4 | 0.348 | 94.25 | 0.779 | 23.8 | 0.447 | 100.75 | 0.373 | -22.7 | 0.184 |
| 110.50 | 0.198 | -25.6 | 0.304 | 97.50 | 0.814 | 18.0 | 0.467 | 104.00 | 0.375 | -22.7 | 0.185 |
| 113.75 | 0.184 | -19.1 | 0.283 | 100.75 | 0.822 | 12.4 | 0.472 | 107.25 | 0.394 | -21.2 | 0.195 |
| 117.00 | 0.198 | -16.3 | 0.304 | 104.00 | 0.753 | 13.8 | 0.432 | 110.50 | 0.413 | -19.5 | 0.204 |
| 123.50 | 0.151 | -15.2 | 0.233 | 107.25 | 0.763 | 16.5 | 0.438 | 113.75 | 0.426 | -16.6 | 0.211 |
| 126.75 | 0.140 | 2.2 | 0.215 | 110.50 | 0.739 | 24.0 | 0.424 | 117.00 | 0.427 | -10.4 | 0.211 |
| 130.00 | 0.153 | 3.0 | 0.236 | 113.75 | 0.774 | 33.3 | 0.444 | 120.25 | 0.441 | -10.2 | 0.218 |
| 133.25 | 0.174 | 10.7 | 0.268 | 120.25 | 0.735 | 33.0 | 0.422 | 123.50 | 0.471 | -5.9 | 0.232 |
| 139.75 | 0.176 | 1.0 | 0.271 | 123.50 | 0.732 | 27.4 | 0.420 | 126.75 | 0.454 | -5.5 | 0.224 |
| 143.00 | 0.170 | 11.2 | 0.261 | 126.75 | 0.786 | 19.1 | 0.451 | 130.00 | 0.454 | -5.4 | 0.224 |
| 146.25 | 0.194 | 13.5 | 0.299 | 130.00 | 0.786 | 15.4 | 0.451 | 133.25 | 0.467 | -3.3 | 0.230 |
| 152.75 | 0.167 | 15.2 | 0.257 | 133.25 | 0.747 | 14.8 | 0.429 | 136.50 | 0.477 | 1.1 | 0.236 |
| 159.25 | 0.157 | 5.6 | 0.242 | 136.50 | 0.666 | 16.0 | 0.382 | 139.75 | 0.471 | 6.2 | 0.233 |
| 162.50 | 0.160 | 17.6 | 0.246 | 139.75 | 0.592 | 14.7 | 0.340 | 143.00 | 0.513 | 11.4 | 0.253 |
| 175.50 | 0.120 | 16.3 | 0.184 | 143.00 | 0.465 | 15.8 | 0.267 | 146.25 | 0.525 | 14.6 | 0.260 |
| 178.75 | 0.094 | 22.9 | 0.145 | 146.25 | 0.460 | 30.1 | 0.264 | 149.50 | 0.515 | 17.0 | 0.254 |
| 198.25 | 0.110 | 58.5 | 0.170 | 152.75 | 0.315 | 26.3 | 0.181 | 152.75 | 0.514 | 16.5 | 0.254 |
| 204.75 | 0.144 | 72.9 | 0.221 | 165.75 | 0.369 | 12.6 | 0.212 | 156.00 | 0.540 | 17.6 | 0.267 |
| 208.00 | 0.130 | 63.9 | 0.200 | 169.00 | 0.340 | 7.7 | 0.195 | 159.25 | 0.557 | 12.0 | 0.275 |
| 214.50 | 0.101 | 67.1 | 0.156 | 172.25 | 0.329 | 6.2 | 0.189 | 162.50 | 0.510 | 10.2 | 0.252 |
| 221.00 | 0.087 | 89.4 | 0.134 | 188.50 | 0.458 | 4.0 | 0.263 | 165.75 | 0.507 | 9.2 | 0.250 |
| 224.25 | 0.055 | 84.8 | 0.085 | 195.00 | 0.441 | 18.2 | 0.253 | 169.00 | 0.494 | 9.3 | 0.244 |
| 237.25 | 0.053 | -164.0 | 0.082 | 204.75 | 0.329 | 29.1 | 0.189 | 172.25 | 0.490 | 9.8 | 0.242 |
| 243.75 | 0.067 | -172.4 | 0.103 | 221.00 | 0.270 | 39.9 | 0.155 | 175.50 | 0.470 | 8.3 | 0.232 |
| 260.00 | 0.082 | -161.9 | 0.126 | 227.50 | 0.289 | 37.3 | 0.166 | 178.75 | 0.473 | 5.5 | 0.234 |
| 276.25 | 0.044 | -175.0 | 0.068 | 230.75 | 0.315 | 37.5 | 0.181 | 182.00 | 0.477 | 3.3 | 0.235 |
| 279.50 | 0.082 | 174.2 | 0.126 | 237.25 | 0.244 | 33.3 | 0.140 | 185.25 | 0.457 | 4.5 | 0.226 |
| 292.50 | 0.127 | -156.7 | 0.195 | 240.50 | 0.277 | 54.9 | 0.159 | 188.50 | 0.487 | 2.7 | 0.241 |
|  |  |  |  | 253.50 | 0.239 | 32.5 | 0.137 | 191.75 | 0.500 | 0.5 | 0.247 |
|  |  |  |  | 256.75 | 0.249 | 23.6 | 0.143 | 195.00 | 0.502 | -0.4 | 0.248 |
|  |  |  |  | 263.25 | 0.277 | 24.4 | 0.159 | 198.25 | 0.471 | 1.6 | 0.233 |
|  |  |  |  | 302.25 | 0.162 | 56.6 | 0.093 | 201.50 | 0.470 | 1.3 | 0.232 |
|  |  |  |  |  |  |  |  | 204.75 | 0.467 | -0.7 | 0.231 |
|  |  |  |  |  |  |  |  | 208.00 | 0.459 | -4.6 | 0.227 |
|  |  |  |  |  |  |  |  | 211.25 | 0.475 | -4.9 | 0.234 |
|  |  |  |  |  |  |  |  | 214.50 | 0.463 | 0.1 | 0.229 |
|  |  |  |  |  |  |  |  | 217.75 | 0.451 | 1.7 | 0.223 |
|  |  |  |  |  |  |  |  | 221.00 | 0.447 | -0.3 | 0.221 |
|  |  |  |  |  |  |  |  | 224.25 | 0.446 | -0.3 | 0.220 |
|  |  |  |  |  |  |  |  | 227.50 | 0.430 | 1.8 | 0.212 |
