



EXAMPLE PHOTO

| PROS | CONS |
|---|---|
| WORKS AT BOTH TERMINALS (SIMILAR CONSTRUCTION REQUIRING TYPICAL PILE DRIVING METHODS) | 6 PILES REQUIRED FOR EACH DOLPHIN |
| USES SIMILAR SIZE PILE TO THAT USED TO FOR PILE PROBING | IMPACT DRIVING REQUIRED FOR TENSION PILES |
| SOIL CONDITIONS GOOD FOR TENSION PILES | MODERATE FIELD WELDING REQUIRED |
| MULTIPLE STAGE FENDER FOR VARYING BERTHING SPEEDS | |
| DAMAGE CAN BE REPAIRED WITHOUT SIGNIFICANT EFFORT | |
| RELATIVELY LOW COST | |
| SMALL DIAMETER PILES ADVANTAGEOUS FOR PERMITTING | |
| ESTIMATE 2-3 MONTHS TO PERMIT | |
| NO B.E. (BIOLOGICAL EVALUATION) REQ'D. NO MARINE MAMMAL OR BIRD MONITORING REQUIRED. MINOR CONSULTATION WITH NMFS AND USFW. | |

| ROUGH ORDER OF MAGNITUDE COST ESTIMATES | | | | | |
|--|-----------------------|--|--|--|--|
| \$130k TO \$160k | ESTIMATE PER DOLPHIN* | | | | |
| \$1,040k TO \$1,280k | CONSTRUCTION COST* | | | | |
| \$200k TO \$250k | ENGINEERING** | | | | |
| ~ \$1.5MM RECOMMENDED BUDGET | | | | | |
| * INCLUDES: 10% MOB/DEMOB, 20% CONSTRUCTION CONTINGENCY, 7.9% SALES TAX. | | | | | |

** INCLUDES: DESIGN, PERMITTING SUPPORT, BIDDING AND CONSTRUCTION SUPPORT.

EXCLUDES: GEOTECHNICAL EXPLORATION, SITE TOPO/BATHYMETRIC SURVEYS, CONCEPT STUDY (ALREADY COMPLETED)

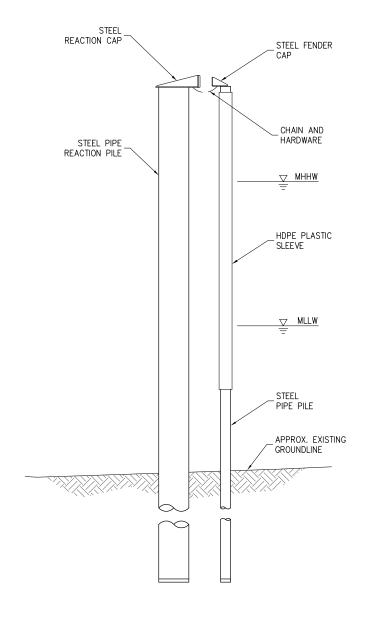
SPIN FIN™ PILE IS A REGISTERED TRADEMARK OF PND ENGINEERS, INC.



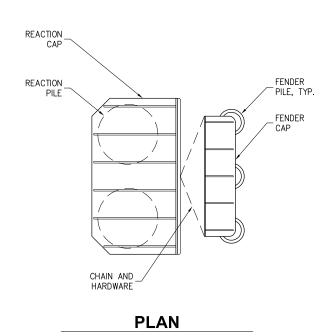
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| | | REVISIONS | PROJECT: | | | ISLAND PLACEME | ENT | |
|-----|--------|-------------|------------------------------|-----|-------------|-------------------|-----------|----|
| | | TILE: | RUBBER ENERGY ABSORBER STYLE | | | | | |
| | | | DESIGNED BY: | GRD | PROJECT NO: | 154034.01 | SHEET NO: | |
| | | | DRAWN BY: | JDO | DATE: | JANUARY 2016 | 1 | |
| RE\ | √ DATE | DESCRIPTION | CHECKED BY: | | SCALF: | NOTED | | OF |

