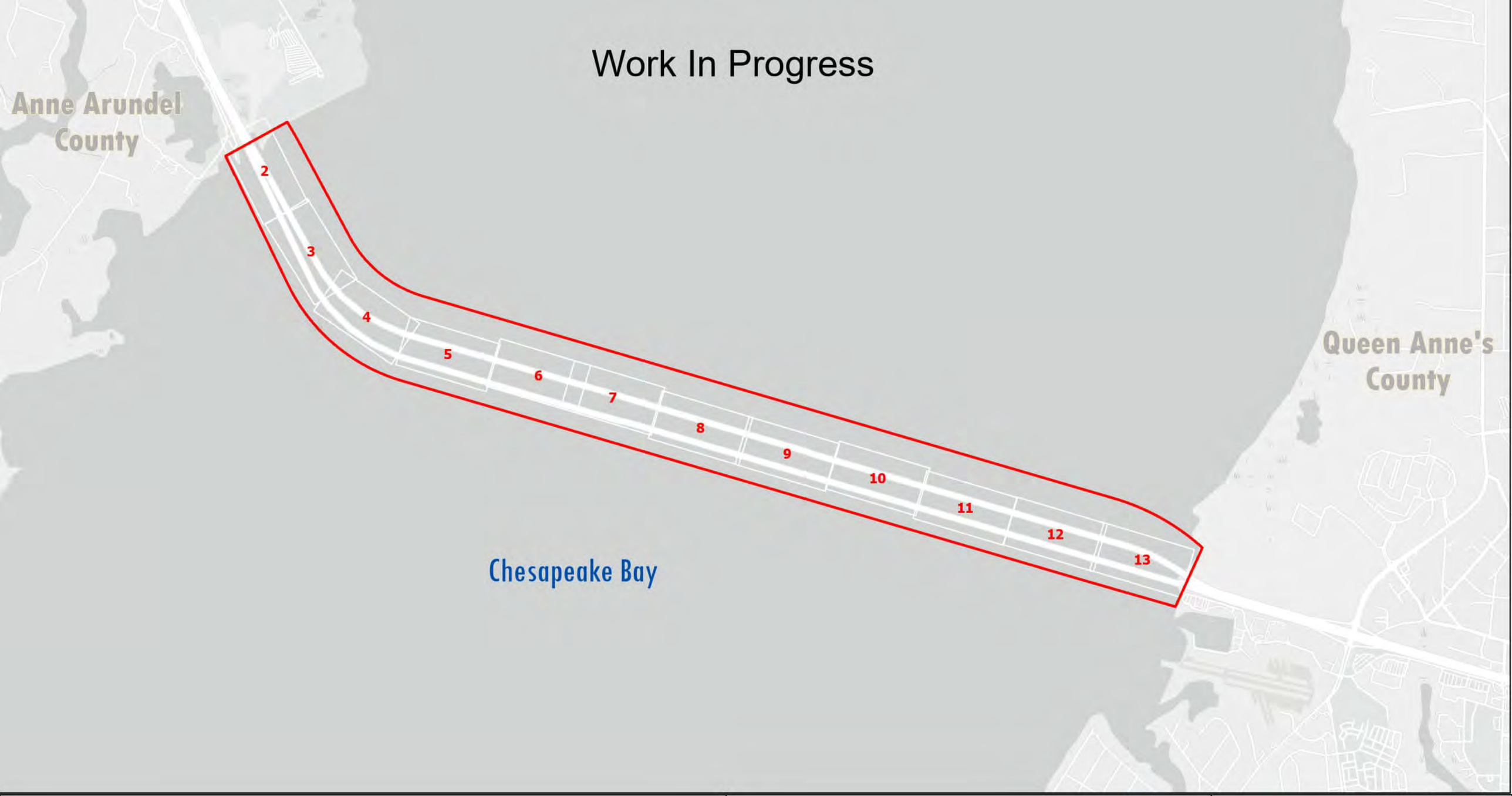
APPENDIX H: CHESAPEAKE BAY MAP SET (NORTHERN ALIGNMENTS)

Work In Progress



Map Pages
Build Alternatives B, D, and F Temporary Construction Action Area

1" = 2,000 Feet

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Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Chesapeake Bay Impact Map Key
Northern Alignments
Build Alternatives B, D, and F

Sandy Point State Park

Shared Use Path Pier Impact

Potential New Pier Construction
Temporary and Permanent Impact

Potential Dredge Area

Existing Pier Demolition
Temporary Impact

Permanent Pier Construction

MDTA Maintenance Facility

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



1" = 100 Feet

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Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F

Shared Use Path Pier Impact

Potential Dredge Area

Existing Pier Demolition
Temporary Impact

Potential New Pier Construction
Temporary and Permanent Impact

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



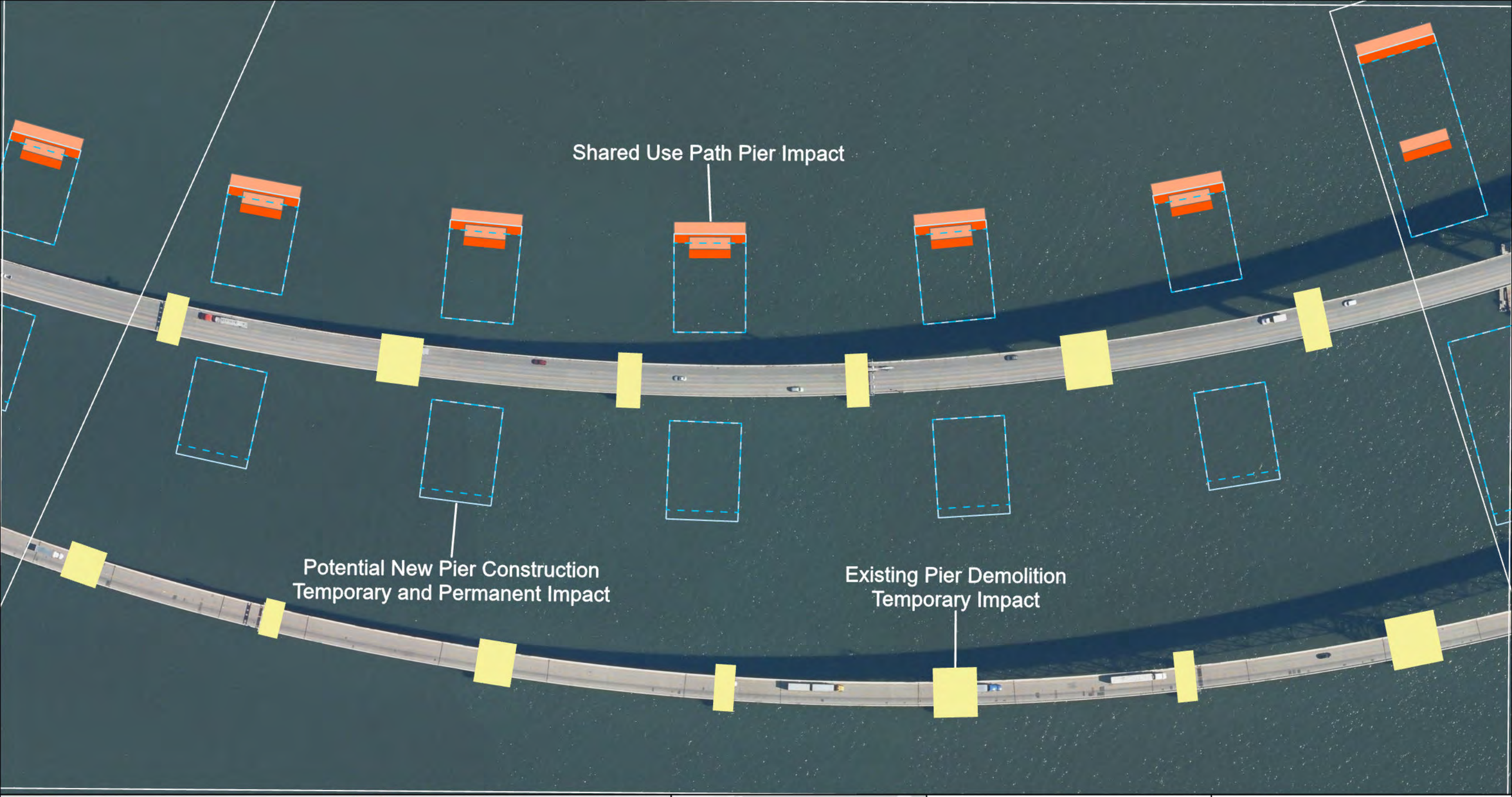
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Transportation
Authority

Chesapeake
BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



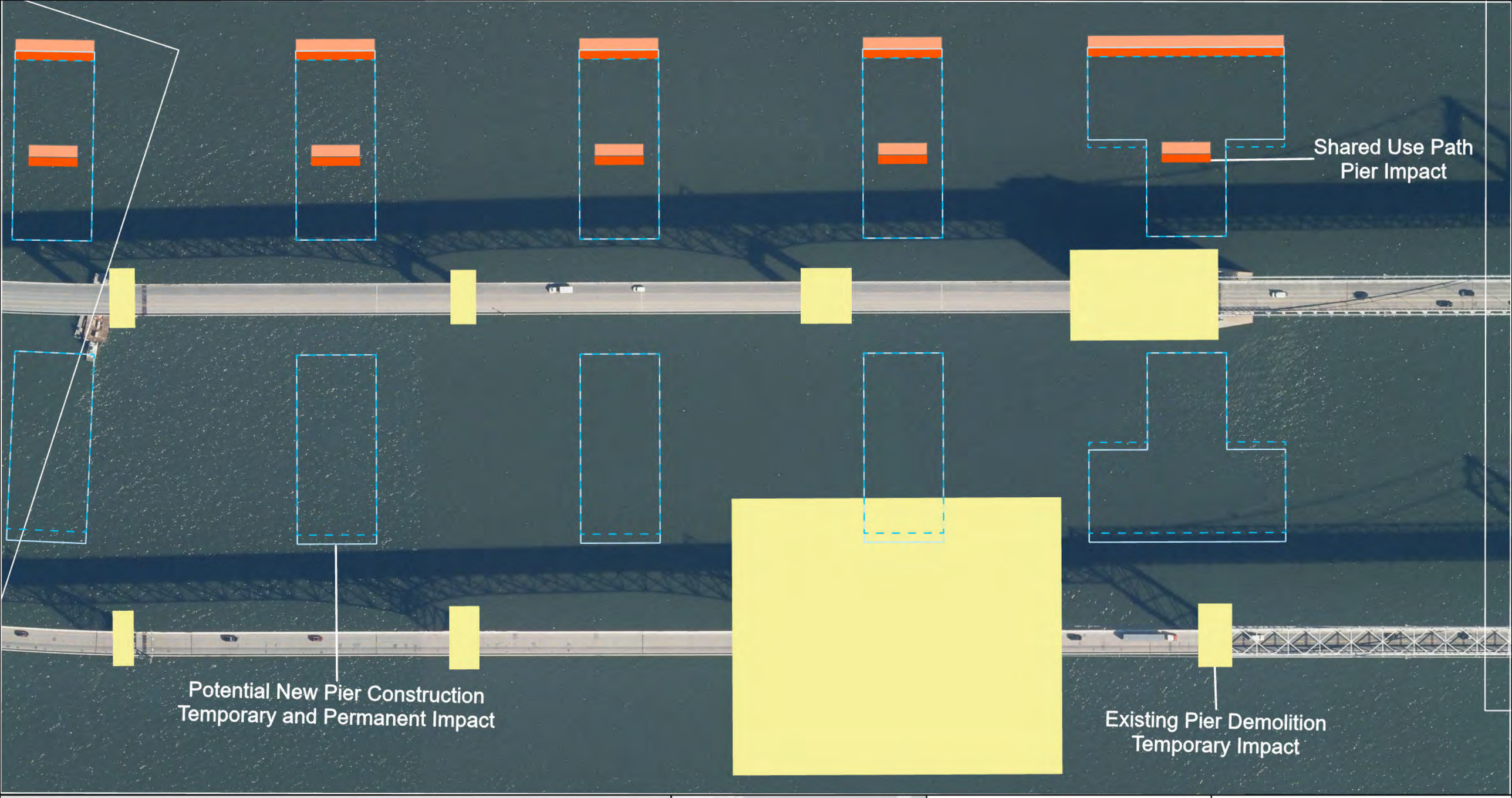
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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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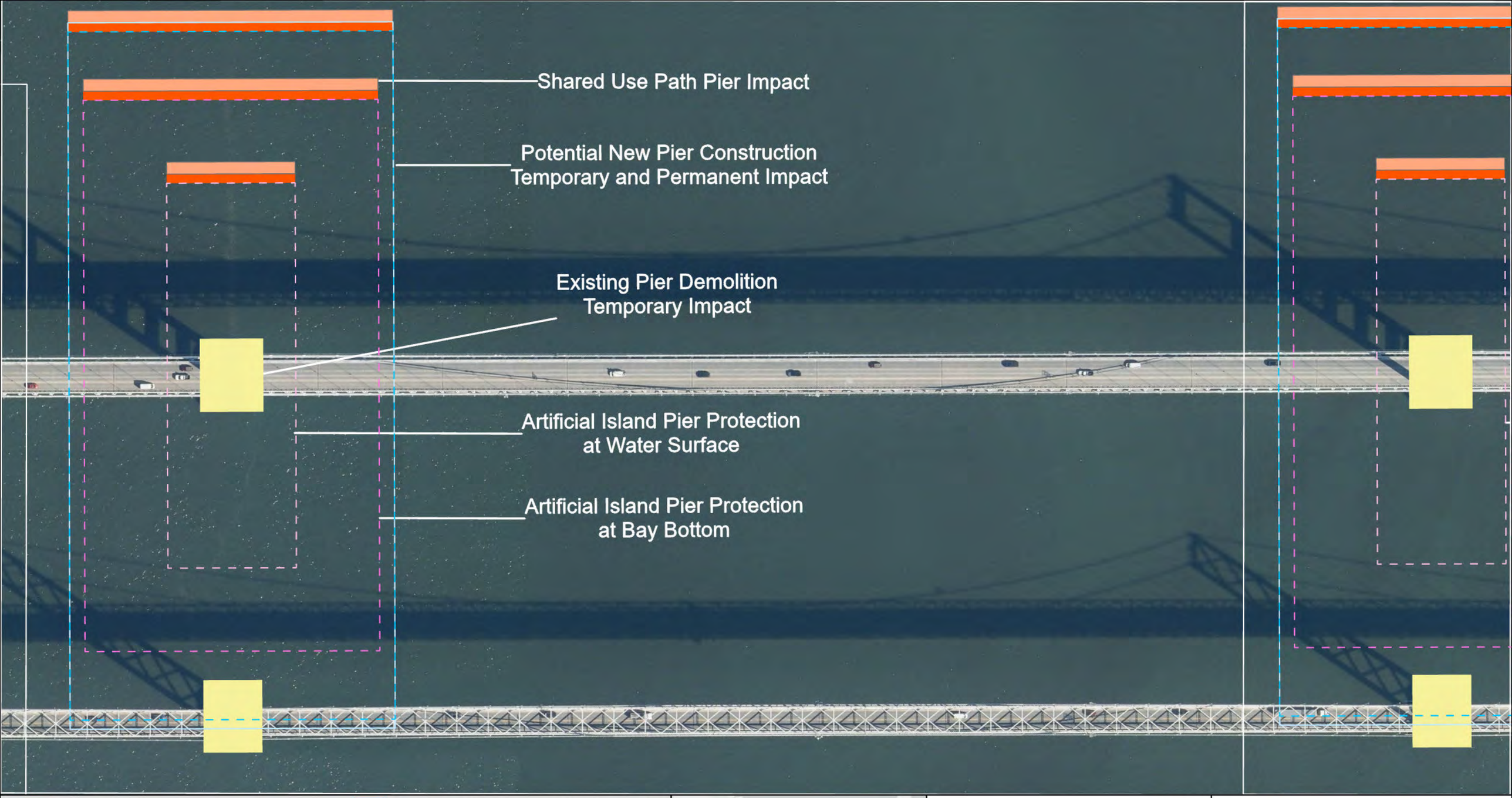
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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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1" = 100 Feet

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BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F

Shared Use Path Pier Impact

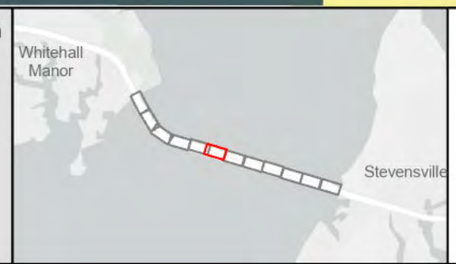
Potential New Pier Construction Temporary and Permanent Impact

Artificial Island Pier Protection at Water Surface

Artificial Island Pier Protection at Bay Bottom

Existing Pier Demolition Temporary Impact

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



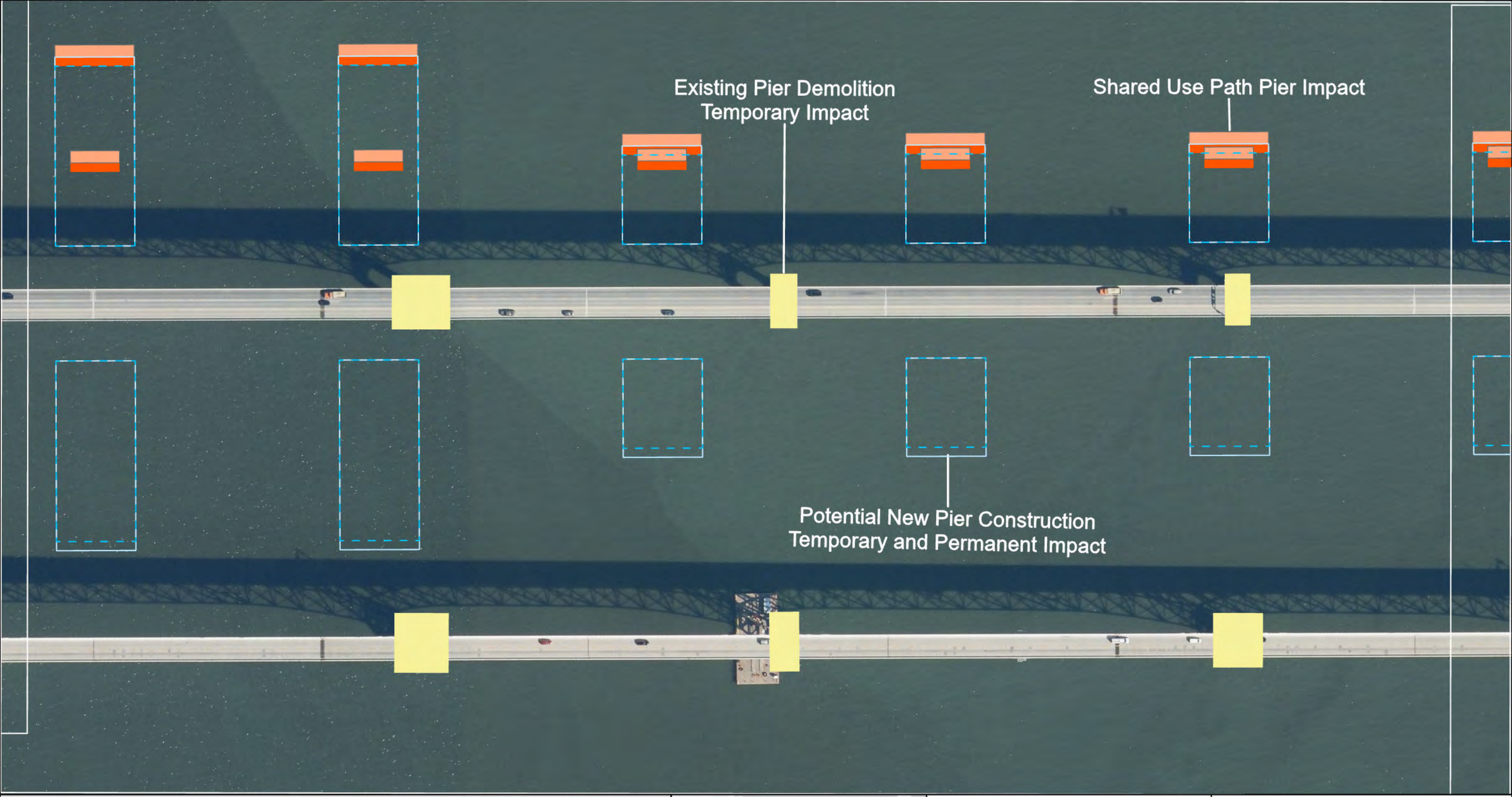
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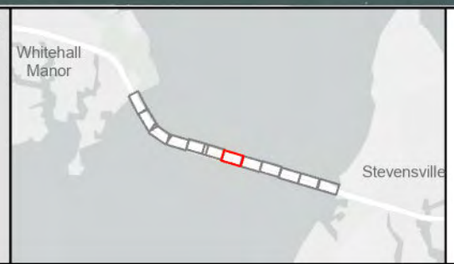
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Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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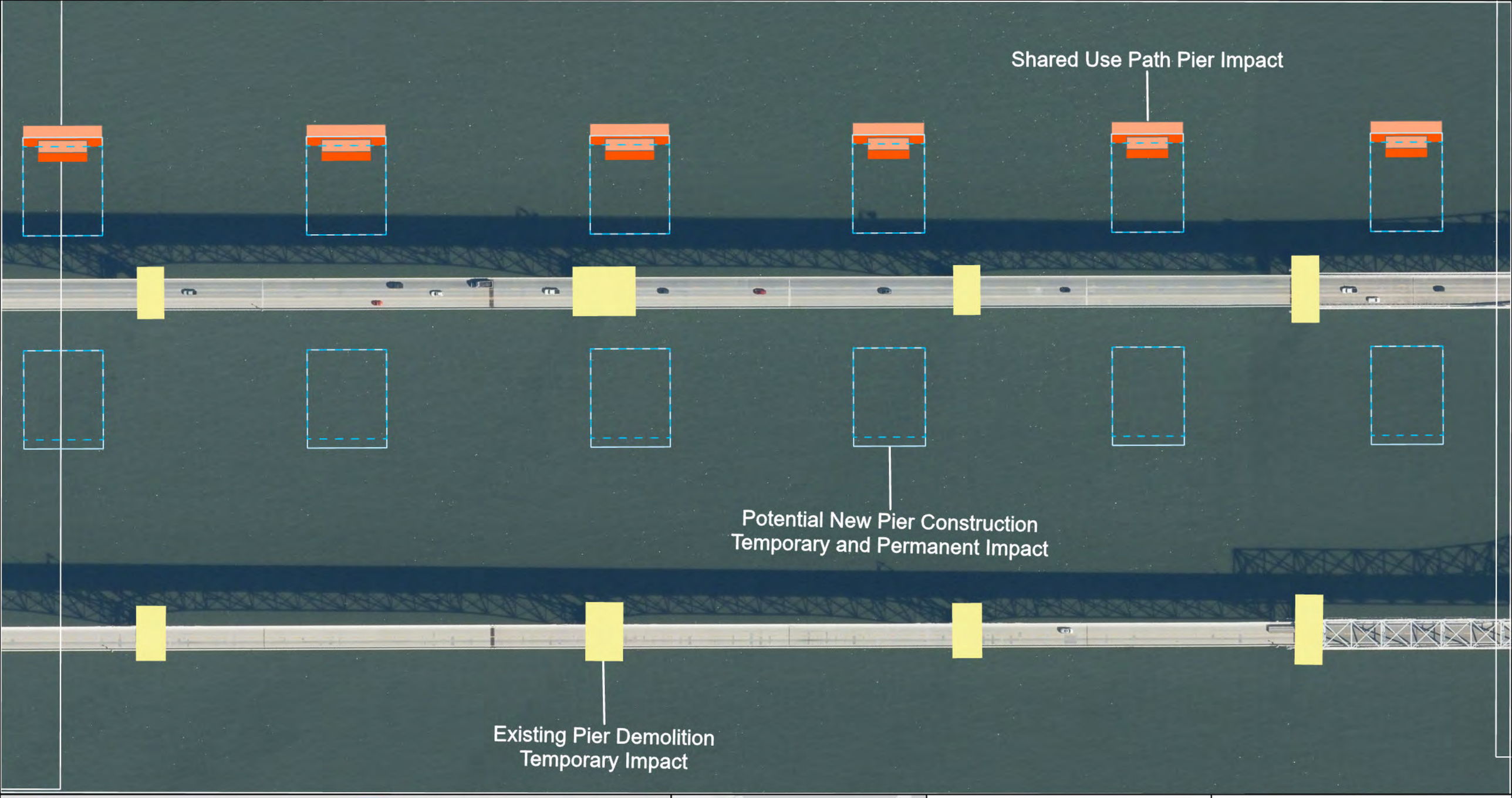
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Chesapeake
BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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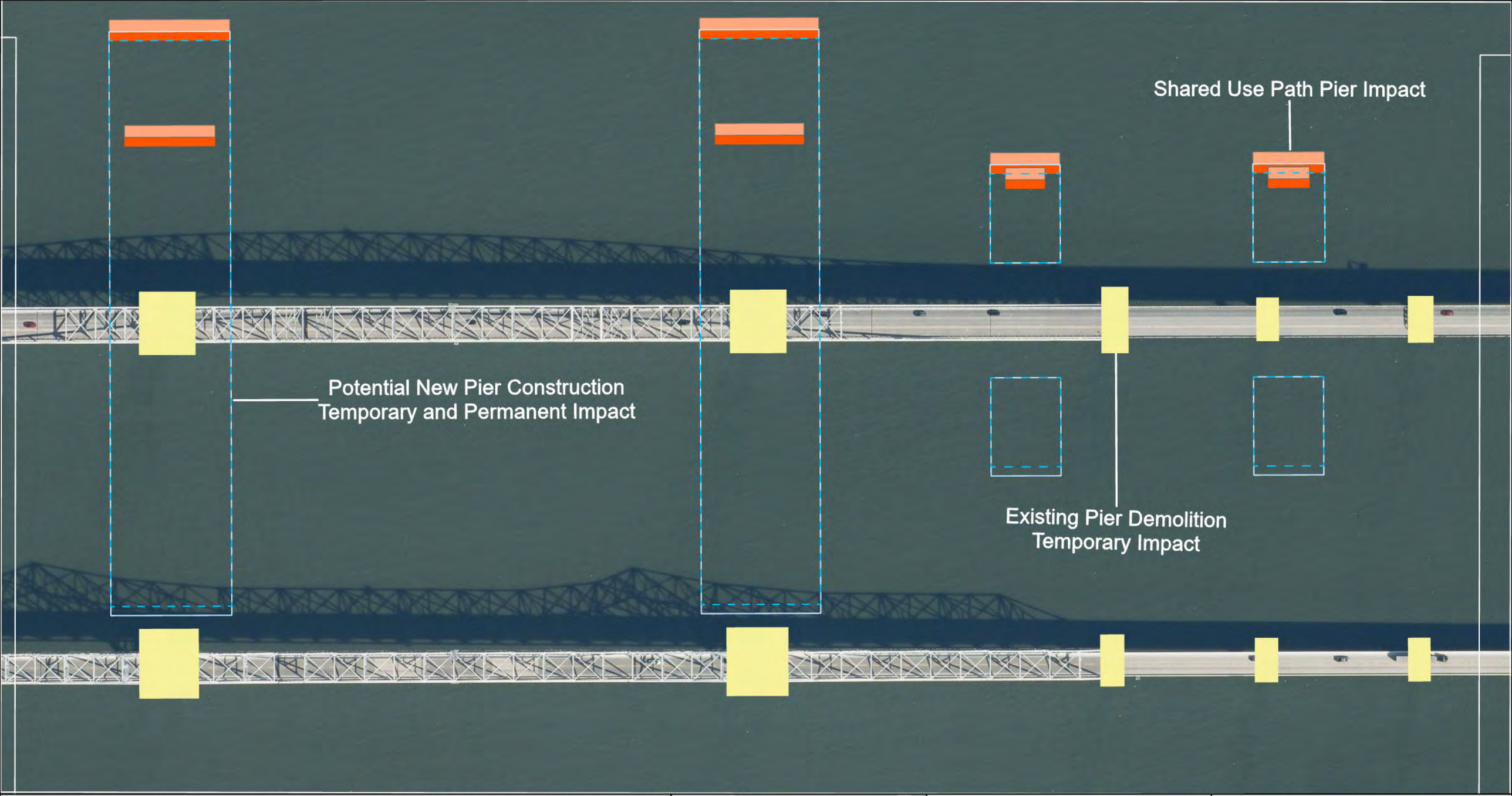
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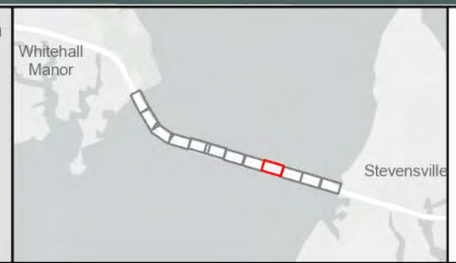
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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
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- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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BAY CROSSING STUDY
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Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F

Shared Use Path Pier Impact

Existing Pier Demolition
Temporary Impact

Potential New Pier Construction
Temporary and Permanent Impact

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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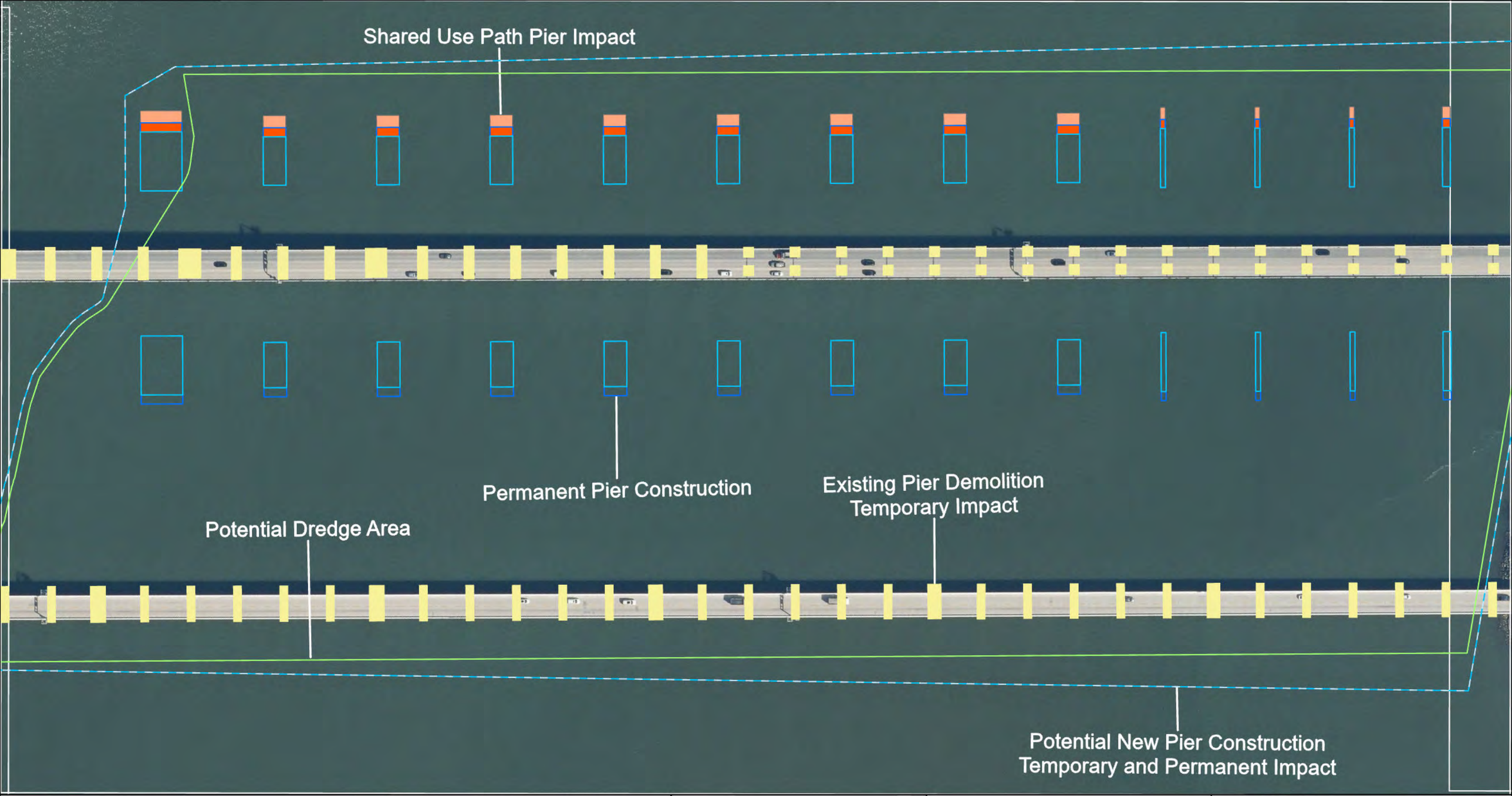
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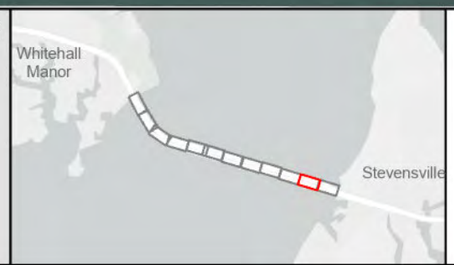
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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
- Alternative B & D Permanent Pier Construction
- Alternative F Permanent Pier Construction
- Alternative F Shared Use Path Impact
- Alternative B & D Shared Use Path Impact



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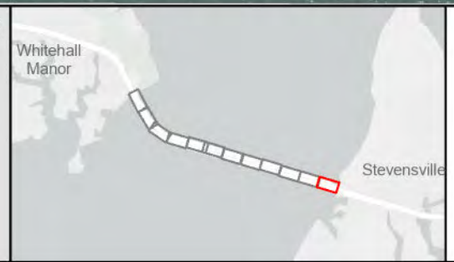
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Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F



Potential Dredge Area
Existing Pier Demolition - Temporary Impact
Artificial Island Pier Protection at Bay Bottom
Artificial Island Pier Protection at Water Surface
Build Alternaive F Potential New Pier Construction - Temporary & Permanent Impact
Build Alternaive B & D Potential New Pier Construction - Temporary & Permanent Impact
Alternative B & D Permanent Pier Construction
Alternative F Permanent Pier Construction
Alternative F Shared Use Path Impact
Alternative B & D Shared Use Path Impact



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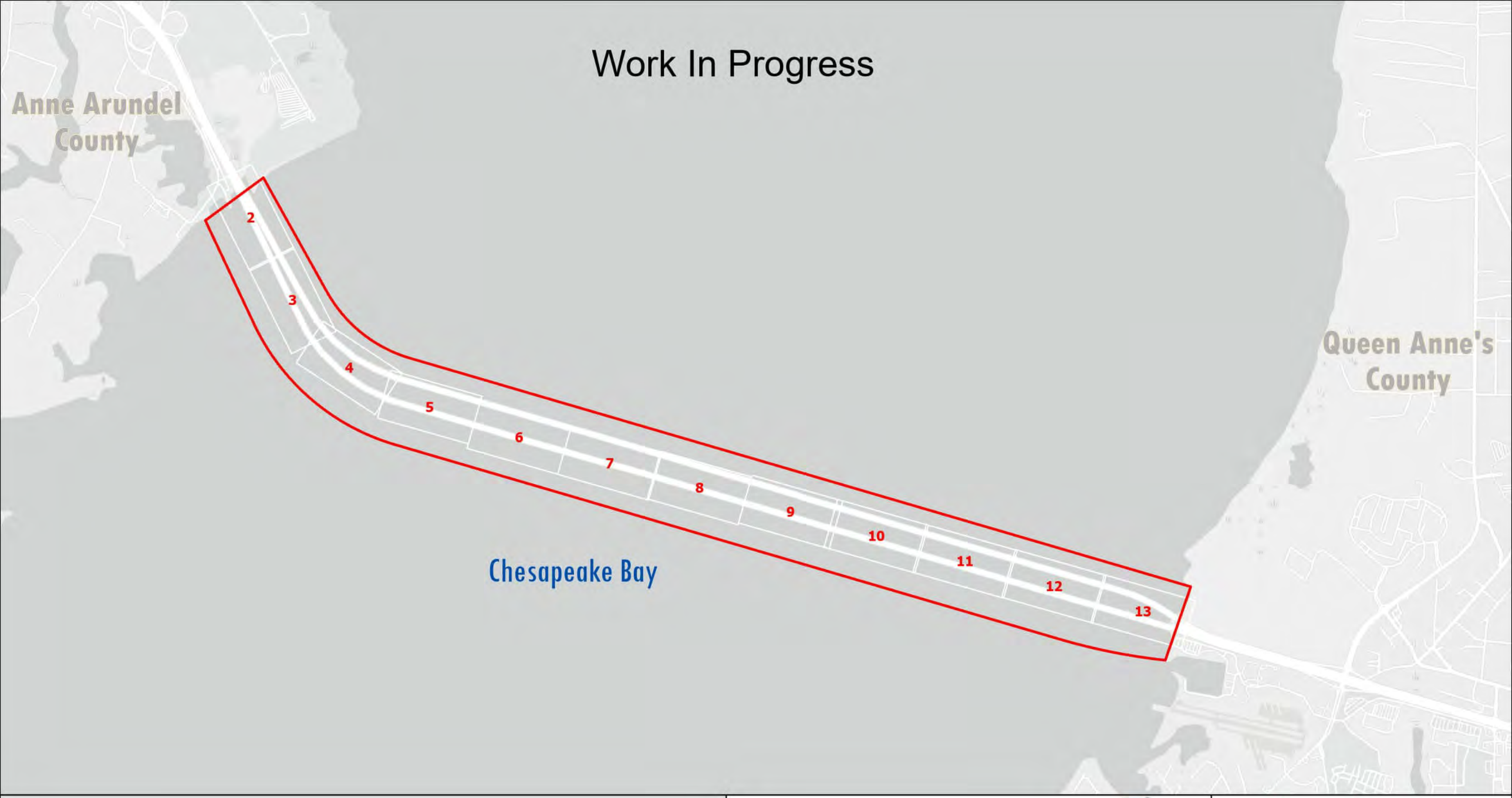
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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Northern Alignments
Build Alternatives B, D, and F

APPENDIX I: CHESAPEAKE BAY MAP SET (SOUTHERN ALIGNMENTS)

Work In Progress



Map Pages
Build Alternatives C, E, and G Potential Construction Activity - Temporary Impact

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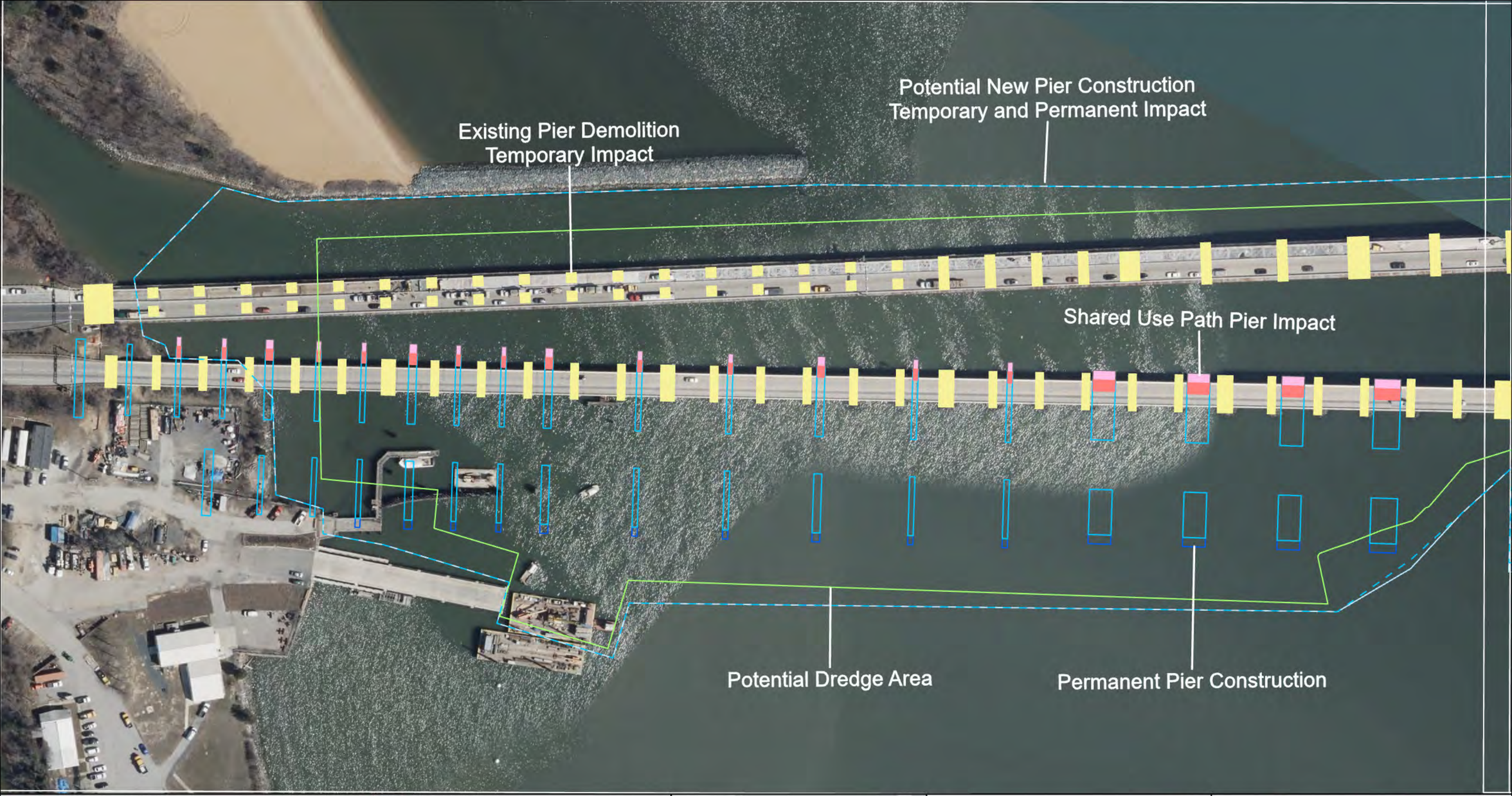
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Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Chesapeake Bay Impact Map Key
Southern Alignments
Build Alternatives C, E, and G



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternatives C & E Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



1" = 100 Feet

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Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G

Existing Pier Demolition
Temporary Impact

Shared Use Path Pier Impact

Potential Dredge
Area

Potential New Pier Construction
Temporary and Permanent Impact

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternatives C & E Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



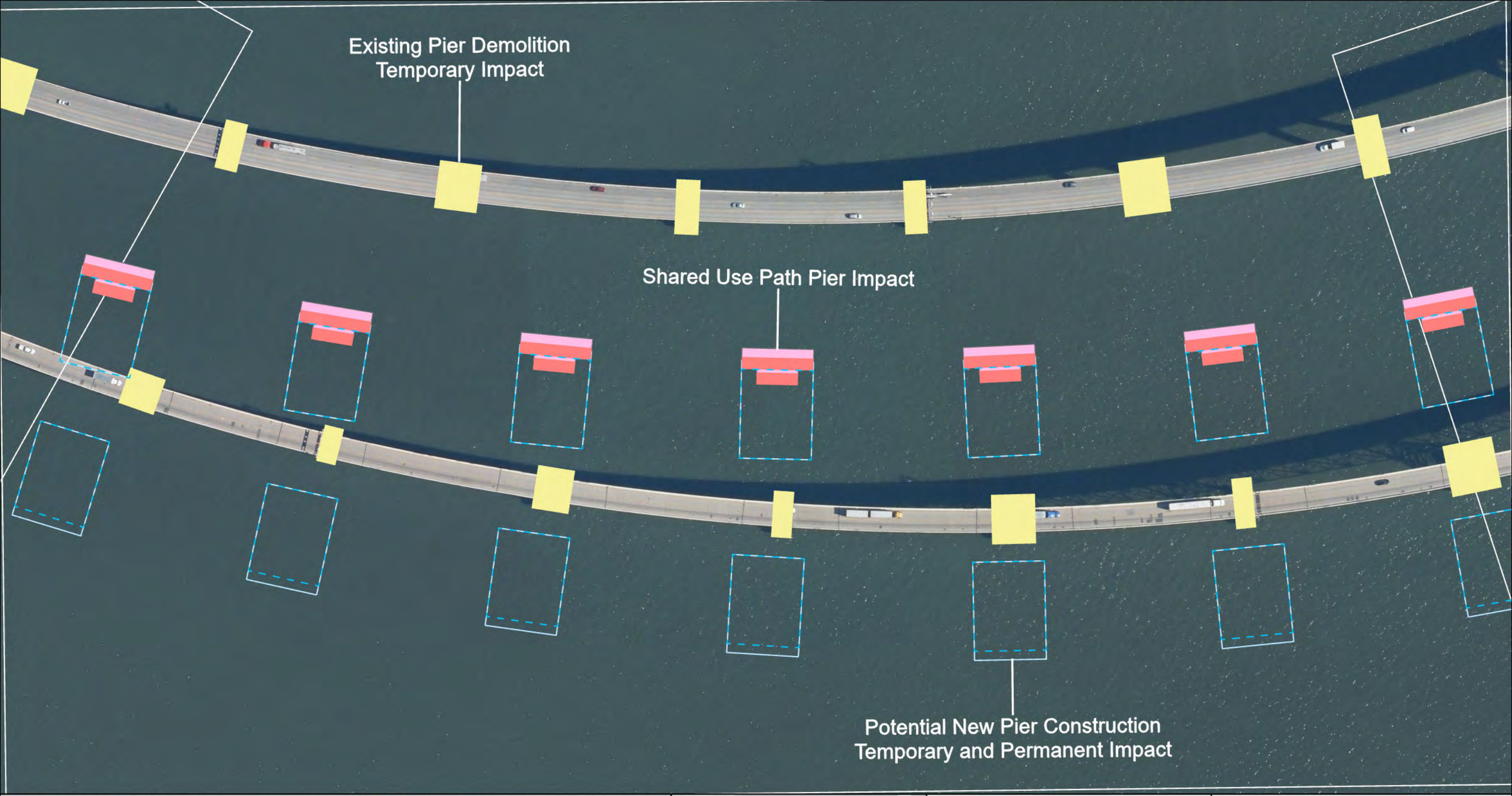
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Chesapeake
BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
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- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



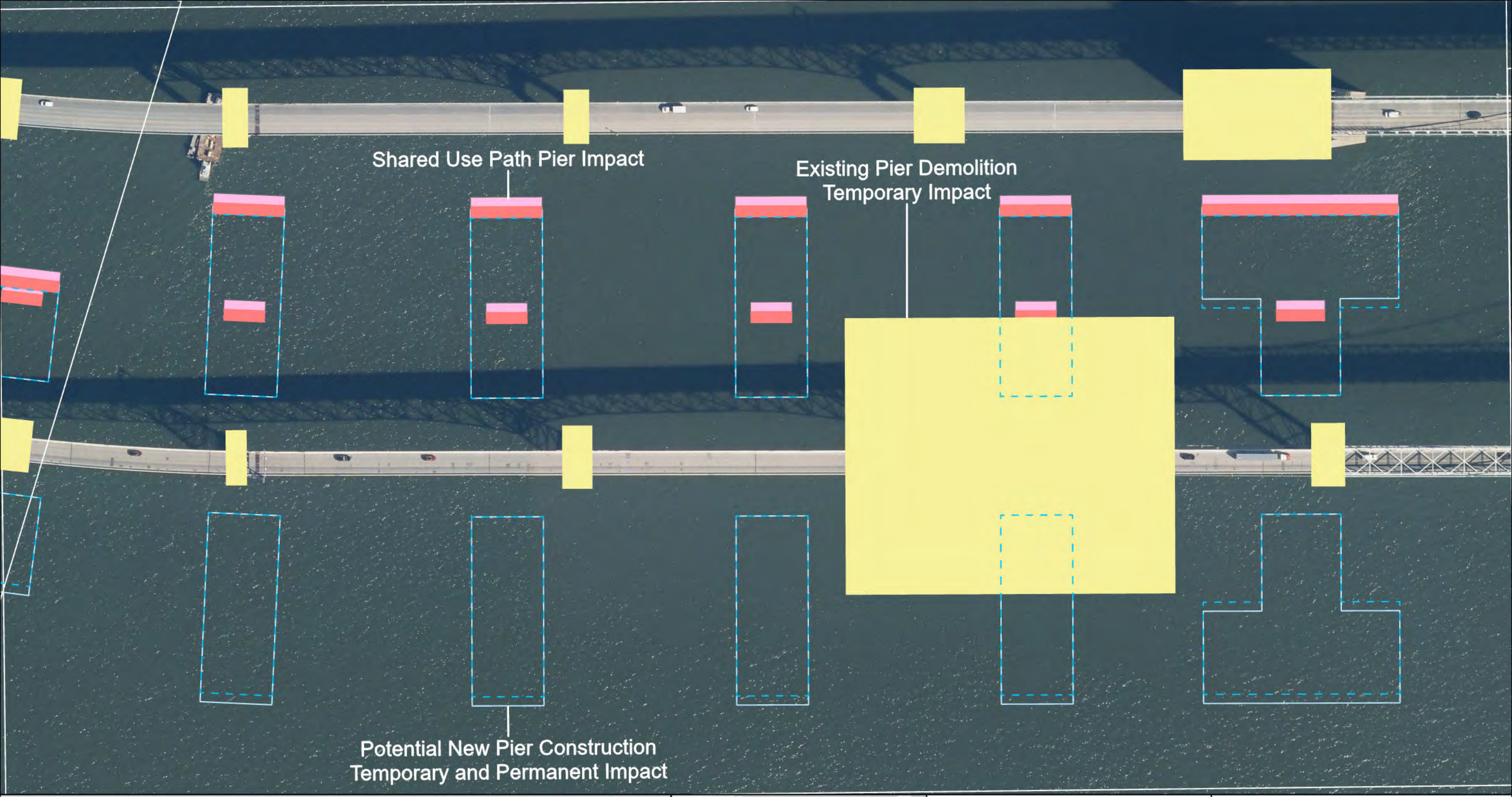
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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G