|  |  |  |  |  |  |  |  | 230.75 | 0.442 | -0.6 | 0.218 |
|  |  |  |  |  |  |  |  | 234.00 | 0.437 | 0.4 | 0.216 |
|  |  |  |  |  |  |  |  | 237.25 | 0.414 | 2.3 | 0.204 |
|  |  |  |  |  |  |  |  | 240.50 | 0.363 | 1.2 | 0.179 |
|  |  |  |  |  |  |  |  | 243.75 | 0.398 | 2.5 | 0.197 |
|  |  |  |  |  |  |  |  | 247.00 | 0.412 | 7.8 | 0.203 |
|  |  |  |  |  |  |  |  | 250.25 | 0.380 | 5.5 | 0.188 |
|  |  |  |  |  |  |  |  | 253.50 | 0.373 | 6.2 | 0.184 |
|  |  |  |  |  |  |  |  | 256.75 | 0.385 | 12.7 | 0.190 |
|  |  |  |  |  |  |  |  | 260.00 | 0.341 | 15.2 | 0.168 |
|  |  |  |  |  |  |  |  | 266.50 | 0.388 | 27.6 | 0.192 |
|  |  |  |  |  |  |  |  | 269.75 | 0.382 | 33.4 | 0.189 |
|  |  |  |  |  |  |  |  | 273.00 | 0.351 | 37.7 | 0.173 |
|  |  |  |  |  |  |  |  | 276.25 | 0.336 | 42.3 | 0.166 |
|  |  |  |  |  |  |  |  | 282.75 | 0.310 | 47.5 | 0.153 |
|  |  |  |  |  |  |  |  | 286.00 | 0.254 | 46.7 | 0.126 |
|  |  |  |  |  |  |  |  | 289.25 | 0.283 | 48.4 | 0.140 |
|  |  |  |  |  |  |  |  | 292.50 | 0.269 | 46.9 | 0.133 |
|  |  |  |  |  |  |  |  | 302.25 | 0.183 | 46.6 | 0.091 |
|  |  |  |  |  |  |  |  | 305.50 | 0.152 | 35.2 | 0.075 |
|  |  |  |  |  |  |  |  | 318.50 | 0.062 | 12.8 | 0.030 |
|  |  |  |  |  |  |  |  | 321.75 | 0.139 | 43.4 | 0.069 |
|  |  |  |  |  |  |  |  | 312.00 | 0.346 | 35.9 | 0.171 |
|  |  |  |  |  |  |  |  | 315.25 | 0.321 | 35.4 | 0.159 |
|  |  |  |  |  |  |  |  | 318.50 | 0.349 | 41.7 | 0.172 |
|  |  |  |  |  |  |  |  | 321.75 | 0.418 | 45.8 | 0.207 |

Events E3A, E3B

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Event: 3A | | | | Event: 3B | | | |
|  |  |  |  |  |  |  |  |
| Referenced Surface Current Speed: | | 1.0 | m/s | Referenced Surface Current Speed: | | 1.2 | m/s |
| Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude |
|  |  |  |  |  |  |  |  |
| 0.00 | 1.000 | -103.2 | 1.046 | 0.000 | 1.000 | -14.0 | 1.209 |
| 29.25 | 1.047 | 45.8 | 1.095 | 6.500 | 0.744 | -93.6 | 0.900 |
| 32.50 | 1.033 | 43.0 | 1.081 | 35.750 | 0.550 | 44.1 | 0.665 |
| 35.75 | 1.011 | 50.2 | 1.058 | 39.000 | 0.564 | 42.1 | 0.682 |
| 39.00 | 0.953 | 45.3 | 0.997 | 42.250 | 0.572 | 44.4 | 0.691 |
| 42.25 | 0.900 | 51.1 | 0.941 | 45.500 | 0.553 | 41.6 | 0.668 |
| 45.50 | 0.930 | 54.3 | 0.973 | 48.750 | 0.557 | 45.4 | 0.673 |
| 48.75 | 0.946 | 56.4 | 0.989 | 55.250 | 0.519 | 66.0 | 0.628 |
| 52.00 | 0.910 | 60.0 | 0.952 | 58.500 | 0.533 | 63.2 | 0.644 |
| 55.25 | 0.921 | 58.2 | 0.963 | 61.750 | 0.526 | 59.4 | 0.636 |
| 58.50 | 0.933 | 61.5 | 0.976 | 65.000 | 0.547 | 0.0 | 0.661 |
| 61.75 | 0.923 | 61.2 | 0.965 | 68.250 | 0.500 | 74.3 | 0.605 |
| 65.00 | 0.959 | 62.4 | 1.003 | 71.500 | 0.524 | 67.5 | 0.634 |
| 68.25 | 0.968 | 61.3 | 1.013 | 74.750 | 0.538 | 80.3 | 0.651 |
| 71.50 | 0.990 | 62.4 | 1.036 | 84.500 | 0.489 | 65.3 | 0.591 |
| 74.75 | 0.991 | 63.3 | 1.037 | 87.750 | 0.524 | 63.3 | 0.633 |
| 78.00 | 1.032 | 65.9 | 1.079 | 94.250 | 0.499 | 55.6 | 0.603 |
| 81.25 | 1.025 | 61.5 | 1.072 | 100.750 | 0.490 | 35.3 | 0.593 |
| 84.50 | 0.961 | 62.2 | 1.005 | 104.000 | 0.510 | 39.1 | 0.616 |
| 87.75 | 1.012 | 64.8 | 1.059 | 107.250 | 0.522 | 32.2 | 0.631 |
| 91.00 | 1.001 | 62.6 | 1.047 | 110.500 | 0.534 | 31.9 | 0.646 |
| 94.25 | 1.023 | 57.7 | 1.070 | 123.500 | 0.746 | 21.4 | 0.902 |
| 97.50 | 1.023 | 50.8 | 1.070 | 126.750 | 0.811 | 19.9 | 0.980 |
| 100.75 | 1.098 | 46.7 | 1.148 | 130.000 | 0.855 | 16.9 | 1.034 |
| 104.00 | 1.117 | 46.9 | 1.168 | 133.250 | 0.949 | 12.3 | 1.147 |