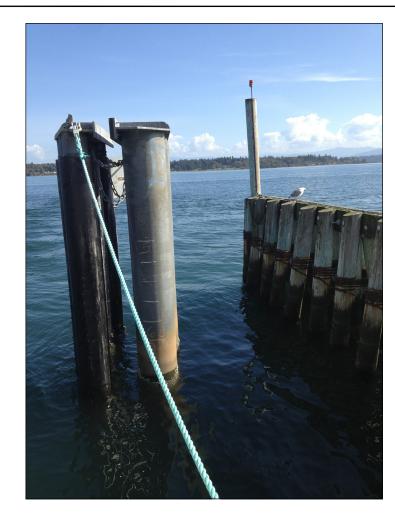
gs/2015\154034 — Herron Island Dolphin Replacement\Concept Dr



ELEVATION



| PROS | CONS |
|--|--|
| SMALL CONSTRUCTION FOOTPRINT (NO BATTER PILES) | ONLY WORKS WHERE ADEQUATE OVERBURDEN EXISTS (MAINLAND TERMINAL) |
| SIMPLE DESIGN WITHOUT SPECIALIZED MATERIALS | EXPENSIVE PILE SOCKETING WOULD BE NEEDED IN SHALLOW OVERBURDEN (ISLAND TERMINAL) |
| MULTIPLE STAGE FENDER FOR VARYING BERTHING SPEEDS | MAY REQUIRE IMPACT DRIVING OR OTHER METHODS TO INSTALL LARGER PILES |
| DAMAGE CAN BE REPAIRED WITHOUT SIGNIFICANT EFFORT | MODERATE FIELD WELDING REQUIRED |
| | MORE COSTLY THAN OTHER OPTIONS |
| | REACTION PILES ARE LARGER DIAMETER REQUIRING ADDITIONAL PERMITTING EFFORT |
| | ESTIMATE 5-6 MONTHS TO PERMIT |
| | PARTIAL B.E. REQUIRED. MARINE MAMMAL AND BIRD MONITORING REQUIRED. MODERATE CONSULTATION WITH NMFS AND USFW NEEDED. |



EXAMPLE PHOTO

| ROUGH ORDER | OF MAGNITUDE | | | | | |
|---|-----------------------|--|--|--|--|--|
| COST ES | TIMATES | | | | | |
| \$160k TO \$190k | ESTIMATE PER DOLPHIN* | | | | | |
| \$1,280k TO \$1,520k | CONSTRUCTION COST* | | | | | |
| \$200k TO \$250k | ENGINEERING** | | | | | |
| ~ \$1.8MM | RECOMMENDED BUDGET | | | | | |
| * INCLUDES: 10% MOB/DEI CONTINGENCY, 7.9% SALES | | | | | | |
| ** INCLUDES: DESIGN, PERMITTING SUPPORT, BIDDING AND CONSTRUCTION SUPPORT. EXCLUDES: GEOTECHNICAL EXPLORATION, SITE TOPO/BATHYMETRIC SURVEYS, CONCEPT STUDY (ALREADY COMPLETED) | | | | | | |

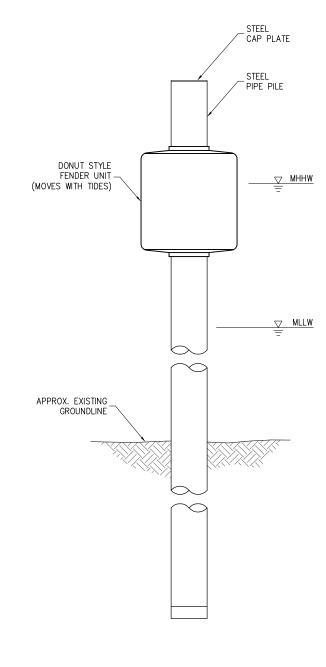
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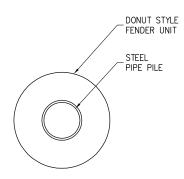
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| | | REVISIONS | PROJECT: | | | ISLAND PLACEME | NT | | | |
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| | | | TITLE: | CANTILE | EVER - RE | EACTION ST | YLE | | | |
| | | | DESIGNED BY: | GRD | PROJECT NO: | 154034.01 | SHEET NO: | | | _ |
| | | | DRAWN BY: | JDO | DATE: | JANUARY 2016 | 2 | | Λ | |
| REV | DATE | DESCRIPTION | CHECKED BY: | | SCALE: | NOTED | _ | OF | 4 | |