Potential Dredge Area
Existing Pier Demolition - Temporary Impact
Artificial Island Pier Protection at Bay Bottom
Artificial Island Pier Protection at Water Surface
Build Alternatives C & E Potential New Pier Construction - Temporary & Permanent Impact
Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact

Alternative C & E Permanent Pier Construction
Alternative G Permanent Pier Construction
Alternative G Shared Use Path Impact
Alternative C & E Shared Use Path Impact



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Chesapeake
BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G

Shared Use Path Pier Impact

Potential New Pier Construction
Temporary and Permanent Impact

Existing Pier Demolition
Temporary Impact

Artificial Island Pier Protection
at Water Surface

Artificial Island Pier Protection
at Bay Bottom

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
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- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



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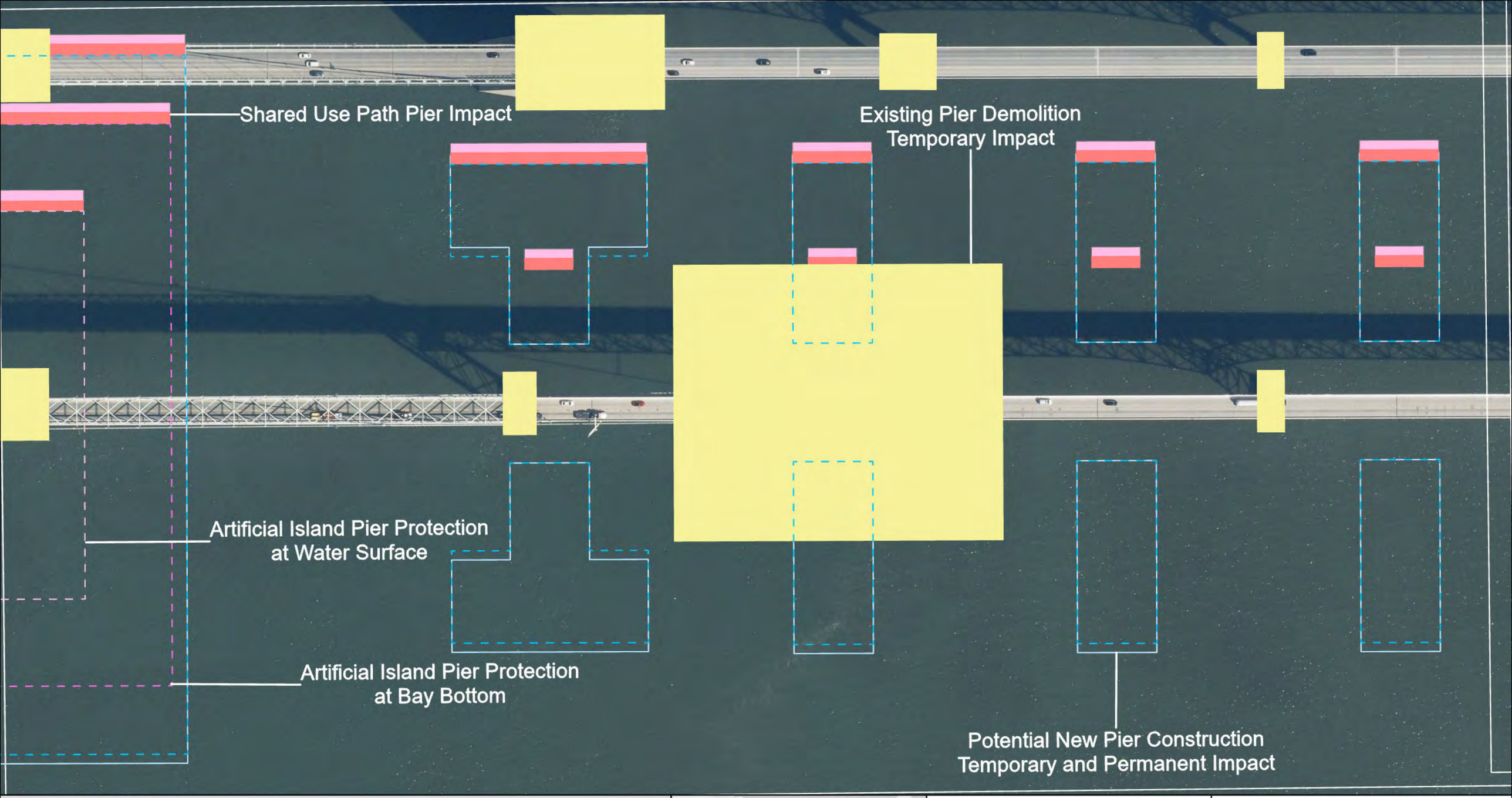
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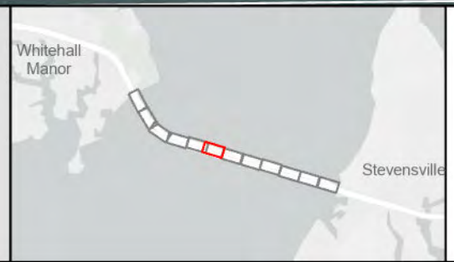
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BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
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- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



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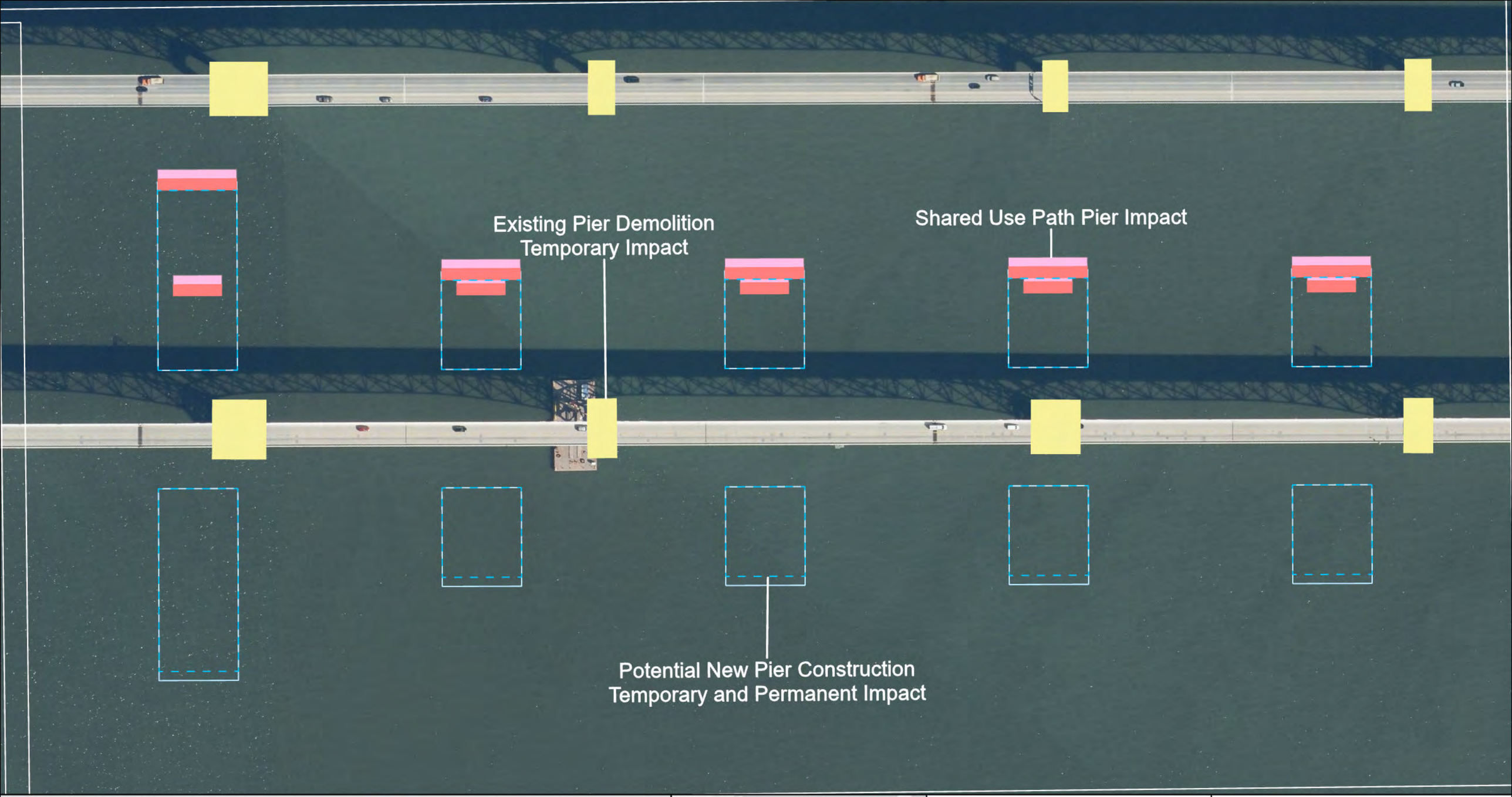
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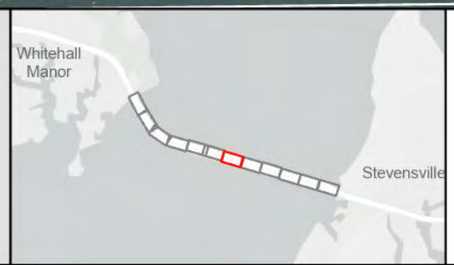
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BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
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- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



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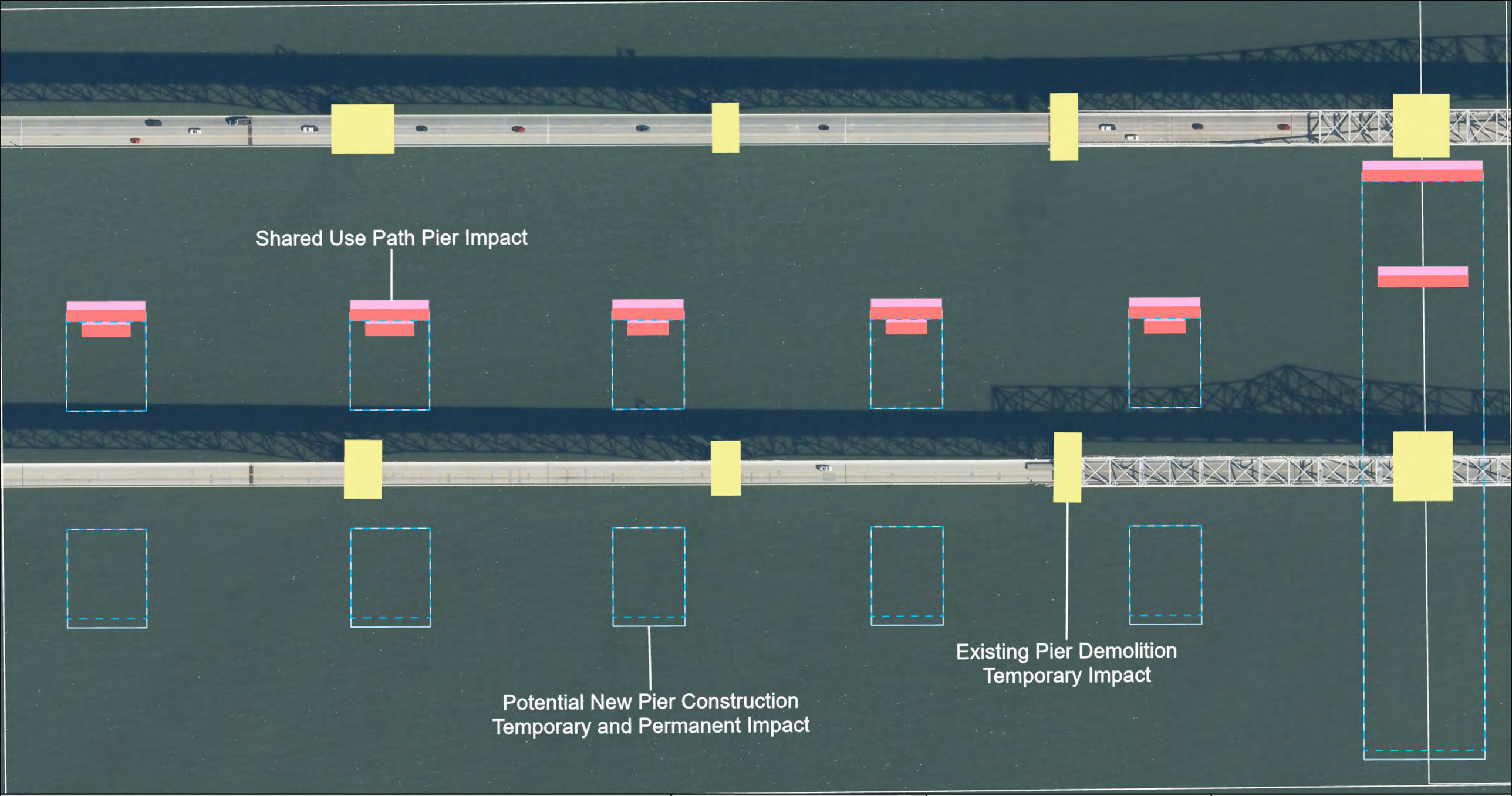
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Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G



Potential Dredge Area
Existing Pier Demolition - Temporary Impact
Artificial Island Pier Protection at Bay Bottom
Artificial Island Pier Protection at Water Surface
Build Alternatives C & E Potential New Pier Construction - Temporary & Permanent Impact
Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact

Alternative C & E Permanent Pier Construction
Alternative G Permanent Pier Construction
Alternative G Shared Use Path Impact
Alternative C & E Shared Use Path Impact



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1" = 100 Feet

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Chesapeake
BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G

Shared Use Path Pier Impact

Existing Pier Demolition
Temporary Impact

Potential New Pier Construction
Temporary and Permanent Impact

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
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- Artificial Island Pier Protection at Water Surface
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- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



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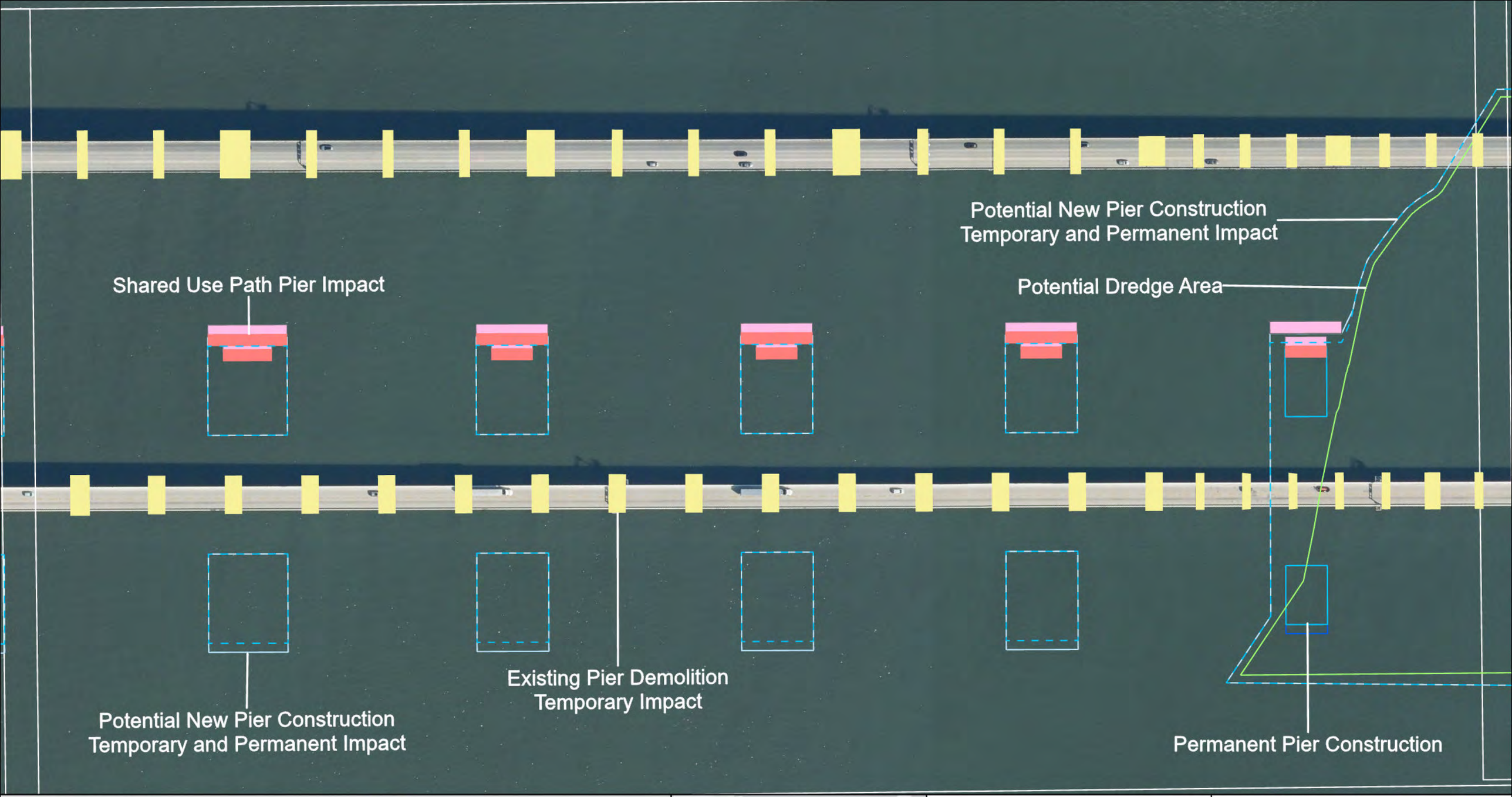
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Chesapeake
BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G



- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
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- Artificial Island Pier Protection at Water Surface
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- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



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1" = 100 Feet

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Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G

Potential New Pier Construction
Temporary and Permanent Impact

Potential Dredge Area

Shared Use Path Pier Impact

Existing Pier Demolition
Temporary Impact

Permanent Pier Construction

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
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- Alternative G Permanent Pier Construction
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- Alternative C & E Shared Use Path Impact



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1" = 100 Feet

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BAY CROSSING STUDY
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Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G

Shared Use Path Pier Impact

Expanded Causeway

Permanent Pier Construction

Potential Dredge Area

Potential New Pier Construction
Temporary and Permanent Impact

- Potential Dredge Area
- Existing Pier Demolition - Temporary Impact
- Artificial Island Pier Protection at Bay Bottom
- Artificial Island Pier Protection at Water Surface
- Build Alternatives C & E Potential New Pier Construction - Temporary & Permanent Impact
- Build Alternative G Potential New Pier Construction - Temporary & Permanent Impact
- Alternative C & E Permanent Pier Construction
- Alternative G Permanent Pier Construction
- Alternative G Shared Use Path Impact
- Alternative C & E Shared Use Path Impact



N

1" = 100 Feet

0 100 200 FT

MDTA
Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Chesapeake Bay Impact Map
Southern Alignments
Build Alternatives C, E, and G

APPENDIX J: Bird Species Documented in the Resource Review Area

Appendix J: Bird Species Documented Within the Resource Review Area

Common Name	Scientific Name	Common Name	Scientific Name
Breeding Status: Confirmed			
Canada goose*	*Branta canadensis*	Eastern kingbird	*Tyrannus tyrannus*
Wood duck*	*Aix sponsa*	Blue jay*	*Cyanocitta cristata*
Mallard*	*Anas platyrhynchos*	American crow*	*Corvus brachyrhynchos*
Wild turkey*	*Meleagris gallopavo*	Fish crow	*Corvus ossifragus*
Rock pigeon	*Columba livia*	Carolina chickadee*	*Poecile carolinensis*
Mourning dove*	*Zenaida macroura*	Tufted titmouse*	*Baeolophus bicolor*
Yellow-billed cuckoo*	*Coccyzus americanus*	Northern rough-winged swallow	*Stelgidopteryx serripennis*
Ruby-throated hummingbird	*Archilochus colubris*	Purple martin	*Progne subis*
Killdeer	*Charadrius vociferus*	Tree swallow	*Tachycineta bicolor*
Willet[1, 3]	*Tringa semipalmata*	Barn swallow	*Hirundo rustica*
Great black-backed gull	*Larus marinus*	White-breasted nuthatch	*Sitta carolinensis*
Least tern[1, 3]	*Sternula antillarum*	Blue-gray gnatcatcher	*Polioptila caerulea*
Common tern[1]	*Sterna hirundo*	Northern house wren	*Troglodytes aedon*
Great blue heron[1]*	*Ardea herodias*	Carolina wren*	*Thryothorus ludovicianus*
Great egret[1]	*Ardea alba*	European starling*	*Sturnus vulgaris*
Snowy egret[1]	*Egretta thula*	Gray catbird*	*Dumetella carolinensis*
Western cattle egret	*Bubulcus ibis*	Brown thrasher	*Toxostoma rufum*
Green heron	*Butorides virescens*	Northern mockingbird*	*Mimus polyglottos*
Black-crowned night heron	*Nycticorax nycticorax*	Eastern bluebird*	*Sialia sialis*
Black vulture*	*Coragyps atratus*	American robin*	*Turdus migratorius*
Osprey	*Pandion haliaetus*	Cedar waxwing*	*Bombycilla cedrorum*
Cooper's hawk	*Accipiter cooperii*	House sparrow*	*Passer domesticus*
Bald eagle[1] *	*Haliaeetus leucocephalus*	House finch*	*Haemorhous mexicanus*
Red-shouldered hawk[2] *	*Buteo lineatus*	American goldfinch*	*Spinus tristis*
Eastern screech-owl	*Megascops asio*	Chipping sparrow	*Spizella passerina*
Great horned owl	*Bubo virginianus*	Song sparrow*	*Melospiza melodia*
Barred owl[2]	*Strix varia*	Eastern towhee*	*Pipilo erythrophthalmus*
Red-bellied woodpecker*	*Melanerpes carolinus*	Orchard oriole	*Icterus spurius*
Hairy woodpecker[2] *	*Dryobates villosus*	Downy woodpecker*	*Dryobates pubescens*
Pileated woodpecker[2] *	*Dryocopus pileatus*	Brown-headed cowbird	*Molothrus ater*
Northern flicker*	*Colaptes auratus*	Common grackle	*Quiscalus quiscula*
Peregrine falcon[1]	*Falco peregrinus*	Common yellowthroat	*Geothlypis trichas*
Acadian flycatcher[1, 2]	*Empidonax virescens*	Northern cardinal*	*Cardinalis cardinalis*
Eastern phoebe*	*Sayornis phoebe*	Blue grosbeak	*Passerina caerulea*
Great crested flycatcher	*Myiarchus crinitus*	Indigo bunting	*Passerina cyanea*
Red-winged blackbird*	*Agelaius phoeniceus*	-----	-----
Breeding Status: Probable			
Chimney swift[1, 3]	*Chaetura pelagica*	Horned lark	*Eremophila alpestris*
Virginia rail	*Rallus limicola*	Brown-headed nuthatch	*Sitta pusilla*
American woodcock[1]	*Scolopax minor*	Marsh wren[1]	*Cistothorus palustris*

Common Name	Scientific Name	Common Name	Scientific Name
American herring gull	*Larus argentatus*	Wood thrush[1, 2, 3]	*Hylocichla mustelina*
Turkey vulture*	*Cathartes aura*	Grasshopper sparrow[1, 3]	*Ammodramus savannarum*
Red-tailed hawk*	*Buteo jamaicensis*	Field sparrow	*Spizella pusilla*
Belted kingfisher*	*Megaceryle alcyon*	Yellow-breasted chat[1, 3]	*Icteria virens*
Eastern wood-pewee	*Contopus virens*	Ovenbird[1, 2]	*Seiurus aurocapilla*
White-eyed vireo	*Vireo griseus*	Pine warbler	*Setophaga pinus*
Red-eyed vireo[2]	*Vireo olivaceus*	Scarlet tanager[1, 2,3]	*Piranga olivacea*
Breeding Status: Possible			
Northern bobwhite[1]	*Colinus virginianus*	American kestrel[1]	*Falco sparverius*
Sora[1]	*Porzana carolina*	Warbling vireo	*Vireo gilvus*
Spotted sandpiper[1]	*Actitis macularius*	Baltimore oriole	*Icterus galbula*
Double-crested cormorant	*Nannopterum auritum*	Black-and-white warbler[1, 2]	*Mniotilta varia*
Least bittern[1]	*Ixobrychus exilis*	Northern parula[1, 2]	*Setophaga americana*
Breeding Status: Observed			
Snow goose	*Anser caerulescens*	White-winged scoter[1]	*Melanitta deglandi*
Cackling goose	*Branta hutchinsii*	Black tern	*Chlidonias niger*
Tundra swan	*Cygnus columbianus*	Bonaparte's gull	*Chroicocephalus philadelphia*
Blue-winged teal[1]	*Spatula discors*	Laughing gull[1]	*Leucophaeus atricilla*
Northern shoveler	*Spatula clypeata*	Ring-billed gull*	*Larus delawarensis*
Gadwall[1]	*Mareca strepera*	Caspian tern	*Hydroprogne caspia*
American wigeon	*Mareca americana*	Lesser black-backed gull	*Larus fuscus*
Northern pintail	*Anas acuta*	Franklin's gull	*Leucophaeus pipixcan*
Black scoter[1]	*Melanitta americana*	Forster's tern[1]	*Sterna forsteri*
Long-tailed duck[1]	*Clangula hyemalis*	Royal tern[1]	*Thalasseus maximus*
Bufflehead	*Bucephala albeola*	Common loon[1]	*Gavia immer*
Common goldeneye	*Bucephala clangula*	Black skimmer[1]	*Rynchops niger*
Hooded merganser*	*Lophodytes cucullatus*	Brown pelican[1,3]	*Pelecanus occidentalis*
Common merganser[1]	*Mergus merganser*	Northern gannet[1]	*Morus bassanus*
Red-breasted merganser	*Mergus serrator*	Little Blue heron[1]	*Egretta caerulea*
Ruddy duck[1]	*Oxyura jamaicensis*	Tricolored heron[1]	*Egretta tricolor*
Pied-billed grebe[1]	*Podilymbus podiceps*	White ibis	*Eudocimus albus*
Horned grebe[1]	*Podiceps auritus*	Glossy ibis[1]	*Plegadis falcinellus*
Common nighthawk[1]	*Chordeiles minor*	Northern harrier[1]	*Circus hudsonius*
Common Gallinule[1]	*Gallinula galeata*	Sharp-shinned hawk[1]	*Accipiter striatus*
Black-necked stilt	*Himantopus mexicanus*	Red-headed woodpecker[1,3]	*Melanerpes erythrocephalus*
Black-bellied plover[1]	*Pluvialis squatarola*	Merlin	*Falco columbarius*
American golden plover	*Pluvialis dominica*	Yellow-bellied sapsucker[1]*	*Sphyrapicus varius*
Semipalmated plover[1]	*Charadrius semipalmatus*	Yellow-bellied flycatcher	*Empidonax flaviventris*
Stilt sandpiper	*Calidris himantopus*	Willow flycatcher[1]	*Empidonax traillii*
Sanderling[1]	*Calidris alba*	Least flycatcher[1]	*Empidonax minimus*
Dunlin[1,3]	*Calidris alpina*	Yellow-throated vireo[1, 2]	*Vireo flavifrons*

Common Name	Scientific Name	Common Name	Scientific Name
Least sandpiper	*Calidris minutilla*	Blue-headed vireo	*Vireo solitarius*
White-rumped sandpiper	*Calidris fuscicollis*	Philadelphia vireo	*Vireo philadelphicus*
Pectoral sandpiper[3]	*Calidris melanotos*	Common raven	*Corvus corax*
Semipalmated[3] sandpiper	*Calidris pusilla*	Bank swallow[1]	*Riparia riparia*
Upland sandpiper[1]	*Bartramia longicauda*	Ruby-crowned kinglet*	*Corthylio calendula*
Short-billed dowitcher[1,3]	*Limnodromus griseus*	Golden-crowned kinglet[1]*	*Regulus satrapa*
Marbled godwit	*Limosa fedoa*	Red-breasted nuthatch[1]	*Sitta canadensis*
Wilson's snipe	*Gallinago delicata*	Savannah sparrow[1]	*Passerculus sandwichensis*
Solitary sandpiper	*Tringa solitaria*	Bobolink[1,3]	*Dolichonyx oryzivorus*
Greater yellowlegs[1]	*Tringa melanoleuca*	Rusty blackbird[1,3]	*Euphagus carolinus*
Lesser yellowlegs[1,3]	*Tringa flavipes*	Worm-eating warbler[1, 2]	*Helmitheros vermivorum*
Ruddy Turnstone[1,3]	*Arenaria interpres*	Northern waterthrush[1]	*Parkesia noveboracensis*
Brown creeper[1, 2] *	*Certhia americana*	American redstart[1, 2]	*Setophaga ruticilla*
Winter wren[1]*	*Troglodytes hiemalis*	Blackburnian warbler[1]	*Setophaga fusca*
Veery[1, 2]	*Catharus fuscescens*	Blackpoll warbler	*Setophaga striata*
Gray-cheeked thrush	*Catharus minimus*	Black-throated blue warbler[1]	*Setophaga caerulescens*
Swainson's thrush[1]	*Catharus ustulatus*	Palm warbler	*Setophaga palmarum*
Bicknell's thrush[1]	*Catharus bicknelli*	Yellow-rumped warbler	*Setophaga coronata*
Hermit thrush*	*Catharus guttatus*	Chestnut-sided warbler	*Setophaga pensylvanica*
American pipit	*Anthus rubescens*	Blue-winged warbler[1,3]	*Vermivora cyanoptera*
Purple finch	*Haemorhous purpureus*	Prothonotary warbler[1, 2,3]	*Protonotaria citrea*
Pine siskin[1]	*Spinus pinus*	Tennessee warbler	*Leiothlypis peregrina*
Lapland longspur	*Calcarius lapponicus*	Orange-crowned warbler	*Leiothlypis celata*
Fox sparrow	*Passerella iliaca*	Nashville warbler[1]	*Leiothlypis ruficapilla*
Dark-eyed Junco[1]	*Junco hyemalis*	Hooded warbler[1, 2]	*Setophaga citrina*
White-crowned sparrow	*Zonotrichia leucophrys*	Cape May warbler	*Setophaga tigrina*
White-throated sparrow*	*Zonotrichia albicollis*	Magnolia warbler[1]	*Setophaga magnolia*
Seaside sparrow[1,3]	*Ammospiza maritima*	Bay-breasted warbler	*Setophaga castanea*
Swamp sparrow*	*Melospiza georgiana*	Yellow warbler	*Setophaga petechia*
Green-winged teal	*Anas crecca*	Yellow-throated warbler	*Setophaga dominica*
Canvasback[1]	*Aythya valisineria*	Prairie warbler[1,3]	*Setophaga discolor*
Redhead[1]	*Aythya americana*	Black-throated green warbler[1, 2]	*Setophaga virens*
Ring-necked duck	*Aythya collaris*	Canada warbler[1,3]	*Cardellina canadensis*
Greater scaup	*Aythya marila*	Wilson's warbler	*Cardellina pusilla*
Lesser scaup	*Aythya affinis*	Summer tanager	*Piranga rubra*
American black duck[1]*	*Anas rubripes*	Rose-breasted grosbeak	*Pheucticus ludovicianus*
Surf scoter[1]	*Melanitta perspicillata*	-----	-----

Confirmed breeding status results from observation of nests with eggs or young, species that are building, actively using, or seeming to distract an observer from a nest, feeding young, or recently fledged young. Probable breeding status is assigned when one or more of the following behaviors is observed: males singing for seven days or more, territorial defense/agitated behavior, male and female in appropriate habitat, courtship, copulation, or visiting probable nest sites (for cavity-nesters). Possible breeding status is a result of an individual in appropriate habitat or a singing male noted for

Common Name	Scientific Name	Common Name	Scientific Name

less than 7 days during the breeding season. Observed breeding status is reserved for species that were detected during the MD-DC BBA3, but showed no signs of breeding or attempting to breed.

[1] Denotes Species of Greatest Conservation Need (SGCN); [2] Denotes Forest Interior Dwelling Species; [3] *Denotes Birds of Conservation Concern (BCC)*

** Denotes species observed incidentally during 2023 wetland delineation field work.*

Source: MD-DC BBA3, 2025; USFWS, 2021;

APPENDIX K: TELEMETRY DATA AND NOAA EFH MAPPER RESULTS

Telemetry Data

Received from NOAA Fisheries 10/1/2025

We would like to acknowledge the contributions of the Atlantic Cooperative Telemetry Network and the following collaborations for providing fish tagging data: Robert Aguilar (Smithsonian Environmental Research Center), Matthew Balazik (Virginia Commonwealth University), Robert Bourdon and Sheila Eyler (U.S. Fish and Wildlife Service), Wilmelie Cruz Marrero (NOAA Chesapeake Bay Office), Benjamin Gahagan (Massachusetts Division of Marine Fisheries / University of Massachusetts), Craig King (Maine Department of Marine Resources), Patrick McGrath (Virginia Institute of Marine Science), Mike O'Brien and David Secor (University of Maryland Center for Environmental Science), Matthew Ogburn (Smithsonian Environmental Research Center), Ian Park (Delaware Department of Natural Resources), Ethan Simpson (Virginia Marine Resources Commission), Chuck Stence (Maryland Department of Natural Resources), and Bethany Williams (NOAA NCCOS).

From:	Jonathan Watson - NOAA Federal
To:	Jeff Gring
Cc:	Sarah Williamson; Wilmelie Cruz - NOAA Federal
Subject:	Figures for Inclusion in BCST2: Telemetry Data for Bay Bridge Array
Date:	Wednesday, October 1, 2025 9:16:42 AM

Hi Jeff,

Please find attached two figures that we would like to see included in the draft EIS for the Bay Crossing Study. We'd recommend that the following description accompany these figures:

Data collected from passive acoustic telemetry at the Chesapeake Bay Bridge North array (2021-2024) offers valuable insights into fish activity in the area, which may be impacted by bridge construction/demolition activities. This data, provided by 12 collaborating researchers, includes detections of 118 tagged individuals across 10 different species originating from the Chesapeake Bay, Delaware Bay, Maine, Massachusetts, and Virginia. The most commonly detected species near the bridge were striped bass, American eel, gizzard shad, cownose ray, and Atlantic sturgeon. Striped bass exhibited consistent detections throughout the year, indicating their year-round presence in the area (see Figures 1-2). In contrast, American eel detections were primarily concentrated at night, with significant seasonal activity in the spring and late fall to early winter. Atlantic sturgeon and cownose ray were detected mainly during the warmer months, while gizzard shad and white perch appeared less frequently. Daily detection patterns showed that striped bass and American eel were more prevalent during cooler periods, whereas migratory species like sturgeon and cownose ray were more commonly observed in the spring and summer. These findings emphasize that several ecologically and economically significant species, including the federally protected Atlantic sturgeon, actively use habitats near the bridge and may be sensitive to noise, habitat changes, or other impacts from construction activities.

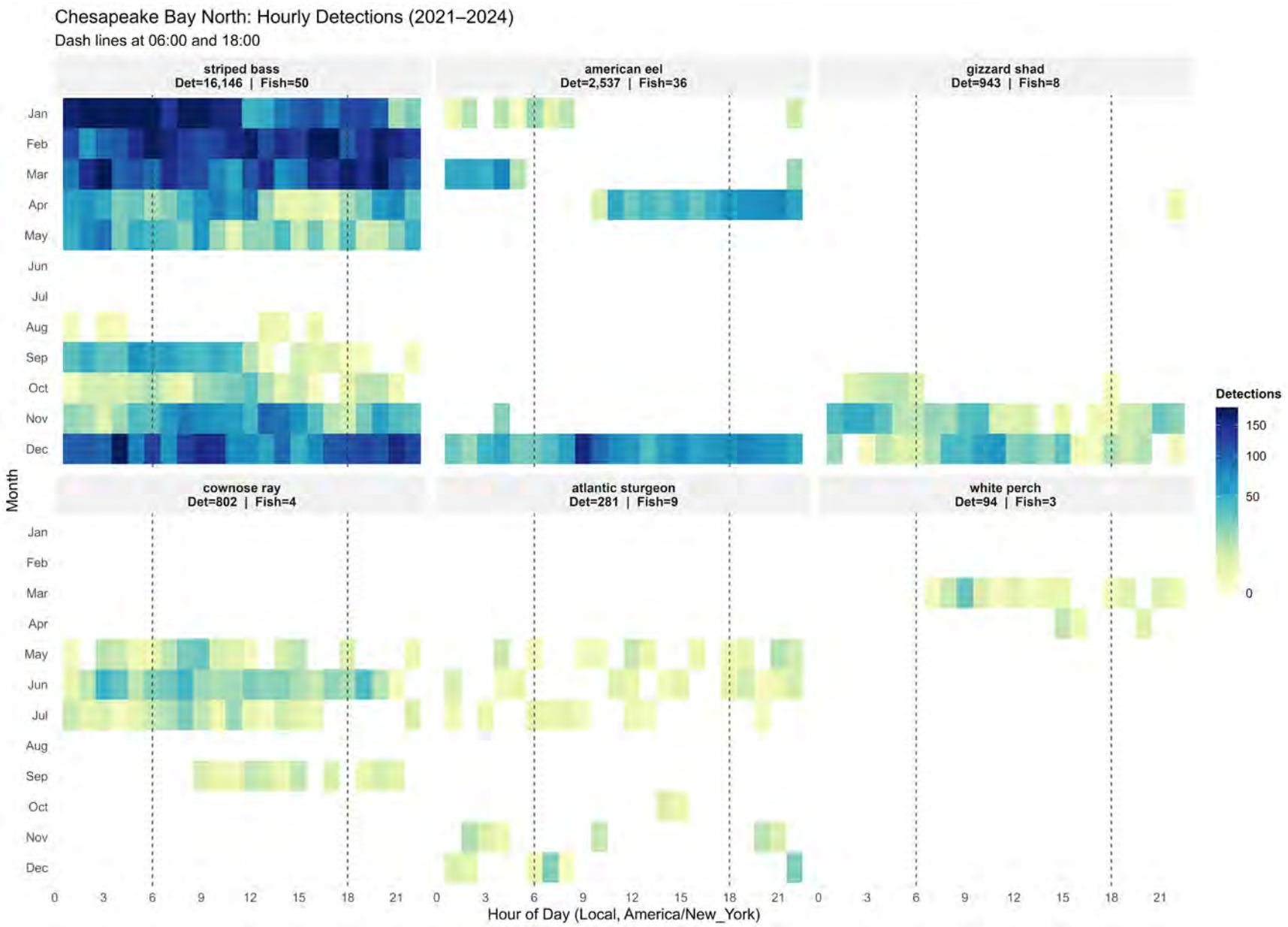
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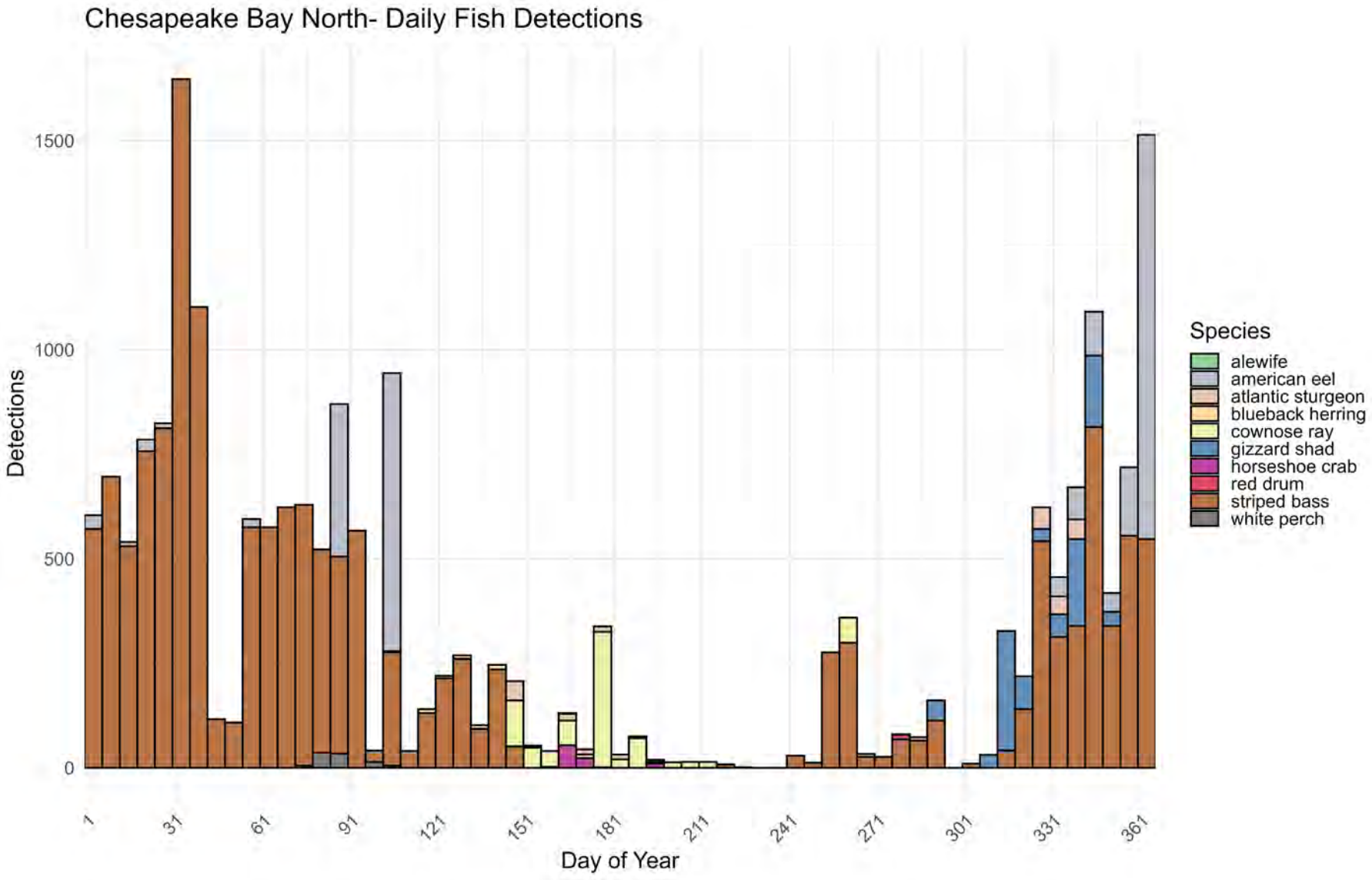
Thanks to both you and Wilmelie for leveraging these very informative data for the NEPA study. Should you have any questions regarding these figures or the accompanying text, please be advised that we will not be able to provide a response until congress appropriates funding.

Jonathan

--

Jonathan Watson
Marine Habitat Resource Specialist, GARFO HESD
NOAA Fisheries | U.S. Department of Commerce
Office: (978) 675-2180
www.fisheries.noaa.gov


Chesapeake Bay North: Hourly Detections (2021–2024)
Dash lines at 06:00 and 18:00
striped bass
Det=16,146 | Fish=50
american eel
Det=2,537 | Fish=36
gizzard shad
Det=943 | Fish=8
cownose ray
Det=802 | Fish=4
atlantic sturgeon
Det=281 | Fish=9
white perch
Det=94 | Fish=3
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0 3 6 9 12 15 18 21
Hour of Day (Local, America/New_York)
Detections
150
100
50
0


Chesapeake Bay North- Daily Fish Detections
Detections
1500
1000
500
0
1
31
61
91
121
151
181
211
241
271
301
331
361
Day of Year
Species
alewife
american eel
atlantic sturgeon
blueback herring
cownose ray
gizzard shad
horseshoe crab
red drum
striped bass
white perch

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

*** W A R N I N G ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Atlantic Butterfish	Adult, Eggs, Juvenile, Larvae	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
		Atlantic Herring	Adult, Juvenile	New England	Amendment 3 to the Atlantic Herring FMP
		Black Sea Bass	Adult, Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Bluefish	Adult, Juvenile	Mid-Atlantic	Bluefish
		Clearnose Skate	Adult, Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Red Hake	Adult, Eggs/Larvae/Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
		Scup	Adult, Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Summer Flounder	Adult, Juvenile, Larvae	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Windowpane Flounder	Adult, Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

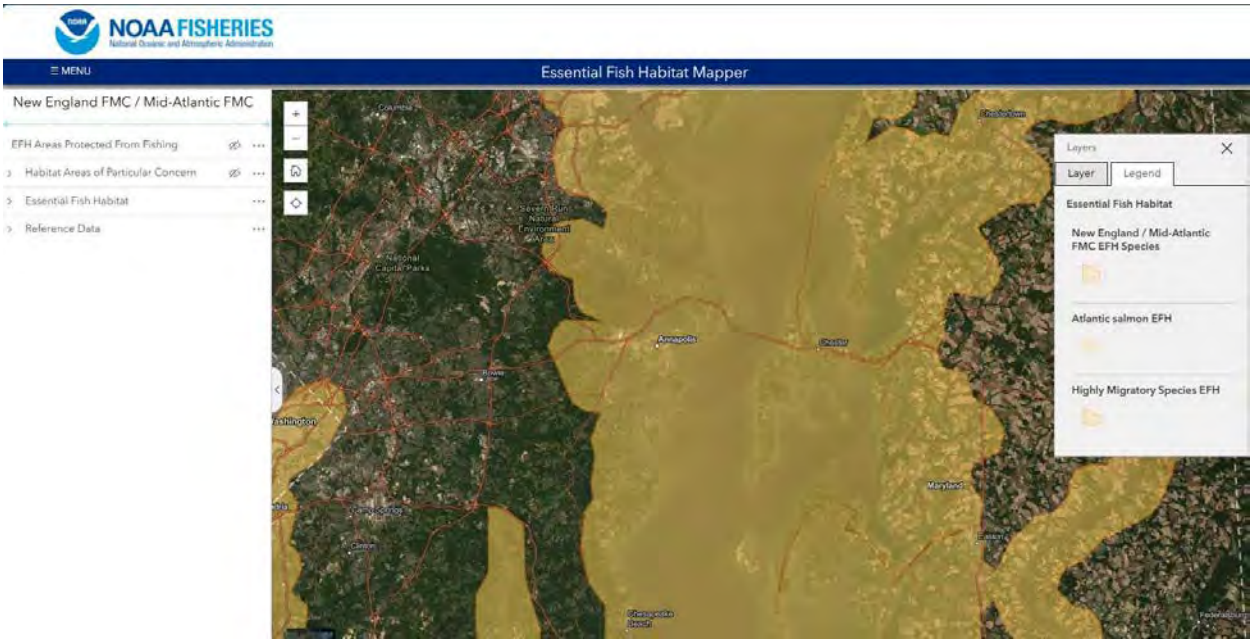
Link	Data Caveats	HAPC Name	Management Council
		Summer Flounder SAV	Mid-Atlantic Fishery Management Council

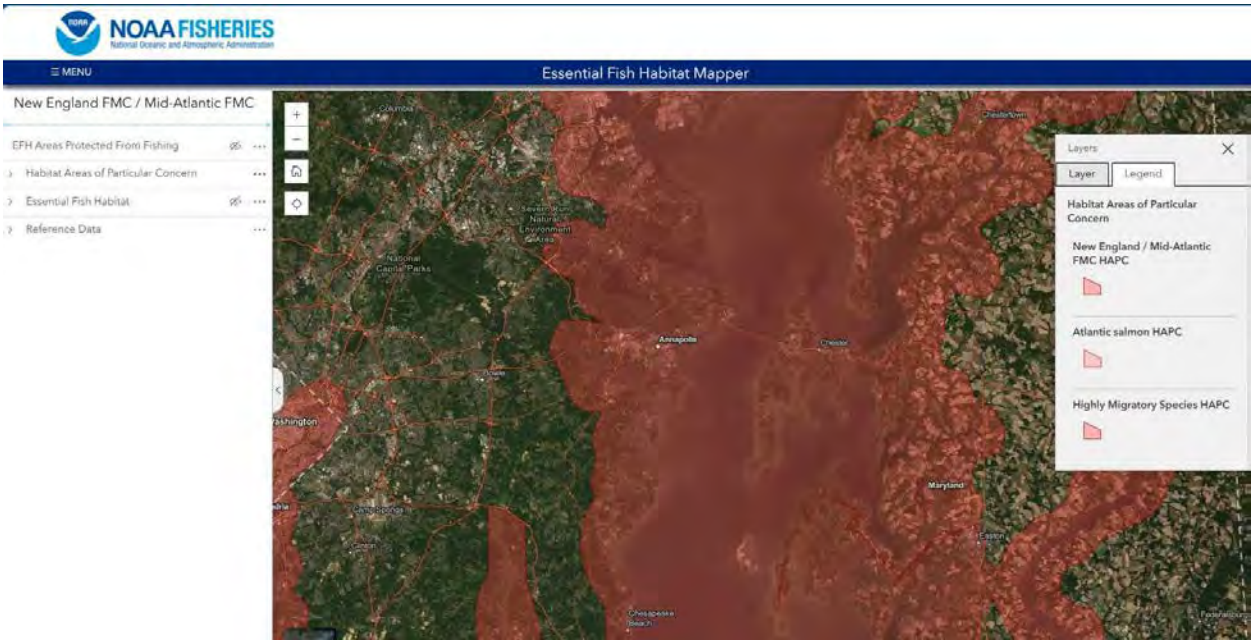
EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.
****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**

All EFH species have been mapped for the Greater Atlantic region,
Atlantic Highly Migratory Species EFH,
Bigeye Sand Tiger Shark,
Bigeye Sixgill Shark,
Caribbean Sharpnose Shark,
Galapagos Shark,
Narrowtooth Shark,
Sevengill Shark,
Sixgill Shark,
Smooth Hammerhead Shark,
Smalltail Shark


NOAA FISHERIES
National Oceanic and Atmospheric Administration
MENU
Essential Fish Habitat Mapper
New England FMC / Mid-Atlantic FMC
EFH Areas Protected From Fishing
Habitat Areas of Particular Concern
Essential Fish Habitat
Reference Data
Layers
Layer
Legend
Essential Fish Habitat
New England / Mid-Atlantic FMC EFH Species
Atlantic salmon EFH
Highly Migratory Species EFH
Annapolis
Maryland


NOAA FISHERIES
National Oceanic and Atmospheric Administration
MENU
Essential Fish Habitat Mapper
New England FMC / Mid-Atlantic FMC
EFH Areas Protected From Fishing
Habitat Areas of Particular Concern
Essential Fish Habitat
Reference Data
Layers
Layer
Legend
Habitat Areas of Particular Concern
New England / Mid-Atlantic FMC HAPC
Atlantic salmon HAPC
Highly Migratory Species HAPC
Annapolis
Maryland

APPENDIX L: MDNR Environmental Review Program Letter

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Wes Moore, Governor
Aruna Miller, Lt. Governor
Josh Kurtz, Secretary
David Goshorn, Deputy Secretary

January 23, 2024

Mr. Jeff Gring
Coastal Resources, Inc.
25 Old Solomons Island Road
Annapolis, MD 21401

RE: Environmental Review for Chesapeake Bay Crossing Study: Tier 2 NEPA, Corridor 7, Anne Arundel and Queen Anne's Counties, Maryland

Dear Mr. Gring:

DNR Environmental Review received your request for a fisheries trilogy letter for the Bay Crossing Study. Below are the environmental resources within the study area.