| 107.25 | 1.088 | 41.5 | 1.138 | 136.500 | 0.994 | 8.4 | 1.202 |
| 110.50 | 1.106 | 34.9 | 1.157 | 139.750 | 0.996 | 10.8 | 1.204 |
| 113.75 | 1.106 | 34.3 | 1.157 | 143.000 | 0.990 | 10.1 | 1.197 |
| 117.00 | 1.109 | 31.4 | 1.160 | 146.250 | 0.945 | 8.4 | 1.143 |
| 120.25 | 1.063 | 29.2 | 1.112 | 149.500 | 0.949 | 9.2 | 1.147 |
| 123.50 | 1.079 | 26.4 | 1.129 | 152.750 | 0.889 | 7.8 | 1.075 |
| 126.75 | 1.065 | 25.7 | 1.114 | 156.000 | 0.833 | 6.3 | 1.007 |
| 130.00 | 1.092 | 23.1 | 1.142 | 159.250 | 0.790 | 8.1 | 0.955 |
| 133.25 | 1.106 | 19.8 | 1.157 | 162.500 | 0.707 | 7.7 | 0.855 |
| 136.50 | 1.158 | 18.7 | 1.211 | 165.750 | 0.644 | 7.2 | 0.779 |
| 139.75 | 1.180 | 16.8 | 1.234 | 169.000 | 0.611 | 6.6 | 0.739 |
| 143.00 | 1.161 | 14.6 | 1.214 | 172.250 | 0.599 | 10.0 | 0.724 |
| 146.25 | 1.112 | 16.2 | 1.163 | 175.500 | 0.562 | 8.3 | 0.679 |
| 149.50 | 1.008 | 14.5 | 1.054 | 178.750 | 0.557 | 3.7 | 0.674 |
| 152.75 | 0.959 | 15.5 | 1.003 | 182.000 | 0.549 | 8.2 | 0.664 |
| 156.00 | 0.876 | 16.9 | 0.916 | 185.250 | 0.508 | 6.9 | 0.614 |
| 159.25 | 0.816 | 15.3 | 0.854 | 188.500 | 0.526 | 8.2 | 0.636 |
| 162.50 | 0.768 | 15.4 | 0.803 | 191.750 | 0.550 | 6.2 | 0.665 |
| 165.75 | 0.750 | 16.9 | 0.784 | 195.000 | 0.533 | 5.4 | 0.645 |
| 169.00 | 0.722 | 14.0 | 0.755 | 198.250 | 0.507 | 6.9 | 0.613 |
| 172.25 | 0.672 | 10.5 | 0.703 | 201.500 | 0.487 | 5.9 | 0.589 |
| 175.50 | 0.685 | 11.7 | 0.716 | 204.750 | 0.489 | 11.4 | 0.591 |
| 178.75 | 0.691 | 10.2 | 0.723 | 208.000 | 0.532 | 6.2 | 0.643 |
| 182.00 | 0.647 | 8.0 | 0.677 | 211.250 | 0.544 | -2.7 | 0.658 |
| 185.25 | 0.581 | 6.4 | 0.608 | 214.500 | 0.533 | 0.4 | 0.645 |
| 188.50 | 0.604 | 8.2 | 0.632 | 217.750 | 0.536 | 1.7 | 0.648 |
| 191.75 | 0.618 | 8.0 | 0.646 | 221.000 | 0.514 | 0.4 | 0.621 |
| 195.00 | 0.597 | 10.3 | 0.624 | 224.250 | 0.505 | 2.4 | 0.611 |
| 198.25 | 0.640 | 6.2 | 0.669 | 227.500 | 0.414 | -2.3 | 0.500 |
| 201.50 | 0.607 | 6.6 | 0.635 | 230.750 | 0.429 | -2.0 | 0.519 |
| 204.75 | 0.611 | 10.8 | 0.639 | 234.000 | 0.431 | 1.7 | 0.521 |
| 208.00 | 0.521 | 10.1 | 0.545 | 237.250 | 0.390 | -1.0 | 0.472 |
| 211.25 | 0.481 | 6.0 | 0.503 | 240.500 | 0.338 | 6.0 | 0.409 |
| 214.50 | 0.533 | 12.6 | 0.557 | 243.750 | 0.333 | 8.1 | 0.403 |
| 217.75 | 0.577 | 12.1 | 0.604 | 253.500 | 0.245 | 19.6 | 0.296 |
| 221.00 | 0.595 | 12.1 | 0.622 | 263.250 | 0.287 | 13.2 | 0.347 |
| 224.25 | 0.520 | 13.2 | 0.544 | 266.500 | 0.280 | 14.8 | 0.338 |
| 227.50 | 0.496 | 15.6 | 0.519 | 269.750 | 0.246 | 13.8 | 0.297 |
| 230.75 | 0.409 | 25.8 | 0.428 | 286.000 | 0.200 | 13.9 | 0.242 |
| 234.00 | 0.395 | 20.8 | 0.413 | 299.000 | 0.151 | 17.6 | 0.182 |
| 237.25 | 0.352 | 21.2 | 0.368 | 302.250 | 0.189 | 15.3 | 0.229 |
| 240.50 | 0.306 | 23.5 | 0.320 |  |  |  |  |
| 253.50 | 0.272 | 19.2 | 0.284 |  |  |  |  |
| 263.25 | 0.177 | 23.5 | 0.185 |  |  |  |  |
| 266.50 | 0.200 | 24.2 | 0.209 |  |  |  |  |
| 269.75 | 0.230 | 14.4 | 0.241 |  |  |  |  |
| 292.50 | 0.144 | 2.8 | 0.151 |  |  |  |  |
| 295.75 | 0.144 | 7.1 | 0.151 |  |  |  |  |

Events E4A, E4B, E4C

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event: 4A | | | | Event 4B: | | | | Event: 4C | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Referenced Surface Current Speed: | | 1.1 | m/s | Referenced Surface Current Speed: | | 0.5 | m/s | Referenced Surface Current Speed: | | 1.1 | m/s |
| Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 0.00 | 1.000 | -91.2 | 1.146 | 0.00 | 1.000 | -145.2 | 0.486 | 0.00 | 1.000 | -81.2 | 1.062 |