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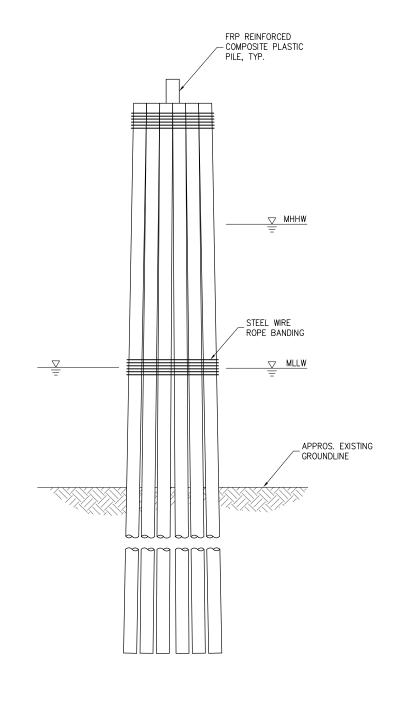
| PROS | CONS | | | | |
|--|---|--|--|--|--|
| SMALL CONSTRUCTION FOOTPRINT (SINGLE PILE) | ONLY WORKS WHERE ADEQUATE OVERBURDEN EXISTS (MAINLAND TERMINAL) | | | | |
| SIMPLE CONSTRUCTION METHOD (UNLESS PILE INSTALLATION REQUIRES DRILLING, SOCKETING, IMPACT DRIVING) | EXPENSIVE PILE SOCKETING AND IMPACT DRIVING WOULD BE NEEDED IN SHALLOW OVERBURDEN (ISLAND TERMINAL) | | | | |
| ASSEMBLY (AFTER PILE INSTALLATION) VERY SIMPLE | ENERGY ABSORPTION SIGNIFICANTLY DEPENDENT ON TIDE LEVEL. | | | | |
| RELATIVELY LOW COST | DONUT FENDER UNIT IS SPECIALTY ITEM AND COSTLY. COULD BE DIFFICULT TO REPLACE IF DAMAGED | | | | |
| | SOFT SURFACE SOILS COULD BE PROBLEMATIC SINCE DOLPHIN DEPENDS ENTIRELY ON LATERAL SUPPORT | | | | |
| | REPAIR OF DAMAGE OFTEN REQUIRES REPLACEMENT | | | | |
| | LARGE DIAMETER PILE REQUIRES ADDITIONAL PERMITTING EFFORTS | | | | |
| | ESTIMATE 8 MONTHS TO PERMIT | | | | |
| | PARTIAL B.E. REQUIRED. MARINE MAMMAL AND BIRD MONITORING REQUIRED. MAJOR CONSULTATION WITH NMFS AND USFW REQUIRED. | | | | |

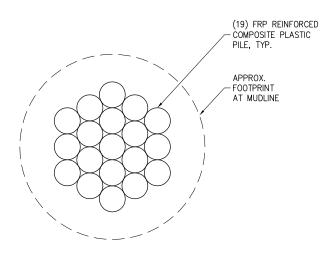
| ROUGH ORDER OF MAGNITUDE | | | | | | | |
|---|-----------------------|--|--|--|--|--|--|
| COST ES | TIMATES | | | | | | |
| \$135k TO \$170k | ESTIMATE PER DOLPHIN* | | | | | | |
| \$1,080k TO \$1,360k | CONSTRUCTION COST* | | | | | | |
| \$200k TO \$250k | ENGINEERING** | | | | | | |
| ~ \$1.6MM | RECOMMENDED BUDGET | | | | | | |
| * INCLUDES: 10% MOB/DENCY, 7.9% SALES | | | | | | | |
| ** INCLUDES: DESIGN, PERMITTING SUPPORT, BIDDING AND CONSTRUCTION SUPPORT. EXCLUDES: GEOTECHNICAL EXPLORATION, SITE TOPO/BATHYMETRIC SURVEYS, CONCEPT STUDY (ALREADY COMPLETED) | | | | | | | |