Time of Year Restrictions:

- Generally, no instream work is permitted in **Use I and certain Use II** streams during the period of March 1 through June 15, inclusive, during any year.

- Where presence of **natural oyster bars** has been documented, generally, no hydraulic or mechanical instream work should be conducted within 500 yards of the edge of the bar or in Use II streams, during the periods of June 1 through September 30 and December 16 through March 14 of any year.

- Where presence of **yellow perch** has been documented in the vicinity of an instream project area, generally no instream work is permitted in Use I waters during the period of February 15 through June 15, inclusive, during any year.

- To avoid potential adverse impacts to **submerged aquatic vegetation beds**, no instream work should be conducted from April 15 through October 15 of any year.

- To minimize disturbance to wintering and staging **waterfowl**, no water dependent work should be conducted from November 15 through March 1 of any year.

- Do not remove or disturb forest habitat during April-August, the breeding season for most **Forest Interior Dwelling Bird habitat** (FIDS). This seasonal restriction may be expanded to February-August if certain early nesting FIDS (e.g., Barred Owl) are present. And maintain grass height at least 10" during the breeding season (April-August).

GENERAL RESOURCES NOTES:

Within this project vicinity, there is potential for substantial impact to recreation, park infrastructure, aesthetics, natural resources, and sensitive habitats.

Please note that this letter does not provide information regarding rare, threatened, and endangered species, which are being coordinated between DNR's Wildlife and Heritage Service separately.

We have noted the presence of **DNR managed lands** within or adjacent to the project study areas; further direct coordination on these resources should be conducted with DNR as project planning and review continues. Please coordinate work with Park Manager at Sandy Point State Park, Curtis Dale at Curtis.Dale@maryland.gov. And coordinate work with Melissa C. Day for Kent Island Research Wildlife Management Area via MelissaC.Day1@maryland.gov. If accessing these properties is necessary during the study, obtaining Minimal Use Impact Agreements (MIUA) will be necessary and no waste should be left behind along roadsides or in visible public areas. Any flagging associated with this project should be removed when work ends. Best Management Practices are always to be used to avoid the spread of potential pests, diseases, and invasive species.

DNR is also in the process of acquiring Holly Beach Farm (pending BPW approval)- any access to this property would also be subject to Internal Review and will need an MIUA for purposes of the study.

Access and impacts to any of these lands will have to be directly coordinated with DNR. If this project will impact DNR land, please contact Melissa C. Day at MelissaC.Day1@maryland.gov to initiate the internal review process.

Piecemealing project plans through the permitting process should be avoided. The applicant will be required to submit plans for the entire development so that a comprehensive review to evaluate all potential impacts to wetlands and aquatic resources can be conducted.

The Maryland Department of Natural Resources, Fishing & Boating Services, is responsible for managing commercial and recreational fishing and shellfish aquaculture production in the State. A diverse range of resident and migratory finfish and shellfish species inhabit tidal portions of the Chesapeake Bay and its tributaries, and may be adversely affected by this project. Many of these species sustain valuable commercial and recreational fisheries and aquaculture industry. DNR's management objective is to maintain sustainable fisheries by using biological, technical, and socio-economic data to develop science-based management strategies for commercial, recreational, ecological and economically important species. For the purpose of this general scoping exercise, we have identified the following categories and types of natural resource issues that MDTA should include in the Tier II study. They include, but are not limited to: commercial fisheries (including but not limited to: blue crabs, striped bass, oysters, clams, white perch and menhaden); recreational fisheries (including but not limited to: striped bass, white perch, spot, croaker, red drum, black drum, weakfish, largemouth bass, smallmouth bass, walleye); forage fish (including but not limited to: menhaden, and bay anchovies); shellfish restoration areas; shellfish aquaculture leases; rare, threatened, and endangered aquatic species; recreational boating; and commercial navigation. The Maryland Department of Natural Resources, Fishing & Boating Services looks forward to working with you on this project.

The proposed project will impact both tidal and non-tidal fisheries resources. As design progresses, DNR will also have concerns over appropriate stormwater design, sediment and erosion control and aquatic animal passage for new construction and widened/ altered road crossings of streams.

The project area also encompasses areas of the Chesapeake Bay with a high density of recreational boating, commercial fishing, and commercial shipping traffic. All in-water activity should be coordinated with the US Coast Guard Sector Baltimore to properly alert mariners. The boat launch and entrance channel at Sandy Point State Park in Corridor 7 is a highly trafficked area, and of particular interest to DNR.

Anadromous fish species, including yellow perch, herring species and white perch have been documented near this project site.

The proposed project site is within 500 yards of designated natural **oyster bars** along the Severn River, the western shore of the Chesapeake Bay, mid-channel, all around Kent Island (including but not limited to: Crab Alley Bay, Crab Alley Creek, Prospect Bay, Warehouse Creek, Cox Creek). We would like to emphasize the need to prevent any sediment or debris from reaching the creek during the period of June 1 through September 30 and December 16 through March 14th, inclusive, during any year.

Tidal waters in the vicinity of this project support important, designated oyster habitat; specific avoidance and minimization requirements and BMPs may apply for aquatic impacts in this vicinity, depending on details and proposed activities in the project plans. Further coordination should be conducted with MD DNR to discuss potential avoidance and minimization measures and BMPs.

This project is located in the **Chesapeake Bay Critical Area** and will need to conform to Critical Area laws and policies.

The project areas are often within or adjacent to wetland and forested areas. Impacts to wetlands, forests, and other riparian vegetation from the use of heavy equipment, disposal of excavated material, or other construction activities should be avoided to the extent possible. Hydrologic and other types of impacts from features and design of the project, such as draining, should be avoided. When there is no reasonable alternative to the adverse effects on wetlands or other aquatic or terrestrial habitat, the applicant shall be required to provide measures to mitigate, replace, or minimize the loss of habitat.

Disturbance of the riparian corridor should be minimized to the greatest extent possible. Disturbed areas in the riparian corridor should be revegetated with native forest species to provide. Areas designated for the access of heavy equipment and for the disposal of excavated material should avoid impacts to wetlands and/or mature forest vegetation.

The project area is adjacent to a mapped Wetland of Special State Concern (WSSC), impacts from the use of heavy equipment, disposal of excavated material, or other construction activities should be avoided to the extent possible. The project should be designed so that existing hydrological conditions are maintained so as not to alter the integrity of the wetlands.

It is the policy of the DNR that shore erosion control measures be undertaken in a manner that has minimum adverse impacts on the ecological values of the subject area. In addition, the State Critical Areas Law

requires that where erosion control is proposed, the measure that best provides for the conservation of fish and plant habitat and which is practical and effective shall be used.

Any stream crossings proposed in the design of this project, including culvert pipes and instream riprap, should not result in the blockage of passage for aquatic life. At least one culvert should be depressed at least one foot below stream invert, and a low flow channel should be provided through any riprap structures.

The use of nonstructural erosion control, by means of vegetative stabilization, is the preferred shoreline protection measure. Marsh plantings can effectively stabilize shoreline areas while maintaining a natural transition from terrestrial to aquatic ecosystem as well as provide beneficial water quality functions. In areas where vegetative control alone is not practical and effective, a low-profile riprap is preferred. If bulkheading is determined to be the most appropriate shoreline protection measure, the bulkhead should not extend channel ward past the mean high waterline in order to preserve shallow water habitat.

SITE SPECIFIC RESOURCE NOTES:

Western Shore.

***Severn River (use II)**
Magothy River (use II)
Unnamed tributaries to Severn River (use II)
Little Magothy River (uses I & II)
Unnamed tributaries to Little Magothy River (use II)
Meredith Creek (uses I & II)
Whitehall Creek (uses I & II)
Mill Creek (uses I & II)
Manresa Pond (use I)
Martin's Pond tributary/ Whitehurst Lake (use II)
Weems Creek (use II)
Luce Creek (use I)
Mezick Pond (use II)
Ridout Creek (uses I & II)
Minnow Creek (uses I & II)
Westinghouse Pond (use II)
Podickery Creek (use II)

A nearby Maryland Biological Stream Survey (MBSS) station on Little Magothy River (uses I & II) documents the following summary of findings for fish: **American Eel,** Eastern Mudminnow, and Golden Shiner.

A Maryland Biological Stream Survey (MBSS) station on Mill Creek (uses I & II) documents the following summary of findings for fish: **American Eel**, **Banded Sunfish**, Bluegill, Eastern Mudminnow, Golden Shiner, Least Brook Lamprey, Pumpkinseed, Redfin Pickerel, and **Yellow Perch**.

There are also documented, on the Severn River: **American Eel**, Eastern Mudminnow, and **Horseshoe crab.**

Anadromous fish species, including Yellow Perch, herring species and White Perch have been documented near this project site in areas including Mill Creek, Whitehall Creek, Weems Creek and Little Magothy River that are habitat to these species.

Diamondback Terrapin nesting has been documented to occur on beaches in the Western shore of Chesapeake Bay vicinity of this project along Meredith Creek and south of the bridge along Moss Pond open

to the Chesapeake Bay and LOD extent reaching the northern part of Goose Pond, DNR may request appropriate time of year restrictions if these beaches are impacted by the project.

Important fisheries resources in this western shore project area include **American** Eel presence. American Eels migrate upstream through this region to smaller streams where they grow to adult stages. Some eels may reside within the project study area long term. Their spawning runs then take them back through this area as they migrate downstream as adults to a specific region of the Atlantic Ocean to spawn. Special attention has been given to American Eel management in recent years, due to their ecological and economic importance, and their declining numbers.

There are records of **Submerged Aquatic Vegetation** (SAV) occurring adjacent or very near the project areas such as in Severn River, a southern Cove of Mill Creek, and Little Magothy River. To protect these sensitive species, the proposed work must be conducted under the most rigorous conformity with State, Federal and County guidelines and regulations for erosion and sediment control - backed by strict monitoring and enforcement.

Horseshoe Crab spawning and nesting has been documented to occur on beaches in the vicinity of this project, DNR may request appropriate time of year restrictions if these beaches are impacted by the project.

The proposed project may be visible from the Severn River which is a designated Maryland Scenic and Wild River, as well as a Stronghold watershed; further coordination may need to be conducted with DNR, as well as the Severn River Commission, as project planning and review continues.

A mapped **vernal pool** appears to be located within the project area near the northern LOD extent on Severn River. Any impacts to vernal pools must be mitigated at 3:1 in kind. Since vernal pools are difficult to recreate and may take years to develop the wildlife that the habitat provides, it is highly recommended that the pool be avoided. Hydrologic and other types of impacts from features and design of the project, such as draining the pool, should be avoided.

Our analysis of the information provided also suggests that the forested area on or adjacent to the project site contains Forest Interior Dwelling Bird habitat. Populations of many Forest Interior Dwelling Bird Species (**FIDS**) are declining in Maryland and throughout the eastern United States. The conservation of FIDS habitat is strongly encouraged by the Department of Natural Resources.

Eastern Shore.

Wye River (use II)
Chester River (use II)
Unnamed tributaries of Chester River (uses I&II)
Cox Creek (uses I & II)
Thompson Creek (uses I & II)
Unnamed tributaries to Chesapeake Bay (use I)
Marshy Creek (use II)
Prospect Bay (use II)
Kirwan Creek (uses I & II)
Crab Alley Creek (uses I & II)
Little Queenstown Creek (uses I & II)
Winchester Creek (uses I & II)
Piney Creek (uses I & II)

Nearby Maryland Biological Stream Survey (MBSS) stations located on Wye River, the following summary of findings for fish: **American Eel,** Bluegill, Creek Chubsucker, Eastern Mosquitofish, Eastern Mudminnow, Golden Shiner, Pumpkinseed, Tessellated Darter, and **Yellow Perch**.

Anadromous fish species, including yellow perch, herring species and white perch have been documented near this project site. White Perch and Yellow Perch have been documented in the Wye River.

Important fisheries resources in this eastern shore project area include **American Eel** presence. American Eels migrate upstream through this region to smaller streams where they grow to adult stages. Some eels may reside within the project study area long term. Their spawning runs then take them back through this area as they migrate downstream as adults to a specific region of the Atlantic Ocean to spawn. Special attention has been given to American Eel management in recent years, due to their ecological and economic importance, and their declining numbers.

Horseshoe Crab spawning and nesting has been documented to occur on beaches in the vicinity of this project along the bridge and north of the bridge and elsewhere, DNR may request appropriate time of year restrictions if these beaches are impacted by the project.

Diamondback Terrapin nesting has been documented to occur on beaches in the Eastern shore vicinity of this project south of the bridge along the eastern shore of Chesapeake Bay, northern portion of Kent Island near Kent Narrows, up Long Point Rd, and continuing nests along that northern shore Queenstown (LOD extent), DNR may request appropriate time of year restrictions if these beaches are impacted by the project.

There are records of **Submerged Aquatic Vegetation** (SAV) occurring adjacent or very near the project area on Eastern Shore of Chesapeake Bay just north of the bridge and up to Walker Rd, as well as two coves to the Chesapeake Bay south of the bridge to Chenowith Dr. To protect these sensitive species, the proposed work must be conducted under the most rigorous conformity with State, Federal and County guidelines and regulations for erosion and sediment control - backed by strict monitoring and enforcement.

ADDITIONAL COMMENTS ON BMPs:

The introduction or further spread of invasive species presents a risk to many rare species' habitats. We recommend these general measures to help prevent such habitat degradation: 1) Minimize soil disturbance, as invasive plants often prefer disturbed ground; 2) Reduce the possible transport of invasive plants by cleaning vehicles and equipment immediately after operating in potentially infested areas, before leaving that area; Special attention should be given to removal of all dirt, plants, and invertebrates from all appropriate parts of the equipment (e.g. topside and underside of mower decks); and 3) Clean vehicles and equipment prior to moving into a new work area.

We recommend the development of a watershed protection strategy for this project which maximizes the beneficial food chain and supports water quality functions provided by the existing resources.

Impacts to headwater streams, wetlands, and floodplain areas should be minimized by requiring upland quality and quantity stormwater management for all future development.

The proposed work must be conducted under the most rigorous conformity with State, Federal and County guidelines and regulations for erosion and sediment control - backed by strict monitoring and enforcement.DNR believes that managing stormwater before it enters stream systems should be considered a priority for highway projects and is highly important for maintaining the health of headwater streams. A primary reason streams need restoration is due to increased development runoff, removal of vegetation, and addition of impervious surfaces.

The proposed project site is within 500 yards of a documented **submerged aquatic vegetation (SAV)** bed. We would like to emphasize the need to prevent any sediment or debris from leaving the project's LOD during the period of April 15 through October 15, inclusive, during any year.

Existing riparian vegetation in the area of stream channels should be preserved as much as possible to maintain aquatic habitat and provide shading to the stream. Areas designated for the access of equipment, storage and for the removal or disposal of material should avoid impacts to streams, forests and associated riparian vegetation. Any temporarily disturbed areas should be restored and re-vegetated.

If bridge demolition is eventually planned as part of this project, note that the Department of Natural Resources, Fisheries Service is engaged in a number of artificial reef construction activities in the Chesapeake Bay through the Maryland Artificial Reef Initiative (MARI). MARI is a volunteer organization dedicated to preserving, restoring and creating fish habitat in tidewater Maryland. The purpose of the Maryland Artificial Reef Program is to provide artificial reef habitat on selected Chesapeake Bay, Atlantic Ocean and coastal bay sites to:

- Enhance habitat for fish and benthic organisms associated with reefs;
- Increase reef biological carrying capacity;
- Enhance biological diversity;
- Increase fish populations, and;
- Provide sustainable fishing opportunities.

Certain clean materials from bridge demolition, including clean concrete rubble and some clean metals, are useful in creating beneficial fish reefs. Materials from demolition projects, particularly bridge demolition projects, can offer logistical advantages including ease of loading and transport of rubble materials by barge to reef construction sites. In some cases, bridge construction costs can be reduced when use of materials for reef construction offers a cost-effective alternative to rubble hauling and disposal costs. The subject transportation project may present opportunities to provide such benefits. We encourage you to contact Michael Malpezzi,

Maryland Reef Coordinator within the Department's Fisheries Service for further information or to explore such opportunities as you proceed through future stages of design or construction of this project. Michael can be contacted at Michael.malpezzi@maryland.gov.

The Economic Growth, Resource Protection, and Planning Act of 1992 establishes a statewide policy governing programs, policies, actions and expenditures for the State of Maryland. The Office of Planning has developed an Elaboration of the Act and State policies. The Department of Natural Resources, in conjunction with the Office of Planning, has developed definitions of sensitive areas and definitions of activities allowed within these areas. For further information or a copy of "Procedures for State Project Review under the Planning Act of 1992", please contact the Office of Planning at (410) 225-54562.

Thanks for continuing to include DNR in the review and comment process. We appreciate the ability to provide input regarding any sensitive environmental and critical resources and to give our recommendations to keep them as secure as possible during the project.

Sincerely,

Melissa C. Day

Melissa C. Day

cc: G. Gibson, DNR ERP
M. Stauss, DNR ERP
C. Jones, CAC
J. Thompson, DNR RAS
M. Groves, DNR RAS
B. Coakley, DNR RAS

APPENDIX M: MDNR WHS Review Letter

Chaisson, Angela

From: Lori Byrne -DNR- <lori.byrne@maryland.gov>
Sent: Tuesday, April 1, 2025 5:56 PM
To: Chaisson, Angela
Subject: Re: Bay Crossing Study - Great Blue Heron nesting colonies

Follow Up Flag: Follow up
Flag Status: Flagged

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Report Suspicious

Dear Ms. Chaisson,
Thank you for providing the mapping with the 2000' study area overlaid. Based on this, WHS only has concerns (potentially) for a great blue heron colony at the Mezick Ponds at Sandy Point State Park, north of US Route 50. This colony is currently active and should be protected by the 660' radius as described in our standard protection guidelines. The rest of the colonies mentioned are either outside of the 2000' study area or no longer active. Let me know if you need the protection guidelines for great blue heron colonies again. Thank you!
Lori

dnr.maryland.gov

Lori A. Byrne
Environmental Review Coordinator
Wildlife and Heritage Service
Department of Natural Resources
580 Taylor Avenue, E-1
Annapolis, MD 21401
410-260-8573 (office)
410-260-8596 (FAX)
lori.byrne@maryland.gov

On Wed, Mar 26, 2025 at 12:25 PM Lori Byrne -DNR- <lori.byrne@maryland.gov> wrote:
> Perfect - thanks!
> Lori

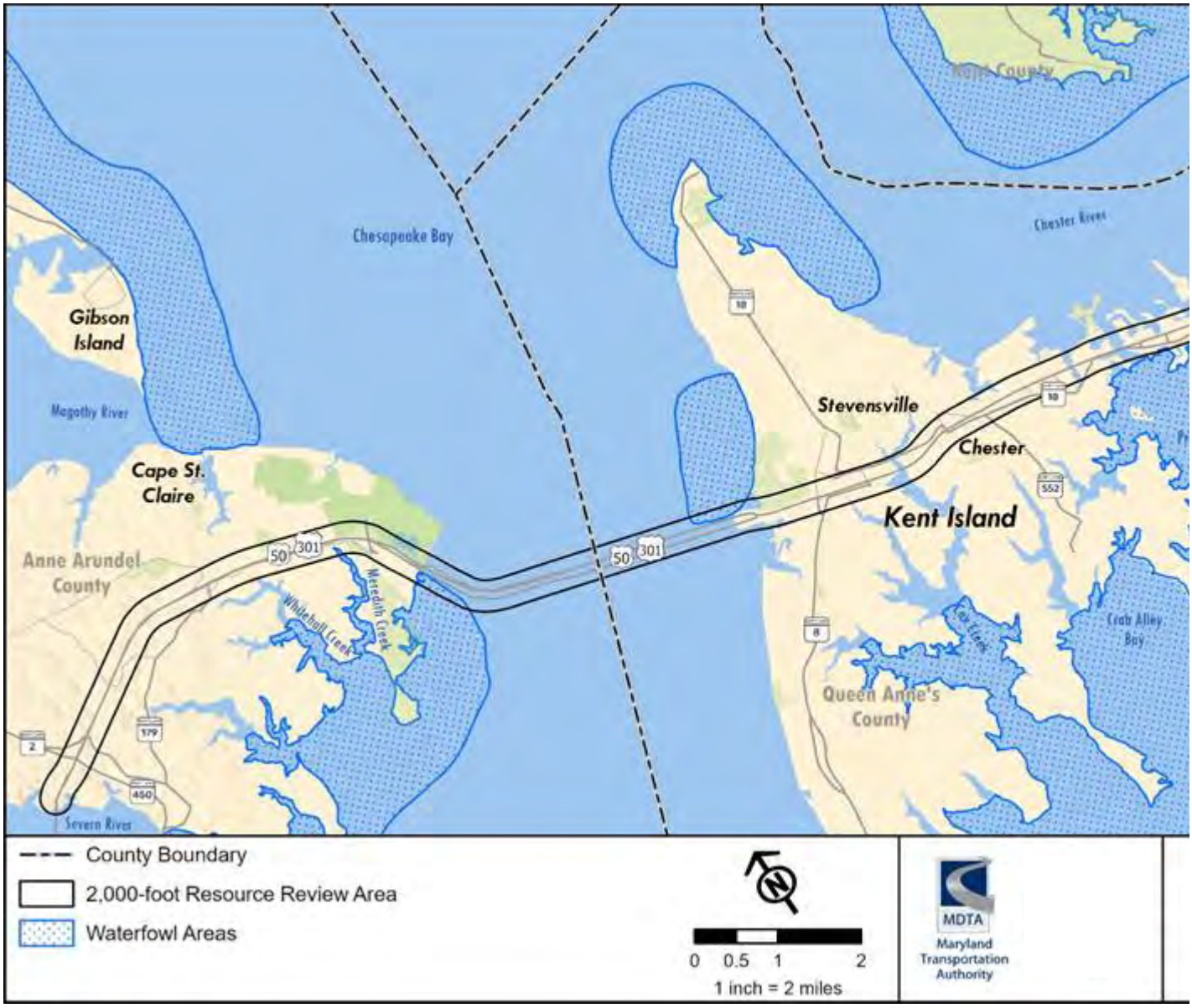
dnr.maryland.gov

Lori A. Byrne
Environmental Review Coordinator
Wildlife and Heritage Service
Department of Natural Resources
580 Taylor Avenue, E-1
Annapolis, MD 21401
410-260-8573 (office)
410-260-8596 (FAX)
lori.byrne@maryland.gov

On Wed, Mar 26, 2025 at 10:18 AM Chaisson, Angela <angela.chaisson@aecom.com> wrote:

Hi Lori,

This is the map we're using to show waterfowl staging and concentration areas, but it shows the 2000-foot-wide corridor that we are using for our study area. Let me know if this works for you.



Angela Chaisson, CWB (she/her/hers)
Principal Ecologist/NEPA Specialist

AECOM

Hunt Valley, MD

M +1-240-439-0113
angela.chaisson@aecom.com

aecom.com

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From: Lori Byrne -DNR- <lori.byrne@maryland.gov>
Sent: Wednesday, March 26, 2025 9:59 AM
To: Chaisson, Angela <angela.chaisson@aecom.com>
Subject: Re: Bay Crossing Study - Great Blue Heron nesting colonies

Dear Ms. Chaisson,

Can you provide a map showing the boundaries of the current study area? That way I can provide a more accurate response. Thanks!

Lori Byrne

dnr.maryland.gov

Lori A. Byrne
Environmental Review Coordinator
Wildlife and Heritage Service
Department of Natural Resources
580 Taylor Avenue, E-1
Annapolis, MD 21401
410-260-8573 (office)
410-260-8596 (FAX)
lori.byrne@maryland.gov

On Tue, Mar 25, 2025 at 4:00 PM Chaisson, Angela <angela.chaisson@aecom.com> wrote:

> Hi Lori,
>
> I'm working on the Natural Environmental Technical Report and addressing the GBH colonies. We have a letter from WHS dated January 18, 2024, with comments on the Bay Crossing Study Tier 2 NEPA, Corridor 7 project in Anne Arundel and Queen Anne's Counties. The letter states:
>
> There are several Great Blue Heron colonies documented in this proposed corridor that may be impacted. Such colonies are generally afforded protection in the Chesapeake Bay Critical Area during their breeding season (15 February through 31 July) and within a 660 foot radius of the colony site. Routine surveys for this species are not conducted annually, so it is possible that these colonies have become inactive or grow/shrunk in size. The general locations of these colonies are known to be: Mezick Pond at Sandy Point State Park and Westinghouse Pond in Anne Arundel County, and in Queen Anne's County: Kirwan's Creek, Little Queenstown Creek (golf course), Cox Creek, and Byrons Cove on Piney Creek.

What I'm trying to do is find out is whether there have been any changes in the locations of these colonies and if you could provide information on how far from the U.S. 50/301 centerline each of these colonies is located. I would use the information to assess potential impacts, we would not show the colonies on any mapping.

Thanks so much!

Angela

Angela Chaisson, CWB (she/her/hers)
Principal Ecologist/NEPA Specialist

AECOM

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angela.chaisson@aecom.com

aecom.com

Delivering a better world

January 18, 2024

«AddressBlock»

RE: Environmental Review for Chesapeake Bay Crossing Study: Tier 2 NEPA, Corridor 7, Anne Arundel and Queen Anne's Counties, Maryland

The Wildlife and Heritage Service has determined that there are the following areas of potential concern for impacts to rare, threatened and endangered species or protected habitats within the study area as shown with your submittal on October 27, 2023. Further coordination may be warranted as this project moves forward.

A site known as Rucker's Ravine is located in the Pines-on-Severn community in Anne Arundel County and is designated as a Nontidal Wetland of Special State Concern (NTWSSC). It supports an occurrence of state-listed threatened Glade Fern (*Homalosorus pycnocarpos*). Activities proposed within the contributing drainage area to this wetland have the potential to impact the Glade Fern.

There are several Great Blue Heron colonies documented in this proposed corridor that may be impacted. Such colonies are generally afforded protection in the Chesapeake Bay Critical Area during their breeding season (15 February through 31 July) and within a 660 foot radius of the colony site. Routine surveys for this species are not conducted annually, so it is possible that these colonies have become inactive or grow/shrunk in size. The general locations of these colonies are known to be: Mezick Pond at Sandy Point State Park and Westinghouse Pond in Anne Arundel County, and in Queen Anne's County: Kirwan's Creek, Little Queenstown Creek (golf course), Cox Creek, and Byrons Cove on Piney Creek.

There is a habitat protection area located between the Exit 32 Interchange and Mezick Pond at Sandy Point State Park. This area is designated as a habitat protection area due to the presence of rare breeding birds. There are historical records for the Least Tern (*Sternula antillarum* – state threatened), Sora (*Porzana carolina* – state rare), and Black Rail (*Laterallus jamaicensis* – state endangered and federally-listed threatened)

Waterfowl Concentration Areas are recognized areas of open water and wetlands adjacent to land that are utilized by significant numbers of ducks, geese, and swans for feeding and resting during the winter months. These areas, in close proximity to the shore are vital as they provide SAV, clams and other invertebrates that serve as primary food sources for many of these birds. In this corridor they are found along the shoreline of Whitehall Creek, Meredith Creek and the Chesapeake Bay south of the bridge in Anne Arundel County, and in Queen Anne's County on shoreline of the Chesapeake Bay north of the bridge, and in Prospect Bay in Queen Anne's County.

Bay Bridge – Several protected bird species utilize man-made structures associated with the William Preston Lane Jr. Memorial Bridge:

- Various species of waterbirds utilize the pier "islands" as nesting sites during their breeding season. Such colonies are afforded protection under Critical Area regulations. Documented breeding species on these islands include Great Egret, Snowy Egret, Cattle Egret, and Black-crowned Night-Heron. The cumulative breeding season for these species is April 1 through August 15 of any given year. Construction or human presence within the immediate area of the pier islands during the breeding season can cause nest abandonment and result in death of eggs or young, and should be avoided.
- Structures underneath the actual roadway of the bridge (near the suspension span) have provided nesting sites for the American Peregrine Falcon (*Falco peregrinus anatum*). This species has In Need of Conservation status in Maryland, and is also protected by the Migratory Bird Treaty Act. Bridge construction or repair work within the immediate area of the nesting peregrine falcons can disturb the birds and can cause nest abandonment. This could result in the death of eggs or young. A time-of-year restriction on bridge repair or construction in the immediate area of the peregrine falcon nests should be observed for any work within the immediate area of active nest sites beginning March 1 and ending June 30 of any given year.

Several rooftop colonies of Least Terns have been documented in the Stevensville area of Queen Anne's County in this corridor. This species has threatened state status as a breeding bird in Maryland, although direct impacts to these sites are unlikely unless buildings are proposed for removal.

In Queen Anne's County in the area north of US 50 from Winchester Creek to Little Queenstown Creek there is known habitat for the Delmarva Fox Squirrel (*Sciurus niger cinereus*), a species with In Need of Conservation status in Maryland. Delmarva fox squirrel habitat is generally characterized as forests with relatively mature trees, either hardwoods or loblolly pine, with a relatively sparse understory. If there is to be development in the forested areas near here, then protection of Delmarva fox squirrel habitat should be considered within the Critical Area.

Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at lori.byrne@maryland.gov or at (410) 260-8573.

Sincerely,

Lori A. Byrne

Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER# 2023.1648.qaaa
cc: G. Gibson, DNR ERP
M. Stauss, DNR ERP
C. Jones, CAC

From: Melissa Day -DNR- <melissac.day1@maryland.gov>
Sent: Tuesday, August 5, 2025 11:51 AM
To: Sarah Williamson <sarahw@cri.biz>
Cc: Gwendolyn Gibson -DNR- <gwendolyn.gibson@maryland.gov>; lori.byrne@maryland.gov; Eric Almquist <ealmquist@rkk.com>; Heather Lowe (hlowe@mdta.state.md.us) <hlowe@mdta.state.md.us>; Gavin Studds <gavins@cri.biz>
Subject: Re: BCST2 - Records for Black Rail

Hi Sarah,
We did a little digging into this.

I'll summarize from our midJuly to August 2nd investigation through Curtis Dale, MPS and Katharine McCarthy, WHS, the story of the Black Rail at Sandy Point. Yes, there is habitat for them and they used to nest and support breeding cycles but phragmites encroachment has degraded the habitat and they haven't been recorded in ~25 years at Sandy Point. The Natural Heritage Program surveyed Sandy Point Marshes in 2024 and did not detect any black rails, sadly. Hal, who's provided extensive history of contributions in the ornithology community and married to someone in WHS, had mentioned use of the site by Virginia rails and sometimes by Sora during migration. Of these two species only Sora is tracked as rare in Maryland, and only breeding locations are protected the way it is listed (S2B, which means state rare, breeding populations).

On Tue, Aug 5, 2025 at 11:25 AM Sarah Williamson <sarahw@cri.biz> wrote:

Hi Gwen & Melissa,

MDNR's ERU letter mentioned Black Rail at SPSP. Since the USFWS IPac did not mention black rail and it is a federally listed species, we followed up with Ray Li and he said he was going to coordinate with DNR. We haven't heard back from him and he is now on vacation until the 8th. We were trying to resolve this before we submit the DEIS and revised NETR next Monday.

I know that black rail came up on the toll plaza project I worked on at the bridge many years ago, and at that time I was told the record was not recent, so I am wondering if this is a relic

that has not been confirmed in the last decade or more, and so is not a viable record for USFWS purposes? That's just speculation on my part though, so I was going to have one of my staff try to call Lori Bryne. Hoping she can shed light on any records for black rail, when they are from, and why USFWS has no knowledge of this. Wanted to let you know to keep you in the loop and also perhaps facilitate us getting answers if we can't reach Lori immediately.

Lori- One of my staff, Gavin Studds, is going to try to call you shortly if you are available today.

Thank you,

Sarah Williamson | *Bay Crossing Study Team*

25 Old Solomons Island Road, Annapolis, MD 21401

Main 410-956-9000 (ext. 113) | Direct 443-837-2155 | Cell 443-995-4131

APPENDIX N: USFWS IPAC OFFICIAL SPECIES LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

In Reply Refer To: 10/28/2025 18:58:47 UTC
Project Code: 2024-0014247
Project Name: Bay Crossing Study Tier 2

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Coastal Barriers
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

PROJECT SUMMARY

Project Code: 2024-0014247
Project Name: Bay Crossing Study Tier 2
Project Type: Road/Hwy - New Construction
Project Description: The Chesapeake Bay Crossing Study: Tier 2 NEPA (Tier 2 Study) is a National Environmental Policy Act (NEPA) study that will analyze alternatives to provide congestion relief and improve travel reliability, mobility and safety across the Chesapeake Bay. The Tier 2 Study is focusing on the Selected Corridor Alternative (Corridor 7) that was identified at the conclusion of the Tier 1 Study. Alternatives will include a No Build Alternative and a range of build alternatives involving various alignments, crossing types and modal and operational alternatives (e.g. transit, pedestrian, bicycle, etc.). Corridor 7 is two miles wide and runs 22 miles from the Severn River Bridge in Anne Arundel County to the U.S. 50/U.S. 301 split in Queen Anne's County.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.9956717,-76.3745195263001,14z



Counties: Anne Arundel and Queen Anne's counties, Maryland

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

COASTAL BARRIERS

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

SYSTEM UNIT (SU)

Most new Federal expenditures and financial assistance, including Federal flood insurance, are prohibited within System Units. ***Federally-funded projects within System Units require consultation with the Service.*** *Consultation is not required for projects using private, state, or local funds.*

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
MD-32	Stevensville	SU	11/16/1990	11/16/1990
MD-32	Stevensville	SU	11/25/2024	11/25/2025

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1Fx
- PFO1Cx
- PSS1S
- PSS4C
- PFO4/SS1S
- PSS1B
- PFO4/1R
- PFO4/EM1R
- PSS1/EM1F
- PSS1/FO4B
- PSS1Ah
- PSS1A
- PSS1Bh
- PFO1D
- PFO4/1B
- PSS3/4R
- PFO1E

- PSS1Ex
- PFO1/SS1S
- PFO1Ch
- PSS1R
- PSS1Cx
- PFO1A
- PSS1/EM1Cx
- PFO1/2F
- PFO1/EM1A
- PFO1F
- PSS1Ch
- PFO1Fb
- PFO4S
- PFO1/SS1A
- PSS1C
- PFO4/1S
- PFO1/4B
- PSS1/EM1C
- PFO1Ex
- PFO1Db
- PFO1/2C
- PFO4/1C
- PFO1C
- PFO1B
- PFO1/4C
- PFO1Fh
- PFO1T
- PFO4D
- PFO1/4A
- PFO1R
- PSS4A
- PFO1/2E
- PFO4B
- PFO1/4S
- PSS1/EM1D
- PFO1Ad

- PFO/SS1A
- PFO1/EM1R
- PSS1E
- PSS1/EM1A
- PSS1D
- PFO1S
- PFO4R
- PFO4C
- PFO1/SS1R
- PFO1/SS1C

FRESHWATER POND

- PUSA
- PUSCx
- PUBF
- PUBH
- PUBHx
- PABHx
- PAB1Hx
- PUBFx
- PUBHh
- PUBVh
- PUBKx

RIVERINE

- R4SBCx
- R5UBH
- R4SBC

FRESHWATER EMERGENT WETLAND

- PEM1Dx
- PEM1Ch
- PEM1Ah
- PEM1B
- PEM5A
- PEM1F
- PEM1Dh
- PEM1D
- PEM1/SS1C

- PEM1A
- PEM1Ex
- PEM1Rh
- PEM1/SS1Fx
- PEM1/SS1Ch
- PEM1/SS1Cx
- PEM1R
- PEM1/SS1D
- PEM1Fx
- PEM1/SS1R
- PEM5C
- PEM1Fb
- PEM1C
- PEM1Fh
- PEM5Eh
- PEM1E
- PEM1Cx

ESTUARINE AND MARINE WETLAND

- E2USP
- E2EM1/SS1P
- E2EM1Pd
- E2SS1P
- E2SS1/EM1P
- E2EM1/SS4P
- E2US/SS1P
- E2US2P
- E2SS3/4P
- E2SS1Pd
- E2USN
- E2SS1/EM5P
- E2USM
- E2SS4P
- E2EM2N
- E2EM1N
- E2EM5P
- E2FO4P

- E2EM1P
- E2SS1/3P

OTHER

- Pf

ESTUARINE AND MARINE DEEPWATER

- E1UBLx
- E1UBLh
- E1ABLh
- E1UBL

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Gavin Studds
Address: 25 Old Solomons Island Road
City: Annapolis
State: MD
Zip: 20401
Email gavins@cri.biz
Phone: 4104746559

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration
Name: Heather Lowe
Email: hlowe@mdta.state.md.us
Phone: 4105375665

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

In Reply Refer To: 04/28/2025 20:03:03 UTC
Project Code: 2025-0046958
Project Name: Bay Crossing Study Tier 2 (2,000-foot corridor)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

PROJECT SUMMARY

Project Code: 2025-0046958
Project Name: Bay Crossing Study Tier 2 (2,000-foot corridor)
Project Type: Bridge - Replacement
Project Description: 2,000-foot resource review area
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.994775000000004,-76.38503034470565,14z



Counties: Anne Arundel and Queen Anne's counties, Maryland

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PFO4/EM1R
- PFO1/EM1R
- PFO1/SS1A
- PSS1Ex
- PFO1Cx
- PFO1/4B
- PSS1Cx
- PFO1R
- PFO1/4C
- PSS1A
- PSS1/EM1A
- PSS1B
- PFO1F
- PFO1Ex
- PFO1E
- PFO1C
- PSS1Ch
- PSS1Bh
- PSS1C
- PFO1A
- PFO1/SS1C
- PFO/SS1A
- PFO1B
- PSS1/EM1F
- PFO4C
- PFO1/SS1S
- PSS1/EM1C
- PFO1Fb
- PFO4/1C
- PSS1D
- PFO1Ch
- PFO1D
- PFO1/4A
- PSS1R
- PFO4/1B

- PFO4B
- PFO1/SS1R
- PFO4R
- PSS3/4R

ESTUARINE AND MARINE WETLAND

- E2EM1N
- E2FO4P
- E2USM
- E2SS3/4P
- E2EM5P
- E2EM1Pd
- E2EM1/SS1P
- E2SS1Pd
- E2EM1P
- E2SS1P
- E2SS1/3P
- E2SS1/EM1P
- E2USP

FRESHWATER EMERGENT WETLAND

- PEM5C
- PEM1E
- PEM1Fh
- PEM1Ex
- PEM1A
- PEM1F
- PEM5Eh
- PEM1C
- PEM1/SS1C
- PEM1Cx
- PEM1Ah
- PEM1/SS1Ch
- PEM1Fx
- PEM1R
- PEM1D
- PEM1/SS1R
- PEM1Fb

FRESHWATER POND

- PUBFx
- PUBHh
- PUSA
- PUBVh
- PUBHx
- PAB1Hx
- PUBH
- PABHx

OTHER

- Pf

RIVERINE

- R4SBCx
- R4SBC
- R5UBH

ESTUARINE AND MARINE DEEPWATER

- E1UBL
- E1UBLx

IPAC USER CONTACT INFORMATION

Agency: AECOM
Name: Angela Chaisson
Address: 4 North Park Drive
Address Line 2: Suite 300
City: Hunt Valley
State: MD
Zip: 21030
Email angela.chaisson@aecom.com
Phone: 2404390113

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration

From: Li, Ray <ray_li@fws.gov>
Sent: Wednesday, May 28, 2025 12:51 PM
To: Sarah Williamson <sarahw@cri.biz>; Heather Lowe <hlowe@mdta.state.md.us>
Subject: Re: [EXTERNAL] RE: BCST2 - Draft Natural Environmental Technical Report for Agency Review

Hi Heather and Sarah -
Appreciate the opportunity to review and provide comments on the draft Natural Environmental Technical Report for the Chesapeake Bay Crossing Tier 2 NEPA Study. FWS comments as follows:

- 8.2.4 Potential Minimization and Mitigation Strategies – in addition to strategies listed, bottomless structures to avoid disrupting streambed can also support maintenance of natural flow patterns, geomorphology, and aquatic organism passage

- 9.1.4 Potential Minimization and Mitigation Strategies – in addition to constructing (new?) culverts, extension of existing culverts should also be designed to maintain movement of aquatic species

- 14.1.4 Potential Minimization and Mitigation Strategies – Integrated Vegetation Management (IVM) can also be effective tool to control invasive plants and maintain native and diverse vegetation along the forest edge over the longterm

- 14.2.2.3 Birds – Migratory Bird Treaty Act (MBTA) was referenced in Section 13.9 (Colonial Waterbird Nesting Areas) but maybe should be included here. The MBTA prohibits take of native and naturally occurring migratory birds including occupied nests

- 14.2.4 Potential Minimization and Mitigation Strategies – in addition to replanting of native trees and shrubs post-construction, native forbs and grasses may be suitable along highway clear zones and can restore lost habitat for pollinators

- 15.2.2 State-Listed Species – There is also a peregrine nesting on the US 50 bridge over the Severn River. This is beyond the study limits, but the nesting buffer might overlap with the 1,000 foot-wide resource review area

- 15.4 Potential Minimization and Mitigation Measures – Please see Range-wide Indiana Bat & Northern Long-eared Bat Survey Guidelines Appendix L: Bat Activity Periods Table for specific for Maryland (https://www.fws.gov/sites/default/files/documents/2025-05/2024_usfws_rangewide_ibat-nleb_survey_guidelines.pdf):
    - Hibernation: November 16 – March 31
    - Winter Torpor: N/A, since Maryland is not within NLEB / Year-round Active Zone 1
    - Spring Staging: April 1 – May 14
    - Summer Occupancy: April 1 – September 30
    - Pup Season: May 15 – July 31
    - Fall Swarming: August 16 – November 15
- 15.4 Potential Minimization and Mitigation Measures - Consultation under Section 7 of the Endangered Species Act is only required for listed species. Since monarch butterfly and tricolored bat are proposed for listing, consultation for these species is not required. Furthermore, a preliminary assessment by FWS is that none of the proposed alternatives are likely to jeopardize the continued existence of monarch butterfly or tricolored bat, and therefore conferencing is also not required under Section 7. However, Federal agencies may choose to voluntarily conference with FWS to help inform future consultation if the proposed rule is finalized and listing becomes effective.
- 16.1 Regulatory Context and Methodology – In addition to protecting critically imperiled species from extinction, the ESA also designates critical habitat that are essential to conserve listed species. There are no designated critical habitat along the study corridor (https://fws.maps.arcgis.com/apps/mapviewer/index.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77)

Please feel free to reach out if any questions or concerns, thanks!
Ray

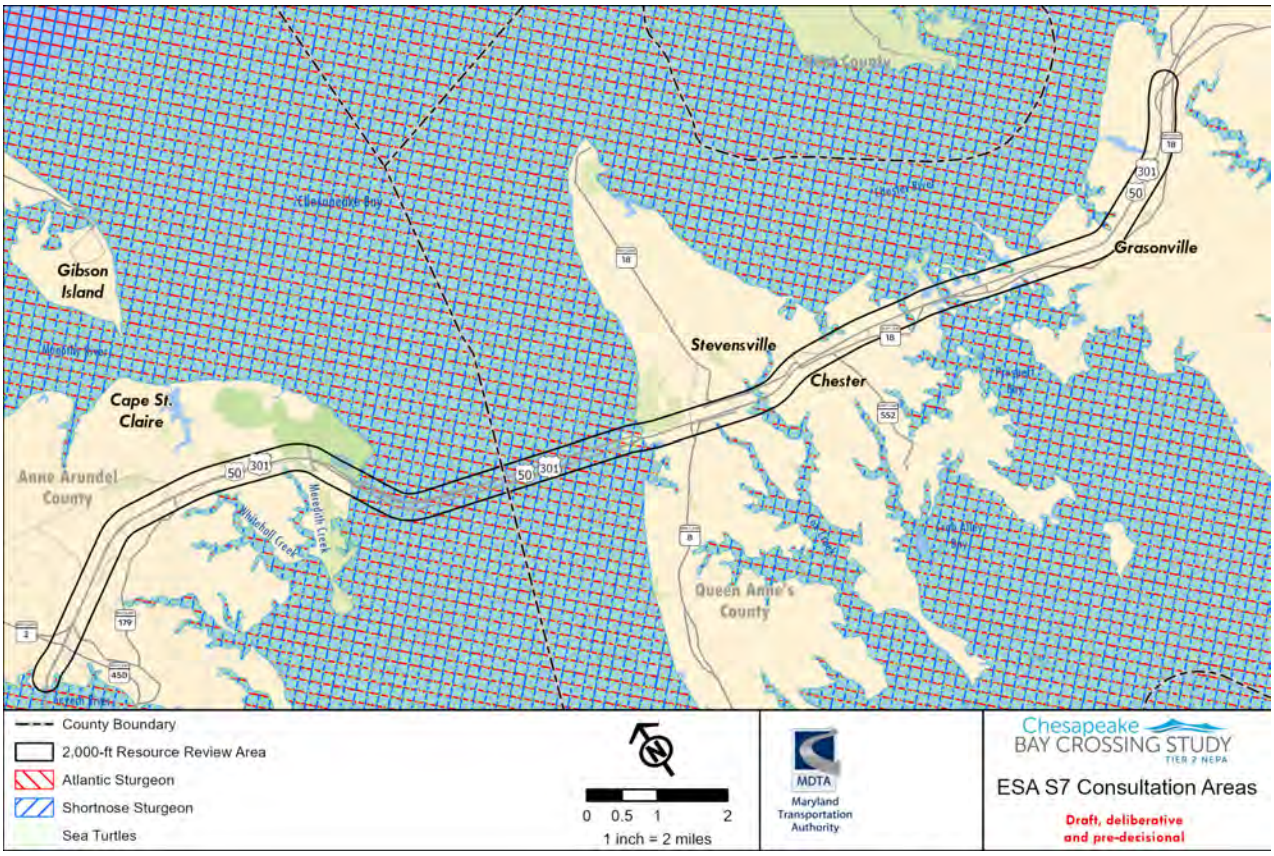
APPENDIX O: NOAA SECTION 7 ESA MAPPER RESULTS

Drawn Action Area & Overlapping S7 Consultation Areas

Area of Interest (AOI) Information

Area : 1,284.82 acres

Feb 5 2025 12:44:02 Eastern Standard Time



Summary

Name	Count	Area(acres)	Length(mi)
BCS 2,000 ft Corridor	1	1,118.33	N/A
Atlantic Sturgeon	3	3,492.69	N/A
Shortnose Sturgeon	2	2,328.46	N/A
Atlantic Salmon	0	0	N/A
Sea Turtles	4	4,656.93	N/A
Atlantic Large Whales	0	0	N/A
In or Near Critical Habitat	0	0	N/A

BCS 2,000 ft Resource Review Area

#	FID	Shape_Leng	BUFF_DIST	ORIG_FID	Shape_Le_1	Shape_Area	Area(acres)
1	0	105638.774992	1000	0	217554.745333	214414913.751	1,118.33

Atlantic Sturgeon

#	Feature ID	Species	Lifestage	Behavior	Zone
1	ANS_CHB_SUB_MAF	Atlantic sturgeon	Subadult	Migrating & Foraging	Chesapeake Bay
2	ANS_CHB_JUV_MAF	Atlantic sturgeon	Juvenile	Migrating & Foraging	Chesapeake Bay
3	ANS_CHB_ADU_MAF	Atlantic sturgeon	Adult	Migrating & Foraging	Chesapeake Bay

#	From	Until	From (2)	Until (2)	Area(acres)
1	03/15	11/30	N/A	N/A	1,164.23
2	01/01	12/31	N/A	N/A	1,164.23
3	03/15	11/30	N/A	N/A	1,164.23

Shortnose Sturgeon

#	Feature ID	Species	Life Stage	Behavior	Zone
1	SNS_CHB_ADU_WIN	Shortnose sturgeon	Adult	Overwintering	Chesapeake Bay
2	SNS_CHB_ADU_MAF	Shortnose sturgeon	Adult	Migrating & Foraging	Chesapeake Bay

#	From	Until	From (2)	Until (2)	Area(acres)
1	11/01	02/28	N/A	N/A	1,164.23
2	01/01	12/31	N/A	N/A	1,164.23

Sea Turtles

#	Feature ID	Species	Life Stage	Behavior	Zone
1	GRN_STS_AJV_MAF	Green sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia
2	KMP_STS_AJV_MAF	Kemp's ridley sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia
3	LTR_STS_AJV_MAF	Leatherback sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia
4	LOG_STS_AJV_MAF	Loggerhead sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia

#	From	Until	From (2)	Until (2)	Area(acres)
1	5/1	11/30	*No Data*	*No Data*	1,164.23
2	5/1	11/30	*No Data*	*No Data*	1,164.23
3	5/1	11/30	*No Data*	*No Data*	1,164.23
4	5/1	11/30	*No Data*	*No Data*	1,164.23

APPENDIX P: ESSENTIAL FISH HABITAT ASSESSMENT

U.S. Department of Transportation
Federal Highway Administration

Maryland Division

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November 26, 2025

In Reply Refer To:
HDA-MD

Mr. Michael Pentony
Regional Administrator
Greater Atlantic Regional Fisheries Office
NOAA Fisheries Service
55 Great Republic Drive
Glouchester, MA 01930

Subject: Chesapeake Bay Crossing Study Tier 2 Environmental Impact Statement
Anne Arundel and Queen Anne Counties, Maryland
Initiation of Formal Section 7 Endangered Species Act Consultation
Initiation of Essential Fish Habitat Consultation

Dear Mr. Pentony:

The Federal Highway Administration (FHWA) is the lead federal agency for the Maryland Transportation Authority (MDTA) preparation of a Tier 2 Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the Chesapeake Bay Crossing Study (CBCS). This letter is to initiate Section 7 Formal Consultation (50 CFR §402.14) under the Endangered Species Act (ESA) and Essential Fish Habitat (EFH) Consultation under the Magnuson-Stevens Fishery Conservation and Management Act for the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) in Anne Arundel and Queen Anne Counties, Maryland.