| 6.50 | 0.881 | -95.9 | 1.010 | 3.25 | 1.004 | -135.2 | 0.488 | 3.25 | 0.958 | -76.5 | 1.017 |
| 9.75 | 0.986 | -99.6 | 1.130 | 16.25 | 0.716 | -152.3 | 0.348 | 6.50 | 0.941 | -81.2 | 0.999 |
| 29.25 | 0.457 | 84.0 | 0.524 | 19.50 | 0.374 | -130.7 | 0.182 | 9.75 | 0.939 | -81.8 | 0.997 |
| 32.50 | 0.430 | 79.8 | 0.493 | 29.25 | 2.148 | -46.0 | 1.044 | 29.25 | 0.963 | 40.8 | 1.023 |
| 35.75 | 0.442 | 72.6 | 0.506 | 32.50 | 2.152 | -45.9 | 1.046 | 32.50 | 0.991 | 45.4 | 1.052 |
| 39.00 | 0.438 | 80.8 | 0.502 | 35.75 | 2.128 | -45.2 | 1.034 | 35.75 | 1.005 | 42.6 | 1.067 |
| 42.25 | 0.417 | 77.9 | 0.478 | 39.00 | 2.226 | -46.5 | 1.082 | 39.00 | 1.002 | 42.3 | 1.064 |
| 45.50 | 0.452 | 77.4 | 0.518 | 42.25 | 2.331 | -46.0 | 1.133 | 42.25 | 1.006 | 44.5 | 1.068 |
| 48.75 | 0.428 | 71.3 | 0.491 | 45.50 | 2.230 | -47.0 | 1.084 | 45.50 | 1.027 | 44.6 | 1.091 |
| 52.00 | 0.455 | 66.0 | 0.521 | 48.75 | 2.173 | -47.6 | 1.056 | 48.75 | 1.014 | 44.6 | 1.077 |
| 55.25 | 0.432 | 62.1 | 0.495 | 52.00 | 2.305 | -49.9 | 1.120 | 52.00 | 1.023 | 44.8 | 1.086 |
| 58.50 | 0.428 | 61.1 | 0.490 | 55.25 | 2.282 | -49.1 | 1.109 | 55.25 | 1.024 | 43.9 | 1.087 |
| 61.75 | 0.382 | 58.2 | 0.438 | 58.50 | 2.200 | -48.5 | 1.069 | 58.50 | 0.997 | 46.8 | 1.059 |
| 65.00 | 0.420 | 54.4 | 0.481 | 61.75 | 2.288 | -48.3 | 1.112 | 61.75 | 1.004 | 44.3 | 1.066 |
| 68.25 | 0.403 | 56.2 | 0.462 | 65.00 | 2.333 | -49.4 | 1.134 | 65.00 | 0.948 | 46.5 | 1.007 |
| 71.50 | 0.408 | 60.1 | 0.468 | 68.25 | 2.377 | -49.4 | 1.155 | 68.25 | 0.945 | 50.8 | 1.004 |
| 74.75 | 0.389 | 53.9 | 0.446 | 71.50 | 2.370 | -48.8 | 1.152 | 71.50 | 0.958 | 48.3 | 1.017 |
| 78.00 | 0.426 | 55.0 | 0.488 | 74.75 | 2.412 | -45.5 | 1.172 | 74.75 | 0.947 | 49.6 | 1.006 |
| 81.25 | 0.430 | 54.3 | 0.493 | 78.00 | 2.436 | -46.0 | 1.184 | 78.00 | 0.919 | 49.4 | 0.976 |
| 84.50 | 0.403 | 49.5 | 0.462 | 81.25 | 2.477 | -42.8 | 1.204 | 81.25 | 0.911 | 49.3 | 0.967 |
| 87.75 | 0.453 | 50.7 | 0.519 | 84.50 | 2.586 | -37.9 | 1.257 | 84.50 | 0.909 | 47.9 | 0.965 |
| 91.00 | 0.445 | 51.4 | 0.510 | 87.75 | 2.605 | -34.5 | 1.266 | 87.75 | 0.928 | 44.3 | 0.986 |
| 94.25 | 0.389 | 48.1 | 0.446 | 91.00 | 2.399 | -32.0 | 1.166 | 91.00 | 0.897 | 43.9 | 0.953 |
| 97.50 | 0.428 | 45.6 | 0.490 | 94.25 | 2.177 | -30.6 | 1.058 | 94.25 | 0.875 | 46.2 | 0.929 |
| 100.75 | 0.413 | 50.0 | 0.473 | 97.50 | 1.944 | -28.9 | 0.945 | 97.50 | 0.896 | 45.7 | 0.952 |
| 104.00 | 0.427 | 48.5 | 0.489 | 100.75 | 1.932 | -27.0 | 0.939 | 100.75 | 0.863 | 43.4 | 0.917 |
| 107.25 | 0.402 | 44.3 | 0.461 | 104.00 | 1.737 | -25.3 | 0.844 | 104.00 | 0.853 | 41.4 | 0.906 |
| 110.50 | 0.454 | 48.2 | 0.520 | 107.25 | 1.677 | -26.6 | 0.815 | 107.25 | 0.852 | 39.9 | 0.905 |
| 113.75 | 0.435 | 47.6 | 0.498 | 110.50 | 1.665 | -28.4 | 0.809 | 110.50 | 0.893 | 40.8 | 0.948 |
| 117.00 | 0.444 | 43.8 | 0.509 | 113.75 | 1.720 | -31.7 | 0.836 | 113.75 | 0.855 | 36.3 | 0.908 |
| 120.25 | 0.455 | 47.4 | 0.522 | 117.00 | 1.660 | -30.0 | 0.807 | 117.00 | 0.832 | 35.9 | 0.884 |
| 123.50 | 0.466 | 48.2 | 0.534 | 120.25 | 1.796 | -28.3 | 0.873 | 120.25 | 0.788 | 37.6 | 0.837 |
| 126.75 | 0.418 | 47.8 | 0.479 | 123.50 | 1.953 | -24.3 | 0.949 | 123.50 | 0.820 | 35.0 | 0.871 |
| 130.00 | 0.440 | 48.9 | 0.504 | 126.75 | 1.885 | -23.7 | 0.916 | 126.75 | 0.809 | 35.4 | 0.859 |
| 133.25 | 0.471 | 48.5 | 0.540 | 130.00 | 1.920 | -24.3 | 0.933 | 130.00 | 0.806 | 33.2 | 0.856 |