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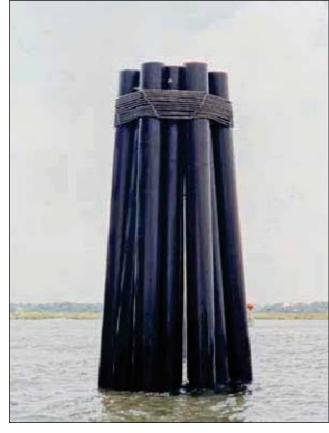
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| | | REVISIONS | PROJECT: | | | ISLAND PLACEME | NT | | |
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| | | | DESIGNED BY: | GRD | PROJECT NO: | 154034.01 | SHEET NO: | | |
| | | | DRAWN BY: | JDO | DATE: | JANUARY 2016 | 2 | | Λ |
| RFV | DATE | DESCRIPTION | CUECKED DA | | SCALE. | NOTED | J | OF | 4 |





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EXAMPLE PHOTO

| PROS | CONS |
|---|---|
| SIMPLE CONSTRUCTION METHOD | COMPOSITE PLASTIC PILES ARE A SPECIALTY ITEM, OFTEN DIFFICULT TO PROCURE WITH INCONSISTENCY FROM MANUFACTURES/VENDORS |
| CAN BE USED AT BOTH TERMINALS | LEAD TIME AVAILABILITY AND COST OF MATERIALS NOT ALWAYS CONSISTENT |
| VIBRO INSTALL OF ALL PILES POSSIBLE PERMIT | WEAR AND CORROSION OF WIRE ROPE BANDING |
| SIMILAR FUNCTION AND FEEL TO EXISTING CLUSTER PILE DOLPHINS | REPAIR OF DAMAGE OFTEN REQUIRES REPLACEMENT |
| NO CORROSION IN PLASTIC PILES TO DEAL WITH | MANY PILES NEEDED (4x OTHER OPTIONS) REQUIRES ADDITIONAL PERMITTING EFFORT |
| | ESTIMATE 8-10 MONTHS TO PERMIT |
| | FULL B.E. REQUIRED. MARINE MAMMAL MONITORING REQUIRED. MAJOR CONSULTATION WITH NMFS REQUIRED AND MODERATE CONSULTATION WITH USFW NEEDED |

| ROUGH ORDER OF MAGNITUDE COST ESTIMATES | | | | | | |
|---|-----------------------|--|--|--|--|--|
| \$220k TO \$260k | ESTIMATE PER DOLPHIN* | | | | | |
| \$1,760k TO \$2,080k | CONSTRUCTION COST* | | | | | |
| \$200k TO \$250k | ENGINEERING** | | | | | |
| ~ \$2.3MM | RECOMMENDED BUDGET | | | | | |
| * INCLUDES: 10% MOB/DEI CONTINGENCY, 7.9% SALES | | | | | | |
| ** INCLUDES: DESIGN, PERMITTING SUPPORT, BIDDING AND CONSTRUCTION SUPPORT. EXCLUDES: GEOTECHNICAL EXPLORATION, SITE TOPO/BATHYMETRIC SURVEYS, CONCEPT STUDY (ALREADY COMPLETED) | | | | | | |

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| | | REVISIONS | HERRON ISLAND | | | | | | |
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| REV | DATE | DESCRIPTION | CHECKED BY: | | SCALE: | NOTED | 4 | OF | + |

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