The Bay Bridge is a two span bridge each 4.3-miles in length over the Chesapeake Bay on U.S. 50/301 connecting Anne Arundel County on the Western Shore to Queen Anne's County on the Eastern Shore. The original span opened in 1952 with the second span opening in 1973. The proposed action involves constructing two new spans and demolishing the two existing spans with a proposed sequencing of build first new span, demolish first original span, build second new span, demolish second original span.

In-water work associated with both the construction of new spans and removal of the original spans has the potential for both lethal and non-lethal take of individuals of listed species under the ESA. A review of the National Oceanic and Atmospheric Administration (NOAA) Fisheries Greater Atlantic Region ESA Section 7 Mapper indicated that the federally listed Atlantic sturgeon (*Acipenser oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) may be present within the Tier 2 EIS area. In addition, four species of federally listed sea turtles occur seasonally in the waters of the Chesapeake Bay from late April to mid-November of each year:

loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*). Designated critical habitat for listed species is not present within the project limits.

In-water work associated with both the construction of new spans and removal of the original spans has the potential to affect EFH protected under the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Fisheries has indicated that the following federally managed fish species occur within the Tier 2 EIS area: Atlantic butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), clearnose skate (*Raja eglanteria*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), and windowpane flounder (*Scophthalmus aquosus*).

In accordance with Section 7 of the ESA, a Biological Assessment (BA) to analyze the potential affects on sturgeon and turtle species listed or eligible for listing under the ESA and designated critical habitat for such species has been prepared and is transmitted with this letter. In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, an EFH Assessment was prepared and is transmitted with this letter as well.

FHWA in coordination with MDTA has determined that the action is likely to adversely affect Atlantic sturgeon, shortnose sturgeon, loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, and leatherback sea turtle. The action is also determined to have an adverse indirect effect to submerged aquatic vegetation as well as adversely affect Habitat Area of Particular Concern for summer flounder.

Thank you in advance for working with the FHWA and for your continued support with this Tier 2 EIS. If you have any questions or concerns, please contact Alexander Bienko, FHWA Maryland Division Environmental Specialist, at alexander.bienko@dot.gov.

Sincerely,

Valeriya Remezova
Division Administrator

cc:
Karen Greene, NOAA Fisheries
Brian Hopper, NOAA Fisheries
Jonathan Watson, NOAA Fisheries
Melissa Williams, Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

ESSENTIAL FISH HABITAT ASSESSMENT

Maryland Transportation Authority
MDTA

JANUARY 2026

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Appendix A Essential Fish Habitat Report

Appendix B NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) Multi-Species Pile Driving Calculator Output

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
ARDS	Alternatives Retained for Detailed Study
ASMFC	Atlantic States Marine Fisheries Commission
BMPs	Best Management Practices
CB3MH	Upper Chesapeake Bay Watershed
CB4MH	Middle Central Chesapeake Bay Watershed
CBBMP	Chesapeake Bay Benthic Monitoring Program
CBP	Chesapeake Bay Program
CFPP	Chesapeake Fish Passage Prioritization
ChesMMAP	Chesapeake Bay Multispecies Monitoring and Assessment Program
CO_2	Carbon Dioxide
COMAR	Code of Maryland Regulations
DO	Dissolved Oxygen
EFH	Essential Fish Habitat
ESC	Erosion and Sediment Control
ERP	Environmental Review Program
FHWA	Federal Highway Administration
FMP	Fishery Management Plan
GARFO	Greater Atlantic Regional Fisheries Office
HAPC	Habitat Areas of Particular Concern
IBI	Index of Biotic Integrity
LOD	Limits of Disturbance
MAFMC	Mid-Atlantic Fishery Management Council
MARMAP	Marine Resources Monitoring, Assessment and Prediction Program
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDTA	Maryland Transportation Authority
MLW	Mean Low Water
MPN	Most Probable Number
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEFSC	North East Fisheries Science Center
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOB	Natural Oyster Bar
NTU	Nephelometric Turbidity Unit
PCBs	Polychlorinated Biphenyls
ppm	Parts per million
ppt	Parts per thousand
PSFA	Public Shellfish Fishery Area
RPA	Recommended Preferred Alternative
RMS	Root-mean-square sound pressure level
SAV	Submerged Aquatic Vegetation
SEL_{cum}	Cumulative Sound Exposure Level

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SEL_{ss}	Single Strike Sound Exposure Level
SWM	Stormwater Management
SZFP	Safe Zone of Fish Passage
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
VIMS	Virginia Institute of Marine Science

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1 EXECUTIVE SUMMARY

The Chesapeake Bay Crossing Study (Bay Crossing Study) is a two-tiered engineering and environmental study being advanced by the Maryland Transportation Authority (MDTA) and Federal Highway Administration (FHWA) to address existing and future transportation issues at the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) and its approaches along U.S. 50/301. The MDTA and FHWA are preparing an Environmental Impact Statement (EIS) for Tier 2 of the Bay Crossing Study (Tier 2 Study) pursuant to the National Environmental Policy Act (NEPA).

During development of the Draft EIS, National Oceanic and Atmospheric Administration (NOAA) Fisheries indicated that Essential Fish Habitat (EFH) exists for the following species that occur within the Tier 2 Study action area: Atlantic butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), clearnose skate (*Raja eglanteria*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), and windowpane flounder (*Scophthalmus aquosus*). Suitable habitat for these EFH species and federally-managed migratory species exist within the EFH action area. Adverse effects to federally-managed fish species would occur due to demolition of the existing bridge and construction of a new bridge and approaches. Activities such as pier construction, dredging, blasting, and filling would have an adverse effect to federally-managed fish species. However, through consultation with NOAA Fisheries, phasing of demolition and construction activities to limit concurrent pile driving operations, minimizing dredging and blasting, and using specialized best management practices (BMPs), long-term adverse effects would be minimized to the greatest extent practicable.

The MDTA Recommended Preferred Alternative (RPA) would have adverse indirect effects to submerged aquatic vegetation (SAV). Demolition and construction activities within the EFH action area would result in turbidity plumes and resulting sedimentation that would adversely affect SAV, a Habitat Area of Particular Concern (HAPC) for summer flounder. Through carefully planned erosion and sediment control (ESC) measures and use of BMPs such as turbidity curtains, adverse effects to HAPC would be minimized to the greatest extent practicable.

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2 INTRODUCTION

The Chesapeake Bay Crossing Study (Bay Crossing Study) is a two-tiered engineering and environmental study being advanced by the Maryland Transportation Authority (MDTA) and Federal Highway Administration (FHWA). The Bay Crossing Study is addressing existing and future transportation issues at the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) and its approaches along U.S. 50/301. Each tier of the Bay Crossing Study involves development of an Environmental Impact Statement (EIS), in compliance with National Environmental Policy Act (NEPA), to describe potential significant environmental effects and inform the evaluation of alternatives. Tier 1 of the Bay Crossing Study (Tier 1 Study) was completed in April 2022. At that time, FHWA issued a Final EIS/Record of Decision (FEIS/ROD) identifying Corridor 7, the corridor that includes the Bay Bridge and its approaches, as the Selected Corridor Alternative for further evaluation. Tier 2 of the Bay Crossing Study (Tier 2 Study) was launched in June 2022 to focus on a project-level (site-specific) analysis within the Tier 1 Selected Corridor Alternative (Corridor 7). The Tier 2 NEPA process was initiated formally with the publication of a Notice of Intent (NOI) to prepare an EIS in the Federal Register on November 15, 2024. The MDTA identified the Alternatives Retained for Detailed Study (ARDS), which are the NEPA range of reasonable alternatives for evaluation in the Tier 2 Study EIS, which resulted in the MDTA identifying the MDTA Recommended Preferred Alternative (RPA). A *Natural Environment Technical Report (NETR)* and *Draft EIS* were prepared in Fall 2025.

Alternative C has been identified from among seven alternatives retained for detailed study (ARDS) as the MDTA's Recommended Preferred Alternative (RPA). Alternative C meets the Tier 2 Study Purpose and Need and has the least environmental impact of the retained build alternatives. The Magnuson-Stevens Fishery Conservation and Management Act does not define an action area. The MDTA determined an EFH action area to include direct and indirect fisheries impacts within the vicinity of the Bay Bridge. **Figure 2-1** shows the project EFH action area**,** which includes: the potential footprint for construction of the new bridge under Alternative C and demolition of the old bridge; dredging areas; and estimated underwater effects, including areas of increased underwater noise due to pile driving and blasting, and areas of decreased water quality due to turbidity and sedimentation. Note that the estimated isopleth radii of underwater noise due to pile driving shown in **Figure 2-1** are wider along the shoreline because the extent of underwater noise produced by driving the proposed steel shaft piles for the temporary access trestle is larger than other underwater noise isopleths generated by driving the proposed bridge piles.

The purpose of this EFH Assessment is to evaluate potential effects of the MDTA RPA on EFH based on the EFH action area, in accordance with the 1996 Amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA). EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 USC 1802(10)). National Oceanic and Atmospheric Administration (NOAA) Fisheries has indicated that the following federally-managed fish species occur within the Tier 2 Study action area: Atlantic butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), clearnose skate (*Raja eglanteria*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), and windowpane flounder (*Scophthalmus aquosus*). **Appendix A** includes the EFH Mapper Report. An EFH Assessment was conducted to evaluate potential effects to EFH for these species within the EFH action area.

2.1 Project Description and Background

The Bay Bridge is a two-span structure that crosses the Chesapeake Bay from Anne Arundel County on the Western Shore to Queen Anne's County on the Eastern shore. The original span opened in 1952, and the second span opened in 1973. Today, the two-lane original span typically carries eastbound traffic, and the three-lane second span typically carries westbound traffic. However, lanes on the bridge can be reversed to accommodate periods of heavy traffic. The approaches along U.S. 50/301 on each shore have six lanes (three lanes for each travel direction). The Bay Bridge has become one of Maryland's most iconic and recognizable landmarks, used by millions of Maryland residents and other travelers every year.

A wide range of engineering and environmental considerations were evaluated for the ARDS, which included one no-build alternative and six build alternatives as detailed in the DEIS. Alternative A (the no-build alternative) is not the MDTA RPA because it would not increase roadway capacity or mobility, correct roadway deficiencies, or provide the navigational clearance established by the U.S. Coast Guard. Alternative A would also require substantial maintenance and related lane closures that would worsen congestion over time and compound existing traffic congestion, mobility, and roadway deficiency issues. Each of the six build alternatives meets the Tier 2 Study's purpose and need and would therefore be reasonable to implement. However, the build alternatives differ in the degree of transportation benefit they would provide as well as the likely environmental impacts and cost. The MDTA RPA, Alternative C (6-8-6 South) (**Figure 2-2**), would have the least impact to natural, cultural, and socioeconomic resources compared to the other build alternatives. Alternative C would result in the least impact to wetlands and non-tidal surface waters; benthic habitat, historic oyster bottom, and submerged aquatic vegetation (SAV.

The MDTA RPA would replace the existing Bay Bridge spans with two new bridge spans and would consist of six lanes along U.S. 50/301 on the Western Shore (three per direction), eight lanes on a new bridge (four per direction), and six lanes along U.S. 50/301 on the Eastern Shore (three per direction). Construction activities would include, but are not limited to, pile driving; dredging; placement of fill/structure for piers, pier protection systems, and pier islands; increased vessel traffic; and demolition and removal of existing structures, including blasting. The two new bridge spans would include one span to the south and one span in between the location of the existing bridge spans. The approach roadways would remain on the existing roadway alignment, except where necessary to connect to the new bridge spans. Thus, the five existing bridge lanes would be increased to eight bridge lanes; however, the number of lanes on the Western Shore and Eastern Shore would not change and would remain at six total travel lanes beyond the immediate tie-ins to the new bridge spans. The MDTA RPA could include a bicycle/pedestrian shared use path (SUP) along a new bridge. The MDTA has identified SUP connections to existing and proposed trails and recreational facilities on the Eastern Shore and Western Shore.

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Figure 2-1: Essential Fish Habitat within the EFH Action Area

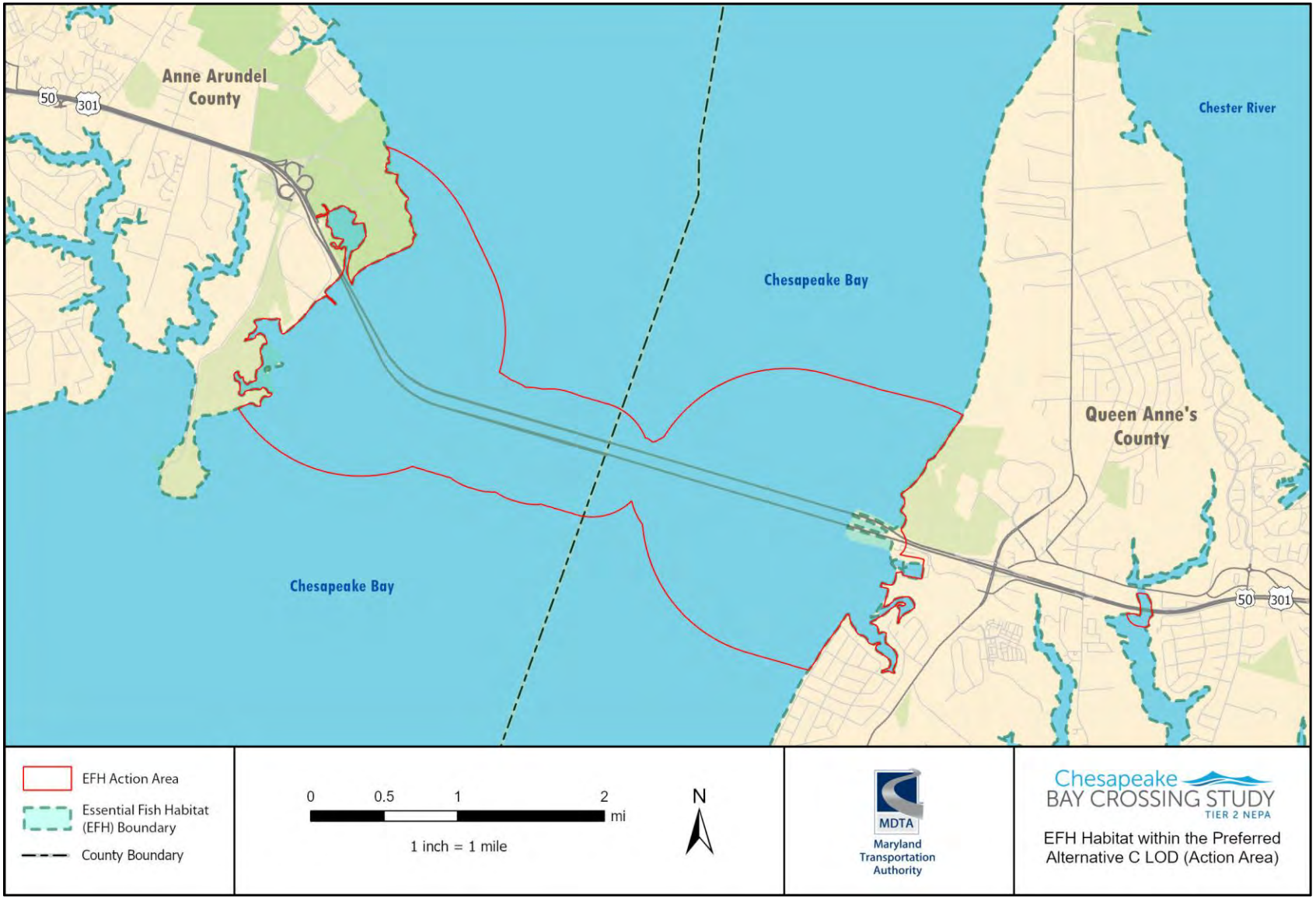


Figure 2-2: MDTA's Recommended Preferred Alternative



The Tier 2 Study is currently in preliminary engineering for the MDTA RPA and as such, design, construction, and demolition means and methods are based on preliminary assumptions. It is anticipated that construction of the new bridge spans would occur in multiple phases. Phasing of the MDTA RPA may involve building one span at a time: the first new bridge span may be built, then one existing bridge span could be demolished manually and with blasting, and the new bridge span would be in use while the second new bridge span is built. Once both new bridge spans are complete, the second span of the existing bridge could be demolished. The exact order and timing of construction have yet to be determined, however, a preliminary construction sequence is included in **Table 2-1**:

Table 2-1: Preliminary Construction Sequence

Construction Activity	Construction Years
Construction of Bridge 1 (eastbound) – Occurring during years 1 through 5	
Start Construction, Bridge 1	1
Construct landings (work completed on land)	1-4
Constructing approaches and main span	1-5
Trestles and water access construction	1
Dredging for eastbound bridge	1-2
Transport and disposal of dredge	1-2
Substructure/pier protection construction	1-3
Superstructure construction	2-5
Complete construction, Bridge 1	5
Demolition of existing eastbound bridge – Occurring during years 6 through 7	
Start demolition, existing eastbound bridge	6
Blasting (total of 9 blast events)	6-7
Cantilever Deck Truss Spans (3 spans and 4 piers)	
Cantilever Deck Truss Spans (9 spans and 8 piers)	
Through Truss Spans (3 spans and 4 piers)	
250' Simple Deck Truss Spans (4 simple spans/4 piers)	
300' Simple Deck Truss Spans (6 simple spans/5 piers)	
Suspension Spans (3 suspension spans/4 piers)	
Dismantling	6-7
Complete demolition, existing eastbound bridge	7
Construction of Bridge 2 (westbound) – Occurring during years 7 through 13	
Start construction, Bridge 2	7
Construct landings (work completed on land)	7-13
Constructing approaches and main span	7-13
Trestles and water access construction	7
Dredging for westbound bridge	7-8
Transport and disposal of dredge	7-8
Substructure/pier protection construction	7-12
Superstructure construction	8-13
Complete construction, Bridge 2	13
Demolition of existing westbound bridge – Occurring during years 14 through 15	
Start demolition, existing westbound bridge	14
Blasting (7 total blast events)	14-15
Cantilever Deck Truss Spans (3 spans and 3 piers)	
Cantilever Deck Truss Spans (9 spans and 8 piers)	
Through Truss Spans (3 spans and 4 piers)	
Suspension Spans (3 suspension spans/4 piers)	
Dismantling	14-15
Complete demolition, existing westbound bridge	15

The following sections include initial assumptions based on the current design and best available information from similar bridge projects including the Francis Scott Key Bridge, Tappan Zee Bridge, and Nice-Middleton Bridge. Information regarding anticipated construction methods and current assumptions of each phase follows.

Construction phase:

Dredging:

Based on existing conditions within the Chesapeake Bay, it is expected that dredging would be necessary to create access channels to support demolition and construction activities. Considering input from previous similar dredging efforts, a target depth of nine feet below the mean low water (MLW) level was assumed. The dredging areas were established using the "Maryland bathymetry Chesapeake Bay contours" data at both shores of the Bay (Annapolis and Kent Island shores). The northern limit of dredging was assumed to have an approximate offset of 50-feet north of the existing piers of the existing westbound span (to be demolished), and the southern limit was assumed to have an approximate offset of 60-feet from the southern edge of the proposed eastbound span.

The total area to be dredged at both shores of the Bay would be approximately 50.2 acres (2.2 million square feet), out of which 16.4 acres are on the Annapolis shore and 33.8 acres are on the Kent Island shore. These areas exclude the footprints of the proposed and existing bridge pier footings. The total dredged volume within the dredging area is approximately 308,800 cubic yards. Applying a bulking factor of 1.3 to the dredged volume, the volume of spoil to be hauled is approximately 401,500 cubic yards and it is proposed to be hauled via barge. For the eastbound bridge, bucket dredging is anticipated to take about 14 days of activity within construction years 1 and 2 and for the westbound bridge bucket dredging is anticipated to take about 7 days of activity within construction years 7 and 8.

For access in shallow areas, dredging would need to be wide enough to facilitate equipment mobility, loading and unloading material barges, and erecting structures. Depending on the consistency of bottom materials, additional dredging area may be needed because the sides of dredged areas must be sloped back to prevent the material from sloughing back into the excavation areas. The bottom materials may need to be sloped as much as 3:1 horizontal to vertical. This additional dredging area is included in the total dredge area of 50.2 acres. Additionally, based on the greater expanse of shallow water from the eastern shoreline, it is anticipated that more dredging would be required along the eastern shoreline than the western shoreline.

Dredging would occur prior to the construction of temporary trestles that facilitate the loading and unloading of barges and support vessels. Multiple access points (dredged channels or trestles) may be needed depending on the work configuration and the specific construction equipment needed. Access and dredging details would be evaluated and further refined in future design phases.

Potential dredge disposal sites include Masonville Cove and Cox Creek dredged material containment facilities (DMCF). Utilizing Masonville Cove DMCF and Cox Creek DMCF would facilitate safe and efficient loading, transport, and placement of dredge material. Both sites are owned and operated by the Maryland Port Administration (MPA), are adjacent to the Patapsco

River, and are accessible by barge for placement operations. Masonville Cove DMCF has a permitted capacity of 10.4 million cubic yards (mcy) on 101 acres. Cox Creek DMCF has a permitted capacity of 14.7 mcy on 241 acres. Both facilities have plans in place to incorporate the creation of wildlife habitat and community access for recreation including birdwatching. The Bay Crossing Study has coordinated with MPA and determined that either DMCF would have the capacity to accommodate the dredging volumes generated by the build alternative. MPA would require that the material suitability and operational plans be approved prior to placement in accordance with their *Right of Entry Application*.

Bridge/Access Construction:

Preliminary engineering assumptions include using a trestle for temporary construction access in waters less than 10 feet deep below MLW. Based on the Francis Scott Key Bridge Rebuild Project design, the MDTA assumes trestle piers would be constructed every 38 feet supported on 36-inch steel pipe piles. Preliminary engineering assumes that bridge piers would be constructed with 36-inch square pre-stressed concrete piles as well as 36-inch, 48-inch, and 96-inch driven steel pipe piles. Pier protection fenders would be supported on 48-inch driven steel pipe piles. Pier protection dolphins are assumed to include 19.6-inch-wide sheet pile, backed by 14-inch steel H-piles. Pier protection would be built with the corresponding bridge. **Table 2-2** and **Table 2-3** provide the estimated number and type of proposed piles and piers for the eastbound and westbound bridges, respectively.

Table 2-2: Eastbound Bridge – Assumed Pile Summary

Pile Type and Size	Total Piles	Total Piers
Bridge Piers	**1,741**	**77**
36” Pre-stressed Square Piles	132	18
36” Steel Pipe Piles	240	10
48” Steel Pipe Piles	1,231	43
96” Steel Pipe Piles	138	6
Trestle Piers		
36” Steel Pipe Piles	628	157*
Pier Protection	**5,144**	**24**
48” Steel Pipe Piles for fenders	40	2
19.6” Sheet Piles (For Dolphins)	2,552**	22
14” Steel H-Piles (For Dolphins)	2,552**	
Grand Total	**7,513**	**258**

**A trestle pier is anticipated every 38 feet, beginning on land and extending one bridge pier beyond the limits of dredging (extending to 10-feet below MLW). Four 36-inch steel pipe piles are assumed to be required for each trestle pier.*

*** Pier protection dolphins have a diameter of 60’ and a circumference of 188.5’. Sheet piles and Steel H-piles would be constructed around the circumference of each dolphin and therefore, 116 sheet piles and 116 Steel H-piles are required per dolphin.*

Table 2-3: Westbound Bridge – Assumed Pile Summary

Pile Type and Size	Total Piles	Total Piers
Bridge Piers	**2,014**	**80**
36” Pre-stressed Square Piles	176	21
36” Steel Pipe Piles	270	10
48” Steel Pipe Piles	1,412	43
96" Steel Pipe Piles	156	6
Trestle Piers		
36” Steel Pipe Piles	628	157*
Pier Protection	**5,144**	**24**
48” Steel Pipe Piles for fenders	40	2
19.6” Sheet Piles (For Dolphins)	2,552**	22
14” Steel H-Piles (For Dolphins)	2,552**	
Grand Total	**7,786**	**261**

** A trestle pier is anticipated every 38 feet, beginning on land and extending one bridge pier beyond the limits of dredging (extending to 10-feet below MLW). Four 36-inch steel pipe piles are assumed to be required for each trestle pier.*

*** Pier protection dolphins have a diameter of 60’ and a circumference of 188.5’. Sheet piles and Steel H-piles would be constructed around the circumference of each dolphin and therefore 116 sheet piles and 116 Steel H-piles are required per dolphin.*

The following are construction assumptions based on preliminary engineering:

- Multiple foundation types could be used by the contactor; however to provide the most impactful estimate of noise, currently, the MDTA assumes the main span is supported by multiple driven steel pipe piles, which require impact and vibratory hammering, and the approach span piles are assumed to be pre-stressed square concrete piles installed by impact hammer.
    - Noise attenuation in the form of bubble curtains would be used.
- Currently, a cable-stayed or suspension bridge is being considered, for the purpose of NEPA.
- Piers would have some form of pier protection. Preliminary design assumes 2 fenders and 22 dolphins would be installed on both the eastbound and westbound bridges, respectively, to provide collision protection.
- Trestles would likely be used for temporary construction access to facilitate pier placement for the new bridge within the dredged area. The preliminary design assumes a trestle pier would be constructed every 38 feet, beginning on land and extending one bridge pier beyond the limits of dredging (extending to 10-feet below MLW). Four 36-inch steel pipe piles are assumed to be required for each trestle pier. Trestles would remain in place until construction is complete.
- Other temporary construction methods including cofferdams and other dewatering devices for pile driving may be used.
- Dredging in the shallows up to approximately 9-foot depth is assumed necessary to access areas for pier construction.
- It is assumed, based on the Francis Scott Key Bridge Test Pile Exposure Analysis assumptions, that impact driving would take a maximum of 2 hours per pile.
    - Due to equipment availability, it is assumed that up to 8 96” steel pipe piles may be driven in one day and up to 16 piles of other pile sizes could be driven in one day.

  - For the eastbound bridge, a total of about 120 days of pile driving is anticipated throughout years 1-5 of construction.
  - For the westbound bridge, a total of about 138 days of pile driving is anticipated throughout years 7-13 of construction.
- Throughout the duration of construction, an effective 12-hour quiet period of no pile driving will be implemented each day.
- For staging areas, MDTA anticipates using the existing MDTA piers that are currently used for bridge maintenance. Additional staging areas may be needed, which will be determined during final design. Additional staging areas are anticipated to include public or private locations in the Baltimore Harbor area, which would not result in additional environmental impacts. Staging areas may also include mooring locations within the Chesapeake Bay. Mooring locations in the Chesapeake Bay may have additional environmental impacts, though MDTA will commit to avoiding areas of oyster beds or SAV.

Temporary lights may be used during construction for extended day or night work, which may impact federally-managed fish species utilization of habitat; however, the use of aesthetic and continuous roadway lighting would be determined in final design. Navigation, aviation, and traffic control lighting are included on the existing bridges and will be included on the new bridges, as required by regulation.

Demolition phase:

Following construction, demolition of the existing bridge spans would occur. Removal of the existing bridge piers by means of blasting and manual methods would result in noise and vibration impacts to federally-managed fish species and are expected to be the most impactful activities during demolition. The following are the demolition assumptions based on preliminary design:

- Manual removal would be employed wherever possible; however blasting may be necessary when water depths or pier element size makes manual removal infeasible, in which case a blasting plan will be developed in coordination with NOAA Fisheries.
- Temporary trestles would be used where water depths are less than 10 feet to perform demolition activities, as needed.
- Marine cranes affixed to barges would be used where water depths are deeper than 10 feet below MLW to perform demolition activities, as needed.
- Steel bracing elements are anticipated to be torch cut and heavy lift marine cranes would be used to maneuver cut pieces.
- Shielding barges are anticipated for the removal and transportation of bridge elements from the water. These barges would be positioned underneath the existing bridge decks to capture any debris that may be released during demolition.
- Terrestrial demolition of bridge decks, girders, substructures, and abutments is anticipated to use saw cutting, excavators, and slab grab buckets. All demolition debris would be disposed of in accordance with regulatory permits and applicable laws and regulations.

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3 EXISTING CONDITIONS

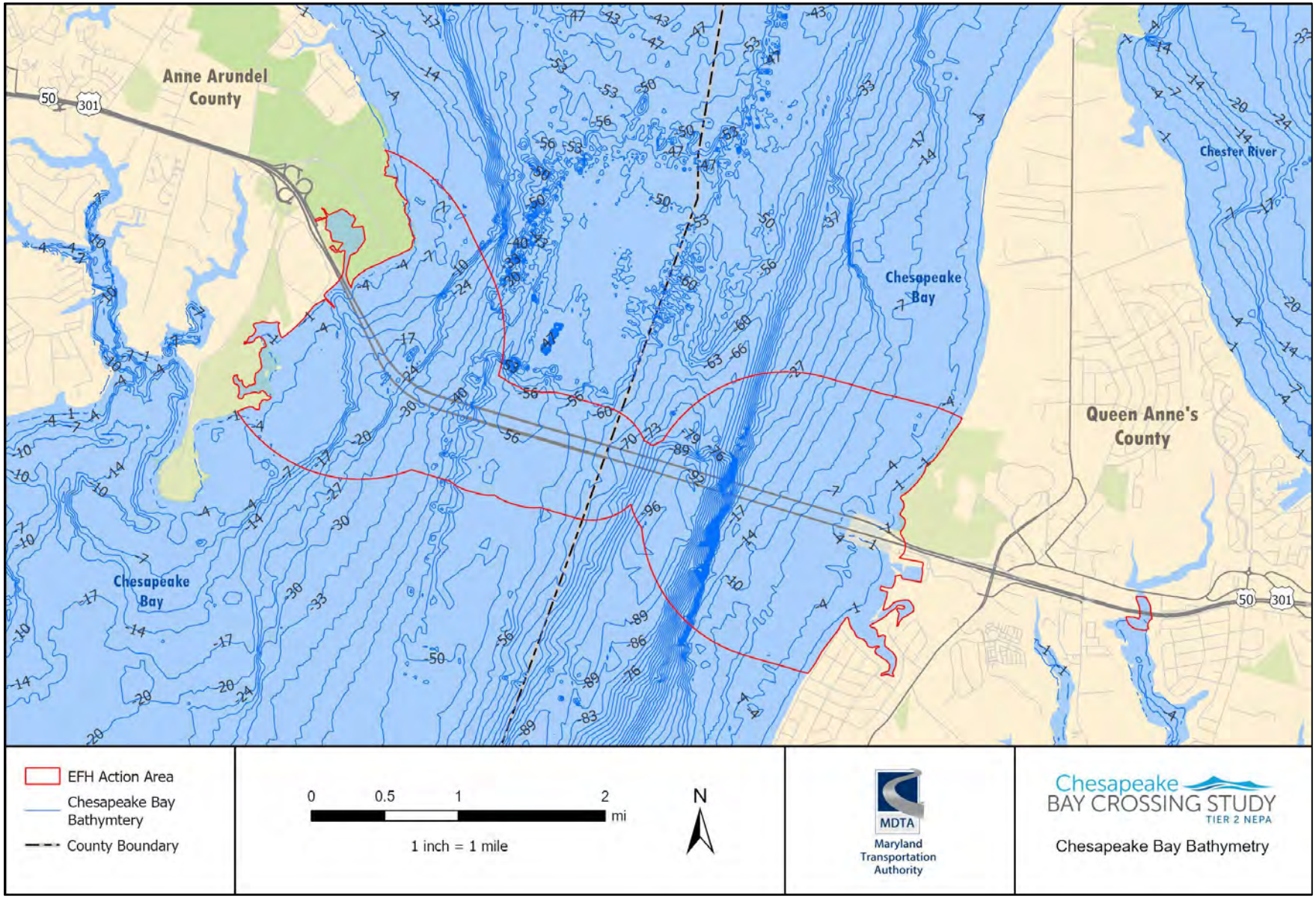
Descriptions of existing conditions including bathymetry, submerged substrates, and aquatic resources are included in this section to provide an overview of the physical characteristics, plant and animal species, and habitat types within the EFH action area. Additional information on existing conditions is included in the *Natural Environment Technical Report*.

3.1 Bathymetry

Within the EFH action area, as depicted in **Figure 3-1**, the Chesapeake Bay is deepest in the center and east of the county boundary, within the Chesapeake Bay Auxiliary navigation channel. As expected, the Bay becomes shallower towards the shorelines. The Chesapeake Bay has an average depth of approximately 40 feet within the EFH action area, with the main channel depth approximately 56 feet, and the Chesapeake Bay Bridge Auxiliary channel depth approximately 92 feet. **Figure 3-1** illustrates the bathymetry of the Chesapeake Bay, with negative numbers representing contours for the elevation below sea level, and the close contours indicative of varying steep slopes within the deeper areas. The shallows of the Chesapeake Bay (1 to 3 feet) extend channelward approximately 800 to 950 feet from the western shoreline in Anne Arundel County, and approximately 1,200 to 1,300 feet from the eastern shoreline in Queen Anne's County. Areas with depths from approximately 3 feet to 12 feet generally extend from about 2,100 to 2,200 feet from the western shoreline and 3,900 to 4,700 feet from the eastern shoreline.

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Figure 3-1: Chesapeake Bay Bathymetry within the EFH Action Area



3.2 Submerged Substrates

The Chesapeake Bay bottom is primarily formed by layers of Magothy, Matawan, and Monmouth formations, which are overlaid by sandy material in the shallow areas and loose silty clay material in the deeper channels. The waves and tide move fine silt, clay, and organic material out of the sand and deposit them in lower energy areas along the bottom. Surficial sand is generally found in the areas that are most affected by wave action and tidal fluctuations. There have been no indications of contaminated materials in the substrates tested for the USACE Baltimore Harbor and Channels 50-Foot Project in the vicinity of the Bay Bridge. Submerged substrate characteristics are described in the *Natural Environment Technical Report*.

The surficial sediments in the shallow areas of the shorelines within the EFH action area contain benthic organisms that form an important part of the food web. Cultch areas that provide points of attachment for oyster spat are found in shallower areas (less than 26 feet deep) and generally found as inclusions in the sandy bottom but may also be incorporated into organic/silt mud areas. Potential benthic macroinvertebrate habitat, which largely aligns with state mapped historic oyster bottom, are located throughout the EFH action area and addressed in **Section 3.4**.

3.3 Water Quality

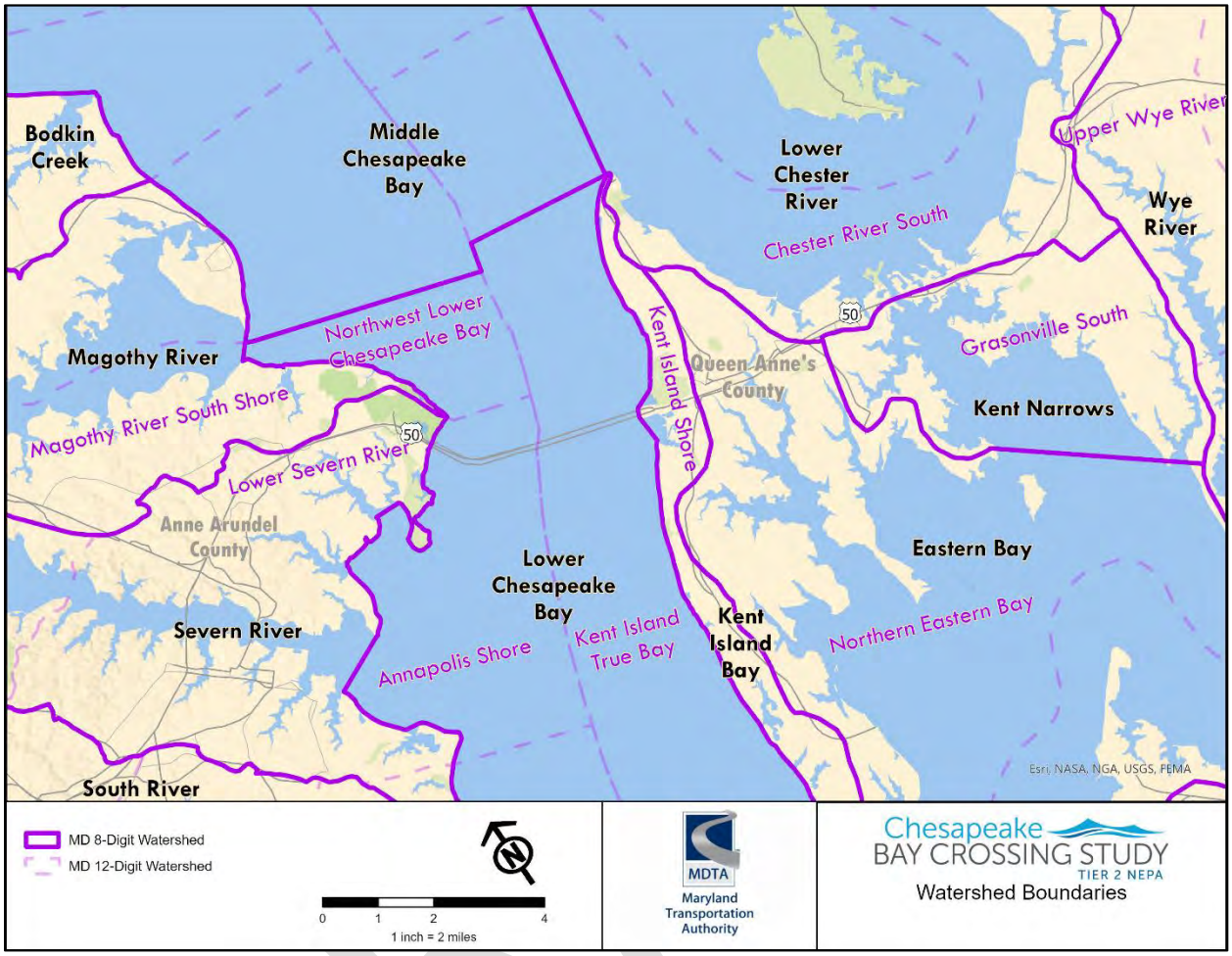
Watersheds

The EFH action area is entirely within the Coastal Plain Physiographic Province. The EFH action area spans three major state-designated 6-digit watersheds: West Chesapeake Bay, Chesapeake Bay Proper, and Chester River. Within each of these major watersheds, the EFH action area crosses the Severn River, Magothy River, Lower Chesapeake Bay, Eastern Bay, and Kent Island Bay Maryland Department of the Environment (MDE) 8-digit watersheds and the Lower Severn River, Magothy River South Shore, Northwest Lower Chesapeake Bay, Annapolis Shore, Kent Island True Bay, Northern Eastern Bay, and Kent Island Shore MD 12-digit sub-watersheds, which are shown in **Figure 3-2**.

All of the MDE 8-digit watersheds crossed by the EFH action area have been listed on the 303(d) impaired waters list due to poor water quality. Total maximum daily loads (TMDLs) have been completed for many of the pollutants, though some are still awaiting an approved TMDL. Pollutants such as fecal coliform, polychlorinated biphenyls (PCBs) in fish tissue, elevated levels of phosphorus and nitrogen, total suspended solids (TSS), and unknown pollutants (based on benthic Indices of Biotic Integrity or IBIs) have been documented within the EFH action area. More details on watershed characteristics are included in the *Draft EIS* and *Natural Environment Technical Report.*

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Figure 3-2: Sub-watersheds

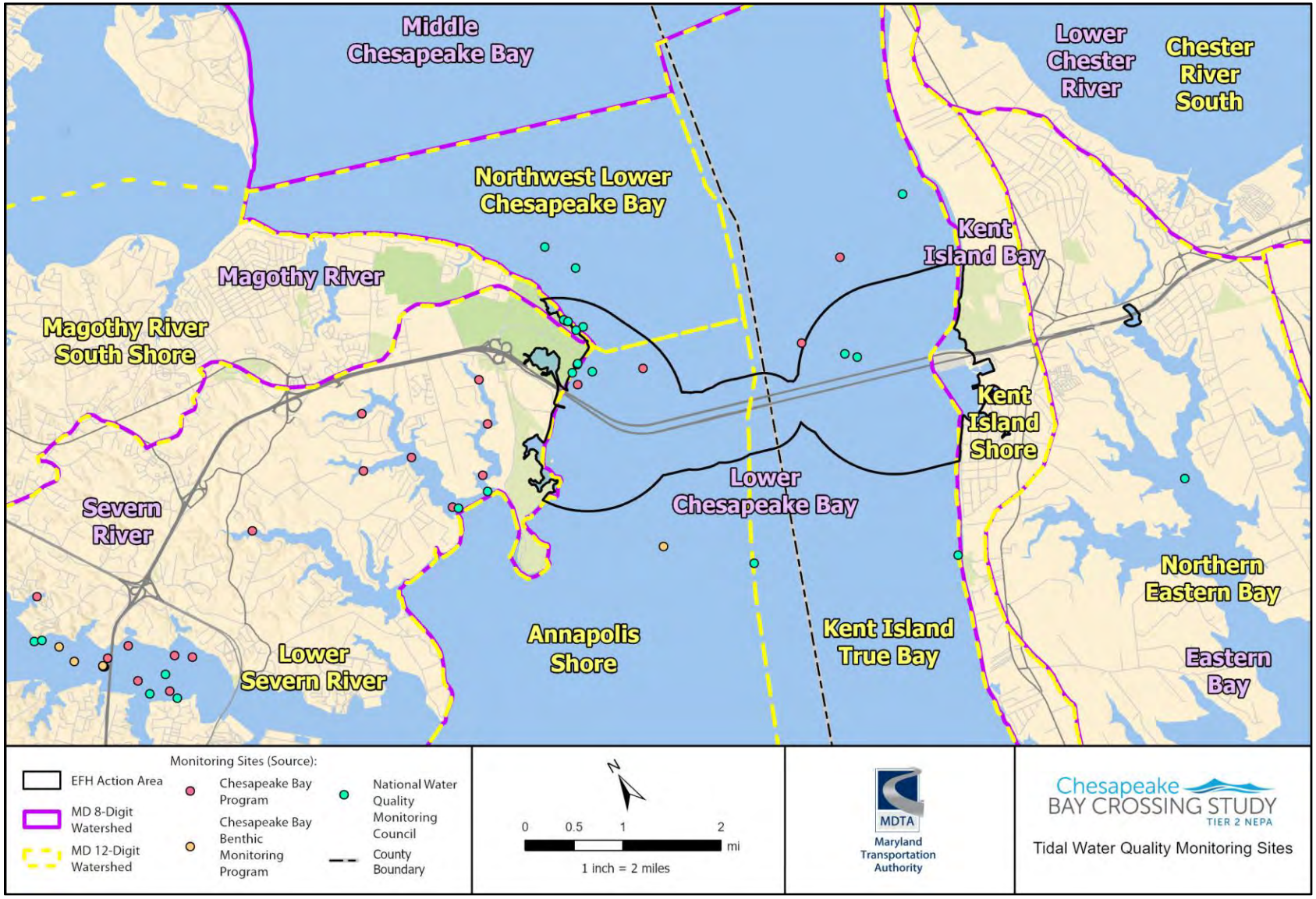


Surface Water Quality

Nontidal and tidal waterways have different state and federally regulated water quality criteria. They also have guidelines that are not regulated criteria, intended to identify stress levels for aquatic biota. Monitoring locations utilized for water quality analyses within the EFH action area are illustrated in **Figure 3-3**. Surface water quality of water bodies within the EFH action area is described in more detail in the *Draft EIS* and *Natural Environment Technical Report.*

Existing tidal water quality data collected within and surrounding the EFH action area indicates many sampling locations well within compliance of current state and federal criteria and acceptable ranges of predicted stressors to aquatic biota. However, there are also areas identified to exceed regulated criteria for dissolved oxygen (DO), pH, and bacteria, including *Enterococcus* and fecal coliform.

Figure 3-3: Water Quality Monitoring Sites



Chesapeake Bay

The Chesapeake Bay is designated by MDE as a Use II tidal waterway, or tidal waters designated for supporting estuarine and marine aquatic life and shellfish harvesting. The Chesapeake Bay is a mesohaline system which means its waters have a low to medium saline content, or are brackish waters, and are typically defined as having salinity between 5 and 18 parts per thousand (ppt) (Park, 2012).

Mezick Pond

East of U.S. 50/301, most surface flow is directed toward Mezick Pond and flanking wetlands, which are located within Sandy Point State Park, with hydrology directly connecting to the Chesapeake Bay. This area is largely influenced by the tides and floodplain, and therefore a mostly tidal estuarine system exists.

Cox Creek

Within the Eastern Bay Watershed, major waterways draining from the north to the south include Cox Creek, a Use II perennial tidal waterway. Cox Creek is a tidal system both north and south of U.S. 50/301. This system is approximately 575 feet wide north of U.S. 50/301 and 1,650 feet wide south of the roadway. Although the FEMA 100-year floodplain is associated with this waterway both north and south U.S. 50/301, there are no wetlands identified to the north. Large areas of estuarine common reed (*Phragmites australis*) wetland are located along the western bank, on the south side of U.S. 50/301.

Other Tidal Waters

Tidal grab sample and in situ water quality data in the vicinity of the EFH action area are discussed relative to the MD 12-digit watersheds. Sampling locations within the Lower Severn River MD 12-digit watershed drain to the Chesapeake Bay south of the EFH action area, so data from these sites are not included in this report. **Table 3-1** and **Table 3-2** summarize the available water quality data in the MD 12-digit watersheds that are within or drain to tidal water bodies within the EFH action area. Water quality data was gathered from MDE, Maryland Department of Natural Resources (MDNR) Eyes on the Bay program and other monitoring programs accessed through the Chesapeake Bay Program (CBP). In situ data were obtained from MDNR's Chesapeake Bay Benthic Monitoring Program (CBBMP). **Table 3-1** summarizes the water quality data corresponding to Code of Maryland Regulations (COMAR) criteria, and **Table 3-2** summarizes salinity and conductivity data.

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Table 3-1: COMAR Water Quality Parameters within 12-digit Watersheds in the EFH Action Area

Watershed	Source	Year	Method	Depth (m)	Parameter					
					Temperature (°C)	pH	DO (mg/L)*	TSS	Enterococcus (MPN/100mL)	Fecal Coliform (MPN)
Annapolis Shore	CBBMP	2018	In-situ	0.5 / 9	26.30 / 26.37	7.8 / 7.2	6.35 / **4.20** (ppm)	-	-	-
	CBP	2013 to 2023	In-situ	0.5 / 4	3.7 - 30.9 / 1 - 28.3	7.1 - **9.1** / 7.1 - 8.4	**4.6** - 15.1 / **0.28** - 12.6	2.5 - 84 / 4.4 - 134 (Grab)	-	-
	NWQMC	2013 to 2019	Grab	-	-	-	-	-	-	1 - 23
Northern Eastern Bay	NWQMC	2013 to 2019	Grab	-	-	-	-	-	10 - **2,010** (2013 - 2022)	1 - **1,100**
Kent Island True Bay	CBP	2013 to 2023	In-situ	0.5 / 6	1.3 - 29.6 / 0 - 28	6.9 - **9.6** / 6.8 - **8.7**	5.1 - 17.8 / **0.09** - 12.7	2.4 - 37 / 2.4 - 96 (Grab)	-	-
	NWQMC	2013 to 2019	Grab	-	1.2 - 29	7.4 - **8.8**	**4.1** - 14.5	0 - 0.8	10 - **1,450** (2013 - 2022)	1 - 23

*In dilute aqueous solutions, 1 mg/L is approximately equivalent to 1 ppm.