| 136.50 | 0.451 | 48.6 | 0.517 | 133.25 | 1.940 | -22.9 | 0.943 | 133.25 | 0.797 | 29.4 | 0.846 |
| 139.75 | 0.471 | 44.2 | 0.540 | 136.50 | 1.903 | -23.7 | 0.925 | 136.50 | 0.764 | 30.8 | 0.811 |
| 143.00 | 0.516 | 42.4 | 0.591 | 139.75 | 1.870 | -20.9 | 0.909 | 139.75 | 0.821 | 25.5 | 0.872 |
| 146.25 | 0.539 | 35.3 | 0.618 | 143.00 | 1.868 | -21.1 | 0.908 | 143.00 | 0.792 | 23.1 | 0.841 |
| 149.50 | 0.640 | 34.6 | 0.734 | 146.25 | 1.833 | -24.3 | 0.891 | 146.25 | 0.873 | 20.7 | 0.927 |
| 152.75 | 0.712 | 26.6 | 0.816 | 149.50 | 1.821 | -20.7 | 0.885 | 149.50 | 0.936 | 17.7 | 0.994 |
| 156.00 | 0.766 | 22.9 | 0.878 | 152.75 | 1.864 | -18.4 | 0.906 | 152.75 | 1.021 | 14.1 | 1.084 |
| 159.25 | 0.858 | 21.5 | 0.983 | 156.00 | 1.920 | -16.7 | 0.933 | 156.00 | 1.105 | 13.0 | 1.174 |
| 162.50 | 0.845 | 22.1 | 0.968 | 159.25 | 1.844 | -14.5 | 0.896 | 159.25 | 1.160 | 12.3 | 1.232 |
| 165.75 | 0.832 | 24.1 | 0.954 | 162.50 | 1.961 | -12.3 | 0.953 | 162.50 | 1.157 | 13.3 | 1.229 |
| 169.00 | 0.839 | 24.7 | 0.962 | 165.75 | 1.928 | -9.0 | 0.937 | 165.75 | 1.162 | 14.8 | 1.234 |
| 172.25 | 0.797 | 27.6 | 0.913 | 169.00 | 2.021 | -7.9 | 0.982 | 169.00 | 1.160 | 14.0 | 1.232 |
| 175.50 | 0.752 | 27.6 | 0.862 | 172.25 | 1.887 | -7.3 | 0.917 | 172.25 | 1.126 | 12.0 | 1.196 |
| 178.75 | 0.727 | 29.6 | 0.833 | 175.50 | 1.936 | -4.4 | 0.941 | 175.50 | 1.113 | 13.0 | 1.182 |
| 182.00 | 0.674 | 34.8 | 0.772 | 178.75 | 1.879 | -6.3 | 0.913 | 178.75 | 1.088 | 12.7 | 1.155 |
| 185.25 | 0.654 | 36.7 | 0.750 | 182.00 | 1.852 | -5.4 | 0.900 | 182.00 | 1.110 | 10.7 | 1.179 |
| 188.50 | 0.595 | 32.3 | 0.682 | 185.25 | 1.784 | -6.4 | 0.867 | 185.25 | 1.150 | 10.5 | 1.221 |
| 191.75 | 0.601 | 34.5 | 0.689 | 188.50 | 1.821 | -3.8 | 0.885 | 188.50 | 1.120 | 11.6 | 1.189 |
| 195.00 | 0.565 | 28.7 | 0.647 | 191.75 | 1.868 | -3.1 | 0.908 | 191.75 | 1.068 | 10.8 | 1.134 |
| 198.25 | 0.495 | 28.9 | 0.567 | 195.00 | 1.757 | -1.0 | 0.854 | 195.00 | 1.075 | 9.1 | 1.142 |
| 201.50 | 0.517 | 25.1 | 0.593 | 198.25 | 1.747 | -0.1 | 0.849 | 198.25 | 1.056 | 9.3 | 1.121 |
| 204.75 | 0.486 | 22.6 | 0.557 | 201.50 | 1.780 | 0.7 | 0.865 | 201.50 | 1.029 | 6.7 | 1.093 |
| 208.00 | 0.457 | 23.5 | 0.524 | 204.75 | 1.788 | -1.1 | 0.869 | 204.75 | 1.007 | 5.7 | 1.069 |
| 211.25 | 0.439 | 20.1 | 0.503 | 208.00 | 1.755 | -3.0 | 0.853 | 208.00 | 0.962 | 5.1 | 1.022 |
| 214.50 | 0.490 | 18.8 | 0.561 | 211.25 | 1.660 | -0.2 | 0.807 | 211.25 | 0.963 | 7.1 | 1.023 |
| 217.75 | 0.501 | 19.8 | 0.574 | 214.50 | 1.687 | -4.2 | 0.820 | 214.50 | 0.937 | 4.9 | 0.995 |
| 221.00 | 0.524 | 15.9 | 0.600 | 217.75 | 1.621 | -0.9 | 0.788 | 217.75 | 0.945 | 7.1 | 1.004 |
| 224.25 | 0.438 | 9.1 | 0.502 | 221.00 | 1.667 | -5.1 | 0.810 | 221.00 | 0.963 | 5.7 | 1.023 |
| 227.50 | 0.404 | 2.4 | 0.463 | 224.25 | 1.660 | -4.7 | 0.807 | 224.25 | 0.927 | 9.4 | 0.984 |
| 230.75 | 0.381 | 3.6 | 0.437 | 227.50 | 1.582 | -2.5 | 0.769 | 227.50 | 0.948 | 12.3 | 1.007 |
| 234.00 | 0.400 | 4.1 | 0.458 | 230.75 | 1.654 | -5.4 | 0.804 | 230.75 | 0.938 | 12.5 | 0.996 |
| 237.25 | 0.392 | 3.3 | 0.449 | 234.00 | 1.588 | -8.7 | 0.772 | 234.00 | 0.905 | 17.7 | 0.961 |
| 240.50 | 0.332 | -2.9 | 0.380 | 237.25 | 1.693 | -10.7 | 0.823 | 237.25 | 0.910 | 21.1 | 0.966 |
| 243.75 | 0.363 | 3.7 | 0.416 | 240.50 | 1.523 | -10.8 | 0.740 | 240.50 | 0.859 | 20.2 | 0.912 |
| 247.00 | 0.376 | -6.7 | 0.431 | 243.75 | 1.564 | -13.1 | 0.760 | 243.75 | 0.815 | 20.7 | 0.866 |
| 250.25 | 0.350 | -0.4 | 0.401 | 247.00 | 1.465 | -13.9 | 0.712 | 247.00 | 0.807 | 23.0 | 0.857 |