Notes:

1. Red values indicate that they exceed/are below COMAR criteria during the listed time period.

2. Data collected at two depths is shown in the same cell separated by a "/," corresponding to the two depths reported in the Depth column.

3. In situ data was collected at one point in time and may not be representative of conditions throughout the year or across years.

Table 3-2: Salinity and Conductivity within 12-digit Watersheds in the EFH Action Area

Watershed	Source	Year	Method	Depth (m)	Parameter	
					Salinity (ppt)*	Conductivity (UMHO/cm)
Annapolis Shore	CBBMP	2018	In-situ	0.5 / 9	3.26 / 5.83 (PSU)	5,972 / 10,340
	CBP	2013 to 2023	In-situ	0.5 / 4	0.61 - 16.43 / 3.38 - 18.48	3,100 - 27,000 / 6,640 - 30,000
Kent Island True Bay	CBP	2013 to 2023	In-situ	0.5 / 6	0.5 - 16.56 / 4.75 - 22.32	3,120 - 27,200 / 8,940 - 35,500
	NWQMC	2013 to 2019	Grab	-	2.8 - 15.2	-

*1 PSU is approximately equivalent to 1 ppt.

The water quality parameters reported in **Table 3-1** and **Table 3-2** influence habitat suitability for federally-managed fish species and SAV. As shown in **Table 3-1**, existing pH levels sampled within the EFH action area extend above regulated water quality criteria levels. High pH can be caused by industrial discharges, alkaline geology and soils, asphalt disposal, input of agricultural lime, as well as other industrial and agricultural inputs. High pH levels can result in decreased reproduction, growth, biodiversity, and damage to fish organs and long-term exposures can result in death (EPA CADDIS, 2025). High pH levels could also affect the distribution of SAV within the EFH action area.

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Existing DO levels within the EFH action area, reported in **Table 3-1,** are below regulated water quality criteria. Low DO can result from industrial point sources of nutrients and agricultural and urban nutrient runoff. High turbidity can also contribute to low DO, since it limits photosynthesis and plant production of oxygen. High turbidity environments with low DO are unlikely to be able to support SAV. Low DO can have effects on aquatic community structure by altering the food web in favor of species and life stages that are more tolerant to low oxygen conditions. Low DO can also have acute effects on aquatic life resulting in biological impairments and even death.

Enterococcus and fecal coliform bacteria levels sampled within the EFH action area reach levels above regulated water quality criteria, as shown in **Table 3-1**. High bacteria levels can adversely impact fish by depleting oxygen levels as they decompose.

Salinity levels within tidal waters of the watersheds that are within the EFH action area range from 0.5 to 22.32 ppt.

3.4 Aquatic Resources

Tidal Aquatic Habitat

Bottom substrates within the EFH action area, based on MDNR's Chesapeake Bay Bottom Survey data (Smith et al., 2001), are mapped in the Annapolis Shore, Kent Island True Bay, and Kent Island Shore 12-digit watersheds. The Chesapeake Bay Bottom Survey geodatabase characterizes bottom type designations determined by MDNR's acoustic bay bottom survey conducted from 1974 to 1983 and includes natural oyster rubble and sand within the EFH action area. Because this dataset is up to 30 years old and areas identified as cultch bottom when the survey was conducted may have degraded since the time of the survey, quantitative impacts were not calculated using this data source. More information on bottom substrates is discussed in the *Draft EIS*.

Benthic Macroinvertebrates

Benthic macroinvertebrate data was available from MDNR for the EFH action area. Benthic macroinvertebrate data is used to calculate the Chesapeake Bay IBI (Bay-IBI), which varies based on salinity regime and bottom substrate (Weisberg et al., 1997; Llansó and Dauer, 2002). Benthic IBI scores within the vicinity of the EFH action area range from "meets restoration goals" to "severely degraded." Benthic habitat, characteristics, and available data are discussed in more detail in the *Draft EIS*.

Submerged Aquatic Vegetation

SAV is designated as a HAPC for summer flounder by the Mid-Atlantic Fisheries Management Council and is considered a priority habitat by NOAA Fisheries and MDNR resource managers. The largest concentrations of SAV are in the tidal creeks of Queen Anne's County surrounding Kent Island Narrows and eastward, including Winchester Creek, Muddy Creek, and Marshy Creek. These locations are generally in shallow, gentle-current water bodies with silt and sandy bottoms. SAV is also found on the eastern shoreline of the Chesapeake Bay mainstem along Terrapin Nature Park, north of the existing Chesapeake Bay Bridge. Most of the SAV beds mapped in 2023 were identified as dense SAV beds (>70% cover).

Review of historical mapping revealed that SAV beds were much more abundant from 1971 through the early 2000s than they are currently. Numerous studies suggest that increases in

nutrient loading are the primary cause of these declines. Species likely to inhabit the EFH action area range from freshwater to mesohaline species that can tolerate moderate salinity levels.

As shown in **Figure 3-4**, SAV has been documented along the northern side of the eastern terminus of the Bay Bridge within the EFH action area. The extent of SAV present in the vicinity of the EFH action area was determined through an analysis of the existing and historical SAV beds documented by the Virginia Institute of Marine Science (VIMS) SAV monitoring program.

The 5-year average extents of SAV were determined using a GIS overlay of the EFH action area with the VIMS data from 2019 through 2023. The MDTA analyzed SAV density from year to year, utilizing the 2000 to 2002 annual datasets from VIMS. MDNR considers any area mapped in those 5 years to be habitat that supports SAV, even if SAV is not found there on a given date during the growing season. This analysis revealed historic patterns and trends that enhanced understanding of SAV in the EFH action area. The extent of SAV coverage would be re-evaluated at the time of permitting based on the 5-year composite coverage from VIMS and any recent surveys.

From 2019 through 2023, 6 species of SAV were documented in the VIMS survey segments that are crossed by the EFH action area (e.g., CBP segments). These 6 SAV species were all documented in 2019 in segment CB4MH. From 2020-2023, there were no recorded SAV ground survey observations within segment CB4MH. SAV likely to inhabit the EFH action area range from freshwater to mesohaline species that can tolerate moderate salinity levels. These species are typically found in the middle and upper reaches of the Chesapeake Bay (see **Table 3-3**). Surveys conducted by VIMS occur later in the growing season; therefore, the presence and density of horned pondweed (*Zannichellia palustris*) beds is often underrepresented as the species senesces during warmer months. SAV habitat and the VIMS data development are discussed in detail in the *Natural Environmental Technical Report.*

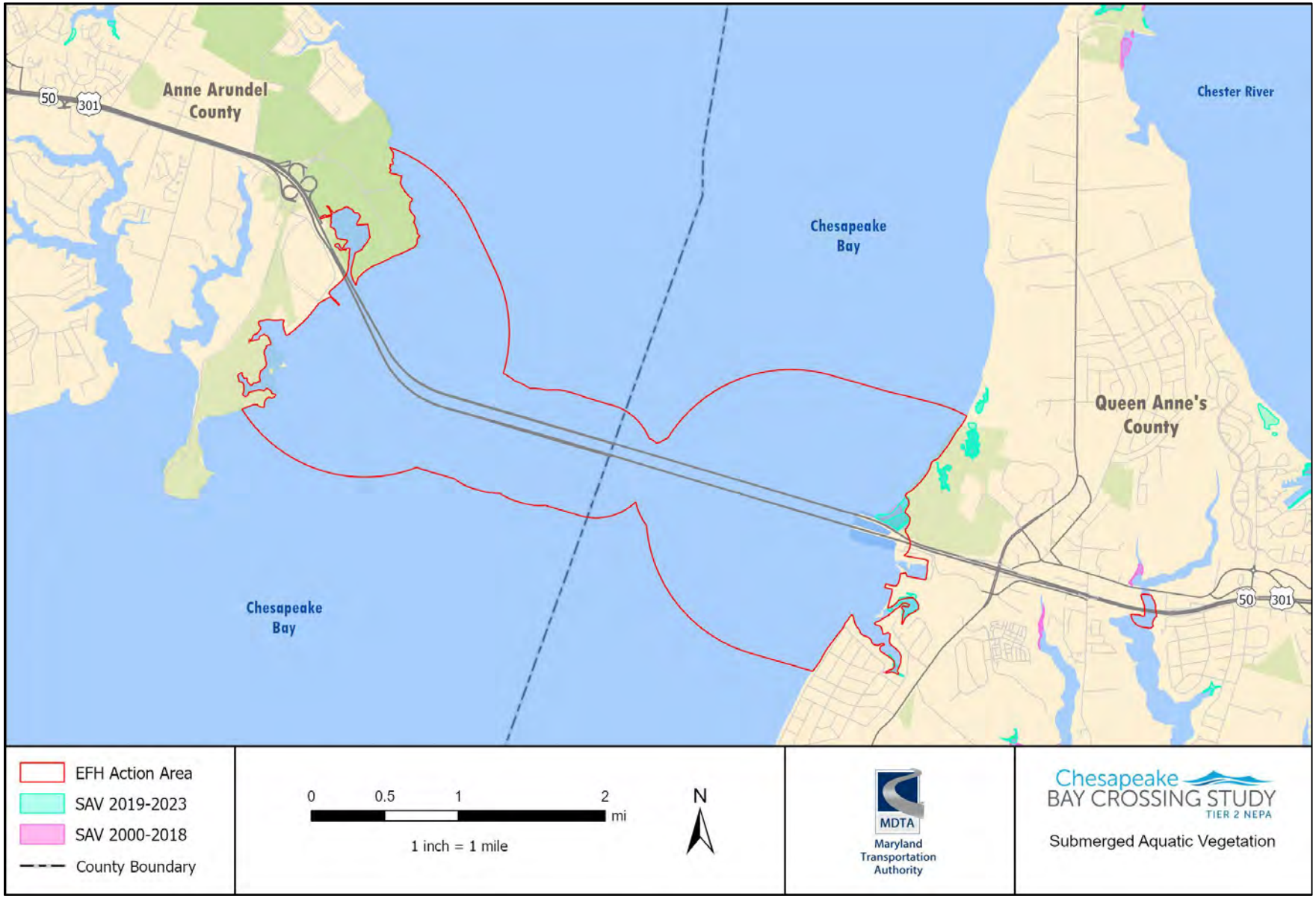
Table 3-3: SAV Species Documented within the EFH Action Area from 2019-2023*

Common Name	Scientific Name
Eurasian watermilfoil	*Myriophyllum spicatum*
Sago pondweed	*Stuckenia pectinata*
Redhead grass	*Potamogeton perfoliatus*
Common elodea	*Elodea canadensis*
Horned pondweed	*Zannichellia palustris*
Widgeon grass	*Ruppia maritima*

***Species identified only in 2019. All other years had no recorded VIMS SAV ground survey observations.

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Figure 3-4: Submerged Aquatic Vegetation within the EFH Action Area



Oyster Beds

The eastern oyster (*Crassostrea virginica*) is a critical component of the Chesapeake Bay ecosystem. Oyster habitat is typically brackish or salt water from 8 to 35 feet deep (CBP, 2023).

Information on the locations and characteristics of oyster beds within the EFH action area was obtained from MDNR's Maryland Shellfish GIS layers, which provide locations of significant oyster features, including legally described Natural Oyster Bars (NOBs), designated Oyster Sanctuaries and oyster seeding areas, Public Shellfish Fishery Areas, and historic oyster bars, sites where watermen have engaged in oyster harvesting for centuries (MD iMap, 2023).

Oyster beds are located throughout the Chesapeake Bay. Within the EFH action area north of the Bay Bridge, historic oyster habitat exists from approximately 1,400 feet to 4,500 feet off the Anne Arundel County shoreline towards the main channel. South of the Bay Bridge, historic oyster habitat exists from approximately 1,800 feet to 5,200 feet off the Anne Arundel County shoreline towards the main channel. See **Figure 3-5** for the location of oyster beds and habitat. This contiguous area of historic oyster habitat from the Magothy River, north of the Bay Bridge to the Severn River, south of the Bay Bridge, encompasses more than 2,000 acres. Oyster plantings and NOBs are located within the EFH action area north and south of the Bay Bridge and oyster sanctuaries are located within Cox Creek in Queen Anne's County within the EFH action area.

Fish

Information on tidal fish communities within the vicinity of the EFH action area was compiled from the VIMS Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP) online database (VIMS, n.d.). The ChesMMAP survey is used to describe fish assemblages in the Chesapeake Bay. For additional discussion of ChesMMAP, see the *Natural Environment Technical Report*. Tidal data from ChesMMAP was received from VIMS on January 18, 2024. Stations sampled from 2013 through 2023 and within 5 miles of the Bay Bridge were reviewed and determined 26 species present. This 5-mile extent of the Chesapeake Bay mainstem on either side of the bridge captures the mouth of the Magothy and Severn Rivers on the western shoreline and north to Love Point on the Eastern Shore. Species documented are included in **Table 3-4**.

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Figure 3-5: Oyster Beds and Habitat within the EFH Action Area

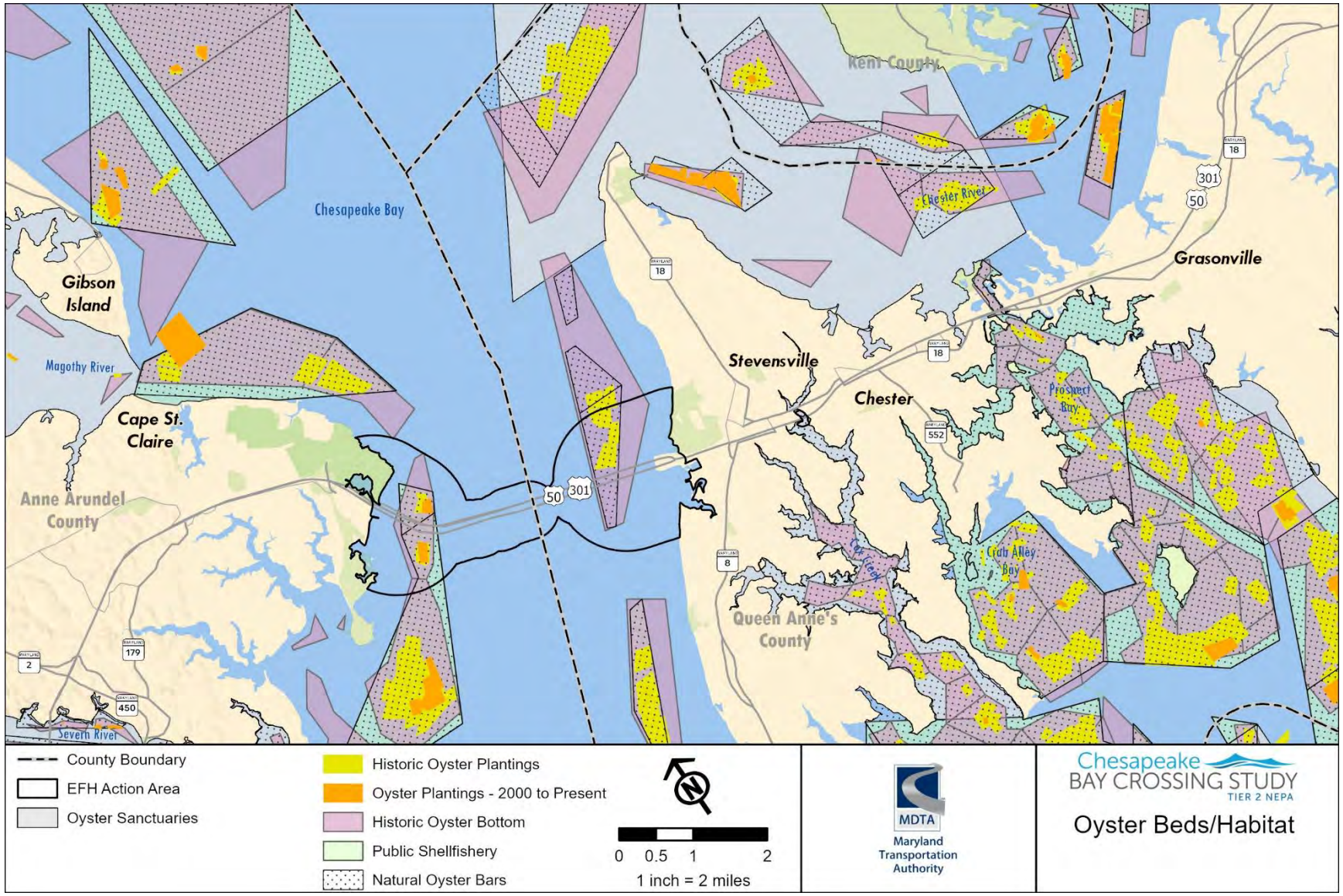


Table 3-4: Fish Species Documented Within 5 Miles of the Bay Bridge (2013-2023)

Common Name	Scientific Name	Common Name	Scientific Name
Alewife	*Alosa pseudoharengus*	Harvestfish	*Peprilus paru*
American eel	*Anguilla rostrata*	Hogchoker	*Trinectes maculatus*
American shad	*Alosa sapidissima*	Oyster toadfish	*Opsanus tau*
Atlantic croaker	*Micropogonias undulatus*	Rough scad	*Trachurus lathami*
Atlantic menhaden	*Brevoortia tyrannus*	Silver perch	*Bairdiella chrysoura*
Atlantic sturgeon	*Acipenser oxyrinchus*	Spanish mackerel	*Scomberomorus maculatus*
Bay anchovy	*Anchoa mitchilli*	Spot	*Leiostomus xanthurus*
Blue catfish	*Ictalurus furcatus*	Striped anchovy	*Anchoa hepsetus*
Blueback herring	*Alosa aestivalis*	Striped bass	*Morone saxatilis*
Bluefish	*Pomatomus saltatrix*	Summer flounder	*Paralichthys dentatus*
Channel catfish	*Ictalurus punctatus*	Weakfish	*Cynoscion regalis*
Cownose ray	*Rhinoptera bonasus*	White catfish	*Ameiurus catus*
Gizzard shad	*Dorosoma cepedianum*	White perch	*Morone americana*

Source: VIMS ChesMMAP

Information regarding fish blockages within the EFH action area was obtained from the Chesapeake Fish Passage Prioritization (CFPP) database was reviewed for all watersheds crossed by the EFH action area. MDNR's Fish Blockage Locations GIS shapefile (MD iMap, 2017) and the North Atlantic Aquatic Connectivity database were used to supplement fish blockage information in the CFPP database. Four migration barriers exist in the Lower Severn River 12-digit watershed. These barriers can affect the historical range for the diadromous species that utilize the watershed. MDNR's diadromous fish GIS layer was also referenced to supplement information from the CFPP project tool.

MDNR Environmental Review Program (ERP) indicated a diverse range of resident and migratory finfish species inhabiting the tidal portion of the Chesapeake Bay and potentially occurring in the vicinity of the Bay Bridge. CFPP project tool and MDNR's diadromous fish GIS data indicate that there are various diadromous species within the EFH action area. The mainstem Chesapeake Bay is a significant migratory pathway for all diadromous species migrating/emigrating to/from the upper Bay and its tributaries. See the *Natural Environment Technical Report* for additional information regarding fish species.

Based on a review of the CFPP project tool and MDNR's diadromous fish GIS data, the species in **Table 3-5** have been either documented to occur (D), likely to occur (L), or potentially occur (P) within these watersheds. Per MDNR ERP, areas including Whitehall Creek and Weems Creek are habitat for white perch and yellow perch.

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Table 3-5: Diadromous Fish Species in the EFH Action Area[1]

Common Name	Lower Severn River	Kent Island Shore	Northern Eastern Bay
Alewife	D	D	D
Blueback herring	L	--	L
American shad	D	D	D
Hickory shad	D	D	D
Striped bass	D	L	L
White perch	D	L	L
Yellow perch	D	--	--

[1] Note that the absence of these species in certain watersheds does not mean that they do not occur, rather that they are not specifically noted in the CFPP project tool and MDNR GIS data. The CFPP project tool uses waterbody feature center lines to display this information; therefore, certain species are likely unaccounted for in watersheds including open tidal portions of the Chesapeake Bay.

American eels are also found throughout all tidal and nontidal watersheds crossed by the EFH action area. Special attention has been given to American eel management in recent years, due to their ecological and economic importance, and their declining numbers. American eels are catadromous, meaning they primarily live in rivers and estuaries but return to the ocean to spawn.

Blue Crabs and Horseshoe Crabs

MDNR regulates Maryland's blue crab (*Callinectes sapidus*) harvest for sustainability and ecosystem health, including size limits, seasonal and gender restrictions, guidelines for harvesting methods, bushel limits, and licensing requirements. MDNR partners with the ASMFC to regulate Maryland's horseshoe crab harvest for sustainable commercial and medical use as well as for ecological function. For more information regarding regulations and methodology related to blue crabs and horseshoe crabs, see the *Natural Environment Technical Report*.

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4 ESSENTIAL FISH HABITAT DESIGNATIONS

4.1 Essential Fish Habitat Within the EFH Action Area

The Mid-Atlantic Fishery Management Council (MAFMC) (created by the MSA) is the regional fishery management council responsible for development of Fishery Management Plans (FMPs) for marine fisheries in U.S. federal waters (3-to-200 miles off the coasts) within the Mid-Atlantic region, including the portion of the Chesapeake Bay spanned by the Tier 2 Study EFH action area. The NOAA Fisheries EFH Mapper for the New England/Mid-Atlantic region identified EFH for nine fish species within the EFH action area (**Appendix A**). However, based on EFH text descriptions, only the six species shown in **Table 4-1** are likely to occur within the EFH action area. The following habitat parameter assumptions were used to assess fish habitat within the EFH action area: a depth ranging from 0 to 92 feet below Mean Low Water (MLW), a salinity range of 5 to 18 ppt, and a water temperature range of 40° to 83 °F (4° to 28 °C). EFH for the species and life stages shown in **Table 4-1** is present within the EFH action area.

Table 4-1: EFH Designations Within the EFH Action Area

Species Present	Life Stage(s)	Habitat
Atlantic butterfish *(Peprilus triacanthus)*	Eggs, larvae, juvenile, adults	Pelagic estuaries including the Chesapeake Bay, bottom depths between 33-1,150 feet, upper 650 feet of water column, water temps 40-81.5 °F, salinity above 5ppt.
Black sea bass *(Centropristis striata)*	Juvenile, adults	Inshore estuaries, water temps >43 °F, structured habitats (natural and man-made), "mixing" salinity zone.
Bluefish *(Pomatomus saltatrix)*	Juvenile, adults	Major estuaries, "mixing" salinity zone.
Scup *(Stenotomus chrysops)*	Juvenile, adults	Estuaries, "mixing" salinity zone, water temps >45 °F, salinity above 5ppt.
Summer flounder *(Paralichthys dentatus)*	Larvae, juvenile, adults	Pelagic estuaries, "mixing" salinity zone, nearshore, water temps >37 °F, depths between 30-230 feet.
Windowpane flounder *(Scophthalmus aquosus)*	Juvenile, adults	Estuaries, sandy substrate, "mixing" salinity zone, maximum depth of 200 feet.
Clearnose skate (*Rostroraja eglanteria*)	Juvenile	High and mixed salinity zones in Chesapeake Bay, shoreline to 40 meters, mud, sand, gravelly/rocky bottom substrate

Atlantic herring (*Clupea harengus*) and red hake (*Urophycis chuss*) were also identified by the EFH Mapper; however, according to the EFH text descriptions (NEFMC, 2017), both Atlantic herring and red hake occur in high salinity zones of greater than 25 ppt in the Chesapeake Bay, whereas the middle Chesapeake Bay, where the project is proposed, is considered a mixing zone, with salinities between 5 and 18 ppt. EFH for these species has been excluded from this assessment.

4.2 Managed Fish Species

This section includes a brief summary of ecological information compiled from NOAA Fisheries' EFH source documents and other relevant sources.

4.2.1 Atlantic Butterfish

The Atlantic butterfish is a migratory species that ranges from Newfoundland and the Gulf of St. Lawrence to the Atlantic and Gulf coasts of Florida. Butterfish are a fast-growing, short-lived pelagic species that form loose schools, often near the surface. Based on the available habitat in the EFH action area, eggs, larvae, juvenile, and adult Atlantic butterfish are likely to occur within the EFH action area based on ecological and salinity tolerances of the species. Butterfish migrate seasonally, wintering near the edge of the continental shelf in the Middle Atlantic Bight and moving inshore in the spring into southern New England and Gulf of Maine waters. Butterfish occur throughout the entire mid-Atlantic shelf during the summer, from sheltered bays and estuaries, such as the Chesapeake Bay, out to depths of approximately 650 feet (about 200 meters) (Cross et al., 1999).

Butterfish spawning occurs from May to October in the Middle Atlantic Bight, on the continental shelf, inshore areas, and bays and estuaries, including the Chesapeake Bay, where spawning begins as early as late May and peaks in June and July. Butterfish eggs and larvae are pelagic and occur from the outer continental shelf to higher salinity parts of estuaries in the Middle Atlantic Bight. Butterfish eggs are approximately 0.68 to 0.82 mm in size, butterfish larvae are approximately 2.6 to 16 mm in size, and both eggs and larvae weigh less than 2 grams (Robins and Ray, 1986). Based on the Northeast Fisheries Science Center's (NEFSC) Marine Resources Monitoring, Assessment and Prediction program ichthyoplankton survey, eggs can be found in water temperatures ranging from 43º to 79ºF (6º to 26ºC) but can be found most often in water temperatures ranging from 52º to 63ºF (11º to 17ºC). Eggs are found in surface waters at depths ranging from 33 to 5,740 feet (10 to 1,750 meters) but are mostly found at depths less than 650 feet (200 meters). Butterfish larvae can be found in water temperatures ranging from 45º to 79ºF (7º to 26ºC) and depths ranging from 33 to 4,100 feet (10 to 1,250 meters) but occur most often in water temperatures ranging from 48º to 66ºF (9º to 19ºC) and depths less than 820 feet (250 meters). Butterfish eggs tolerate estuarine to full seawater (about 25 to 33 ppt), and butterfish larvae tolerate salinity levels ranging from 6.4 to 37.4 ppt. Butterfish eggs and larvae are common in high salinity zones of estuaries in the Middle Atlantic Bight, and in the mixing zone of the Chesapeake Bay (Cross et al., 1999).

Juvenile and adult butterfish are pelagic and form loose schools near the surface. Juvenile butterfish are approximately 16 to 120 mm in size and typically weigh approximately 0.06 to 36 g, and adult butterfish are approximately 121 mm to 31 cm in size and typically weigh approximately 36 to 712 g (Robins and Ray, 1986). Both juveniles and adults are tolerant of wide water temperatures (14º to 71ºF (4.4º to 21.6º C)) and salinity (5 to 32 ppt) ranges. Juvenile and adult butterfish are often found over sand, mud, and mixed substrates. During the summer months, butterfish occur inshore where they remain at shallow depths and are frequently observed on shallow flats, in sheltered bays and estuaries, and in the surf zone. Smaller juvenile butterfish often form groups beneath floating objects, such as jellyfish, while larger juveniles are pelagic schooling fishes which are found near the bottom during the day and disperse upwards at night. Butterfish are primarily planktivorous and feed on a variety of planktonic prey, including mollusks, crustaceans, worms, coelenterates, small fish, and ctenophores (Cross et al., 1999).

Butterfish are managed under the Mackerel, Squid, Butterfish FMP. The FMP is administered by the MAFMC and includes commercial quotas, recreational limits, as well as other thresholds as defined on the MAFMC website (www.mafmc.org).

4.2.2 Black Sea Bass

The black sea bass is a warm temperate migratory species that ranges from Southern Nova Scotia and the Bay of Fundy to southern Florida and into the Gulf of Mexico. The black sea bass exists as two populations, or stocks; the Middle Atlantic stock and the South Atlantic stock. Black sea bass are seasonal migrants. Based on the available habitat in the EFH action area, juvenile and adult black sea bass are likely to occur within the EFH action area based on ecological and salinity tolerances of the species. When water temperatures dip below 57ºF (14ºC) in the autumn, the Middle Atlantic stock migrates south and offshore to wintering areas in deeper waters between New Jersey and North Carolina. As bottom waters warm above 45ºF (7ºC) in the spring, the stock migrates inshore to coastal areas and bays, including the Chesapeake Bay.

Black sea bass spawning occurs from May to July in the Middle Atlantic population, primarily along the inner continental shelf during inshore migrations. Black sea bass eggs are pelagic and typically found in water ranging from 54º to 75ºF (12º to 24ºC) at depths less than 120 feet (50 meters), according to the NEFSC Marine Resources Monitoring, Assessment and Prediction Program (MARMAP) ichthyoplankton survey. Black sea bass eggs are not often found in estuaries. Black sea bass larvae are also pelagic and are most commonly found in waters ranging from 52º to 79ºF (11º to 26ºC) at depths less than 392 feet (200 meters). Similarly to their eggs, black sea bass larvae are seldom found in estuaries. Black sea bass eggs and larvae are sensitive to extremely low or high salinity levels, and larvae prefer salinity levels ranging from 30 to 35 ppt (Steimle et al., 1999).

Juvenile black sea bass are most abundant in oceanic waters and polyhaline estuaries. They are most commonly encountered in the spring and summer where they are generally associated with structurally complex habitats and steep depth gradients. Juvenile black sea bass display extremely high site fidelity and use a variety of man-made habitats including artificial reefs, shipwrecks, bridge abutments, piers, and pilings. In the Mid-Atlantic Bight, most black sea bass nurseries occur at depths less than 65 feet (20 meters). Within estuaries, older juveniles use habitats less than 33 feet (10 meters) deep. Growth rates of juvenile black sea bass vary with temperature, salinity, DO levels and prey quality. They prefer intermediate salinities between 28 and 36 ppt, however they may occur at salinities as low as 8 ppt. Juveniles prefer temperatures between 40 º to 65º F (4 to18 ºC), and a wide range of depths (between 3 feet to 460 feet (1 to 140 meters)) (Drohan et.al., 2007).

Adult black sea bass prefer deeper waters (6 to 125 feet (2 to 38 meters)) and salinity levels greater than 20 ppt in the summer, when they can be found occupying mussel beds, rocky bottom areas, artificial reefs, wrecks, and other structures. Adult black sea bass are approximately 11 to 60 cm in size and typically weigh approximately 24 to 3,390 g (Robins and Ray, 1986). Adult black sea bass are found at much greater depths (typically 197 to 492 feet (60 to 150 meters)) and prefer water temperatures ranging from 48º to 54ºF (9º to 12ºC). Adult black sea bass prefer salinity levels ranging from 15 to 35 ppt and are intolerant of DO levels less than 2 parts per million (ppm). Adult black sea bass prey on epibenthic invertebrates as well as small fish and squid (*Lolliguncula brevis*) (Steimle et al., 1999).

Black sea bass are managed under the Summer Flounder, Scup, and Black Sea Bass FMP. This FMP is administered jointly by the Atlantic States Marine Fisheries Commission (ASMFC) and MAFMC, and includes commercial quotas, recreational limits, as well as other thresholds as defined on the MAFMC website (www.mafmc.org).

4.2.3 Bluefish

The bluefish is a migratory species that is found in the Atlantic Ocean from Maine to Florida, and around the world in temperate coastal regions (Fahay et al., 1999). Bluefish are a pelagic species, inhabiting the water column anywhere from the surface to the ocean floor, but are usually found between 25 to 33 feet deep. Based on the available habitat in the EFH action area, juvenile and adult bluefish are likely to occur within the EFH action area based on ecological and salinity tolerances of the species. Juvenile bluefish are approximately 4 to 24 cm in size and weigh approximately <2 to 145 g (Dooley, 1990). Juvenile bluefish generally occur in estuaries from May through October in Mid-Atlantic waters (Shepherd, 2006). Bluefish migrate seasonally, moving north in spring and summer as water temperatures rise and then south in autumn and winter to waters in the South Atlantic Bight (NOAA Fisheries, 2025).

Based on VIMS bottom trawl surveys within the Chesapeake Bay tributaries between 1988 and 1999, juvenile bluefish prefer salinity ranges greater than 16 ppt, with the majority of fish in the 31 ppt to 32 ppt range (Shepherd, 2006) but are known to enter estuaries where salinity is less than 10 ppt (SMS, 2005). Most juveniles occur between 75.2°F and 78.8°F (24° to 26°C) and at DO levels of 6 to 8 ppm (Shepherd and Packer, 2006). Bluefish cannot tolerate temperatures below 50°F (10°C) or above 86.7°F (30.4°C) (SMS, 2005), and as a pelagic open water species, bluefish are not well adapted to hypoxic conditions. Juveniles prefer sandy ocean bottoms but will also inhabit mud, silt, or clay ocean bottoms or vegetated areas (NOAA Fisheries, 2025). Disturbances that increase water turbidity may affect distribution and feeding of bluefish due to a reliance on vision to locate prey.

Adult bluefish live in both inshore and offshore areas and favor warmer water (NOAA Fisheries, 2025). Adult bluefish are approximately 25 to 115 cm in size and weigh approximately 163 g to 6.8 kg (Dooley, 1990). Spawning occurs in open ocean waters and takes place twice a year. It is also possible that the species has a long spawning period, and the eggs do not survive during the middle of the season, which gives the appearance of two separate spawning periods. Once bluefish hatch and are able to swim, they appear in nursery areas in estuaries and along the continental shelf in late May to mid-June with a second stock of juveniles appearing in estuaries in late August (Shepherd and Packer, 2006). Juveniles from both seasons migrate toward North Carolina in October. The current bluefish FMP was implemented in 1990 and prepared cooperatively by the MAFMC and the ASMFC. The FMP limits recreational and commercial fishing for the bluefish (these fishing limits are described in detail on the MAFMC website (www.mafmc.org)).

4.2.4 Clearnose Skate

The clearnose skate occurs along the eastern United States coast from the Nova Scotian Shelf to northeastern Florida and in the northern Gulf of Mexico. The species is considered rare in the northern part of its range (Bigelow and Shroeder, 1953). Juvenile clearnose skate are likely to occur within the EFH action area based on salinity tolerances and substrate preference.

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According to NEFSC and VIMS bottom trawl surveys, juvenile clearnose skate can be found in the Chesapeake Bay during all four seasons, most often between April and December, with peak abundance in May and August, and mostly absent in January and February. Juvenile clearnose skate are approximately 15 to 49 cm in size and weigh approximately 9.5 to 169 g. Clearnose skate have been found in other areas of their habitat range at salinities less than 20 ppt, but the VIMS trawl survey in the Chesapeake Bay observed most at salinities ≥ 22 ppt (Geer, 2002; Fitz and Daiber, 1963).

Juvenile clearnose skate prefer soft bottoms, but also occur on rocky or gravelly bottoms (Bullis and Thompson, 1965; Struhsaker, 1969). Within the Chesapeake Bight, they are more abundant in shallow water during spring and summer and more abundant overall in the Bight during the summer and autumn (McEachran and Musick, 1975). Juveniles have been collected at temperatures between 46.4°F to 75°F (8°C to 24°C) and depths of 1 to 33 meters, with most catches occurring between 7 to 15 meters. DO level preference was not described for Chesapeake Bay populations, but most juvenile clearnose skate were observed at DO levels between 6 to 10 ppm. Clearnose skate feed on several species of shrimp, small crabs, squids, and small fish such as soles, weakfish, butterfish, and scup (NOAA Fisheries, 2003).

4.2.5 Scup

Scup is a migratory species that is found in the Atlantic Ocean from Maine to Cape Hatteras, North Carolina (Steimle et al., 1999), although it has been found as far south as Florida coastal areas and bays in the spring. Based on the available habitat in the EFH action area, juvenile and adult scup are likely to occur within the EFH action area based on ecological and salinity tolerances of the species. The life history of scup is typical of most demersal fishes, with pelagic eggs and larvae, and a gradual transition to the demersal adult stage. There are two stocks of scup: Mid-Atlantic and South Atlantic, however the South Atlantic population has not been assessed and so the population status is unknown (NOAA, 2025). The Middle Atlantic Bight scup population appears to make extensive seasonal migrations and is commonly found during the summer in larger estuaries such as the Chesapeake Bay and in coastal waters.

Scup spawn once a year beginning in spring when water temperatures are greater than 50°F (10°C), along the inner continental shelf off southern New England from May through August, with a peak in June to July. Most spawning occurs in southern New England in shoal waters less than 33 feet deep until late June, when scup move into deeper waters. As inshore temperatures drop below 46°F (8°C) in the winter, scup migrate to warmer waters along the outer continental shelf to about 200 meters deep. Juveniles follow adults to the mid to outer continental shelf south of Long Island, although some remain in larger and deeper estuaries during warmer winters. During the summer and early fall, juveniles and adults are common in most larger estuaries and coastal areas in open and structured habitats. Juvenile scup appear in estuaries such as the Chesapeake Bay in June, migrate south for the winter, and return in the spring. Juvenile scup feed during the day, primarily on polychaetes, epibenthic amphipods, and other small crustaceans, mollusks and fish eggs and larvae. Copepods and mysids are also important to early juvenile diets. Juvenile scup are approximately 1.5 to 13 cm in size and weigh approximately 0.05 to 45 g. Juvenile scup have been collected at bottom temperatures of 45° to 65°F (7°to 18°C) in the spring and 59° to 72°F (15° to 22°C) in the fall at salinities of 18 to 33 ppt, and DO levels greater than 4 ppm.

Adult scup reside in the Middle Atlantic Bight from spring to fall and are generally found on a variety of structured habitats such as mussel beds, reefs, or rough bottom. Adult scup are

approximately 15.5 to 46 cm in size and weigh approximately 79 g to 2.1 kg. Smaller adult scup are commonly found in larger bays and estuaries such as the Chesapeake Bay, but larger scup tend to be found in deeper waters. Adult scup are benthic feeders and forage on a variety of prey, including small crustaceans, polychaetes, mollusks, small squid, vegetable detritus, insect larvae, hydroids, sand dollars, and small fish. When scup move inshore, they gradually accumulate food reserves from the spring into the fall to support extra energy demands of migration, reproductive development, and reduced feeding in winter. Adult scup can be found at bottom water temperatures of 43° to 81°F (6° to 27°C), and their winter distribution is mostly limited by their preferred lower limit of 45°F (7°C). Adult scup are found primarily in waters with the salinity range of 20 to 31 ppt and DO levels greater than or equal to 4 ppm.

4.2.6 Summer Flounder

Summer flounder exhibit strong seasonal inshore-offshore movements, although they are not as migratory as other species (Packer et al., 1999). Their geographical range encompasses the shallow estuarine waters and outer continental shelf from Nova Scotia to Florida; however, they are most abundant within the Middle Atlantic Bight from Cape Cod, MA to Cape Hatteras, NC. Based on the available habitat in the EFH action area, larvae, juvenile, and adult summer flounder are likely to occur within the EFH action area based on ecological and salinity tolerances of the species. Adult flounder normally inhabit shallow coastal and estuarine waters such as those of the Chesapeake Bay during the warmer months at depths of 40 to 50 feet (12 to 15 meters) and move offshore during colder months to the outer continental shelf, as deep as 150 meters. Some older adults have been shown to remain offshore year-long; however, due to overfishing most summer flounder are three years of age or less.

Tagging studies have shown that fish which spend their summer in a particular bay tend to return to that same bay in the following year. Migration timing of inshore fish varies across regions but typically occur around late April and early May. Summer flounder migrate to the outer continental shelf beginning in September or October, and it is believed that spawning occurs within the territorial waters south of Cape Cod. Summer flounder adults average 30-50cm in length and they are found in salinities of 15ppt or more. Preferred habitat for summer flounder includes sandy/shell substrates or artificial reefs (Packer et al., 1999). Information regarding summer flounder HAPC, SAV, is included in **Section 4.3**.

Estuaries, such as the Chesapeake Bay, serve as an important nursery area for juvenile summer flounders, at intermediate or high salinities. Summer flounder spawn during the fall and winter as fish move offshore to the open ocean areas of the continental shelf. The older and larger fish migrate first each year, timed by the beginning of the spawning migration period which can vary by latitude (Packer et al., 1999).

Larval summer flounder are planktonic and most abundant at depths of 10 to 70 meters between September and February (Packer et al., 1999). Larval summer flounder are approximately 8.1 to 17 mm in size and weigh less than 2 g (Robins and Ray, 1986). Larvae are most abundant at temperatures ranging from 48° to 64°F (9° to 18°C), and salinities of 20 to 35ppt. Once larval to juvenile metamorphosis begins, they leave the water column and settle to the bottom where they bury in the sediment and develop into juveniles. Juvenile summer flounder are distributed inshore and in many estuaries throughout the species range during spring, summer, and fall. Juvenile summer flounder are approximately 18 to 390 mm in size and weigh approximately 0.04 to 666 g (Robins and Ray, 1986). Some juveniles will migrate offshore to deeper waters with adult fish

during the colder months, however most will remain inshore. Juvenile summer flounder inhabit many estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas, in similar temperature and salinity profiles as larval summer flounder.

Adult summer flounder are often found in temperatures from 48° to 79°F (9° to 26°C) in the fall, 39° to 55°F (4° to 13°C) in the winter, 36° to 68°F (2° to 20°C) from the spring, and 48° to 81°F (9° to 27°C) in summer, and high salinity portions of estuaries. Adult summer flounder are approximately 28 to 94 cm in size and weigh approximately 232 g to 12 kg (Robins and Ray, 1986). They are opportunistic feeders; however, fish and crustaceans make up the majority of their diet. They are most active during daylight hours and can be commonly found in seagrass and sand habitats. (Packer et al., 1999). DO effects on summer flounder adults have not been investigated.

Despite various literature suggesting several separate stock populations of summer flounder within the Atlantic Ocean habitats, summer flounder are managed and assessed as a single stock by the MAFMC within the U.S. Exclusive Economic Zone. Spring surveys have shown that the Chesapeake Bight is a significant habitat for this species, particularly for juvenile summer flounder.

4.2.7 Windowpane Flounder

The windowpane flounder is a fast-growing left-eyed flounder species found from the Gulf of St Lawrence to Florida. Windowpane flounder make seasonal movements as bottom temperatures decrease, though their movements are less significant than other more migratory species. Based on the available habitat in the EFH action area, juvenile and adult windowpane flounder are likely to occur within the EFH action area based on ecological and salinity tolerances of the species. Both adult and juvenile flounder make seasonal movements from estuarine areas such as the Chesapeake Bay and shallow coastal waters into deeper areas during the autumn but are wide ranging throughout the year along the continental shelf, according to NEFSC bottom trawl survey data (Chang et al., 1999).

Windowpane flounder spawning occurs throughout most of the year in the Middle Atlantic Bight, with separate peaks in the spring and autumn. Spawning occurs at or near the bottom in high-salinity areas of estuaries within the Middle Atlantic Bight, though spawning is not common in the Chesapeake Bay. Windowpane flounder eggs are pelagic and are found along the nearshore continental shelf in the Middle Atlantic Bight in water temperatures ranging from 41° to 68°F (5° to 20°C) at depths less than 230 feet (70 meters), according to the NEFSC MARMAP ichthyoplankton survey. Larvae are planktonic and are found across a similar geographic range to eggs, in water temperatures ranging from 37° to 66°F (3° to 19°C) at depths less than 230 feet (70 meters). Windowpane flounder eggs and larvae are not common in the Chesapeake Bay (Chang et al., 1999).

Adult and juvenile windowpane flounder occur in nearshore bays and estuaries throughout the Middle Atlantic Bight throughout most of the year, moving into deeper waters in the winter. Juvenile windowpane flounder are approximately 11 mm to 21 cm in size and weigh approximately 0.02 to 106 g. Adult windowpane flounder are approximately 22 to 46 cm in size and weigh approximately 121 g to 1.05 kg (Robins and Ray, 1986). Both adult and juvenile flounder are typically found in waters less than 246 feet (75 meters) deep and at temperatures ranging from 39° to 75°F (4° to 24°C), on fine sandy sediment bottoms. Both adult and juvenile

flounder tolerate salinity ranging from 15 to 33 ppt and DO levels ranging from 2 to 13 mg/l. Juvenile windowpane flounder prey upon small worms, fish, and crustaceans, especially mysid shrimp (Chang et al., 1999).

Windowpane flounder are managed by the New England Fishery Management Council (NEFMC) and NOAA Fisheries under the Northeast Multispecies FMP. This FMP includes commercial quotas, recreational limits, as well as other thresholds as defined on the NEFMC website (www.nefmc.org).

4.2.8 Prey Species of Managed Fish

Federally-managed fish species prey upon other fish species within the project area. Prey species are important to an assessment of federally-managed fish species occurrence because fish species often travel based on the migratory patterns of their prey. Any impacts to these prey species are likely to result in behavioral modifications to the federally-managed fish species as they adapt to the changing prey conditions. Prey species of each of the federal-managed species are discussed below.

Prey species within the project area that are consumed by butterfish include a wide variety of planktonic prey, including crustaceans, mollusks, small fish, and a variety of other invertebrate species (Cross et al., 1999). Plankton can be found in the Chesapeake Bay throughout the year.

Prey species within the project area that are consumed by black sea bass and scup include small crustaceans such as juvenile blue crab (*Callinectes sapidus*), mollusks such as mussels, multiple species of small pelagic baitfish, squid, and a variety of other aquatic invertebrates. Blue crab are found along the Atlantic coast from Massachusetts Bay to northern South America. Blue crabs are abundant throughout the Chesapeake Bay during the summer and male crabs winter in shallow grass beds, muddy-bottom areas, and deep water throughout the bay, while female crabs winter in saltier waters near the mouth of the bay (MDNR, 2007c). Blue crabs are managed by MDNR within the EFH action area under the Chesapeake Bay Blue Crab FMP. This FMP includes commercial quotas, recreational limits, as well as other thresholds.

Prey species within the project area that are consumed by bluefish include bay anchovies, squid, butterfish, round herring (*Etrumeus sadina*), alewife, American shad, white perch, Atlantic menhaden, and blueback herring (Buckel et al., 1998).

Alewife and blueback herring are often managed together and collectively known as "river herring." Alewife spawn in coastal rivers in the spring when water temperatures reach 60.8°F (16°C) to 66.2°F (19°C), and blueback spawn in coastal rivers in temperatures of 69.8°F (21 °C) to 75.2°F (24°C) (Haas-Castro, 2006). River herring have been managed since 1985 by ASMFC under the FMP for American shad and river herring to stop exploitation of the species. American shad are found from Labrador to northern Florida (Haas-Castro, 2006). Shad migrate to the Chesapeake Bay in the spring for spawning and leave the Bay by summer. The American shad is managed by ASMFC under the FMP for American shad and river herring. White perch inhabit the Chesapeake Bay and its tidal tributaries. Mid-Atlantic Acoustic Telemetry Observation System data for 2021 through 2024 from the Chesapeake Bay North Array, located just south of the Bay Bridge, indicates that white perch were detected in the area around the Bay Bridge in March and April. They are found in open waters close to the shore and upstream tributaries (Lippson, 2006) and reside throughout the year within the Chesapeake Bay and its tributaries.

White perch spawn in fresh or brackish water during the summer (Jordan and Evermann, 1896 to 1900).

Atlantic menhaden are an important food source for many predatory fish species in the Chesapeake Bay, including bluefish and summer flounder. They are common throughout the Chesapeake Bay from spring to fall. Menhaden are a migratory species and typically migrate from the Chesapeake Bay to deeper waters off the coast in late fall (VIMS, 2025a). Menhaden are managed by the ASMFC Atlantic Menhaden Management Board (ASMFC, 2025).

Other small forage fish species common in the Chesapeake Bay that are preyed upon by bluefish and summer flounder include Atlantic silversides (*Menidia menidia*), killifishes (*Cyprinodontiformes* family), gizzard shad, and spot. Atlantic silversides are one of the most common forage fish species found in the Bay and are common in shallow waters of the Bay during the summer (CBP, 2025a). The striped killifish and mummichog are the most common killifish species found in the Chesapeake Bay. Mummichog can tolerate a wider salinity range and can be found in fresher water than the striped killifish, which prefers more saline waters (CBP, 2025b and CBP, 2025c). Gizzard shad are found year-round in fresh to slightly brackish waters in the Chesapeake Bay region. Mid-Atlantic Acoustic Telemetry Observation System data for 2021 through 2024 from the Chesapeake Bay North Array indicates that gizzard shad are common in the area around the Bay Bridge in November and December. Adult gizzard shad are tolerant of brackish to saline waters, while juveniles are less tolerant of salinity than adults and are more commonly found upstream in freshwater habitats (MDNR, 2007a). Spot are found in the Chesapeake Bay from spring to fall, before moving offshore to spawn. Juveniles are more widespread than adults and can be found in the bay as well as freshwater habitats (MDNR, 2007b).

Prey species within the project area that are consumed by clearnose skate include polychaetes (clam worms and lugworms), amphipods including several species of shrimp, small crabs, squids, and small fish such as soles, weakfish, butterfish, and scup (NOAA Fisheries, 2003).

Prey species within the project area that are consumed by windowpane flounder include small worms, fish, and crustaceans, especially mysid shrimp (Chang et al., 1999). Mysid shrimp are abundant in the Chesapeake Bay and are an important food source for many juvenile and adult fish species (Sea Grant, 2021).

4.3 Habitat Areas of Particular Concern Within the EFH Action Area

SAV, or rooted macrophytes, are important HAPCs for the growth and protection of juvenile summer flounder. SAV is present within and surrounding the EFH action area. The Fisheries Management Councils and NOAA Fisheries provide conservation, management, and research priority to HAPCs because they are critical elements of healthy ecosystems and sustainable fisheries.