| 253.50 | 0.366 | -2.3 | 0.420 | 250.25 | 1.508 | -12.2 | 0.733 | 250.25 | 0.788 | 21.7 | 0.837 |
| 256.75 | 0.353 | 4.9 | 0.404 | 253.50 | 1.449 | -6.9 | 0.704 | 253.50 | 0.802 | 24.7 | 0.852 |
| 260.00 | 0.315 | 3.6 | 0.361 | 256.75 | 1.374 | -8.2 | 0.668 | 256.75 | 0.789 | 24.2 | 0.838 |
| 263.25 | 0.271 | 18.0 | 0.311 | 260.00 | 1.368 | -4.8 | 0.665 | 260.00 | 0.772 | 26.7 | 0.820 |
| 266.50 | 0.250 | 19.7 | 0.286 | 263.25 | 1.165 | -6.4 | 0.566 | 263.25 | 0.760 | 24.3 | 0.807 |
| 269.75 | 0.207 | 32.2 | 0.237 | 266.50 | 0.963 | -5.0 | 0.468 | 269.75 | 0.679 | 24.1 | 0.721 |
| 273.00 | 0.228 | 36.8 | 0.261 | 273.00 | 0.877 | -6.4 | 0.426 | 273.00 | 0.648 | 23.9 | 0.688 |
| 276.25 | 0.217 | 42.6 | 0.249 | 279.50 | 0.831 | 1.2 | 0.404 | 276.25 | 0.621 | 26.0 | 0.659 |
| 279.50 | 0.184 | 52.0 | 0.211 | 282.75 | 0.759 | -2.1 | 0.369 | 282.75 | 0.562 | 23.8 | 0.597 |
| 286.00 | 0.155 | 48.3 | 0.178 | 286.00 | 0.535 | -5.6 | 0.260 | 286.00 | 0.518 | 28.9 | 0.550 |
| 289.25 | 0.195 | 41.0 | 0.223 | 289.25 | 0.556 | -9.1 | 0.270 | 289.25 | 0.494 | 28.3 | 0.525 |
| 292.50 | 0.137 | 15.0 | 0.157 | 295.75 | 0.556 | -11.9 | 0.270 | 292.50 | 0.451 | 30.7 | 0.479 |
|  |  |  |  | 299.00 | 0.599 | -17.1 | 0.291 | 295.75 | 0.427 | 30.6 | 0.454 |
|  |  |  |  | 308.75 | 0.525 | -4.3 | 0.255 | 299.00 | 0.429 | 33.0 | 0.456 |
|  |  |  |  | 315.25 | 0.442 | -28.8 | 0.215 | 302.25 | 0.356 | 36.2 | 0.378 |
|  |  |  |  | 321.75 | 0.665 | 8.0 | 0.323 | 305.50 | 0.317 | 36.4 | 0.337 |
|  |  |  |  |  |  |  |  | 308.75 | 0.356 | 35.9 | 0.378 |
|  |  |  |  |  |  |  |  | 312.00 | 0.348 | 31.1 | 0.370 |
|  |  |  |  |  |  |  |  | 315.25 | 0.340 | 34.8 | 0.361 |
|  |  |  |  |  |  |  |  | 321.75 | 0.323 | 32.8 | 0.343 |

Events E5A, E5B, E5C

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Event: 5A | | | | Event 5B: | | | | Event: 5C | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Referenced Surface Current Speed: | | 1.3 | m/s | Referenced Surface Current Speed: | | 0.0 | m/s | Referenced Surface Current Speed: | | 1.2 | m/s |
| Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude | Depth | OrcaFlex Factor | Rotation (deg) | Magnitude |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 0.00 | 1.000 | 117.7 | 1.324 | 0.00 | 1.000 | 118.1 | 0.042 | 0.00 | 1.000 | -5.1 | 1.221 |
| 3.25 | 1.006 | 121.2 | 1.332 | 9.75 | 3.024 | -145.8 | 0.127 | 3.25 | 0.993 | -4.5 | 1.212 |
| 6.50 | 0.918 | 122.3 | 1.215 | 19.50 | 5.857 | 162.3 | 0.246 | 16.25 | 0.442 | -32.9 | 0.540 |
| 9.75 | 0.872 | 124.1 | 1.154 | 26.00 | 21.881 | -18.6 | 0.919 | 19.50 | 0.343 | -31.5 | 0.419 |
| 13.00 | 0.805 | 125.9 | 1.066 | 29.25 | 21.833 | -18.9 | 0.917 | 29.25 | 1.149 | 25.4 | 1.403 |
| 16.25 | 0.643 | 135.3 | 0.851 | 32.50 | 20.810 | -22.6 | 0.874 | 32.50 | 1.124 | 24.3 | 1.373 |
| 29.25 | 0.511 | 9.2 | 0.676 | 35.75 | 20.452 | -17.6 | 0.859 | 35.75 | 1.114 | 21.3 | 1.360 |
| 32.50 | 0.548 | 13.9 | 0.726 | 39.00 | 21.238 | -20.3 | 0.892 | 39.00 | 1.083 | 22.4 | 1.322 |
| 35.75 | 0.554 | 16.0 | 0.733 | 42.25 | 20.762 | -19.1 | 0.872 | 42.25 | 1.089 | 22.5 | 1.330 |
| 39.00 | 0.550 | 16.4 | 0.728 | 45.50 | 20.524 | -18.6 | 0.862 | 45.50 | 1.083 | 23.9 | 1.322 |
| 42.25 | 0.521 | 12.5 | 0.690 | 48.75 | 19.643 | -18.3 | 0.825 | 48.75 | 1.088 | 23.6 | 1.328 |
| 45.50 | 0.526 | 17.1 | 0.696 | 52.00 | 18.476 | -18.7 | 0.776 | 52.00 | 1.064 | 22.8 | 1.299 |
| 48.75 | 0.552 | 19.0 | 0.731 | 55.25 | 17.810 | -16.2 | 0.748 | 55.25 | 1.106 | 21.6 | 1.350 |