4.3.1 SAV Habitat and Requirements

Summer flounder HAPC is defined by MAFMC as, “all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH…”. SAV beds serve as vital habitat for summer flounder in several life stages. Juvenile summer flounder favor eelgrass for shelter and feeding, as preferred prey species are attracted to eelgrass beds. Macroalgae beds are also used by juvenile flounder,

as they offer similar ecological benefits to eelgrass beds. Adult flounder use seagrass and macroalgae beds as foraging habitat by sheltering in sandy areas within or adjacent to beds and using seagrass or macroalgae as visual cover to capture prey moving within the beds (Packer et al, 1999). SAV beds also serve as essential habitat for many summer flounder prey species.

SAV is present within the EFH action area along the northern side of the eastern terminus of the Bay Bridge, according to VIMS SAV GIS data from 2019-2023. SAV grows in clear, shallow water where sunlight can reach the bottom sediment. Turbidity in the water column limits the depth at which SAV can grow and can cause SAV dieback at high levels (VIMS, 2025b). Sedimentation can cover SAV plants and limit their ability to photosynthesize. Excess nutrients in the water column contribute to algal blooms, which can shade underlying SAV and limit growth or cause die-back. Physical impact to SAV beds from dredging, debris, and boat propellers can uproot and damage SAV plants, eliminating sections of or even entire SAV beds.

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5 ASSESSMENTS OF IMPACTS AND MITIGATION MEASURES

Impacts to federally-managed fish species and their habitat would occur as a result of construction of new bridges and the demolition of the existing bridges. The Tier 2 Study is currently in preliminary engineering for the MDTA RPA and as such, design, construction, and demolition means and methods are based on preliminary assumptions. Impacts analysis is estimated from preliminary design, assumptions based on best professional judgement, and information gathered from similar bridge construction projects. Shock waves produced by pile-driving for construction and subaqueous demolition of the existing bridge are likely to have the largest negative consequences for fish species and their associated habitat. Activities with the potential to cause fish mortality during construction of the new bridge and demolition of the existing bridge include pile driving/removal, mechanical dredging, , blasting, permanent fill of EFH, potential water quality degradation associated with increasing impervious landcover, and rubble removal.

The MDTA is committed to applying the appropriate mitigation methods to minimize impacts to federally-managed fish species, their designated EFH, and HAPC identified within and adjacent to the EFH action area. The MDTA would implement protection measures specific to the project setting and construction methods to minimize impacts within the EFH action area to the greatest extent practicable during construction. The MDTA would determine protection measures during final design. Using the latest and evolving technologies, drawing upon lessons learned from similar projects in the area, and in consultation with NOAA Fisheries, the MDTA would incorporate best management practices (BMPs) to protect fish and associated habitat. Anticipated impacts to EFH, federally-managed fish species, and HAPC within the EFH action area are presented in this section following a discussion of preliminary proposed construction methods.

5.1 Impacts to EFH and Environmental Consequences

Demolition and construction methods used to implement the MDTA RPA would result in adverse effects to federally-managed fish species within the EFH action area. Adverse effects would be caused by construction of the new bridge, construction of roadway approaches, and demolition of the existing bridge via blasting and manual methods. Adverse effects caused by pier construction and dredging would include increased turbidity due to sedimentation, changes in bottom sediments and bathymetry, bottom habitat conversion, noise and vibration from pile driving, and impediments to fish passage. Permanent fills from pier construction and pier protection would result in irretrievable loss of bottom habitat and/or habitat conversion. Construction activities may also disrupt fish movement and migrations. Long-term temporal effects on EFH are anticipated.

Dredged areas will be in place throughout the construction duration. Although the exact timing of the dredging is unknown, an estimated two thirds of the dredging will take place in the first and second years of construction to accommodate the eastbound bridge. This initial dredged area will remain in place for 15 years or more if there is a gap between construction of the two bridges. The remaining one third of dredging will take place at the start of construction of the westbound bridge and is estimated to be in place for 8 years. Dredging for the eastbound bridge is estimated to take up to 14 days to complete and dredging for the westbound bridge is estimated to take up to 7 days to complete. During these approximately 21 days of dredging in the shallow areas of the Chesapeake Bay within the MDTA RPA LOD, increases in sedimentation and turbidity will likely impact fish behavior and biology throughout the EFH action area, as fish avoid shallow

waters and respond to increased turbidity. Due to the duration of the placement of dredge material, any pre-existing habitat within the proposed dredging footprint would be considered permanently lost. Within the dredged area, benthic contours would be restored and benthic habitat would begin to re-establish after the construction period. Other potential impacts of dredging to all federally-managed species and life stages present within the EFH action area for the MDTA RPA include:

- the generation of suspended solids/turbidity and the resultant degradation of surface water quality and sediment quality;
- a decreased photic zone due to increased turbidity;
- elimination of benthic populations within the dredging zone;
- deposition of dredge-induced suspended sediment on benthic populations downstream of the dredging zone;
- alteration of bottom substrate and depth characteristics of niche habitats in shallow waters potentially displacing species adapted to those habitats;
- fish mortality from dredge equipment;
- disruption of normal foraging or spawning behaviors of fauna;
- gill injury to fish from exposure to local increases in turbidity; and/or
- re-suspension of contaminants, and/or release of nutrients resulting in eutrophication of the waters and increase biological oxygen demand and subsequent reduction of dissolved oxygen.

Underwater noise and vibrations caused by demolition of the existing bridge and construction of the new bridge would have the largest adverse effects on federally-managed fish species. Noise may cause physical injury to fish hearing, swim bladders, and tissues, which may be fatal. Fish kills can attract predators to the area, including other fish, birds, and mammals. These predators may then be affected by construction and demolition operations, compounding their effects. Behavioral modifications can also result from underwater noise, including delayed, abandoned, or altered spawning migrations, reduced movement, and a smaller foraging area.

All life stages of federally-managed fish species within the EFH action area would be affected by underwater noise, since the current design assumptions indicate that pile driving would likely occur throughout years 1 through 3 of construction of the eastbound bridge and its pier protection, and years 7 through 12 for the westbound bridge and its pier protection, for a total of 9 years of intermittent pile driving. Pile driving is estimated to occur on about 120 days for the eastbound bridge within the 3-year pile driving window, and about 138 days for the westbound bridge within a 6-year window. It is important to understand that although the pile driving time will be protracted, it will not happen on a daily basis and when it occurs, it will not always occur for full days. Exact timing for pile driving has not been determined, but it could possibly take place throughout multiple seasons of the year, with breaks for time-of-year restrictions to protect aquatic species, for adverse weather conditions, to set-up or break-down equipment, and to conduct other construction activities.

While there will be a 12-hour quiet period implemented each day within the MDTA RPA LOD in which pile driving will not be conducted, extended periods of noise throughout the middle Chesapeake Bay are likely to affect migration and spawning patterns. These effects will likely affect population numbers, as multiple year classes of federally-managed fish and their prey are affected by far-reaching and high-intensity underwater vibration and pressure caused by pile

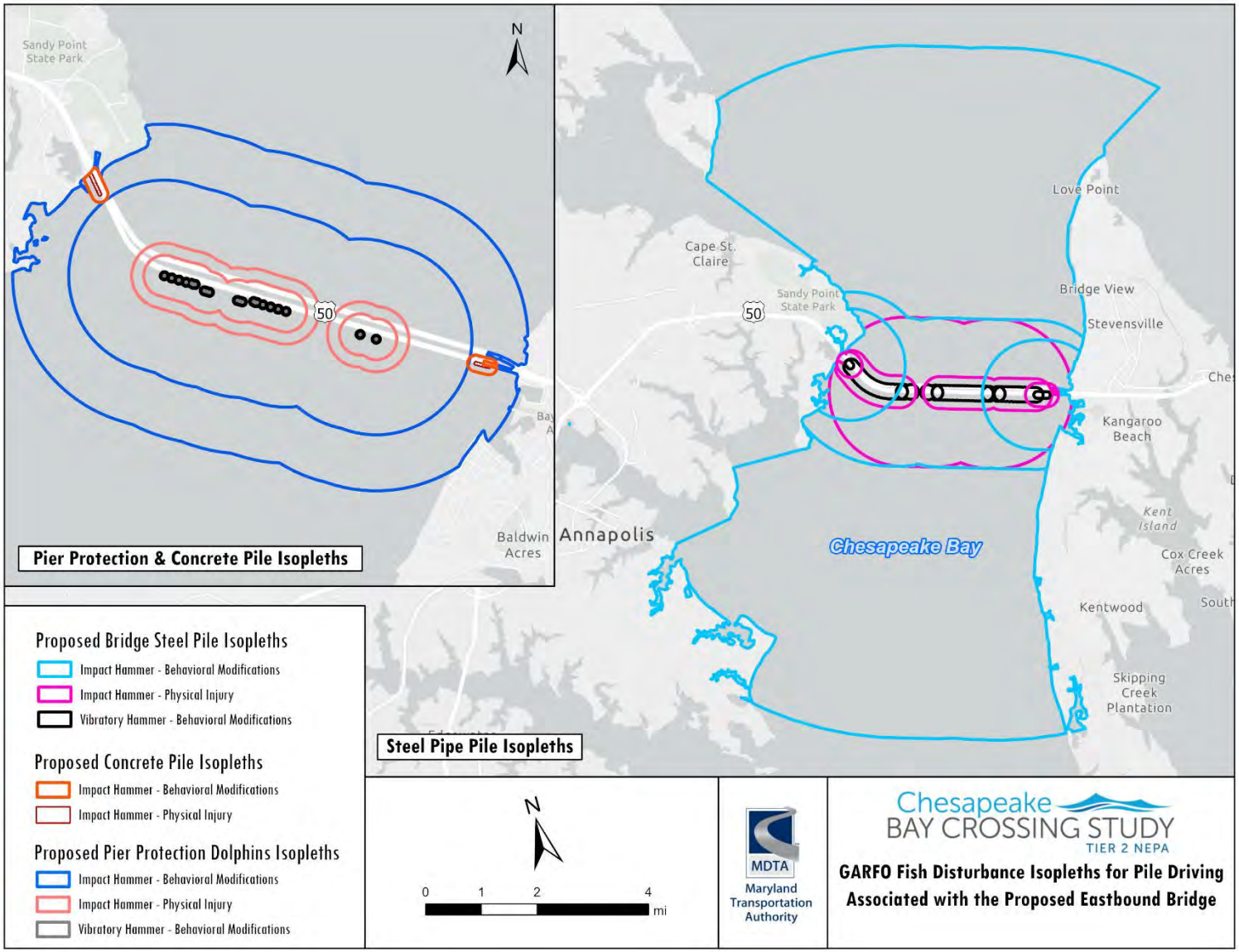
driving. The fact that pile driving for the eastbound and westbound bridges will be separated by at least a 3-year gap will provide federally-managed fish species some time to rebound from adverse effects before entering a new phase of noise impact.

Noise disturbance is quantified as a circular area emanating from a point source (in this case, pile driving or blasting), indicated by an underwater isopleth. As shown in **Figure 5-1**, the distance of the sound effects of pile driving is dependent upon the pile size, material, and methods used. Note that individual pile driving isopleth extents were merged for each pile type and are shown in **Figure 5-1Error! Reference source not found.**. Up to 16 piles could be driven at any given time, resulting in concurrent isopleths or zones of fish injury/behavioral modification.

Though specific construction means and methods have not been developed, estimates of pile types and installation methods were assumed based on construction means and methods of similar projects, including Nice-Middleton Bridge and Francis Scott Key Bridge and to provide the most impactful reasonable estimate of impacts. Actual noise levels resulting from pile driving operations for the pile types and sizes assumed during preliminary design are not available at this time. Therefore, the extent of pile installation noise impacts were calculated using proxy noise levels for pile driving provided by the NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) Multi-Species Pile Driving Calculator (NMFS 2025). Proxy sound levels were used for the Peak, Single Strike Sound Exposure Level (SELss), and Root Mean Square (RMS) Unattenuated Single Strike Level. Calculations were completed for multiple bridge pier types based on the current design assumptions, including: impact hammer installation of 36” square concrete piles, impact hammer and vibratory hammer installation of 36” steel pipe piles; 48” steel pipe piles (for bridge pier and fender installation); 96” steel pipe piles; and 14” steel H-piles and 19.6” sheet piles for dolphin pier protection. Conservative estimates were used for all instances. When a proxy was not available for a specific pile type, a larger pipe proxy was included in the calculations to provide the largest estimate of noise impacts.

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Figure 5-1: GARFO Fish Disturbance Isopleths for Pile Driving Associated with the Proposed Eastbound Bridge



The MDTA assumes construction of the MDTA RPA would require installation of up to 16 piles per day, 2,500 strikes per pile (impact), and 30 minutes per pile (vibratory), based on the Underwater Noise Monitoring Plan for the Francis Scott Key Bridge Project. In the GARFO tool, the Distance Associated with Single Strike Level/Measurement Distance (meters) and Transmission Loss Constant values were maintained at their default values, 10 and 15, respectively. Attenuation is assumed, as bubble curtains would be in place. Calculations were completed with attenuation levels set at 10 dB for bridge pile installation, a conservative estimate based on the 15-20 dB of attenuation attained with pile installation associated with the Nice-Middleton Bridge Project. Dolphin pier protection installation calculations were completed with attenuation levels set at 5 dB based on the assumption that the bubble curtain would be less protective in this scenario.

Table 5-1 provides a summary of the pile driving isopleths resulting from impact and vibratory hammers for each of the proposed pile types that would cause onset of physical injury and behavioral modification to fish. Isopleths (in feet) provided by the GARFO Multi-Species Pile Driving Calculator include peak threshold, cumulative Sound Exposure Level (SEL_{cum}) for physical injury and RMS threshold for behavioral modification.

Table 5-1: GARFO Tool Summary: Response of Fish to Impact and Vibratory Hammer Operation

Impact Hammer				Vibratory Hammer
Pile Type	Onset of Physical Injury		Behavior Modification	Behavior Modification
	Peak threshold (FT)	SEL_{cum} (FT)	RMS Threshold (FT)	RMS Threshold (FT)
36" Square Concrete	2.8	82.4	382.5	N/A
36" Steel Pipe	13.1	1,120.3	5,199.8	328.1
48" Steel Pipe	20.7	606.3	4,459.8	706.8**
48" Steel Pipe (60" Steel Pipe Proxy)*	13.1	1,522.8	7,068.4	706.8**
96" Steel Pipe	60.6	7,068.4	32,808.4	706.8**
14" Steel H-Pile	20.7	960.8	4,459.8	15.23
AZ Sheet Pile	13.1	1,522.8	7,068.4	152.3

Note: SEL_{cum} for fish >2g and fish <2g are the same value and therefore only presented once.
**In order to create an increasing trend in noise effect between all steel pipe pile sizes, two 48" steel pipe proxies were used to create a range of likely impacts. The noise proxy levels for a 48" steel pipe did not produce the expected impacts for the SEL_{cum} and RMS Threshold and therefore the noise proxy for a 60" steel pipe was used instead.*
***The GARFO tool only includes vibratory proxies for 36" steel pipes and 72" steel pipes. Therefore, for every steel pipe greater than 36" in diameter, 72" steel pipe sound proxy levels were used.*
Sound proxy levels used were not attenuated and a 10dB attenuation was then added in the GARFO tool.
*See **Appendix B** for the GARFO tool output.*

Pile driving (via impact hammer) the 96" steel pipe piles would likely result in the largest physical injury and behavior modification potential of all pile types, as indicated in **Table 5-1**. Up to 12 hours of noise due to piling driving is anticipated per day. An effective quiet time of 12 hours per day will be implemented, as practicable. See **Figure 5-1**Error! Reference source not found. for a visual representation of the isopleths associated with all pile driving activities. The resulting isopleths for installation of piles for the main bridge spans, pier protection, and trestle installation

would possibly result in physical injury and likely result in behavior modification to fish. Accurate fish stock counts for the middle Chesapeake Bay are not known at this time, and therefore exact mortality and behavior modification numbers for federally-managed fish species cannot be determined.

While details of what would be required with regards to blasting are unknown at this preliminary stage of design, it is assumed that based on the depth and size of some existing piers, blasting would be required to remove select bridge elements. According to current design assumptions, blasting would occur in years 6 and 7 for the eastbound bridge, totaling 9 blast events, and would occur again in years 14 and 15 for the westbound bridge, totaling 7 blasting events. Blasting instances are considered intense, discrete impact events and therefore the timing of these events can be scheduled to minimize impacts to federally-managed species. To minimize duration and magnitude of impact, any required blasting would take place during times of lower biological activity, from October 1 to December 15. During this period, juveniles and adults of all federally-managed fish species and larval summer flounder would be affected by blasting within the EFH action area.

Blasting produces pressure waves that can cause swim bladders to rupture, causing severe injury or mortality. The acoustic effects of blasting affect fish hearing and tissues. Blasting can also increase water turbidity and sedimentation in the area surrounding the blasting event, resulting in decreased water quality and impacts on fish respiration. However, prior to blasting, scare charges and fish deterrent boats will be used to minimize injury and mortality. A blasting plan will be developed in coordination with the appropriate regulatory agencies. For more information on avoidance and minimization techniques, see **Section 5.4**.

Adverse effects to water quality from dredging and in-water demolition may include an increase in turbidity and potential release of nutrients and contaminants from bottom sediments. Increased turbidity can deplete DO within EFH. As reported in **Table 3-1**, existing DO levels within the EFH action area are already below the regulated water quality criteria. Construction activities resulting from the MDTA RPA may further reduce DO levels and negatively affect federally-managed fish species. For example, Bluefish are not well adapted to low DO levels, and summer flounder are highly sensitive to DO levels less than 3 ppm, as well as areas of significant pollution. Adult black sea bass are intolerant of DO levels less than 2 ppm. Adult scup are found primarily in waters with DO levels greater than or equal to 4 ppm. Turbid water also limits vision in fish, which can inhibit the predation success of fish species. Dredging and pier construction would also result in changes to bottom sediments and bathymetry in the shallow areas of the EFH action area that have the potential to convert and/or completely fill bottom habitat of federally-managed fish species including flounder.

Impediments to fish passage would only be partial and concentrated to specific areas, as the MDTA would utilize specialized work zones during construction. Impacts from vessel interaction are unlikely because construction would utilize slow moving barges that federally-managed fish species can readily avoid. Fish entanglement is unlikely to occur with the current design assumptions.

Adverse effects within the EFH action area may include pollution from stormwater runoff resulting from increased impervious area, potentially resulting in long-term loss of forage and prey species that are sensitive to changes in water quality (EPA CADDIS, 2025). Roadway maintenance and

stormwater runoff may convey particulates, metals, oil and grease, organics, nutrients, and other substances to EFH. These runoff constituents can be grouped as heavy metals, salt, organic molecules, and nutrients (Trombulak and Frissell, 1999). As noted in **Section 3**, pH levels and bacteria levels sampled within the EFH action area are already above regulated water quality criteria. Additional impervious area resulting from the MDTA RPA construction activities may increase the levels of pH and bacteria and may further affect federally-managed fish species.

There would be adverse effects to aquatic life in the EFH action area waters. Specialized protection measures would be implemented during construction to reduce impacts to EFH, federally-managed fish species, and SAV. The MDTA will continue to coordinate with NOAA Fisheries and MDNR to determine and implement appropriate avoidance and minimization measures as design progresses. **Section 5.4** includes proposed avoidance and minimization measures.

Table 5-2 summarizes the area of adverse effects to EFH and other aquatic habitats found within and surrounding the EFH action area that would result from the MDTA RPA. Impacts to EFH within the EFH action area in acres were determined by overlaying the EFH area from the NOAA Fisheries EFH Mapper with the EFH action area in GIS. Alternative C was identified as the MDTA RPA because it has the least overall environmental impact, including fewer EFH impacts, compared to the other build alternatives. All EFH boundaries for federally-managed fish species were reviewed to ensure they accurately reflect the EFH text description and were amended if needed.

Table 5-2: Action area EFH and Aquatic Habitat Effects

EFH Resource/Habitat	Impact (acres)
Atlantic butterfish* EFH – Adult, Juvenile, Larvae, and Egg	1,289
Black sea bass EFH – Adult and Juvenile Bluefish EFH – Adult and Juvenile, Clearnose skate EFH – Juvenile, Scup EFH – Adult and Juvenile, Summer flounder EFH – Adult Juvenile, and Larvae, Windowpane flounder EFH – Adult and Juvenile	4,013
Tidal Wetlands (Acres)	9
Tidal Waterways** (Acres)	4,013
SAV† (Acres)	22
NOB (Acres)	729
Historic Oyster Bottom (Acres)	1,065
Oyster Plantings (Acres)	38
Oyster Sanctuaries (Acres)	15
Public Shellfisheries (Acres)	372
Horseshoe Crab Habitat (Linear Feet)	14,972

EFH boundaries derived from the NOAA Fisheries EFH Mapper – New England/Mid-Atlantic Region at: https://www.habitat.noaa.gov/protection/efh/newInv/index.html
** Atlantic butterfish EFH boundaries were amended from the mapped NOAA boundaries to more accurately reflect butterfish habitat as described in the EFH text description and only includes depths of 33 feet and greater.*
*** Tidal waterways are considered diadromous fish habitat.*
† The EFH action area's 500-foot buffer of the RPA LOD accounts for potential turbidity effects to SAV.
Tidal waterways and EFH impact numbers reported above include existing pier and pier protection areas.

5.2 Impacts to HAPC

The MDTA RPA avoids direct adverse effects to SAV, but would have substantial indirect adverse effects. Adverse effects to HAPC (SAV) from the MDTA RPA could include impacts to SAV

photosynthesis from increased turbidity and sedimentation from ground disturbances, such as grading and vegetation clearing, and impacts to SAV health due to pollution from stormwater runoff or construction equipment fuel leaks. Due to the location of the mapped SAV north of the existing bridge, no additional impacts resulting from shading from the newly constructed and widened bridge decks are anticipated. SAV establishment would be limited in the future due to increased areas of shading from the widened bridge spans. Increased turbidity can also lead to deposition of silt on fish spawning sites and could discourage the growth of SAV, which provides valuable DO to the water column and habitat for fish, shellfish, and other aquatic biota. Removal of SAV by dredge or fill is not anticipated. Long-term temporal effects on HAPC are anticipated, but the overall construction schedule is unknown at this preliminary design stage. Demolition of the existing bridge spans and construction of new bridges may be separated by years or even decades. The current bridge design assumptions include a continuous sequence of construction from year 1 through year 15 for construction of the eastbound bridge, demolition of the existing eastbound bridge, construction of the westbound bridge, and demolition of the existing westbound bridge. Even if the construction of both bridges were to be conducted continuously without a pause between the eastbound and westbound bridges, SAV would be exposed to construction stressors for 15 years, affecting water clarity and altering growing conditions.

The MDTA RPA would avoid direct adverse effects to SAV because it is a southern alignment and avoids the area just north of the bridge along the eastern shoreline and therefore does not encroach upon SAV areas near Kent Narrows. However, the MDTA RPA will have substantial indirect adverse effects to SAV through temporary but repeated effects of sedimentation and turbidity from demolition and construction activities and permanent effects of shading and stormwater runoff limiting the expansion of SAV beds within the EFH action area. Impacts to SAV would be re-evaluated during final design based on the 5-year composite coverage from VIMS and any recent surveys. The MDTA will incorporate necessary measures to avoid, minimize, or otherwise offset impacts to SAV, as appropriate. Impacts to SAV shall be mitigated at a 3:1 ratio.

5.3 Proposed Avoidance and Minimization Measures

The MDTA will determine in coordination with NOAA Fisheries whether it is practicable to implement a Safe Zone of Fish Passage (SZFP). A SZFP could potentially include both shallows and channel edges to allow for a sufficient migratory corridor and would be intended to allow fish to move freely and safely to their spawning grounds.

While blasting would have an acute adverse effect on fish in close proximity to the charge, the duration of impact would be short and timing of blasting would be coordinated with NOAA Fisheries to ensure the least potential impact on federally-managed fish species, which would likely be between October 1 and December 15.

Fish habitat and water quality impacts due to demolition, construction, and the increase in impervious surfaces related to the project would be managed through implementation of erosion and sediment control BMPs along with water quality monitoring plans, which will document compliance with state water quality standards, and commitments to minimize underwater noise, including bubble curtains. The MDTA intends to consider time-of-year restrictions for aquatic biota and to work with the resource agencies to develop a construction plan that considers protection for sensitive resources. Additionally, as outlined below, the MDTA intends to commit to some avoidance and minimization measures and plans to consider other avoidance and minimization measures.

Avoidance and minimization measures would continue to be evaluated for the MDTA RPA during final design. This would include implementation of specialized construction methods to ensure the protection of sensitive resources. The MDTA commits to minimizing all in-water fills, both temporary and permanent. Temporary impacts in place for greater than 1 year would be considered permanent impacts to account for the temporal loss of function in these areas. Temporary versus permanent impacts have not been determined at this stage of design. The MDTA has prepared a hydrodynamic modeling report that evaluates the existing hydrodynamic conditions of the broader study area. During final design, the MDTA commits to evaluating the hydrologic implications of the proposed design to maintain hydrodynamic conditions to the greatest extent practicable. Specialized construction methods may include time-of-year restrictions, detailed monitoring plans, and project implementation schedules.

Potential construction methods to minimize impacts to federally-managed fish species (adapted from the *NOAA Fisheries/FHWA BMP Manual* (NMFS GARFO, 2017) and the *FHWA Programmatic Essential Fish Habitat Consultation and General Concurrence for Select Transportation Actions in the NMFS Greater Atlantic Region* (NMFS GARFO, 2024)) are summarized in the following sections. The MDTA will commit to the avoidance and minimization methods included in the first list below and will consider all other measures/methods, included in the second list below, that may or may not be adopted and will be negotiated with the resource agencies.

List of Avoidance and Minimization Commitments:

Underwater Noise/Hydroacoustic Energy

1) Use noise attenuation and minimization measures during pile driving, including:
   a) Surrounding piles with a bubble curtain system.
   b) Using a “soft start” or “ramping up” pile driving (e.g., driving does not begin at 100% energy).
2) Develop an underwater noise monitoring plan to describe the underwater noise generated by project activities and adaptive management measures planned to address the underwater noise.
3) Employ scare charges and fish deterrent boats ahead of blasting activities.
4) Implement an effective quiet time of no pile driving for 12 hours per day.
5) Develop a detailed blast plan with minimization measures, and submit to NOAA Fisheries for review, in advance of any detonation activity.

Turbidity and Sedimentation

1) Limit the amount and extent of turbidity and sedimentation by using appropriate sedimentation and turbidity controls such as silt curtains, settling basins, and cofferdams. The MDTA will specify the measures to be used in the construction plans:
   a) Install erosion control measures prior to ground disturbance;
   b) Inspect daily and maintain continuously in an effective operating condition all ESC measures until such time as they are removed with prior permission from the MDE inspector;
   c) Upon project completion, remove and stabilize all temporary construction materials with sediment and erosion control measures to prevent reentry into waterways.

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Reduced Water Quality

1) Avoid, to the greatest extent practicable, the use of creosote or pressure treated (Chromated Copper Arsenate or Alkaline Copper Quaternary etc.) piles and do not locate any treated piles in areas containing shellfish or in sensitive habitats.
2) Remove cofferdams or other diversion structures only after water quality is consistent with ambient levels outside the structure.
3) Remove contaminants and sediments from water discharge prior to entering aquatic habitats.
4) Evaluate dredge material to determine the appropriate disposal method and location.
5) Manage concrete wash water and cooling water effluent from concrete saw operations to ensure they do not enter the Bay untreated.

Habitat Alteration

1) Remove temporary structures and fills including monitoring devices in their entirety. Return aquatic habitats impacted by temporary activities, fills, or structures to pre-construction or better condition, including contours, elevations, substrate, and vegetation.
2) Include methods to document fish stuns/kills in the Underwater Noise Monitoring Plan and coordinate these methods with NOAA Fisheries Habitat and Ecosystem Services Division.
3) Coordinate with GARFO on specific recommended time-of-year restriction dates, based on the proposed activities and location.

Vessel Interaction

1) Do not moor vessels in SAV or in such a way that could shade SAV.

List of Avoidance and Minimization Considerations:

Underwater Noise/Hydroacoustic Energy

1) Use of mechanical demolition methods, instead of blasting, when possible.
2) Conduct noise-generating work in a way that minimizes acoustic effects and avoids injury to federally-managed fish species. Explore potential attenuation measures based on the Section 7 Acoustic Tool.
3) Use of noise attenuation and minimization measures during pile driving, such as:
   a) Isolation casing or dewatered cofferdam. Contained bubble curtains would be utilized to the extent practicable. Where use of a contained bubble curtain is not feasible, use of an uncontained bubble curtain would be evaluated. There may be some circumstances in which neither a contained nor uncontained bubble curtain would be feasible, in these circumstances rationale would be provided to the resource agencies prior to driving piles.
   b) Using vibratory hammers and construction phasing to minimize acoustic impacts.
   c) Minimizing the number and size of temporary and permanent piles.
   d) Using steel versus concrete piles and pre-cast piles to minimize the use of vibratory hammers and reduce underwater noise.
   e) Driving piles as deep as possible with a vibratory hammer prior to using an impact hammer.
   f) Using cushion blocks when using an impact hammer.
   g) Using drilled shafts instead of hammered piles where appropriate.

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4) The detailed blast plan may include measures to:
   a) Stem (cap/fill) each detonation bore hole;
   b) Fire all charges in a single firing circuit with a delayed detonation between each charge;
   c) Focus blast energy towards a solid substrate rather than towards the water column;
   d) Install noise attenuating devices such as bubble curtains;
   e) Conduct the blasting during periods of low water or low tide;
   f) Use rubber blasting mats to reduce debris and acoustic signature;
   g) Use low weight/energy repellant charges that startle fish from the area prior to blasting;
   h) Install appropriate monitoring devices to adaptively manage the blasting plan;
   i) Detonate charges using explosive weights that result in pressure levels less than species injury/mortality and behavioral thresholds. The production of injury/mortality thresholds should remain within 100 feet of the blasting source; and
   j) Place a weighted turbidity curtain around blast areas to act as a barrier. Ensure the area is clear of all ESA-listed species prior to closing the curtain. If injury/mortality thresholds are expected, the turbidity curtain should be placed at a distance from the source beyond where injury thresholds would occur.

Turbidity and Sedimentation

1) Position new structures to avoid altering natural sediment accretion rates and pattern.
2) Use operational modifications such as conducting the work at low tide to limit sedimentation and turbidity.
   a) Prevent sediment and debris from entering the water using geo-textile fabric, hay bales, or other methods. Use nets, tarps, and pans when demolishing bridge superstructures; remove demolition debris that falls into the water.
3) Minimize the suspension of sediments and disturbance of the substrate when removing piles by implementing the applicable techniques:
   a) Remove piles with a vibratory hammer, rather than by direct pull, jetting, or clamshell;
   b) Remove piles slowly to reduce sediment sloughing off in the water column;
   c) Strike or vibrate the pile to break the bond between the sediment and pile to minimize the pile breakage, and reduce the amount of sediment sloughing off the pile during removal;
   d) Cut or drive the piles at least two feet below the mudline and leave the stub in place;
   e) Place piles on a barge equipped with a basin to contain all attached sediment and runoff water after removal.
4) Use operational modifications to minimize turbidity and sedimentation during dredging. This may include using an environmental bucket on mechanical dredges, reducing lift speeds, using small diameter cutterhead dredges, and/or limiting the use of large hopper dredges.
5) Design the dredge footprint to avoid sensitive habitats to the greatest extent practicable and provide appropriate buffers to protect these areas from accretion of sediment resuspended during dredging.
6) Prohibit side-casting or temporary storage of dredged material in the waterway.
7) Prohibit unfiltered or unprocessed overflows from barges into the water and ensure that any barge transfer is accomplished without generating sediment plumes.

Reduced Water Quality

1) Only use clean fill. Place fill so that it is not likely to be eroded by high water flows.
2) Minimize the amount of new impervious surfaces and maintain a vegetated buffer between the water and upland activities.

3) Incorporate stormwater controls to minimize pollutants in aquatic habitats, including determining whether the proposed bridge could include measures to collect runoff and route it to upland features for treatment prior to discharge.
4) Ensure temperature and DO levels remain within the appropriate ranges to reduce any effects to federally-managed fish species.
5) Ensure that raw concrete or grout does not contact the water.

Habitat Alteration

1) Place a geotextile barrier under any temporary platforms and/or access fills to ensure that any fill would be removed completely at the end of construction.
2) Develop a project schedule and plan prior to construction, which avoids or minimizes sediment disturbance, noise, and physical obstruction during sensitive life stages (migration and spawning) of federally-managed fish species. This may include isolating in-water work or implementing time-of-year restrictions.
3) Complete pre- and post-construction monitoring to determine the project was completed as intended to determine fishery resources present, habitat impacts, and mitigation needs.
4) Use multiple-season biological sampling data (pre- and post-construction) to assess the potential and resultant impacts on habitat and aquatic organisms.
5) Conduct post-dredge surveys to ensure targeted depths are reached and to determine benthic recovery.
6) Fill all holes left by the piles with clean substrate appropriate for the site.
7) Orient artificial lighting on crossings to avoid illumination of the surrounding waters at night.
8) Design bridge abutments to minimize disturbances to banks and locate them outside of the floodplain.
9) Incorporate measures that increase the ambient light transmission under the bridge including:
    - maximizing the height of the structure;
    - minimizing the width of the structure; and
    - minimizing the number of instream pilings/piers.
10) Consider beneficial use of suitable sediments and give priority to beneficial uses of material that contributes to habitat restoration and enhancement.
11) Ensure that any proposed dredging is necessary to maintain target depths. Evaluate recent bathymetric surveys to determine the existing depths of the proposed dredge area.
12) Use waterline pile cap/pier footings to avoid dredging to construct footings below the mudline.
13) Avoid and minimize all activities (including work footprint, structures, shading, temporary and permanent fill, excavation, etc.) in shallow water habitats and sensitive habitats such as critical habitat, SAV, mudflats, salt marsh, areas containing shellfish, and intertidal areas.
14) Consult historic SAV surveys and conduct new pre-construction SAV surveys in the growing season due to the spatial and temporal dynamic nature of SAV beds. Have a qualified, professional biologist delineate any SAV in the field prior to the start of any work.
15) Provide compensatory mitigation for all unavoidable impacts to EFH and sensitive habitats.

Fish Passage and Migration Habitat

1) Ensure temporary structures or barriers do not block federally-managed fish species' access to an area, preventing movement in or out of a river or channel.
2) Consider including a Safe Zone of Fish Passage that allows federally-managed fish species, including migratory fish, to safely navigate around undesirable noise and/or turbidity levels,

including both shallows and channel edges outside of the estimated isopleth for behavioral modification.

3) Design projects to maintain adequate flow conditions for fish passage, maintain water quality, and to maintain properly functioning channel, floodplain, riparian, and estuarine conditions.

Vessel Interaction

1) Reduce vessel speeds in inshore areas, or otherwise minimize wake damage to shorelines, and consider no-wake zones in highly sensitive areas, such as spawning habitat and SAV beds. Identify appropriate vessel routes in the design process to minimize impacts to shorelines and shallow water habitats.
2) Consider the effects of increased vessel traffic when conducting in-water actions.
3) Ensure that vessels are operated in adequate water depths to avoid propeller scour and grounding at all tides. Use shallow draft vessels that maximize the navigational clearance between the vessel and the bottom in shallow areas.

Impingement/Entrainment and Entanglement

1) Ensure any in-water lines, ropes, or chains are made of materials and installed in a manner (properly spaced) to minimize the risk of entanglement by using thick, heavy, and taut lines that do not loop or entangle. Lines can be enclosed in a rigid sleeve.
2) Attach any cables or utility lines to structures above the water, instead of locating them in water or within the substrate. Bury and prevent cables or utility lines from coming through the substrate if they are necessary to be in the water.
3) Allow all fish to exit an enclosed area prior to any dewatering. Trapped fish greater than 5 inches long, observed during dewatering shall be captured and released from the dewatering area except for invasive species (snakehead, blue catfish, flathead catfish) that will be disposed of.
4) Any water intakes (e.g., pumps) drawing from surface tidal waters should employ screening (1 mm wedgewire or better technology with maximum intake velocity of 0.5 fps) to minimize impingement/entrainment of fish and nekton.
5) Properly secure turbidity control measures and design them in a manner that does not block entry to or exit from critical habitat.
6) Monitor turbidity control measures to ensure aquatic species are not entangled or trapped within them.

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6 CONCLUSION

FHWA, in coordination with MDTA, has determined that the Chesapeake Bay Crossing Study MDTA RPA will result in substantial adverse effects to Essential Fish Habitat. This assessment is based on preliminary design, construction, and demolition methods. The exact suite of construction measures will be defined in final design in coordination with NOAA Fisheries.

The project's EFH action area contains suitable habitat for Atlantic butterfish, black sea bass, bluefish, clearnose skate, scup, summer flounder, and windowpane flounder within the EFH action area. Based on current design assumptions, noise and vibration impacts from pile driving operations would have the greatest adverse effect on federally-managed species. Physical injury and behavior modification to federally-manages species may occur. MDTA and FHWA, in coordination with NOAA Fisheries, will determine whether it is practicable to implement a SZFP and other BMPs to limit adverse effects to federally-managed and migratory fish species.

The action would likely result in permanent, substantial adverse effects to EFH that include physical, chemical, or biological alterations of the waters or substrate and potential loss of, or injury to, benthic organisms, prey species, and their habitat, and other ecosystem components. Adverse effects to EFH would likely result from actions occurring within and outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

The action would result in temporary adverse effects to summer flounder HAPC. The MDTA is dedicated to ensuring that adverse effects to EFH and HAPC within the project area are avoided, minimized, or otherwise offset to the greatest extent practicable.

Due to the extent of potential adverse effects to EFH, the FHWA requests an expanded EFH consultation.

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7 REFERENCES

7.1 Federal Regulations and Executive Orders

Contents of fishery management plans (16 USC 1853(a)(7))

Essential Fish Habitat definition (16 USC § 1802(10))

Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 USC § 1801 et seq.)

7.2 State Regulations

Annotated Code of Maryland (Nat. Res. § 4-213)

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APPENDIX A

AGENCY COORDINATION

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EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

*** W A R N I N G ***

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Atlantic Butterfish	Adult, Eggs, Juvenile, Larvae	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
		Atlantic Herring	Adult, Juvenile	New England	Amendment 3 to the Atlantic Herring FMP
		Black Sea Bass	Adult, Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Bluefish	Adult, Juvenile	Mid-Atlantic	Bluefish
		Clearnose Skate	Adult, Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Red Hake	Adult, Eggs/Larvae/Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
		Scup	Adult, Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Summer Flounder	Adult, Juvenile, Larvae	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Windowpane Flounder	Adult, Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

Link	Data Caveats	HAPC Name	Management Council
		Summer Flounder SAV	Mid-Atlantic Fishery Management Council

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.
****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**

All EFH species have been mapped for the Greater Atlantic region,
Atlantic Highly Migratory Species EFH,
Bigeye Sand Tiger Shark,
Bigeye Sixgill Shark,
Caribbean Sharpnose Shark,
Galapagos Shark,
Narrowtooth Shark,
Sevengill Shark,
Sixgill Shark,
Smooth Hammerhead Shark,
Smalltail Shark

APPENDIX B

NOAA FISHERIES GREATER ATLANTIC REGIONAL FISHERIES OFFICE (GARFO) MULTI-SPECIES PILE DRIVING CALCULATOR OUTPUT

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IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	190	156	166
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	202		

OTHER INFO 0

NOTES 36" Square Concrete Pile - Using Proxy of 30" Square Concrete Pile Tyle II

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	0.9	25.1	25.1	116.6
Isopleth (feet)	2.8	82.4	82.4	382.5

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.0	158.3	2.5
Isopleth (feet)	0.1	519.5	8.2

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.1	0.0	1.6	0.1	0.0
AUD INJ ONSET (Peak isopleth, feet)	0.2	0.1	5.2	0.2	0.1
AUD INJ ONSET (SEL_{cum} isopleth, meters)	184.4	23.5	285.4	163.9	61.1
AUD INJ ONSET (SEL_{cum} isopleth, feet)	605.1	77.2	936.4	537.6	200.4
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	25.1	NO LF CET.			
Behavior (RMS isopleth, feet)	82.4				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	200	173	183
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	219		

OTHER INFO 0

NOTES 36" Steel Pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	4.0	341.5	341.5	1,584.9
Isopleth (feet)	13.1	1,120.3	1,120.3	5,199.8

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.1	2152.4	34.1
Isopleth (feet)	0.3	7,061.8	112.0

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.3	0.1	7.4	0.3	0.1
AUD INJ ONSET (Peak isopleth, feet)	1.1	0.3	24.1	1.0	0.3
AUD INJ ONSET (SEL_{cum} isopleth, meters)	2,507.2	319.9	3,880.0	2,227.3	830.3
AUD INJ ONSET (SEL_{cum} isopleth, feet)	8,225.9	1,049.5	12,729.6	7,307.6	2,723.9
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	341.5	NO LF CET.			
Behavior (RMS isopleth, feet)	1,120.3				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	165
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	210

OTHER INFO 0

NOTES 36" Steel pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	100.0
ISOPLETHS (feet)	328.1

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	59.0	2.2
ISOPLETHS (feet)	193.7	7.1

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	68.2	26.2	55.7	87.7	29.5
AUD INJ ONSET (SELcum isopleth, feet)	223.6	85.9	182.7	287.9	96.9
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	10,000.0	NO LF CET.			
Behavior (RMS isopleth, feet)	32,808.4				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	203	169	182
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	215		

OTHER INFO 0

NOTES 48" Steel Pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	6.3	184.8	184.8	1,359.4
Isopleth (feet)	20.7	606.2	606.2	4,459.8

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.2	1164.8	29.3
Isopleth (feet)	0.5	3,821.6	96.1

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.5	0.2	11.7	0.5	0.2
AUD INJ ONSET (Peak isopleth, feet)	1.8	0.5	38.3	1.5	0.5
AUD INJ ONSET (SEL_{cum} isopleth, meters)	1,356.8	173.1	2,099.7	1,205.4	449.3
AUD INJ ONSET (SEL_{cum} isopleth, feet)	4,451.6	568.0	6,888.8	3,954.6	1,474.1
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	292.9	NO LF CET.			
Behavior (RMS isopleth, feet)	960.8				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	200	175	185
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	221		

OTHER INFO 0

NOTES 48" Steel Pipe - Using proxy for 60" steel pipe to assume higher SELss and RMS values

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	4.0	464.2	464.2	2,154.4
Isopleth (feet)	13.1	1,522.8	1,522.8	7,068.4

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.1	2925.9	46.4
Isopleth (feet)	0.3	9,599.5	152.3

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.3	0.1	7.4	0.3	0.1
AUD INJ ONSET (Peak isopleth, feet)	1.1	0.3	24.1	1.0	0.3
AUD INJ ONSET (SEL_{cum} isopleth, meters)	3,408.2	434.9	5,274.3	3,027.8	1,128.6
AUD INJ ONSET (SEL_{cum} isopleth, feet)	11,181.9	1,426.7	17,304.0	9,933.6	3,702.8
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	464.2	NO LF CET.			
Behavior (RMS isopleth, feet)	1,522.8				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	170
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	215

OTHER INFO 0

NOTES 48" Steel Pipe - Using 72" Steel Pipe Proxy

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	215.4
ISOPLETHS (feet)	706.8

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	127.2	4.6
ISOPLETHS (feet)	417.3	15.2

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	146.9	56.4	120.0	189.0	63.6
AUD INJ ONSET (SELcum isopleth, feet)	481.8	185.1	393.6	620.2	208.8
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	21,544.3	NO LF CET.			
Behavior (RMS isopleth, feet)	70,683.6				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	210	185	195
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	8		
Number of strikes per pile	2500		
Number of strikes per day	20000		
Cumulative SEL at measured distance	228		

OTHER INFO 0

NOTES 96" Steel Pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth	
		Fish ≥ 2 g	Fish < 2 g		
ISOPLETHS (meters)	18.5	2,154.4	2,154.4	10,000.0	Fishes present
Isopleth (feet)	60.6	7,068.4	7,068.4	32,808.4	

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth	
ISOPLETHS (meters)	0.5	8555.5	215.4	Sea Turtles present
Isopleth (feet)	1.5	28,069.2	706.8	

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	1.6	0.5	34.1	1.4	0.5
AUD INJ ONSET (Peak isopleth, feet)	5.2	1.5	112.0	4.5	1.5
AUD INJ ONSET (SEL_{cum} isopleth, meters)	9,965.8	1,271.5	15,422.0	8,853.2	3,300.1
AUD INJ ONSET (SEL_{cum} isopleth, feet)	32,696.1	4,171.6	50,597.2	29,045.9	10,827.1
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	2,154.4	NO LF CET.			
Behavior (RMS isopleth, feet)	7,068.4				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	170
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	8
Duration to drive pile (minutes)	30
Duration of sound production in day	14400
Cumulative SEL at measured distance	212

OTHER INFO 0

NOTES 96" Steel Pipe - Using 72" Steel Pipe proxy

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	215.4
ISOPLETHS (feet)	706.8

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	80.1	4.6
ISOPLETHS (feet)	262.9	15.2

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	92.5	35.5	75.6	119.1	40.1
AUD INJ ONSET (SELcum isopleth, feet)	303.5	116.6	247.9	390.7	131.5
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	21,544.3	NO LF CET.			
Behavior (RMS isopleth, feet)	70,683.6				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	203	172	182
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	218		

OTHER INFO 0

NOTES 14" Steel H-pile

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth	
		Fish ≥ 2 g	Fish < 2 g		
ISOPLETHS (meters)	6.3	292.9	292.9	1,359.4	Fishes present
Isopleth (feet)	20.7	960.8	960.8	4,459.8	

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth	
ISOPLETHS (meters)	0.2	1846.1	29.3	Sea Turtles present
Isopleth (feet)	0.5	6,056.9	96.1	

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.5	0.2	11.7	0.5	0.2
AUD INJ ONSET (Peak isopleth, feet)	1.8	0.5	38.3	1.5	0.5
AUD INJ ONSET (SEL_{cum} isopleth, meters)	2,150.5	274.4	3,327.8	1,910.4	712.1
AUD INJ ONSET (SEL_{cum} isopleth, feet)	7,055.3	900.2	10,918.1	6,267.7	2,336.3
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	292.9	NO LF CET.			
Behavior (RMS isopleth, feet)	960.8				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	145
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	190

OTHER INFO 0

NOTES 14" Steel H-pile

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

Fishes present	BEHAVIOR
	RMS Isopleth
ISOPLETHS (meters)	4.6
ISOPLETHS (feet)	15.2

SEA TURTLES

Sea Turtles present	AUD INJ ONSET	BEHAVIOR
	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	2.7	0.1
ISOPLETHS (feet)	9.0	0.3

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	3.2	1.2	2.6	4.1	1.4
AUD INJ ONSET (SELcum isopleth, feet)	10.4	4.0	8.5	13.4	4.5
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	464.2	NO LF CET.			
Behavior (RMS isopleth, feet)	1,522.8				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	200	175	185
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	221		

OTHER INFO 0

NOTES 24" AZ Sheet Pile

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	4.0	464.2	464.2	2,154.4
Isopleth (feet)	13.1	1,522.8	1,522.8	7,068.4

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.1	2925.9	46.4
Isopleth (feet)	0.3	9,599.5	152.3

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.3	0.1	7.4	0.3	0.1
AUD INJ ONSET (Peak isopleth, feet)	1.1	0.3	24.1	1.0	0.3
AUD INJ ONSET (SEL_{cum} isopleth, meters)	3,408.2	434.9	5,274.3	3,027.8	1,128.6
AUD INJ ONSET (SEL_{cum} isopleth, feet)	11,181.9	1,426.7	17,304.0	9,933.6	3,702.8
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	464.2	NO LF CET.			
Behavior (RMS isopleth, feet)	1,522.8				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	160
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	205

OTHER INFO 0

NOTES AZ Steel Sheet - loudest

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	46.4
ISOPLETHS (feet)	152.3

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	27.4	1.0
ISOPLETHS (feet)	89.9	3.3

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	31.6	12.2	25.8	40.7	13.7
AUD INJ ONSET (SELcum isopleth, feet)	103.8	39.9	84.8	133.6	45.0
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	4,641.6	NO LF CET.			
Behavior (RMS isopleth, feet)	15,228.3				

APPENDIX Q: BIOLOGICAL ASSESSMENT, NORTHERN LONG-EARED AND TRICOLORED BAT

U.S. Department of Transportation
Federal Highway Administration

Maryland Division

31 Hopkins Plaza, Suite 1520
Baltimore, Maryland 21201
(410) 962-4440
(410) 962-4054

November 26, 2025

In Reply Refer To:
HDA-MD

Genevieve Pullis LaRouche
Field Office Supervisor
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401

Subject: Chesapeake Bay Crossing Study Tier 2 Environmental Impact Statement
Anne Arundel and Queen Anne Counties, Maryland
Initiation of Formal Section 7 Endangered Species Act Consultation

Dear Genevieve LaRouche:

The Federal Highway Administration (FHWA) is the lead federal agency for the Maryland Transportation Authority (MDTA) preparation of a Tier 2 Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the Chesapeake Bay Crossing Study (CBCS). This letter is to initiate Section 7 Formal Consultation (50 CFR §402.14) under the Endangered Species Act (ESA) for the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) in Anne Arundel and Queen Anne Counties, Maryland.

The Bay Bridge is a two span bridge each 4.3-miles in length over the Chesapeake Bay on U.S. 50/301 connecting Anne Arundel County on the Western Shore to Queen Anne's County on the Eastern Shore. The original span opened in 1952 with the second span opening in 1973. The proposed action involves constructing two new spans and demolishing the two existing spans with a proposed sequencing of build first new span, demolish first original span, build second new span, demolish second original span.

On-land work associated with the construction of new spans, removal of the original spans, and construction activities on the roadway approaches and interchanges along U.S. 50/301 may affect listed species under the ESA. A review of the Information for Planning and Consultation (IPaC) tool indicated that the federally listed northern long-eared bat (*Myotis septentrionalis*) (NLEB) range is within the Tier 2 EIS area. The project also lies within the range of the tricolored bat (*Perimyotis subflavus*) (TCB), which is federally proposed for listing as endangered and will likely become listed during the project timelines. Critical habitat has not been designated for NLEB and TCB.

In accordance with Section 7 of the ESA, a Biological Assessment (BA) to analyze the potential affects on bat species listed or eligible for listing under the ESA has been prepared and is transmitted with this letter.

FHWA in coordination with MDTA has determined that the action may affect but is not likely to adversely affect the NLEB and TCB.

Thank you in advance for working with the FHWA and for your continued support with this Tier 2 EIS. If you have any questions or concerns, please contact Alexander Bienko, FHWA Maryland Division Environmental Specialist, at alexander.bienko@dot.gov.

Sincerely,

Valeriya Remezova
Division Administrator

cc:
Julie Thompson-Slacum, U.S. FWS
Ray Li, U.S. FWS
Trevor Clark, U.S. FWS
Melissa Williams, MDTA

Chesapeake BAY CROSSING STUDY

TIER 2 NEPA

DRAFT BIOLOGICAL ASSESSMENT

NORTHERN LONG-EARED AND TRICOLORED BAT



Maryland Transportation Authority

DRAFT

OCTOBER 2025

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ABBREVIATIONS AND ACRONYMS

ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADT	Average Daily Traffic
AET	All Electronic Tolling
APE	Area of Potential Effects
ARDS	Alternatives Retained for Detailed Study
BA	Biological Assessment
BCS	Bay Crossing Study
BMP	Best Management Practices
CAV	Connected and Automated Vehicle
CBCAA	Chesapeake Bay Critical Area Act
CWA	Clean Water Act
DBH	Diameter at breast height

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DEIS	Draft Environmental Impact Statement
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
EV	Electric Vehicle
FAST (Act)	Fixing America's Surface Transportation
FCA	Forest Conservation Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
GGRA	Greenhouse Gas Emissions Reduction Act
GHG	Greenhouse Gas
ICE	Indirect and Cumulative Effects
ICM	Interagency Coordination Meetings
JPA	Joint Permit Application
LOD	Limits of Disturbance
LOS	Level of Service
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDOT	Maryland Department of Transportation
MDTA	Maryland Transportation Authority
MHT	Maryland Historical Trust
MTA	Maryland Transit Administration
NEPA	National Environmental Policy Act
NETR	Natural Environment Technical Report
NLEB	Northern long-eared bat
NOI	Notice of Intent
OSHA	Occupational Safety and Health Administration
RCP	Reinforced concrete pipe
ROD	Record of Decision
RPU	Representation Units
SAV	Submerged Aquatic Vegetation
SSPRAs	Sensitive Species Project Review Areas
SWM	Stormwater management
TCB	Tricolored bat
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
VMT	Vehicle Miles Traveled
VPD	Vehicles Per Day
WNS	White-nose syndrome
WOTUS	Waters of the U.S.
WOC	Water Quality Certification
ZEV	Zero Emission Vehicle

DRAFT

1 INTRODUCTION

The Chesapeake Bay Crossing Study (Bay Crossing Study) is a two-tiered engineering and environmental study being advanced by the Maryland Transportation Authority (MDTA) and Federal Highway Administration (FHWA). The Bay Crossing Study is addressing existing and future transportation issues at the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) and its approaches along U.S. 50/301. Each tier of the Bay Crossing Study involves development of an Environmental Impact Statement (EIS), in compliance with the National Environmental Policy Act (NEPA), to describe potential significant environmental effects and inform the evaluation of alternatives. Tier 1 of the Bay Crossing Study (Tier 1 Study) was completed in April 2022. At that time, FHWA issued a combined Final Environmental Impact Statement/Record of Decision (FEIS/ROD) identifying Corridor 7, the corridor that includes the Bay Bridge and its approaches, as the Selected Corridor Alternative for further evaluation. Tier 2 of the Bay Crossing Study (Tier 2 Study) was launched in June 2022 to focus on a project-level (site-specific) analysis within the Tier 1 Selected Corridor Alternative (Corridor 7). The Tier 2 NEPA process was initiated formally with the publication of a Notice of Intent (NOI) to prepare an EIS in the Federal Register on November 15, 2024. The MDTA identified the Alternatives Retained for Detailed Study (ARDS), which are the NEPA range of reasonable alternatives for evaluation in the Tier 2 Study EIS. Since then, the MDTA Recommended Preferred Alternative (RPA) has been identified as Alternative C, a build alternative that includes construction of two new spans as well as demolition of the existing bridge spans. A Natural Environment Technical Report (NETR) and Draft EIS (DEIS) are currently being prepared by the MDTA and FHWA and are expected to be made available for the public in January 2026.

This Biological Assessment (BA) evaluates the potential effects of the MDTA RPA on bat species that are federally listed or proposed for listing under the Endangered Species Act (ESA). Specific project design elements will be developed, as the project progresses, that avoid or minimize adverse effects to listed or proposed species. The project area lies within the range of one federally endangered species, the northern long-eared bat (*Myotis septentrionalis*) (NLEB). The project also lies within the range of the tricolored bat (*Perimyotis subflavus*) (TCB), which is federally proposed for listing as endangered and will likely become listed during the project timeline. Critical habitat has not been designated for NLEB and TCB; therefore, it is not discussed further in this BA.

The MDTA RPA is in the early stages of design. As the design progresses through NEPA and into final design, the MDTA, in coordination with FHWA, will continue to consult with the United States Fish and Wildlife Service (USFWS) to develop a bridge design and construction means and methods that avoid and minimize impacts and ensure the protection of listed species.

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 United States Code [USC] 1531 *et seq.*), the MDTA has prepared this BA to analyze the potential effects on bat species listed or proposed for listing under the ESA.

2 CONSULTATION HISTORY

- In November 2023, an official species list was generated using the USFWS Information for Planning and Consultation (IPaC) website. This official species list has been regenerated multiple times to ensure relevance and was last generated October 28, 2025.

- In November 2024, USFWS reviewed and provided comments on the Notice of Intent (NOI) for FHWA to prepare an EIS for the Tier 2 Study (proposed project). Copies of the correspondence are provided in **Appendix A**. Additional coordination and agency meetings occurred through the DEIS phase of the project. USFWS provided comments on the NETR and DEIS.

- On September 19, 2025, MDTA began species surveys coordinated with USFWS and will continue to be conducted, as needed, during final design to provide the most accurate and representative information as well as coordination with the Maryland Department of Natural Resources (MDNR). USFWS reviewed the bat forest habitat assessment and indicated that the project may be outside the scope of the *Programmatic Biological Opinion / Conference Opinion for Transportation Projects in the Range of the Indiana Bat, Northern Long-eared Bat, and Tricolored Bat* (PBO/PCO) due to forest clearing acreages.

- On October 9, 2025, USFWS individually reviewed the project and determined that the project may affect but is not likely to adversely affect NLEB and TCB.

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3 PROPOSED ACTION

The Bay Bridge is a two-span structure that crosses the Chesapeake Bay from Anne Arundel County on the Western Shore to Queen Anne's County on the Eastern Shore. The original span opened in 1952, and the second span opened in 1973. Today, the two-lane original span typically carries eastbound traffic, and the three-lane second span typically carries westbound traffic. However, lanes on the bridge can be reversed to accommodate periods of heavy traffic. The approaches along U.S. 50/301 on each shore have six lanes (three lanes for each travel direction).

A wide range of engineering and environmental considerations were evaluated for one no-build alternative and six build alternatives as detailed in the DEIS. Alternative A (no-build) is not the MDTA RPA because it would not meet the Tier 2 Study purpose and need. Alternative A (no-build) would not increase roadway capacity or mobility, correct roadway deficiencies, or provide the navigational clearance established by the U.S. Coast Guard. Alternative A (no-build) would also require substantial maintenance and related lane closures that would worsen congestion over time and compound existing traffic congestion, mobility, and roadway deficiency issues.

Each of the six build alternatives meet the Tier 2 Study's purpose and need and would therefore be reasonable to implement. However, the build alternatives differ in the degree of transportation benefit they would provide as well as likely environmental impacts and cost.

The MDTA RPA, Alternative C (6-8-6 South), has the least impact to natural, cultural, and socioeconomic resources compared to the other build alternatives. Alternative C would result in the least impact to forests, bridges, overpasses, culverts, buildings, historic properties, and park properties. The anticipated impacts from the build alternatives are discussed in detail in the NETR and DEIS.

The MDTA RPA (**Figure 3-1**) would replace the existing Bay Bridge spans with two new bridge spans and would consist of six lanes along U.S. 50/301 on the Western Shore (three per direction), eight lanes on a new bridge (four per direction), and six lanes along U.S. 50/301 on the Eastern Shore (three per direction). The two new bridge spans would include one span to the south and one span in between the location of the existing bridge spans. The approach roadways would remain on the existing roadway alignment, except where necessary to connect to the new bridge spans. Thus, the five existing bridge lanes would be increased to eight bridge lanes; however, the number of lanes on the Western Shore and Eastern Shore would not change and would remain at six total travel lanes beyond the immediate tie-ins to the new bridge spans. The MDTA RPA could include a bicycle/pedestrian shared use path (SUP) along a new bridge. The MDTA has identified SUP connections to existing and proposed trails and recreational facilities on the Eastern Shore and Western Shore.

The Tier 2 Study is currently in preliminary engineering; therefore, construction means and methods have not been developed. It is anticipated that construction of the new bridge spans would occur in multiple phases. Phasing of the MDTA RPA may involve building one span at a time: the first new bridge span may be built, then one existing bridge span could be demolished, and the new bridge span would be in use while the second new bridge span is built. Once both new bridge spans are complete, the second span of the existing bridge could be demolished. The

exact order and timing of construction have yet to be determined; however, a preliminary construction sequence is found in **Table 3-1**.

Table 3-1 Preliminary Construction Sequence

Construction Activity	Construction Years
Construction of Bridge 1 (eastbound) – Occurring during years 1 through 5	
Start Construction, Bridge 1	1
Construct landings (work completed on land)	1-4
Constructing approaches and main span	1-5
Trestles and water access construction	1
Dredging for eastbound bridge	1-2
Transport and disposal of dredge	1-2
Substructure/pier protection construction	1-3
Superstructure construction	2-5
Complete construction, Bridge 1	5
Demolition of existing eastbound bridge – Occurring during years 6 through 7	
Start demolition, existing eastbound bridge	6
Blasting (total of 9 blast events)	6-7
Cantilever Deck Truss Spans (3 spans and 4 piers)	
Cantilever Deck Truss Spans (9 spans and 8 piers)	
Through Truss Spans (3 spans and 4 piers)	
250' Simple Deck Truss Spans (4 simple spans/4 piers)	
300' Simple Deck Truss Spans (6 simple spans/5 piers)	
Suspension Spans (3 suspension spans/4 piers)	
Dismantling	6-7
Complete demolition, existing eastbound bridge	7
Construction of Bridge 2 (westbound) – Occurring during years 7 through 13	
Start construction, Bridge 2	7
Construct landings (work completed on land)	7-13
Constructing approaches and main span	7-13
Trestles and water access construction	7
Dredging for westbound bridge	7-8
Transport and disposal of dredge	7-8
Substructure/pier protection construction	7-12
Superstructure construction	8-13
Complete construction, Bridge 2	13
Demolition of existing westbound bridge – Occurring during years 14 through 15	
Start demolition, existing westbound bridge	14
Blasting (7 total events)	14-15
Cantilever Deck Truss Spans (3 spans and 4 piers)	
Cantilever Deck Truss Spans (9 spans and 8 piers)	

Construction Activity	Construction Years
Through Truss Spans (3 spans and 8 piers)	
Suspension Spans (3 suspension spans/4 piers)	
Dismantling	14-15
Complete demolition, existing westbound bridge	15

3.1 Land-based Activities

The Tier 2 Study is in preliminary engineering for the MDTA RPA. The MDTA RPA extends along U.S. 50/301 for approximately 8.3 miles from west of Oceanic Drive to east of Cox Creek. The limits of disturbance (LOD) is the boundary that would include all proposed construction, erosion and sediment control (ESC), stormwater management (SWM), and right-of-way offsets. Impacts to bat habitat within the LOD relate to the acreage of forest clearing, the number of bridges, overpasses, buildings, and culverts impacted, construction techniques, construction access and duration, and the success of implemented ESC and SWM Best Management Practices (BMPs).

Forests and other linear wooded features containing live trees and snags, especially those with exfoliating bark, crevices, cavities, or leaf clusters provide suitable habitat for NLEB and TCB. Forest clearing impacts have been determined to be 27.4 acres, or 27.6 acres if an SUP is constructed. Streams and wetlands may provide NLEB and TCB with forage, water, and cover from predators. The MDTA RPA will impact 670 linear feet of nontidal waterways, or 700 linear feet if an SUP is constructed, and 290 linear feet of tidal waterway, with less than a foot of additional impacts if an SUP is constructed. For wetlands, the MDTA RPA will impact 5.5 acres, or 6.2 acres if an SUP is constructed.

Expansion joints and other crevices on bridges can provide habitat for roosting bats by mimicking cave-like conditions. Bridges impacted by the MDTA RPA include the Bay Bridge and Cox Creek bridge. The Bay Bridge will be demolished and replaced. The eastbound span of the Cox Creek bridge will be widened. Work is not proposed directly to the Oceanic Drive overpass; however, coordination with USFWS indicated concerns of this overpass as suitable bat habitat. Impacting the road surface underneath the overpass may impact bats; therefore, it is included in this assessment.

Cracks and crevices within 36-inches or wider culverts may also mimic cave-like environments and provide suitable habitat for NLEB and TCB. The MDTA RPA will impact thirteen (13) 36-inch or wider culverts.

The MDTA RPA will require total property acquisition (displacement) of two business properties and a partial displacement of a third business property. During preliminary engineering, the conservative assumption is that these full displacements will require the demolition/removal of all buildings or structures on the identified properties. The MDTA RPA will include the full removal of two buildings and the partial removal of a third building, all on the Western Shore.

These land-based activities have the potential to impact existing bat habitat including forests, streams and wetlands, bridges, culverts, and buildings. A more extensive examination of these impacts is discussed in **Section 6 Effects Determination**.

Figure 3-1: Vicinity Map



4 ACTION AREA

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). The action area of a project includes the project area and any area where stressors may affect any listed species, terrestrial and marine. This BA focuses on impacts to NLEB and TCB; however, the action area includes any area where there may be impacts to all listed or proposed species in accordance with 50 CFR 402.02. The action area spans 1267.8 acres across land and water, currently determined by the land-based construction area and the potential in-water construction, sedimentation, and turbidity impacts associated with the MDTA RPA. A map of the action area is presented in **Appendix B**.

Within the action area, direct impacts to NLEB and TCB will likely be contained within the identified LOD for the MDTA RPA. The action area for the MDTA RPA includes all areas affected by temporary and permanent disturbances associated with the proposed project, including construction of the new bridge spans (pile driving), approach roadway widening (tree/vegetation removal), demolition of the existing bridge spans (cutting and/or blasting, temporary access, and all land-based construction activities.

4.1 Existing Conditions within the Action Area

The action area lies within the Severn River (02131002), Magothy River (02131001), Lower Chesapeake Bay (02139998), Kent Island Bay (02130511), Eastern Bay (02130501), Kent Narrows (02130504), Wye River (02130503), and Lower Chester River (02130505) 8-digit federal HUC watersheds. Land use within the vicinity of the action area on either side of the Chesapeake Bay consists of low-density residential, medium-density residential, commercial, transportation, institutional, and water.

The action area is in the Atlantic Coastal Plain physiographic province, specifically within the Western Shore Lowlands Region and Delmarva Peninsula Region. The Western Shore Lowlands Region borders the Western Shore Uplands Regions of the Atlantic Coastal Plain physiographic province and is characterized as a region with flat-lying sedimentary beds. Elevation in the Western Shore Lowlands Region ranges from 0 to 65 feet. The Delmarva Peninsula Region is also characterized by flat sedimentary beds, some of which are bioturbated. This region features low salt marshes and islands with a maximum elevation of 80 feet.

The action area contains forests, tree clusters, wetlands, and streams, which provide NLEB and TCB with habitat, forage, water, and protection from predation. Throughout the action area, 144 wetland systems have been identified, including 36 palustrine emergent wetlands, 58 palustrine forested wetlands, six (6) palustrine scrub/shrub wetlands, nine (9) palustrine unconsolidated bottom wetlands, 31 estuarine emergent wetlands, and four (4) estuarine scrub/shrub or forested wetlands. Fifty-eight (58) waterways have been identified within the action area, including 16 nontidal perennial waterways, 23 nontidal intermittent waterways, and 19 tidal waterways. Prevalent forest communities in the action area include pine-oak heath forests, bottomland hardwood forest, and tidal hardwood swamp. Common tree species within these forests include oaks, gums, hickories, pines, and maples.

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Noise may negatively impact bats in the action area by altering behavior, reducing foraging efficiency, and increasing susceptibility to disease. A noise monitoring study completed in 2023 and discussed in the *Bay Crossing Study Noise Technical Report,* included 136 measurements used to validate the computer model that would be used to predict future noise conditions of the proposed action. Short-term noise monitoring was conducted in the form of 15-minute spot measurements. These 15-minute measurements were then multiplied by four to develop hourly volumes. This noise monitoring study measured sound level weighted to the sensitivity of human hearing using the A-weighted sound level (dBA) via the equivalent sound level (L_{eq}), which is the constant sound level over a given period and situation. Short-term noise monitoring revealed that the highest noise levels, measured in dBA, originated from two monitoring sites along U.S. 50/301 on the Western Shore at a L_{eq} value of 75 between 1200 and 1500 hours. The lowest noise level, measured in dBA, was recorded, on the same day, at a different monitoring site, also on the Western Shore along U.S. 50/301, at a L_{eq} value of 47 between 1300 and 1500 hours. The study also predicts that lands within 100 feet of proposed construction activity may experience noise levels between 78 to 83 dBA.

4.2 USFWS Listed Species in the Action Area

There is one federally endangered bat species and one federally proposed endangered bat species that have the potential to occur in the action area and may be affected by the proposed action. ESA-listed and proposed bat species include:

- Northern long-eared bat (*Myotis septentrionalis*) – endangered
- Tricolored bat (*Perimyots subflavus*) – proposed endangered

Northern Long-Eared Bat (NLEB)

The NLEB is a medium-sized insectivorous bat that typically hibernates within caves or abandoned mines and may use man-made structures when typical habitats are limited (USFWS/ECOS, 2015). On October 2, 2013, USFWS issued a proposed rule to list the NLEB as endangered, with a final listing of the species as threatened on April 2, 2015 (80 FR 17974). On November 30, 2022, the NLEB was uplisted to endangered; this reclassification went into effect March 31, 2023 (88 FR 4908; 87 FR 73488). The NLEB is found across much of the eastern and northcentral United States (range includes 37 states) and all Canadian provinces from the Atlantic coast west to the southern Northwest Territories and eastern British Columbia. Populations tend to be patchy across its range and are typically composed of small numbers. More than 1,100 winter hibernacula have been identified in the United States, most of which contain only a few (1 to 3) individuals. USFWS recognizes four United States populations of NLEB. NLEBs inhabiting Maryland are considered part of the Eastern population, which has historically been the most abundant population and consists of individuals inhabiting Maine south to Virginia and west to West Virginia (USFWS/ECOS, 2015).

The primary factor, as cited in the ESA listing, for the decline of NLEB populations is white-nose syndrome (WNS), a lethal fungal disease spread while the species inhabits caves and mines during winter hibernation. The NLEB has experienced a sharp decline in the northeastern part of its range, as evidenced by a combination of hibernacula surveys and summer capture trends. Although the disease has not yet spread throughout the species' entire range (WNS is currently found throughout approximately 80% of the NLEB range) it continues to spread. Other factors contributing to the decline in populations include collisions with wind turbines, human disturbance

of hibernacula, nonstationary climate, and loss of summer habitat due to forest conversion and forest management (USFWS/ECOS, 2015).

NLEBs primarily overwinter in hibernacula of various sizes including caves and abandoned mines. Hibernacula have relatively constant, cool temperatures with very high humidity and no air currents. Less commonly, NLEBs have been observed overwintering in abandoned railroad tunnels, storm sewers, aqueducts, attics, and other non-cave or mine hibernacula with temperature, humidity, and air flow conditions resembling suitable caves and mines (USFWS/ECOS, 2015).

Spring staging is the time between winter hibernation and spring migration to summer habitat when bats begin to gradually emerge from hibernation. Individuals will exit the hibernacula to feed but re-enter the same or alternative hibernacula to resume periods of physical inactivity. The staging period, in Maryland, is believed to be short for the NLEB and may last from April through mid-May with variations in timing and duration based on latitude and weather (USFWS, 2011).

NLEBs typically roost during summer underneath bark or in cavities or crevices of both live trees and snags individually or in colonies. Males and nonreproductive females may also roost in cooler locations, including caves and mines. Individuals have also been observed roosting in colonies in buildings, barns, on utility poles, and in other man-made structures. The species has been documented to roost in many species of trees, including black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), silver maple (*Acer saccharinum*), black locust (*Robinia pseudoacacia*), American beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), sourwood (*Oxydendrum arboreum*), and shortleaf pine *(Pinus echinata*) (Foster and Kurta, 1999).

Fall swarming is the time between the summer and winter seasons and includes behaviors such as copulation, introduction of juveniles to hibernacula, and stop-overs at sites between summer and winter regions. Both males and females are present together at swarming sites, and other bat species are often present as well. For NLEBs, the swarming period, in Maryland, may occur between mid-August and mid-November. NLEBs may use caves and mines during swarming. Little is known about roost tree selection during this period, but some studies suggest that a wider variation in tree selection may occur during swarming than during the summer (USFWS/ECOS, 2015).

Tricolored Bat (TCB)

The TCB is a small insectivorous bat that typically hibernates within caves or abandoned mines (USFWS, 2021). On September 14, 2022, USFWS issued a proposed rule to list the TCB as endangered (87 FR 56381). The bat is found across much of the eastern and central United States (range includes 39 states), Washington D.C., and in four Canadian provinces, from southern Ontario to Nova Scotia (USFWS, 2021). The species is experiencing a westward expansion due to the increase in riparian trees as well as man-made structures for roosting. Most TCB roosts are composed of one individual and range upwards from roosting pairs to small groups. USFWS recognizes three United States Representation Units (RPU), each different due to genetic and behavioral diversity. TCBs inhabiting northern and western Maryland are considered part of the Eastern RPU, while the rest of Maryland is within the Southern RPU. The Eastern RPU extends from southeastern Virginia and continues up the Atlantic coast to Nova Scotia, containing the lowest abundance of TCB (11%) and known winter hibernacula (11%). The

Southern RPU, containing the action area, begins as far north as central Maryland and continues south through Honduras (USFWS, 2021).

The primary factor, as cited in the ESA-listing proposed rule, for the decline of TCB populations is WNS. The TCB has experienced a sharp decline across the majority of its range as evidenced by a combination of hibernacula surveys and predictive modeling. Recent estimations from data of 27 states and two North American provinces show declines of up to 100% over 59% of TCB range. TCB of the Southern RPU that hibernate in roadside culverts have experienced a far more severe effect of WNS compared to TCB hibernating in caves across all RPU. Although the disease has not yet spread throughout the species' entire range (WNS is currently found in 36 of 39 States where the TCB occurs), it continues to spread. Other factors contributing to the decline in populations include collisions with wind turbines, loss of deciduous forest and emergent wetland habitat, and a nonstationary climate (USFWS, 2021).

TCBs overwinter primarily in hibernacula of various sizes including caves, abandoned mines, and culverts in the Southern RPU. TCB require hibernacula to have relatively constant and higher temperature requirements than other cave-roosting species, with very high humidity and no air currents. TCBs may also overwinter in tree cavities, abandoned wells, and other human-made structures with the narrow temperature, humidity, and air flow conditions resembling suitable caves and mines (USFWS, 2021).

Spring staging is the time between winter hibernation and spring migration to summer habitat when bats begin to gradually emerge from hibernation. Individuals will exit the hibernacula to feed but re-enter the same or alternative hibernacula to resume periods of physical inactivity. During this time, bats are preparing for spring migration to summer habitat. The staging period in Maryland is believed to be short for the TCB and may last from April through mid-May, with variations in timing and duration based on latitude and weather (USFWS 2024).

TCBs typically roost during summer within leaf clusters of living or newly dead deciduous trees and may also roost in pine needles and eastern redcedar (*Juniperus virginiana*). TCB will roost in the mid to upper canopy of a variety of tree species, showing some degree of preference for larger oaks (*Quercus spp*.). In some sections of the species' range, TCB will roost within Spanish moss (*Tillandisa usneoides*) and bony bear lichen (*Usnea trichodea)*. Bridges, barns, and concrete surfaces may also provide artificial summer roosting habitat for TCB. Female TCB are known to return to the same roost each year and form maternity colonies with other females. Male TCB are known to roost as individuals (USFWS, 2021).

Fall swarming is the time between the summer and winter seasons and includes behaviors such as copulation, introduction of juveniles to hibernacula, and stop-overs at sites between summer and winter regions. For TCBs in Maryland, the swarming period may occur between mid-August and mid-November. TCB are known to begin hibernation earlier following the fall swarming period compared to other cave-hibernating species (USFWS, 2021 and Tate, 2020). Previous studies have shown that TCB, during this time, will roost in leaf clusters of living trees and that proximity to hibernaculum is important (Tate 2020).

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5 BAT HABITAT SURVEYS

A bat habitat suitability assessment was conducted in the field within the action area in fall 2025. Prior to this assessment, a desktop review identified 20 percent, or 960 acres, of the total action area as forest cover. Forest is the largest land use category in the Anne Arundel County portion of the action area and is more scattered in the Queen Anne's County portion due to higher levels of development and more tidal emergent wetlands and waterways.

The *Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines* (USFWS, 2024) were followed during the bat habitat assessment. A total of 32 individual suitable bat habitat areas were identified. Within the LOD, 73.52 acres (21%) are classified as suitable habitat for NLEB and TCB; and 283.97 acres (79%) are classified as unsuitable bat habitat.

In general, wooded areas within the action area follow a linear path and are typified by a moderate to heavy vine load, including oriental bittersweet and English ivy, as well as being dominated by trees not typically favored by NLEB or TCB, such as Callery pear and sweetgum. Canopy is the least dense forest layer, never exceeding 50% density, which may expose bats roosting in these stands to predation. Midstory and understory layers vary throughout the action area and are occupied, to some extent, by denser shrubs and trees such as Callery pear and autumn olive. Many of the wooded areas are adjacent to the highway, creating tracts of forest edge, which may be beneficial to TCB. Unsuitable areas of bat habitat include roadways, trees with a diameter at breast height (DBH) of three inches or less, and areas with only shrubby vegetation. The complete suitable habitat assessment is presented in **Appendix C**.

On September 19, October 7 and 16, 2025, systematic visual assessments were conducted on two (2) bridges, one (1) overpass, 13 culverts, and three (3) buildings throughout the action area for evidence of roosting bats. Per USFWS coordination, the assessment of the Bay Bridge was conducted using MDTA biennial inspection reports. The Oceanic Drive overpass as well as three buildings were assessed using only publicly available imagery. The visual assessments of the Cox Creek bridge and all culverts were completed, in the field, following Appendix K of the *Range-wide Indiana Bat & Northern Long-eared Bat Survey Guidelines* and included the use of a borescope with a 20-foot reach, an infrared camera, binoculars, and spotlights (USFWS, 2024, Appendix K).

The visual assessment of all 19 structures yielded no evidence of roosting bats. Despite suitable cracks, crevices, and concrete surfaces along the exterior as well as interior structures, no evidence of roosting bats was detected within the Bay Bridge. The Cox Creek bridge and Oceanic Drive overpass did not yield evidence of roosting bats, despite also containing concrete elements. Bats within the LOD may be avoiding roosting in bridges due to increased noise and light of heavy vehicular traffic, especially considering that suitable forested habitat exists within 1,000 feet of these bridges (Zurcher et al., 2010). Similarly, the three buildings assessed yielded no evidence of roosting bats, which may be due to increased lighting and noise from commercial buildings and the highway as well as proximity to, likely, higher quality habitat in forested areas. Finally, none of the culverts assessed contained evidence of roosting bats; however, most of the culverts were blocked to bats via debris or other obstructions, heavily limiting the ability of bats to utilize them. The complete bridge and culvert survey report is in **Appendix D**.

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6 EFFECTS ANALYSIS

Habitat Modification

Potential direct effects to NLEB and TCB include habitat loss, degradation, disturbance, and fragmentation. NLEB and TCB habitat in the action area may be distributed amongst 73.52 acres of suitable forest habitat of varied quality as well as 19 potential roosting locations in bridges, overpasses, culverts, and buildings.

The Tier 2 Study MDTA RPA will require the removal of 27.4 acres of forest. Forest impacts in the Anne Arundel County portion of the action area will largely occur surrounding Mezick Pond and adjacent to a Habitat Protection Area north of Mezick Pond. In Queen Anne's County, forest impacts would primarily occur in a previously disturbed area between the eastern shoreline of the Chesapeake Bay and MD 8. Potential impacts to forest within the action area, would occur primarily within forest edge and fragmented forests, due to disturbance typical of a linear transportation corridor. A more detailed view of these forested areas is shown in **Appendix C**. Forest fragments and edge is the preferred forest habitat of TCB, allowing for efficient foraging to facilitate their fast metabolism (USFWS, 2024). Other preferred habitat elements for this species includes deciduous trees, especially oaks, providing live or dead leaf clusters for roosting. NLEB are more likely to be found in forests containing trees with exfoliating or shaggy bark, cracks, crevices, or cavities. This species shows preference for intact forests of various size and is less commonly seen along fragmented forest or forest edge (USFWS, 2024). The assessment of bat habitat within the LOD indicates that the majority of forested resources are within 100 feet of the highway and generally composed of invasive vegetation, providing low-quality bat habitat for NLEB and TCB.

Proposed forest impacts would comply with the Forest Conservation Act (FCA) and Chesapeake Bay Critical Area Act (CBCAA) where required. Maryland Reforestation Law requires 1:1 replacement of impacted forest acreage. Where possible, the MDTA will replace trees on-site; however, it is expected that all required reforestation and/or afforestation would not be possible on site, potentially requiring some off-site replacement. The MDTA will prioritize off-site planting areas that expand existing forest habitats where practicable. Mitigation would be required for forest impacts within the Critical Area at a ratio ranging from 1:1 to 3:1 depending on the percent of forest acreage cleared, designated land use classification, and whether impacts fall within the identified Critical Area Buffer. During final design, the MDTA would look to replace affected trees and forest. The MDTA will work with the MDNR Critical Area Commission to identify additional land within the Critical Area outside the LOD, and within the Critical Area Buffer, as appropriate, to fully address mitigation requirements. These laws limit clearing and require specific mitigation through reforestation and tree planting, potentially benefitting NLEB and TCB. Tree clearing will be prohibited during the active season (April 1 to September 30) to avoid and minimize potential direct effects to NLEB and TCB in the action area. there are no known NLEB roosts or hibernacula in the action area and it is unknown whether TCB are roosting or hibernating in the action area.

The MDTA RPA will permanently impact 5.5 acres of tidal and nontidal wetlands as well as 960 linear feet of tidal and nontidal waterways. Wetlands and streams may provide NLEB and TCB with forage, water, and cover from predators. A compensatory mitigation plan for unavoidable wetland impacts will be coordinated with State and federal regulatory agencies during final design. Mitigation for wetland impacts would focus on qualitative measures, such as the replacement of

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wetland function, as well as quantitative measures, such as specified acreage of wetland loss and/or construction activities.

The MDTA RPA would result in impacts to two bridges in the action area. Impacts to bridges include the replacement and demolition of the existing Bay Bridge spans and the widening of the eastbound span of the Cox Creek bridge, in Stevensville, shown in **Figure 6-1**. The removal of the existing Bay Bridge spans would remove potential NLEB and TCB habitat; however, the October 2025 visual assessment did not reveal evidence of bat use. Further coordination with USFWS would be required if roosting bats are detected in a bridge span and may result in time of year restriction(s) for construction activity on the bridges. However, the MDTA RPA proposes a wider Bay Bridge structure that would provide a net increase in potential bat roosting habitat. The widening of the Cox Creek eastbound span would also provide a slight increase in potential bat roosting habitat. This roadway widening project will result in an increase in impervious surface, meaning the project must comply with the Maryland Department of the Environment's (MDE) Stormwater Design Manual.

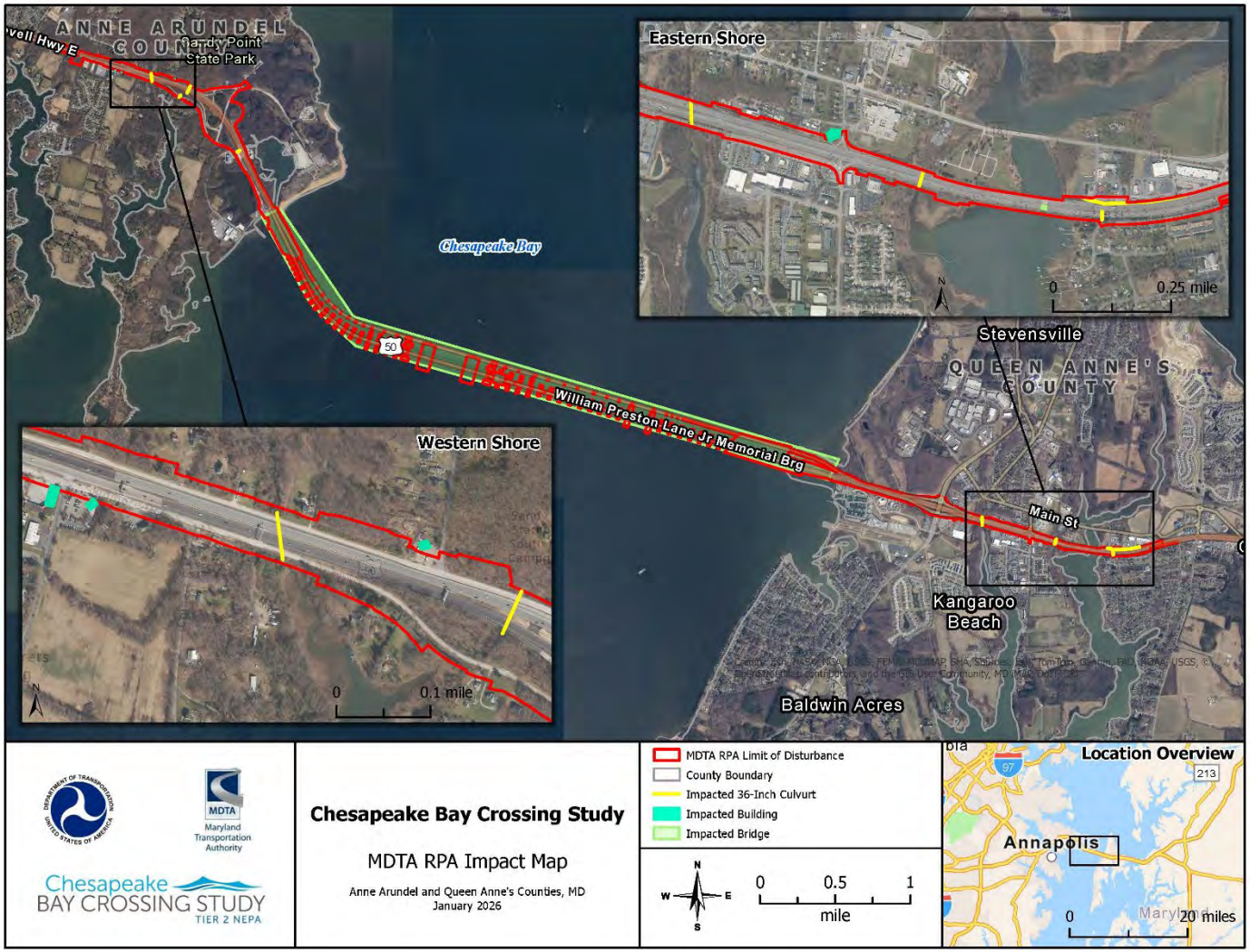
Modification or replacement is anticipated for most culverts in the action area due to concerns of projected hydrologic conditions and headwater elevations that overtop the roadway. Culvert modifications will also be required to accommodate roadway widening. In the action area, an assessment of 36-inch or wider diameter culverts determined that the 36-inch reinforced concrete pipe conveying Meredith Creek beneath U.S. 50/301 does not currently meet the criteria of the MDOT Highway Drainage Manual (MDOT, 2023). The methods to increase capacity at Meredith Creek may include a full replacement with a larger pipe or the addition of three (3) 36-inch RCPs. The assessment identified two (2) additional RCPs that are undersized, shown in **Figure 6-1**, one on the Eastern Shore conveying Thompson Creek and one on the Western Shore, just east of the Meredith Creek RCP. To address these concerns, while maintaining MDOT SHA Drainage Manual standards (MDOT, 2023), culvert capacity increases may be completed by replacing the culvert, either in sections or entirely, or by adding pipes adjacent to the existing pipe. Another option that may be employed to address the excessive headwater elevation would be to improve the headwalls of some culverts. The method used to increase capacity and improve these identified culverts will be determined in final design. The proposed action would impact 1,330 linear feet of culverted waterways in the action area. Additional culverts that need increased capacity may be identified during final design; however, if the culverts are smaller than 36 inches in diameter, they are currently unsuitable for use by NLEB and TCB (USFWS, 2024). Culverts that are blocked by debris would also be highly unlikely to support NLEB and TCB (USFWS, 2024). There are no known roosts of NLEB or TCB occurring in culverts within the action area. Bat usage was not observed during the October 2025 visual assessments of the three (3) culverts that require modification, and 10 other 36-inch or greater culverts whose modification requirements are unknown at this time.

Currently, two buildings may be fully removed and one building may be partially removed as part of the MDTA RPA, **Figure 6-1.** All of these structures occur on the Western Shore of Maryland, in Annapolis. Since the Western Shore provides substantial forest cover, the removal of buildings in this portion of the action area would likely have minimal impacts to bats because ample, likely higher quality, forested habitat would remain. The buildings to be fully removed are commercial, including a tree/lawn care business and an automotive retail center. The partial building removal would also occur to a shopping center, also a commercial building. The potential removal of these

buildings will likely have minimal impact to bats in the action area because commercial buildings are generally associated with higher noise levels from pedestrian and vehicular traffic and increased levels of artificial light. Substantial forest habitat is also present adjacent to these buildings, further reducing impacts to these buildings to essential bat functions. The buildings proposed for total acquisition/removal may change during final design, which would alter the impacts described above.

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Figure 6-1: Impacts to Bridges, Culverts, and Buildings



Bats utilize day and night roosts, each serving unique purposes. Day roosts protect bats while resting or tending to young, while night roosts are needed for bats to digest food while feeding (Keeley and Tuttle, 1999). Due to the requirements of day roosts, human-made structures along busy highways are less likely to be suitable habitat. Structures composed of concrete with crevices 0.5 to 1.25 inches wide and 12 inches or greater in depth are of high priority for bats. Quiet roosts are also of some priority, as bats within them will be with young or resting (Keeley and Tuttle, 1999). The Chesapeake Bay Bridge is a mostly steel structure, containing some concrete portions, that experiences high traffic volumes of cars and trucks, as well as vessel traffic underneath the spans. The Cox Creek bridge is a much smaller bridge, with proportionally greater concrete surface when compared to the Bay Bridge. The Cox Creek bridge is positioned closer to the water, meaning that vessel traffic is not a concern for bats; however, heavy vehicular traffic would still impact bats potentially roosting in this bridge. Bats are more likely to seek bridges at night as they retain heat, reducing the energetic cost of thermoregulation (Keeley and Tuttle, 1999). Bats show preference for bridges as night roosts that are fully exposed to sun and with space between beams of the deck (Keeley and Tuttle, 1999). Evidence of bats was not detected during the October 2025 visual assessments; however, these bridge structures may provide bats with suitable habitat in the form of poor-quality night roosts. Most culverts in the LOD were blocked to some extent and are unlikely to support NLEB and TCB during the day or night (USFWS, 2024).

The LOD is not located within a karst area and does not contain documented habitat for NLEB and TCB. The suitable habitat available within the LOD is typical of a transportation corridor, being heavily fragmented, exposed to heavy vehicular traffic, and moderately developed in some areas. Furthermore, the MDTA and FHWA will ensure no tree clearing will occur from April 1 to September 30 of any year, which will avoid direct injury or mortality to NLEB and TCB from tree clearing. Large areas of high-quality forest adjacent to the LOD will remain for use by NLEB and TCB. For these reasons, impacts to forest resources may affect but are not likely to adversely affect NLEB and TCB. The impacts of the MDTA RPA to bridges, culverts, and buildings in the action area may affect, but are not likely to adversely affect NLEB and TCB. The proposed wider/larger structures will increase the potential suitable habitat for NLEB and TCB, which could benefit these species.

Noise

Noise impacts may originate from pile driving, bridge demolition, tree/vegetation clearing, and the operation of equipment associated with construction activities. As pile driving and bridge demolition, either cutting or blasting, would impact the subaqueous environment, it would not impact suitable bat habitat. Construction activities that may produce noise within or adjacent to suitable bat habitat include, but are not limited to, tree/vegetation clearing, structure takes, construction access, and equipment mobilization. Ambient noise monitoring in the action area revealed noise levels ranging from 47 dBA to 75 dBA. The noise study was completed to validate a computer model that would be used to predict the noise increase in the action area during the construction of the MDTA RPA. The model predicts that lands within 100 feet of construction may experience noise levels up to 83 dBA. The model also predicts that there would not be substantial increases in noise levels in Noise Sensitive Areas (NSA), which include single and multiple family structures, following the completion of the MDTA RPA. While dBA is not typically used in studies pertaining to noise impacts on bats, there is evidence to show that bats may experience decreased foraging efficiency under the effects of noise at 56 dBA to 88 dBA as well as changes

to call frequency and amplitude of echolocation at 88 dBA (Bunkley and Barber, 2015). Additionally, bats foraging near highways, especially those with high traffic volumes, may experience decreased foraging efficiency up to 60 meters from road surface (Siemers and Schaub, 2011). Over time, bats may adjust to low noise levels or louder noise levels at greater distances. However, high noise levels at close proximity, accompanied by vibration, may force bats away from roosting areas and induce evasive responses (USFWS, 2015). In proximity to highways, bats are more likely to engage in evasive actions and are less likely to cross roadways, posing a barrier to foraging habitat when traffic volumes are higher (Zurcher et al., 2010). Evasive actions and alterations to call frequency and echolocation incur energetic costs to bats, which are intensified by decreased forage efficiency and restricted access to forage areas associated with high noise levels. Along with increased energy costs, chronic exposure to excess noise may induce stress responses and increase the incidence of disease (Song et al., 2018; Davy et al., 2017). WNS is a disease of concern as it has resulted in heavy declines of North American bat populations (Bektas et al., 2021; Powell et al., 2021). As pile driving and bridge demolition would occur within the water, the impacts to NLEB, TCB, and suitable habitat are negligible. Bats that may be roosting within the action area are likely adjusted to heightened noise levels and would likely shift roosting locations or temporarily abandon the roost during construction activities. As a result, noise impacts from the MDTA RPA may affect but are not likely to adversely affect NLEB and TCB.

Lighting

Artificial light, especially at night, may negatively affect bats by entombing them in their roost, forcing them to abandon roosts, or disrupting behaviors such as foraging or avoiding predators (Zeale et al., 2016). Temporary lighting may encourage insect-gleaning species, such as the NLEB and TCB, to forage; however, the effects are relative to individuals (Voigt et al., 2021). Some studies have shown that members of the *Myotis* genus forage less within areas lit by streetlamps and forage more in darker areas (Rydell, 1992). However, artificial light may disturb the forage base for bats, as congregating insects will be preyed upon by multiple predators (Van Grunsven et al., 2020). Finally, bats may be at greater risk of predation as they take less optimal paths to avoid artificial light (Voigt and Kingston, 2016).

The MDTA RPA may include temporary artificial light to support extended day and overnight construction activities. Nighttime construction is most likely to occur on the Bay Bridge spans; however, it is unknown if nighttime work will be required at this time. If temporary artificial light is used, it will comply with applicable Occupational Safety and Health Administration (OSHA) standards. This utilization of temporary lighting would be an increase from existing conditions in the action area. As the temporary lighting would be focused on the Bay Bridge spans and any required access roads or access trestles, it is unlikely that it would impact suitable bat forest habitat. This would minimize exposure of suitable bat habitat, and any bats that may be within it, to artificial light.

Currently, any changes to the existing permanent lighting regime of the action area are unknown. Assessments of the lighting in the action area indicate that minor increases in permanent lighting may be needed to meet the exact requirements for interchange lighting outlined in the *MDTA and SHA Lighting Guidelines* (MDTA, 2019). On the Bay Bridge, at minimum, safety lighting for air traffic on bridge towers, U.S. Coast Guard required navigational channel lighting, as well as functional roadway lighting would be anticipated. The design of the bridge's lighting system will

be based on DarkSky International's Five Principles for Responsible Outdoor Lighting: Useful, Targeted, Low Level, Controlled, and Warm-Colored. By integrating these principles, the project can minimize light pollution, protect wildlife habitats, reduce energy costs, and comply with *MDTA and SHA Lighting Guidelines* (MDTA, 2019). Specific details of this safety lighting, as well as any continuous or aesthetic lighting on the bridge deck, would be determined in final design. Currently, the Bay Bridge is unlit, except for overhead gantry systems and necessary lighting for roadway safety, vessel navigation, and aviation. Any additional permanent lighting would be an increase from existing conditions. Any changes to the continuous or aesthetic lighting regime would include measures to ensure safety and navigational compliance, and minimize impacts on species and the environment, particularly within the ecologically sensitive Chesapeake Bay region. These considerations may include the use of energy-efficient lighting systems installed along the main span, approaches, and support piers to provide uniform illumination for vehicular traffic, maintenance operations, and emergency access. Navigational lighting, as required by the U.S. Coast Guard, would be implemented on the bridge's substructure to ensure safe passage for maritime vessels, utilizing shielded, downward-directed fixtures to reduce glare and light trespass into the Chesapeake Bay's sensitive aquatic and avian habitats. Aesthetic lighting may be considered for the bridge towers, with the option of employing programmable low-intensity lighting to adhere to DarkSky principles to minimize impacts on migratory birds and the scenic viewsheds of the Chesapeake Bay.

If utilized, temporary nighttime lighting would be directed on the Bay Bridge and accompanied by elevated noise originating from construction. It is likely that NLEB and TCB would avoid this area or not remain for extended periods of time. Currently, temporary nighttime light is only anticipated on the Bay Bridge spans; therefore, it is unlikely that bats occupying forest habitat within the action area would be impacted by temporary nighttime lighting. For these reasons, if nighttime work were to be conducted, it may affect but is not likely to adversely affect NLEB and TCB.

Currently, increases in the permanent lighting along U.S. 50/301 or other roadways are expected to be minor. If permanent lighting increases are determined during final design, they would comply with the *MDTA and SHA Lighting Guidelines* (MDTA, 2019). Considerations for potential environmental impacts include the installation of full-cutoff fixtures with warm-toned wavelengths (below 3000 Kelvin) or house side shields to reduce skyglow and light trespass into NLEB and TCB suitable habitat. Additionally, adaptive controls can dim lights during low-traffic periods to minimize energy consumption and ecological disturbance. Changes to permanent lighting along U.S. 50/301 or other roadways would likely have less impact on the NLEB and TCB on the Eastern Shore, as that area is highly lit by commercial buildings and parking lots compared to the forest habitat of the Western Shore. Although any increase in permanent light on the Bay Bridge would be an increase compared to the existing condition, it is unlikely that there will be much impact from this light source to bats due to distance to forest habitat and potential disturbance from vehicular and vessel traffic at the Bay Bridge spans. Currently, temporary and permanent lighting in the action area is not expected to increase substantially beyond current conditions; therefore, it is anticipated that impacts of the proposed project from lighting may affect but are not likely to adversely affect NLEB and TCB. Determinations on lighting will be made during final design; therefore, anticipated impacts to bats may change.

Indirect Effects

Throughout the action area, land-based construction activities such as clearing and grading have the potential to deposit sediment in NLEB and TCB habitat, such as streams and wetlands. Sediment deposition may be detrimental to NLEB and TCB as streams and wetlands may provide bats with forage, water, and cover. An ESC plan, in accordance with MDE guidelines, will be prepared during final design, ensuring that appropriate BMPs are implemented at each area of construction. The LOD of the MDTA RPA has been developed to accommodate all aspects of the ESC plan. The project will increase the amount of impervious surface in the action area. This may result in indirect effects to bats via groundwater impacts to wetlands and streams, as well as pollutant runoff into these resources. As a result, this project must comply with the MDE Stormwater Design Manual. The MDTA's approach to design and development will aim to incorporate ESD to meet (and exceed where feasible) surface and protection requirements along the roadway and the Bay Bridge. The MDTA would adhere to the developed ESD and required BMPs, ESC, and SWM practices to treat runoff from new impervious surfaces and manage stormwater quality and quantity. Similar to the ESC plan, the LOD will accommodate all elements of the SWM plan, but details will not be determined until final design. For these reasons, it is anticipated that, at this time, indirect impacts of the MDTA RPA may affect but are not likely to adversely affect NLEB and TCB in the action area.