| 52.00 | 0.568 | 17.6 | 0.752 | 58.50 | 17.643 | -17.6 | 0.741 | 58.50 | 1.056 | 21.6 | 1.289 |
| 55.25 | 0.563 | 17.8 | 0.745 | 61.75 | 18.357 | -18.2 | 0.771 | 61.75 | 1.049 | 22.7 | 1.281 |
| 58.50 | 0.549 | 16.9 | 0.727 | 65.00 | 18.119 | -20.1 | 0.761 | 65.00 | 1.078 | 21.5 | 1.316 |
| 61.75 | 0.577 | 17.4 | 0.764 | 68.25 | 19.000 | -18.5 | 0.798 | 68.25 | 1.078 | 20.8 | 1.316 |
| 65.00 | 0.600 | 21.3 | 0.794 | 71.50 | 17.976 | -23.0 | 0.755 | 71.50 | 1.083 | 23.9 | 1.322 |
| 68.25 | 0.567 | 20.6 | 0.751 | 74.75 | 17.595 | -21.2 | 0.739 | 74.75 | 1.066 | 23.1 | 1.301 |
| 71.50 | 0.547 | 23.5 | 0.724 | 78.00 | 17.119 | -22.2 | 0.719 | 78.00 | 1.075 | 24.5 | 1.312 |
| 74.75 | 0.573 | 17.4 | 0.759 | 81.25 | 16.000 | -24.0 | 0.672 | 81.25 | 1.093 | 24.8 | 1.334 |
| 78.00 | 0.560 | 24.7 | 0.741 | 84.50 | 15.190 | -24.7 | 0.638 | 84.50 | 1.075 | 26.1 | 1.312 |
| 81.25 | 0.545 | 23.9 | 0.721 | 87.75 | 14.286 | -22.3 | 0.600 | 87.75 | 1.017 | 28.1 | 1.242 |
| 84.50 | 0.535 | 24.7 | 0.708 | 91.00 | 15.667 | -18.0 | 0.658 | 91.00 | 1.010 | 27.7 | 1.233 |
| 87.75 | 0.519 | 26.6 | 0.687 | 94.25 | 17.714 | -15.9 | 0.744 | 94.25 | 0.998 | 28.1 | 1.218 |
| 91.00 | 0.497 | 28.2 | 0.658 | 97.50 | 17.595 | -14.1 | 0.739 | 97.50 | 0.974 | 29.9 | 1.189 |
| 94.25 | 0.498 | 25.2 | 0.660 | 100.75 | 19.262 | -7.5 | 0.809 | 100.75 | 0.945 | 30.8 | 1.154 |
| 97.50 | 0.474 | 21.1 | 0.627 | 104.00 | 18.810 | -5.6 | 0.790 | 104.00 | 0.902 | 31.2 | 1.101 |
| 100.75 | 0.428 | 23.5 | 0.567 | 107.25 | 18.500 | -5.5 | 0.777 | 107.25 | 0.841 | 32.9 | 1.027 |
| 107.25 | 0.432 | 20.2 | 0.572 | 110.50 | 17.405 | -6.0 | 0.731 | 110.50 | 0.753 | 36.6 | 0.920 |
| 110.50 | 0.424 | 18.7 | 0.562 | 113.75 | 15.214 | -1.9 | 0.639 | 113.75 | 0.704 | 36.3 | 0.860 |
| 113.75 | 0.400 | 14.2 | 0.529 | 117.00 | 14.333 | 1.9 | 0.602 | 117.00 | 0.614 | 36.1 | 0.750 |
| 117.00 | 0.440 | 12.1 | 0.582 | 120.25 | 12.452 | -3.2 | 0.523 | 120.25 | 0.581 | 34.5 | 0.709 |
| 120.25 | 0.410 | 3.2 | 0.543 | 123.50 | 11.500 | -1.4 | 0.483 | 123.50 | 0.505 | 29.2 | 0.617 |
| 123.50 | 0.437 | 7.2 | 0.578 | 126.75 | 10.810 | -0.9 | 0.454 | 126.75 | 0.481 | 26.1 | 0.587 |
| 126.75 | 0.462 | 3.5 | 0.612 | 130.00 | 9.548 | 1.3 | 0.401 | 130.00 | 0.449 | 26.5 | 0.548 |
| 130.00 | 0.433 | 1.2 | 0.573 | 133.25 | 9.071 | 2.0 | 0.381 | 133.25 | 0.448 | 26.2 | 0.547 |
| 133.25 | 0.421 | 1.9 | 0.557 | 139.75 | 8.905 | 5.8 | 0.374 | 136.50 | 0.439 | 22.4 | 0.536 |
| 136.50 | 0.408 | -4.6 | 0.540 | 143.00 | 9.690 | 7.0 | 0.407 | 139.75 | 0.434 | 19.3 | 0.530 |
| 139.75 | 0.341 | 1.0 | 0.451 | 146.25 | 9.071 | 9.2 | 0.381 | 143.00 | 0.460 | 18.6 | 0.562 |
| 143.00 | 0.288 | 9.5 | 0.381 | 149.50 | 9.238 | 17.2 | 0.388 | 146.25 | 0.455 | 10.9 | 0.555 |
| 146.25 | 0.324 | 5.6 | 0.429 | 152.75 | 9.143 | 18.7 | 0.384 | 149.50 | 0.435 | 8.3 | 0.531 |
| 149.50 | 0.310 | 0.4 | 0.410 | 156.00 | 9.357 | 20.9 | 0.393 | 152.75 | 0.390 | 7.7 | 0.476 |
| 152.75 | 0.307 | -3.5 | 0.406 | 159.25 | 10.643 | 16.5 | 0.447 | 156.00 | 0.446 | 10.4 | 0.544 |
| 159.25 | 0.267 | -1.4 | 0.353 | 162.50 | 11.738 | 17.0 | 0.493 | 159.25 | 0.419 | 11.3 | 0.511 |
| 169.00 | 0.230 | 0.8 | 0.305 | 165.75 | 12.167 | 13.9 | 0.511 | 162.50 | 0.428 | 7.4 | 0.522 |
| 172.25 | 0.277 | 7.1 | 0.367 | 169.00 | 12.095 | 9.7 | 0.508 | 165.75 | 0.478 | 4.5 | 0.584 |
| 175.50 | 0.293 | 9.1 | 0.388 | 172.25 | 12.762 | 8.4 | 0.536 | 169.00 | 0.433 | 2.8 | 0.529 |
| 178.75 | 0.335 | 9.1 | 0.444 | 175.50 | 11.024 | 5.7 | 0.463 | 172.25 | 0.396 | 7.3 | 0.483 |
| 182.00 | 0.343 | 11.7 | 0.454 | 178.75 | 11.405 | 0.5 | 0.479 | 175.50 | 0.413 | 5.5 | 0.504 |
| 185.25 | 0.328 | 7.4 | 0.434 | 182.00 | 12.381 | 7.9 | 0.520 | 178.75 | 0.421 | 5.4 | 0.514 |
| 188.50 | 0.310 | 12.9 | 0.411 | 185.25 | 11.929 | 6.2 | 0.501 | 182.00 | 0.429 | -0.7 | 0.524 |
| 191.75 | 0.312 | 12.1 | 0.413 | 188.50 | 11.786 | 8.7 | 0.495 | 185.25 | 0.465 | -3.1 | 0.568 |
| 195.00 | 0.301 | 8.3 | 0.398 | 191.75 | 11.571 | 3.0 | 0.486 | 188.50 | 0.428 | -1.3 | 0.522 |
| 198.25 | 0.316 | 5.5 | 0.419 | 195.00 | 12.857 | 0.4 | 0.540 | 191.75 | 0.412 | 3.0 | 0.503 |
| 201.50 | 0.262 | 12.6 | 0.347 | 198.25 | 12.071 | 8.3 | 0.507 | 195.00 | 0.437 | 6.4 | 0.533 |
| 204.75 | 0.267 | 12.1 | 0.353 | 201.50 | 10.048 | 13.1 | 0.422 | 198.25 | 0.375 | 7.5 | 0.458 |
| 208.00 | 0.320 | 12.4 | 0.424 | 204.75 | 10.262 | 16.0 | 0.431 | 201.50 | 0.372 | 3.3 | 0.454 |
| 211.25 | 0.302 | 20.2 | 0.400 | 208.00 | 8.500 | 17.7 | 0.357 | 204.75 | 0.410 | 4.8 | 0.500 |
| 214.50 | 0.263 | 13.9 | 0.348 | 211.25 | 7.476 | 22.6 | 0.314 | 208.00 | 0.423 | 8.5 | 0.517 |
| 217.75 | 0.223 | 23.3 | 0.295 | 217.75 | 7.167 | 17.2 | 0.301 | 217.75 | 0.296 | 11.4 | 0.362 |
| 221.00 | 0.184 | 41.2 | 0.244 | 224.25 | 6.548 | 9.1 | 0.275 | 221.00 | 0.240 | 15.9 | 0.293 |
| 230.75 | 0.159 | 44.2 | 0.211 | 227.50 | 5.786 | 12.9 | 0.243 | 224.25 | 0.240 | 10.8 | 0.293 |
| 234.00 | 0.177 | 41.8 | 0.235 | 243.75 | 6.738 | -8.7 | 0.283 | 227.50 | 0.243 | 19.5 | 0.297 |
| 240.50 | 0.156 | 24.5 | 0.207 | 247.00 | 5.595 | -6.9 | 0.235 | 230.75 | 0.238 | 13.1 | 0.290 |
| 243.75 | 0.143 | 23.1 | 0.189 | 253.50 | 6.833 | -9.2 | 0.287 | 234.00 | 0.229 | 3.7 | 0.279 |
| 247.00 | 0.157 | 22.0 | 0.208 | 260.00 | 6.643 | -7.0 | 0.279 | 237.25 | 0.245 | 2.9 | 0.299 |
| 263.25 | 0.144 | 8.5 | 0.191 | 266.50 | 6.762 | -6.9 | 0.284 | 240.50 | 0.267 | -4.1 | 0.326 |
| 273.00 | 0.134 | 0.3 | 0.178 | 269.75 | 7.024 | -8.2 | 0.295 | 243.75 | 0.269 | -5.3 | 0.329 |
| 289.25 | 0.082 | 16.1 | 0.108 | 276.25 | 7.833 | -10.5 | 0.329 | 247.00 | 0.215 | -10.5 | 0.263 |
|  |  |  |  | 282.75 | 4.857 | -3.8 | 0.204 | 250.25 | 0.247 | -3.3 | 0.301 |
|  |  |  |  | 286.00 | 5.310 | -33.4 | 0.223 | 256.75 | 0.171 | 2.1 | 0.209 |
|  |  |  |  | 289.25 | 4.310 | -33.0 | 0.181 | 279.50 | 0.083 | -0.8 | 0.101 |
|  |  |  |  | 315.25 | 1.167 | -149.0 | 0.049 | 315.25 | 0.066 | 44.7 | 0.081 |
|  |  |  |  |  |  |  |  | 318.50 | 0.088 | -3.2 | 0.107 |
|  |  |  |  |  |  |  |  | 321.75 | 0.135 | -4.9 | 0.165 |
|  |  |  |  |  |  |  |  | 266.50 | 0.388 | 27.6 | 0.474 |
|  |  |  |  |  |  |  |  | 269.75 | 0.382 | 33.4 | 0.466 |
|  |  |  |  |  |  |  |  | 273.00 | 0.351 | 37.7 | 0.428 |
|  |  |  |  |  |  |  |  | 276.25 | 0.336 | 42.3 | 0.411 |
|  |  |  |  |  |  |  |  | 282.75 | 0.310 | 47.5 | 0.378 |
|  |  |  |  |  |  |  |  | 286.00 | 0.254 | 46.7 | 0.310 |
|  |  |  |  |  |  |  |  | 289.25 | 0.283 | 48.4 | 0.346 |
|  |  |  |  |  |  |  |  | 292.50 | 0.269 | 46.9 | 0.329 |
|  |  |  |  |  |  |  |  | 302.25 | 0.183 | 46.6 | 0.224 |
|  |  |  |  |  |  |  |  | 305.50 | 0.152 | 35.2 | 0.186 |
|  |  |  |  |  |  |  |  | 318.50 | 0.062 | 12.8 | 0.075 |
|  |  |  |  |  |  |  |  | 321.75 | 0.139 | 43.4 | 0.170 |
|  |  |  |  |  |  |  |  | 312.00 | 0.346 | 35.9 | 0.422 |
|  |  |  |  |  |  |  |  | 315.25 | 0.321 | 35.4 | 0.392 |
|  |  |  |  |  |  |  |  | 318.50 | 0.349 | 41.7 | 0.426 |
|  |  |  |  |  |  |  |  | 321.75 | 0.418 | 45.8 | 0.510 |