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7 CONCLUSION AND EFFECTS DETERMINATION

This Biological Assessment evaluated the potential effects of the proposed Chesapeake Bay Crossing project on the NLEB and the TCB. The proposed action is Alternative C from the Tier 2 Study EIS. Based on currently available Tier 2 Study information, FHWA, in coordination with the MDTA, has made a determination that the MDTA RPA may affect but is not likely to adversely affect the NLEB and TCB. Effects to NLEB and TCB are expected to be discountable because: 1) bat surveys did not detect NLEB or TCB on or within any of existing bridge or culverts within the LOD, 2) tree clearing will be prohibited during the bat active season (April 1 to September 30), 3) vegetation removal is limited to 27.4 acres primarily within forest edge and fragmented forests found within 100 feet of the roadway, and 4) Visual assessments of all bridges, culverts, and buildings identified for take will occur every two years and before and structure takes to maintain probable absence of NLEB and TCB. Further evaluation of potential impacts will be conducted during final design, and the effects determination will be re-assessed as more detailed construction means and methods are made available. FHWA, in coordination with the MDTA, will continue to coordinate with USFWS through final design to ensure implementation of appropriate avoidance, minimization, and mitigative protection measures so that there are no adverse effects to listed or proposed bat species.

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APPENDIX A

AGENCY COORESPONDENCE

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

In Reply Refer To: 07/28/2025 18:48:35 UTC
Project Code: 2024-0014247
Project Name: Bay Crossing Study Tier 2

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Coastal Barriers
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

PROJECT SUMMARY

Project Code: 2024-0014247
Project Name: Bay Crossing Study Tier 2
Project Type: Road/Hwy - New Construction
Project Description: The Chesapeake Bay Crossing Study: Tier 2 NEPA (Tier 2 Study) is a National Environmental Policy Act (NEPA) study that will analyze alternatives to provide congestion relief and improve travel reliability, mobility and safety across the Chesapeake Bay. The Tier 2 Study is focusing on the Selected Corridor Alternative (Corridor 7) that was identified at the conclusion of the Tier 1 Study. Alternatives will include a No Build Alternative and a range of build alternatives involving various alignments, crossing types and modal and operational alternatives (e.g. transit, pedestrian, bicycle, etc.). Corridor 7 is two miles wide and runs 22 miles from the Severn River Bridge in Anne Arundel County to the U.S. 50/U.S. 301 split in Queen Anne's County.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.9956717,-76.3745195263001,14z



Counties: Anne Arundel and Queen Anne's counties, Maryland

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

COASTAL BARRIERS

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

SYSTEM UNIT (SU)

Most new Federal expenditures and financial assistance, including Federal flood insurance, are prohibited within System Units. ***Federally-funded projects within System Units require consultation with the Service.*** *Consultation is not required for projects using private, state, or local funds.*

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
MD-32	Stevensville	SU	11/16/1990	11/16/1990
MD-32	Stevensville	SU	11/25/2024	11/25/2025

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1Fx
- PFO1Cx
- PSS1S
- PSS4C
- PFO4/SS1S
- PSS1B
- PFO4/1R
- PFO4/EM1R
- PSS1/EM1F
- PSS1/FO4B
- PSS1Ah
- PSS1A
- PSS1Bh
- PFO1D
- PFO4/1B
- PSS3/4R
- PFO1E

- PSS1Ex
- PFO1/SS1S
- PFO1Ch
- PSS1R
- PSS1Cx
- PFO1A
- PSS1/EM1Cx
- PFO1/2F
- PFO1/EM1A
- PFO1F
- PSS1Ch
- PFO1Fb
- PFO4S
- PFO1/SS1A
- PSS1C
- PFO4/1S
- PFO1/4B
- PSS1/EM1C
- PFO1Ex
- PFO1Db
- PFO1/2C
- PFO4/1C
- PFO1C
- PFO1B
- PFO1/4C
- PFO1Fh
- PFO1T
- PFO4D
- PFO1/4A
- PFO1R
- PSS4A
- PFO1/2E
- PFO4B
- PFO1/4S
- PSS1/EM1D
- PFO1Ad

- PFO/SS1A
- PFO1/EM1R
- PSS1E
- PSS1/EM1A
- PSS1D
- PFO1S
- PFO4R
- PFO4C
- PFO1/SS1R
- PFO1/SS1C

FRESHWATER POND

- PUSA
- PUSCx
- PUBF
- PUBH
- PUBHx
- PABHx
- PAB1Hx
- PUBFx
- PUBHh
- PUBVh
- PUBKx

RIVERINE

- R4SBCx
- R5UBH
- R4SBC

FRESHWATER EMERGENT WETLAND

- PEM1Dx
- PEM1Ch
- PEM1Ah
- PEM1B
- PEM5A
- PEM1F
- PEM1Dh
- PEM1D
- PEM1/SS1C

- PEM1A
- PEM1Ex
- PEM1Rh
- PEM1/SS1Fx
- PEM1/SS1Ch
- PEM1/SS1Cx
- PEM1R
- PEM1/SS1D
- PEM1Fx
- PEM1/SS1R
- PEM5C
- PEM1Fb
- PEM1C
- PEM1Fh
- PEM5Eh
- PEM1E
- PEM1Cx

ESTUARINE AND MARINE WETLAND

- E2USP
- E2EM1/SS1P
- E2EM1Pd
- E2SS1P
- E2SS1/EM1P
- E2EM1/SS4P
- E2US/SS1P
- E2US2P
- E2SS3/4P
- E2SS1Pd
- E2USN
- E2SS1/EM5P
- E2USM
- E2SS4P
- E2EM2N
- E2EM1N
- E2EM5P
- E2FO4P

- E2EM1P
- E2SS1/3P

OTHER

- Pf

ESTUARINE AND MARINE DEEPWATER

- E1UBLx
- E1UBLh
- E1ABLh
- E1UBL

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Gavin Studds
Address: 25 Old Solomons Island Road
City: Annapolis
State: MD
Zip: 20401
Email gavins@cri.biz
Phone: 4104746559

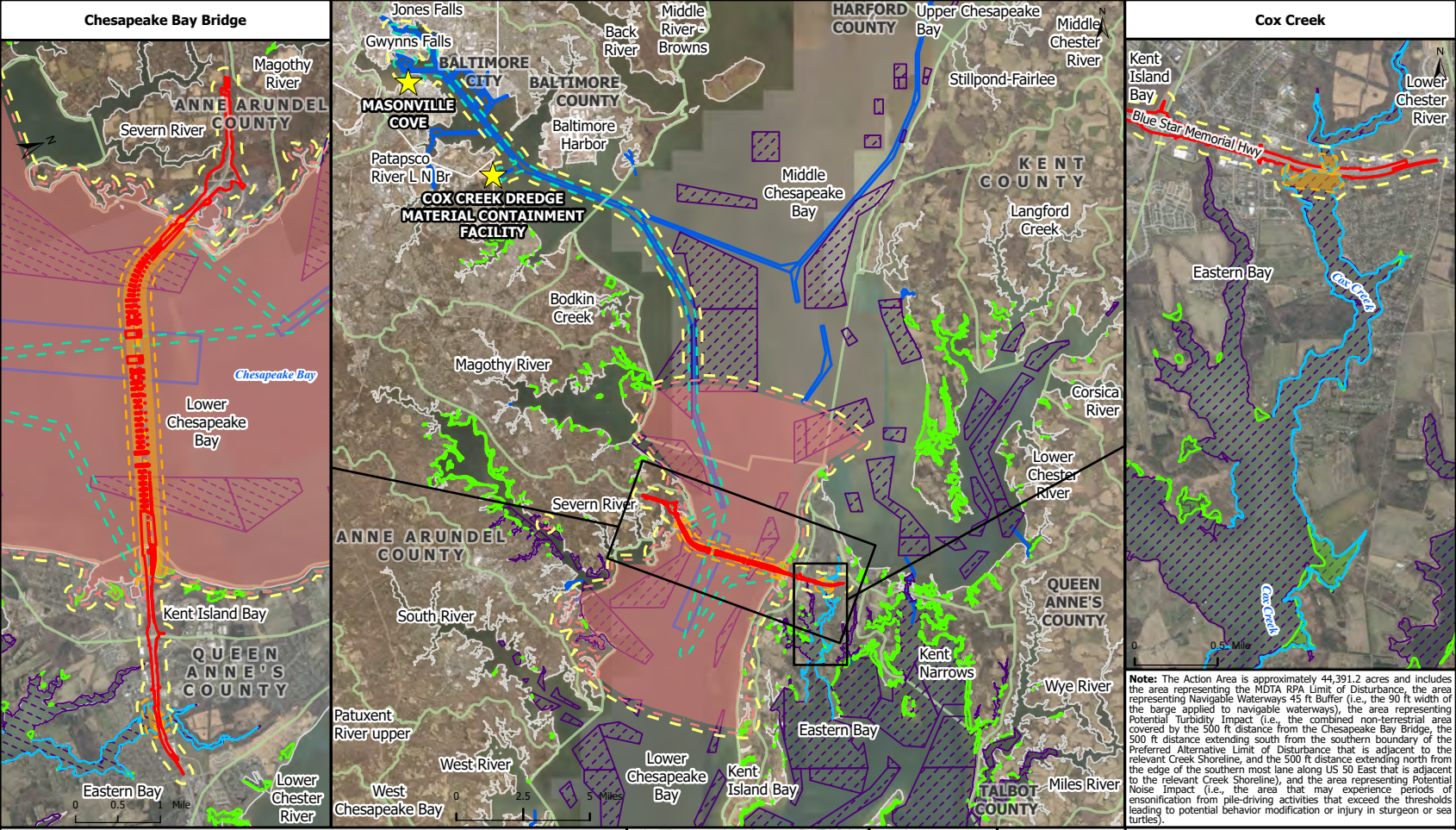
LEAD AGENCY CONTACT INFORMATION

Lead Agency: Federal Highway Administration
Name: Heather Lowe
Email: hlowe@mdta.state.md.us
Phone: 4105375665

APPENDIX B

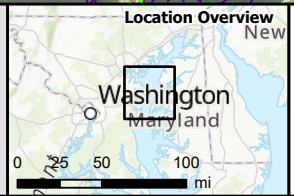
ACTION AREA MAP

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Note: The Action Area is approximately 44,391.2 acres and includes the area representing the MDTA RPA Limit of Disturbance, the area representing Navigable Waterways 45 ft Buffer (i.e., the 90 ft width of the barge applied to navigable waterways), the area representing Potential Turbidity Impact (i.e., the combined non-terrestrial area covered by the 500 ft distance from the Chesapeake Bay Bridge, the 500 ft distance extending south from the southern boundary of the Preferred Alternative Limit of Disturbance that is adjacent to the relevant Creek Shoreline, and the 500 ft distance extending north from the edge of the southern most lane along US 50 East that is adjacent to the relevant Creek Shoreline), and the area representing Potential Noise Impact (i.e., the area that may experience periods of ensonification from pile-driving activities that exceed the thresholds leading to potential behavior modification or injury in sturgeon or sea turtles).

- Potential Dredge Disposal Site
- MDTA RPA Limit of Disturbance
- SAV (2023)
- Natural Oyster Bottom (NOB)
- Action Area
- Action Area - Navigable Waterways 45 ft Buffer
- Action Area - Potential Turbidity Impact
- Action Area - Potential Noise Impact
- Cox Creek Shoreline
- National Channel Framework
- MDE 8-Digit Watershed
- County Boundary



Credits: MD iMAP, DNR, MD iMAP, SHA, MD iMAP, DoIT, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, USGS

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Action Area Map

APPENDIX C

BAT HABITAT ASSESSMENT

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DRAFT BAT HABITAT ASSESSMENT

BAY CROSSING TIER 2 STUDY

ANNE ARUNDEL & QUEEN ANNE'S COUNTY(S), MARYLAND





DRAFT

OCTOBER 2025

Prepared For:

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

MDTA Maryland Transportation Authority

Prepared By:

COASTAL RESOURCES INC.

25 Old Solomons Island Road, Annapolis, Maryland 21401

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1.0 Introduction

Coastal Resources, Inc. (CRI), sub-consultant to Rummel, Klepper, & Kahl, LLP (RKK), under contract with Maryland Transportation Authority (MDTA), has completed a bat habitat assessment for the Northern long-eared bat (*Myotis lucifugus*, NLEB) and the tricolored bat (*Perimyotis subflavus*, TCB) in support of the Chesapeake Bay Crossing Study Tier 2 NEPA Project, in Anne Arundel and Queen Anne's Counties, Maryland.

2.0 Study Area

The study area is comprised of approximately eight miles of MDTA right of way spanning across the Chesapeake Bay from west of Oceanic Drive in Annapolis to east of Cox Creek in Chester (**Figure 1 – Vicinity Map**). Land use classifications within and adjacent to the study areas include transportation, commercial, low density residential, and other land. The Bay Crossing Study Tier 2 NEPA project occurs within the Severn River (02131002), Lower Chesapeake Bay (02139998), Kent Island Bay (02130511), and Chester River (02130501) MDE 8-digit watersheds and lies within the Coastal Plain physiographic province.

3.0 Methodology

Prior to conducting the bat habitat assessment, CRI began the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) review process. The IPaC review was conducted on June 28, 2025, and indicated the federally endangered NLEB and proposed endangered TCB may occur within the project area. IPaC documentation is included in **Appendix B**.

Prior to the bat habitat assessment, CRI researched existing literature on the habitat types associated with each of the bat species of concern (**Table 1**). During the field assessment, potential bat habitat identified using the definitions of suitable NLEB and TCB habitat as defined in the 2024 USFWS *Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines* (USFWS 2024). Areas of potential bat habitat were created using the ArcGIS Field Maps application on an iOS device. These areas were field verified and adjusted using the cruise method. Inaccessible areas are assumed to be comprised of suitable bat habitat.

DRAFT

Figure 1: Vicinity Map

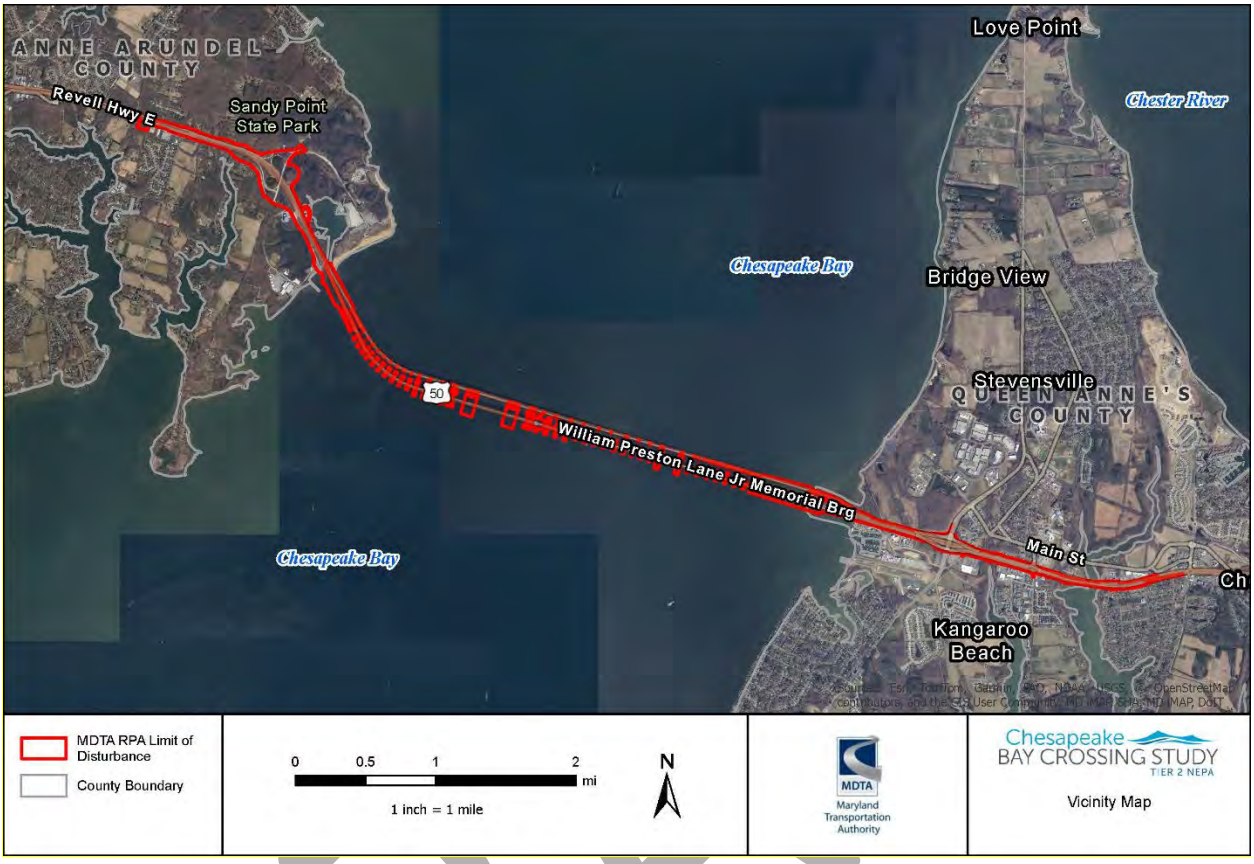


Table 1. Summary of RTE Habitat Assessment Results for Northern Long-eared Bat and Tricolored Bat

Common Name	Species	RTE Status[1]	Habitat Preference[2]	Suitable Habitat Present (Yes/No)
Northern Long-eared Bat	*Myotis septentrionalis*	FE, SE	Mixed-type wooded areas with potential roost trees and variable amounts of canopy closure and small gaps. May roost in human-made structures. [2]	Yes
Tri-colored Bat	*Perimyotis subflavus*	FPE, HSR	Wooded areas and adjacent non-forested habitat that includes emergent wetlands, shrublands, grasslands, and forested edges of fields and pastures. Will roost in human-made structures. [2]	Yes

[1]FT = Federally Endangered; FPE = Federally Proposed Endangered; SE = State Endangered; HSR = Highly State Rare
[2]Habitat associations obtained from 2024 USFWS Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines

4.0 Results and Discussion

The results of the bat habitat assessment are summarized below. Maps depicting the locations of bat habitat are included in **Appendix A**. Bat habitat characterization datasheets are included in **Appendix C**.

Representative site photographs of forest stands and tree clusters are included in **Appendix D** and bat habitat suitability data are included in **Appendix E**.

Both species of bats are insectivores. Because insects are so closely associated with water resources, streams and wetlands within suitable portions of the study area may provide important food sources and water for these species. These bats will typically forage over or along the edges of ponds, wetlands, and streams. During the waters of the U.S. (including wetlands) delineation, 38 wetland systems were identified within the LOD, including seven palustrine emergent wetlands, eight estuarine emergent wetlands, 21 palustrine forested wetlands, one palustrine scrub-shrub wetlands, one estuarine scrub-shrub wetland. Fifteen watercourses were identified within the study area, including 10 perennial streams and five intermittent streams.

Within the LOD, approximately 72.41 acres (20.58%) are classified as suitable bat habitat for the NLEB and TCB; and 279.41 acres (79.42%) are classified as unsuitable bat habitat. Much of the wooded areas in the project corridor provide suitable habitat, 10.23 acres (13.91%) of which is classified as good habitat for NLEB, 42.57 acres (59.43%) which is classified as moderate habitat for NLEB, and 19.6 acres (26.66%) which is classified as moderate-to-good habitat for NLEB. Within the LOD, 13.3 acres (18.41%) of suitable bat habitat is classified as good quality for TCB, 38.19 acres (53.43%) is classified as moderate quality for TCB, and 20.7 acres (28.16%) is classified as moderate-to-good habitat for TCB. In general, wooded areas along the project corridor follow a linear structure and are typified by a moderate to heavy vine load, including oriental bittersweet and English ivy, as well as being dominated by trees not typically favored by NLEB or TCB, such as Callery pear and sweetgum. Canopy was also the least dense forest layer, never exceeding 50% density, which may expose bats roosting in these stands to predation. Midstory and understory layers varied throughout the study area and were occupied, to some extent, by denser shrubs and trees such as Callery pear and autumn olive. Many of the wooded areas abutted the highway, creating tracts of forest edge, which may be beneficial to TCB. Unsuitable areas of bat habitat included roadways, trees with a DBH of three inches or less, and areas with only shrubby vegetation. The forest stands and tree clusters are depicted on the Bat Habitat Assessment Maps, included as **Appendix A**.

5.0 Conclusions

A habitat assessment was conducted for the Chesapeake Bay Crossing Tier 2 NEPA project to determine the potential for federally listed bat species to occur within the study area. Based on the results of the assessment, suitable roosting, traveling, and foraging bat habitat is present within the study area. Time of year restrictions and minimization measures will continue to be coordinated with USFWS as the project design progresses.

6.0 Literature Cited

U.S. Army Corps of Engineers (USACE). 2012. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region Version 2.0, ed. J. F. Berkowitz, J. S. Wakeley, R. W. Lichvar, C. V. Noble. ERDC/EL TR-12-9. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

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U.S. Fish and Wildlife Service (USWFS). 2024. Range-wide Indiana Bat & Northern Long-eared Bat Survey Guidelines. U.S. Fish and Wildlife Service, Region 3, Bloomington, MN. 95 pp.

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APPENDIX A: BAT HABITAT MAP

DRAFT



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview

Chesapeake Bay

0 1.25 2.5 5 mi

0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 1 of 14

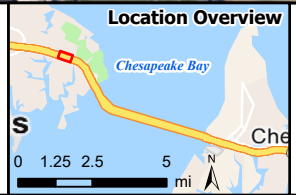


MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 2 of 14

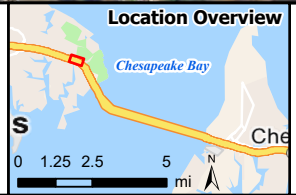


MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 3 of 14



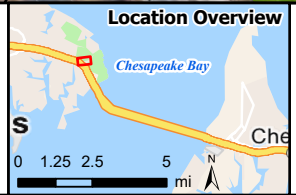
MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Specimen Tree

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

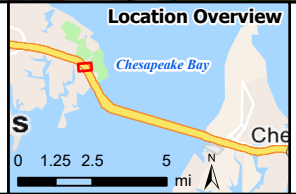
Sheet 4 of 14



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 5 of 14

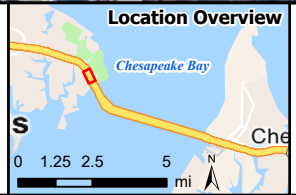


MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 6 of 14



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview

Chesapeake Bay

0 1.25 2.5 5 mi

0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

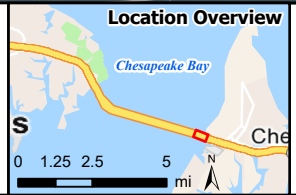
Sheet 7 of 14



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat



0 0.01 0.03 0.05 mi

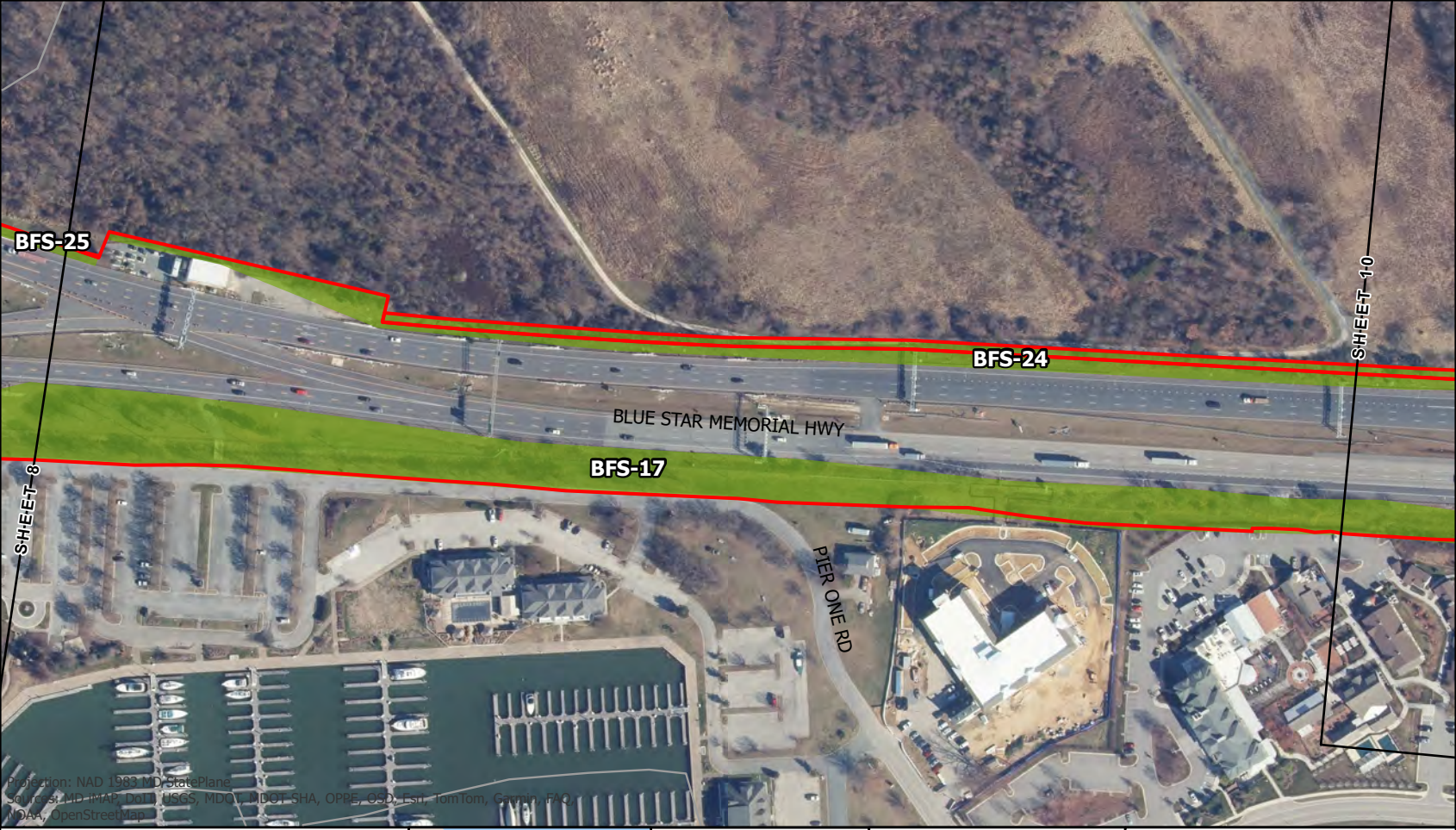
1 inch = 0.05 mile

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

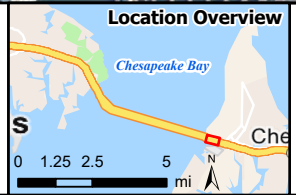
Sheet 8 of 14



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 9 of 14

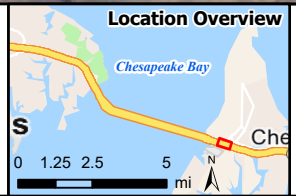


MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 10 of 14

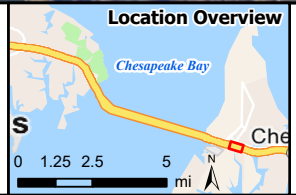


MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 11 of 14

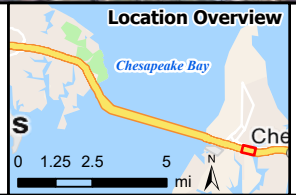


MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 12 of 14



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat

Location Overview

Chesapeake Bay

0 1.25 2.5 5 mi

0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

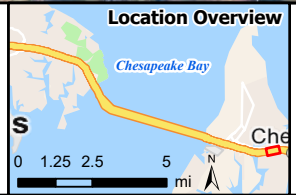
Sheet 13 of 14



MDTA RPA Limit of Disturbance

Map Sheet

Bat Forest Habitat



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Bat Habitat Assessment Maps

Sheet 14 of 14

APPENDIX B: FEDERAL AGENCY COORDINATION

DRAFT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127

In Reply Refer To: 07/28/2025 18:48:35 UTC
Project Code: 2024-0014247
Project Name: Bay Crossing Study Tier 2

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

- USFWS National Wildlife Refuges and Fish Hatcheries
- Coastal Barriers
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

PROJECT SUMMARY

Project Code: 2024-0014247
Project Name: Bay Crossing Study Tier 2
Project Type: Road/Hwy - New Construction
Project Description: The Chesapeake Bay Crossing Study: Tier 2 NEPA (Tier 2 Study) is a National Environmental Policy Act (NEPA) study that will analyze alternatives to provide congestion relief and improve travel reliability, mobility and safety across the Chesapeake Bay. The Tier 2 Study is focusing on the Selected Corridor Alternative (Corridor 7) that was identified at the conclusion of the Tier 1 Study. Alternatives will include a No Build Alternative and a range of build alternatives involving various alignments, crossing types and modal and operational alternatives (e.g. transit, pedestrian, bicycle, etc.). Corridor 7 is two miles wide and runs 22 miles from the Severn River Bridge in Anne Arundel County to the U.S. 50/U.S. 301 split in Queen Anne's County.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.9956717,-76.3745195263001,14z



Counties: Anne Arundel and Queen Anne's counties, Maryland

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

COASTAL BARRIERS

Projects within the John H. Chafee Coastal Barrier Resources System (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local Ecological Services Field Office or visit the CBRA Consultations website. The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

SYSTEM UNIT (SU)

Most new Federal expenditures and financial assistance, including Federal flood insurance, are prohibited within System Units. ***Federally-funded projects within System Units require consultation with the Service.*** *Consultation is not required for projects using private, state, or local funds.*

UNIT	NAME	TYPE	SYSTEM UNIT ESTABLISHMENT DATE	FLOOD INSURANCE PROHIBITION DATE
MD-32	Stevensville	SU	11/16/1990	11/16/1990
MD-32	Stevensville	SU	11/25/2024	11/25/2025

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1Fx
- PFO1Cx
- PSS1S
- PSS4C
- PFO4/SS1S
- PSS1B
- PFO4/1R
- PFO4/EM1R
- PSS1/EM1F
- PSS1/FO4B
- PSS1Ah
- PSS1A
- PSS1Bh
- PFO1D
- PFO4/1B
- PSS3/4R
- PFO1E

- PSS1Ex
- PFO1/SS1S
- PFO1Ch
- PSS1R
- PSS1Cx
- PFO1A
- PSS1/EM1Cx
- PFO1/2F
- PFO1/EM1A
- PFO1F
- PSS1Ch
- PFO1Fb
- PFO4S
- PFO1/SS1A
- PSS1C
- PFO4/1S
- PFO1/4B
- PSS1/EM1C
- PFO1Ex
- PFO1Db
- PFO1/2C
- PFO4/1C
- PFO1C
- PFO1B
- PFO1/4C
- PFO1Fh
- PFO1T
- PFO4D
- PFO1/4A
- PFO1R
- PSS4A
- PFO1/2E
- PFO4B
- PFO1/4S
- PSS1/EM1D
- PFO1Ad

- PFO/SS1A
- PFO1/EM1R
- PSS1E
- PSS1/EM1A
- PSS1D
- PFO1S
- PFO4R
- PFO4C
- PFO1/SS1R
- PFO1/SS1C

FRESHWATER POND

- PUSA
- PUSCx
- PUBF
- PUBH
- PUBHx
- PABHx
- PAB1Hx
- PUBFx
- PUBHh
- PUBVh
- PUBKx

RIVERINE

- R4SBCx
- R5UBH
- R4SBC

FRESHWATER EMERGENT WETLAND

- PEM1Dx
- PEM1Ch
- PEM1Ah
- PEM1B
- PEM5A
- PEM1F
- PEM1Dh
- PEM1D
- PEM1/SS1C

- PEM1A
- PEM1Ex
- PEM1Rh
- PEM1/SS1Fx
- PEM1/SS1Ch
- PEM1/SS1Cx
- PEM1R
- PEM1/SS1D
- PEM1Fx
- PEM1/SS1R
- PEM5C
- PEM1Fb
- PEM1C
- PEM1Fh
- PEM5Eh
- PEM1E
- PEM1Cx

ESTUARINE AND MARINE WETLAND

- E2USP
- E2EM1/SS1P
- E2EM1Pd
- E2SS1P
- E2SS1/EM1P
- E2EM1/SS4P
- E2US/SS1P
- E2US2P
- E2SS3/4P
- E2SS1Pd
- E2USN
- E2SS1/EM5P
- E2USM
- E2SS4P
- E2EM2N
- E2EM1N
- E2EM5P
- E2FO4P

- E2EM1P
- E2SS1/3P

OTHER

- Pf

ESTUARINE AND MARINE DEEPWATER

- E1UBLx
- E1UBLh
- E1ABLh
- E1UBL

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Gavin Studds
Address: 25 Old Solomons Island Road
City: Annapolis
State: MD
Zip: 20401
Email gavins@cri.biz
Phone: 4104746559

LEAD AGENCY CONTACT INFORMATION

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APPENDIX C: BAT HABITAT CHARACTERIZATION DATASHEETS

Sample Site No.(s): BFS-1

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	40	50	35
Dominant Species of Mature Trees	PRAV, MOAL, Elm sp., JUNI		
% Trees w Exfoliating Bark	0	5	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	60	35	5
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ → Mod/Good

Tricolored Bats? ✓ → Mod

Additional Comments

Western extend of stand is likely out of LOD behind of forceline, aside from dripline
Heavy vine load of QUPA2, HEHE, LOMA, + porcelainberry
Moving east, forest bumps out to a deeper stand (mostly 9-15" JUNI), decreased vines, increased forest structure

Sample Site No.(s): BFS-2

Water Resources at Sample Site						
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**	1 40ft
Pools/Ponds (# and size)			**Open and accessible to bats?**		✓	
Wetlands (approx. ac.)	**Permanent**		**Seasonal**			

Describe existing condition of water resources: Meredith Creek

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	30	45	15
Dominant Species of Mature Trees	LIST, ACSA2, JUVI, ROPS		
% Trees w Exfoliating Bark	2	0	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	15	70	15
No. of Suitable Snags	2		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ → Mod

Tricolored Bats? ✓ Mod/Good

Additional Comments

Heavy vine load, esp @ Gilbert Rd
Evidence of pruning @ powerline
Mostly smaller trees along Skidmore Dr, opens to sapling/shrub section (<3" DBH) abutting a WL/RIC
↳ Dense cluster of SANI, MOAL
Stand, moving east, returns to heavy vines + pruned JUVI, LIST
Western extent = better NLEB hab, East = better TCB hab

Sample Site No.(s): BFS-3

Water Resources at Sample Site						
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**	
(# and length)					1	2202ft
Pools/Ponds		**Open and accessible to bats?**				
(# and size)		✓				
Wetlands	**Permanent**	**Seasonal**				
(approx. ac.)						

Describe existing condition of water resources: Meredith Creek

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	30	40	15
Dominant Species of Mature Trees	LIST, JUNI, NYSY, ACSA2		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	25	65	10
No. of Suitable Snags	5		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ → Good

Tricolored Bats? ✓ → Mod

Additional Comments

Moving E, few canopy openings, tree size + vine load increases
Fairly open understory
Transitions to wetland, includes Meredith Creek, phragmites stand dominates understory
Small flowing WC abutting US30
Eastern extent → increases understory clutter + midstory clutter, + young/smaller trees
↳ Then again transitions to more open understory

Sample Site No.(s): BFS-4

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds		**Open and accessible to bats?**					
(# and size)							
Wetlands	**Permanent**	**Seasonal**					
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	0	10	30
Dominant Species of Mature Trees	DIVI, LIST, JUVI		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	90	10	0
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Dense understory of autumn olive, JUVI, HEHE

Sample Site No.(s): BFS-5

Water Resources at Sample Site						
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)						
Pools/Ponds		**Open and accessible to bats?**				
(# and size)						
Wetlands	**Permanent**	**Seasonal**				
(approx. ac.)						

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	50	35	20
Dominant Species of Mature Trees	LIST, PITA, ACRU, ACSA2		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	50	40	10
No. of Suitable Snags	3		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Good

Tricolored Bats? ✓ Mod

Additional Comments

Dense canopy → understory. evidence of pruning @ powerline
20ft of old growth field before forest edge
Forest opens over Carrs Rd, connected by midstory
West of Carrs Rd, understory is very open, low vines
Forest opening for powerline

Sample Site No.(s): BFS-6

Water Resources at Sample Site						
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)						
Pools/Ponds		**Open and accessible to bats?**				
(# and size)						
Wetlands	**Permanent**	**Seasonal**				
(approx. ac.)						

Forest Resources at Sample Site				
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**	1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%
	10	85	15	
Dominant Species of Mature Trees	LIST, Unknown ornamental			
% Trees w Exfoliating Bark	0	0	0	
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**	
Live Trees (%)	50	45	5	
No. of Suitable Snags	0			

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Small strip of yard trees - connecting BFS-5 + BFS-7

Heavy vine load + dense midstory clutter of white pine + ornamental sp

Sample Site No.(s): BFS-7

Water Resources at Sample Site							
Stream Type (# and length)	Ephemeral		Intermittent		Perennial	30ft	Describe existing condition of water resources: Meredith Creek
Pools/Ponds (# and size)			Open and accessible to bats?				
Wetlands (approx. ac.)	Permanent		Seasonal				

Forest Resources at Sample Site			
Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')
	40	30	35
Dominant Species of Mature Trees	LIST, QUAL		
% Trees w Exfoliating Bark	0	0	0
Size Composition of Live Trees (%)	Small (3-8")	Med (9-15")	Large(>15")
	80	70	10
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ → Mod/Good

Tricolored Bats? ✓ → Good

Additional Comments

Linear forested feature abutting WL/WL
Heavy vine load in the mid/understory
From Skidmore Dr: 20ft of field growth (sapling JUNI + RUPS) before forest edge
↳ Cleared for powerline

Sample Site No.(s): BFS-8

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	25	30	20
Dominant Species of Mature Trees	QUAC 80, PYCA 80, PITA, LIST 2		
% Trees w Exfoliating Bark	20	0	2
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	50	40	10
No. of Suitable Snags	6		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ mod

Tricolored Bats? ✓ mod

Additional Comments

Ditch between US50 + forest, currently dry

Moving E, understory = more cluttered, low vine load, small saplings (JUVI), tall shrubs (autumnolive, hawthorne sp)

Sample Site No.(s): BFS-9

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	15	45	25
Dominant Species of Mature Trees	ACRU, QUPA2, QUPH, ILOP		
% Trees w Exfoliating Bark	0	5	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	30	40	30
No. of Suitable Snags	4		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Moderately open understory, low-mod vine load
Mixed oak + maple, typically large
Currently dry ditch surrounds forest island as it approaches road surface, phrag + other clutter in the understory - more present @ forest edge, smilax density increases @ edge
Moving E - forest breaks over access path, then returns to forest w/ heavy vines

Sample Site No.(s): BFS-10

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)					1	50ft	Meredith Creek
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	35	60	60
Dominant Species of Mature Trees	PYCA80, LIST, ROPS		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	65	30	5
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Dense vine load + understory clutter of PYCA80
↳ HEHE + grape sp
Opens to stand of phragmites, likely depressed wetland (Heading west)
Heading east, more dense/cluttered understory 3-10" PYCA80
Heavier vine load @ forest edge within LOD. Beyond LOD, vine load decreases
↳ (PAQU)
Forest opens @ NHP Building over a maintained lawn

Sample Site No.(s): B FS-11

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	20	15	30
Dominant Species of Mature Trees	PYCA80, QURU, NOAL, QUPH, QUAL80		
% Trees w Exfoliating Bark	0	0	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	65	30	5
No. of Suitable Snags			

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Uphill small forested island between US50 + College Pkwy
Understory moderately cluttered w/ vines (PAQU2, TORA2) + PYCA80
Mixed oak assemblege, moderately sized

Sample Site No.(s): BFS-12

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	10	30	60
Dominant Species of Mature Trees	ACRU, LITU, QUAC80		
% Trees w Exfoliating Bark	0	0	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	10	50	10
No. of Suitable Snags			

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Linear forest edge feature

Moderately dense understory w <20' JUVI + vines (grape sp, QUPA2)

↳ Moving west, vine load increases to heavy, very dense

Sample Site No.(s): BFS-13

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
					1	40ft	Meredith Creek
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	0	5	35
Dominant Species of Mature Trees	PLOC, LIST2, JUVI		
% Trees w Exfoliating Bark	5	5	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	80	20	0
No. of Suitable Snags	2		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod/Good

Tricolored Bats? ✓ Good

Additional Comments

Better TCB habitat → Linear feature of small residential trees that opens over a wetland w/ standing water. Understory cluttered w/ vines

At the western most extent, understory thrayh canopy density increases

Sample Site No.(s): BFS-14

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	35	50	45
Dominant Species of Mature Trees	LIST2, QURU, PRSE2		
% Trees w Exfoliating Bark	0	2	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	40	55	5
No. of Suitable Snags	10		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Forest edge → heavy vine load (HEHE, PAQU2) in understory + midstory
Few standing snags, overtaken by vines

Sample Site No.(s): BFS -15

Water Resources at Sample Site						
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**	**Describe existing condition of water resources:**
(# and length)						
Pools/Ponds		**Open and accessible to bats?**				
(# and size)						
Wetlands	**Permanent**	**Seasonal**				
(approx. ac.)						

Forest Resources at Sample Site				
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**	1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%
	0	30	50	
Dominant Species of Mature Trees	LITU, PYCA80, ACRS			
% Trees w Exfoliating Bark	0	0	0	
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**	
Live Trees (%)	40	60	0	
No. of Suitable Snags	0			

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Forest island between US50 + Bike path, 450ft West = 30" + QURU

Understory moderately cluttered by PYCA80 + vines

Forest edge has standing water, mowing east = many plantings of shrubs + saplings

↳ Likely favors TCB ↳ canopy + midstory not present

Sample Site No.(s): BFS-17

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	0	45	20
Dominant Species of Mature Trees	Japanese Zelkova, PITA, Callery, Crape Myrtle, Southern Red Oak		
% Trees w Exfoliating Bark	0	40	
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	10	65	20
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Good/Mod

Additional Comments

Linear feature of street trees, continuous phragmites stand, some areas of standing water. Better TCB habitat - more openings, no canopy.

Moving east, stand incorporates singular new sp, adding to the midstory = more oak mix, smaller diameters like crape-myrtle + hawthorn sp., Further east, = more standing water

Vine load very low, few heavy spots moving east

Sample Site No.(s): BFS-18

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds		**Open and accessible to bats?**					
(# and size)							
Wetlands	**Permanent**	**Seasonal**					
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	5	20	30
Dominant Species of Mature Trees	QUPH, Sawtooth Oak, QURU		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	5	55	40
No. of Suitable Snags	6		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? _____

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod/Good

Additional Comments

Mixed oak corridor, divided by roadsurface
Better TCB habitat due to linear feature, open on most sides + species comp
Vine load low, except for few trees at eastern most

Sample Site No.(s): BFS-19

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)					1	30ft	Cox Creek
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	0	10	40
Dominant Species of Mature Trees	Honey Locust, Elm 2		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	65	35	0
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Most likely

Tricolored Bats? ✓ Good

Additional Comments

Linear street tree feature parallel to US 50 + going over Cox Creek
Better for TCB due to openness + proximity to water
Western bank of Cox Creek has heavy vine load
Vines also present on east bank

Sample Site No.(s): BFS-20

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	0	3	40
Dominant Species of Mature Trees	JUVI, Caller Pe	oa	
% Trees w Exfoliating Bark			0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	55	40	5
No. of Suitable Snags	1		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? Mod

Tricolored Bats? Mod/Good

Additional Comments

Moderate vine load (grape & Dense understory due to JUVI branching, pear, + pin oak
Western most end abuts Cox Creek
Vines consistent throughout, includes Amur honeysuckle + VA creeper
Better for TCB due to oak assemblage + openness. Easternmost extent = heavily dense understory due to JUVI

Sample Site No.(s): BFS-21

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	0	10	10
Dominant Species of Mature Trees	PLOC		
% Trees w Exfoliating Bark	0	100	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	0	100	0
No. of Suitable Snags	6		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

2 PLOC within 100ft of FS-20

Sample Site No.(s): BFS-22

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	5	10	60
Dominant Species of Mature Trees	V. DUPH, ACO, Callery Pear		
% Trees w Exfoliating Bark	0	0	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	70	25	5
No. of Suitable Snags	11		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ mod

Tricolored Bats? ✓ Mod|Good

Additional Comments

Linear forest feature abutting US50, mixed assemblage, esp oaks (QUPH, QUMU)
Some portions w/ standing water
Understory dense w/ shrubs like staghorn sumac + sapling callery pear
Vine load heavy (VA Creeper, poison ivy, grape sp. multiflora rose)
Better for TCB due to assemblage, water, + openness

Sample Site No.(s): PFS-23

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)					1	30ft	Thompson Creek
Pools/Ponds		**Open and accessible to bats?**					
(# and size)							
Wetlands	**Permanent**	**Seasonal**					
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	10	20	15
Dominant Species of Mature Trees	JUNI, ACRU, JUNI, LIST, Pin oak		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	35	60	5
No. of Suitable Snags	2		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod/ Good

Tricolored Bats? ✓ Mod/ Good

Additional Comments

Linear forested feature along USSD that crosses Thompson Creek
Between USSD + FS-23 is a drainage ditch, w/ standing water
Moderate vine load
Likely better for TCB due to water, open linear feature, + mixed oaks (QUAL, QUNI, Pin oak, Shumard oak)

Sample Site No.(s): BFS-24

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	5	30	60
Dominant Species of Mature Trees	LIST: PITA ACRU, Mixed oak, Eastern cottonwood		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	30	60	10
No. of Suitable Snags			

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod/high

Additional Comments

Easternmost portion includes sloped forest

Includes phrag stand, likely wetland, lake-like has water w/in

Moving west, stand becomes more

Likely better TCB hab due to oak

↳ Very open canopy, dense understory

Sample Site No.(s): BFS-25

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	5	20	25
Dominant Species of Mature Trees	PYCA80		
% Trees w Exfoliating Bark	0	0	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	60	35	5
No. of Suitable Snags	0		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Small strips of woody veg abutting the Bay Bridge
↳ Includes staghorn sumac

Sample Site No.(s): BFS-26

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	15	30	15
Dominant Species of Mature Trees	Witch Oak Gallery Pear, PITA		
% Trees w Exfoliating Bark		0	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	45	45	10
No. of Suitable Snags	~~HH~~ III		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod/Good

Tricolored Bats? ✓ Mod

Additional Comments

Forest edge dominated by larger trees, mostly Southern red oak + PITA + Gallery pear, tall autumn olive
↳ Interior dominated by smaller trees, also including LIST + JUVI + mixed oaks
Vine load low-moderate, not restrictive on the whole
Currently wet drainage ditch sits between USGS + forest interior
Moving east to the portion within the ramp, forest interior dominated by larger trees, mostly PITA, resulting in a more dense stand, phragmites stand where edge meets USGS

Sample Site No.(s): BFS-27

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	10	15	30
Dominant Species of Mature Trees	Japanese zelkova, LITU, QUPH		
% Trees w Exfoliating Bark	5		
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	60	30	10
No. of Suitable Snags	III		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Vine load moderate (HEHE, ROMU, greenbriar, CEOR)
Understory dense w/ fallen woody debris overtaken by vines
Standing water + wetland veg seen at forest edge along E College Pkwy

Sample Site No.(s): BFS-28

Water Resources at Sample Site							
Stream Type (# and length)	Ephemeral		Intermittent		Perennial		Describe existing condition of water resources:
Pools/Ponds (# and size)			Open and accessible to bats?				
Wetlands (approx. ac.)	Permanent		Seasonal				

Forest Resources at Sample Site			
Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')
	40	50	15
Dominant Species of Mature Trees	PITA, Sawtooth Oak, P. oak, QUPH		
% Trees w Exfoliating Bark	5	5	0
Size Composition of Live Trees (%)	Small (3-8")	Med (9-15")	Large(>15")
	20	30	50
No. of Suitable Snags	1		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? 0

Northern Long-eared Bats? " (Good)

Tricolored Bats? " Good

Additional Comments
Forest includes extensive wetland w/ standing water with [illegible] a variety of large oaks + PITA Understory fairly open, sapling/valley oak with mid-story

Sample Site No.(s): BFS-29

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	20	5	50
Dominant Species of Mature Trees	A S 25		
% Trees w Exfoliating Bark	10	10	0
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	15	60	25
No. of Suitable Snags	IIII		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod

Additional Comments

Vine load mod - heavy, mostly TORA

Southern extent is almost exclusively Sassafras cat

↳ North extent - more PITA

Depression @ the eastern extent of Phase present

Sample Site No.(s): BFS-30

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)					1	170ft	
Pools/Ponds			**Open and accessible to bats?**				
(# and size)			✓				
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	20	40	30
Dominant Species of Mature Trees	ACRU, LITU		
% Trees w Exfoliating Bark	15	5	0
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	2	60	15
No. of Suitable Snags	IIII		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? ✓

Northern Long-eared Bats? ✓ Mod

Tricolored Bats? ✓ Mod/Good

Additional Comments

Forested wetland, little standing water @ time of survey at the western ending
From the ramp, there is a steep slope down into the forest
Looking NE vine load is low (TOPA, HEHE, RAMO)
Abuts Meezick Pond wetland; edge likely better habitat for TCB

Sample Site No.(s): BFS-31

Water Resources at Sample Site							
Stream Type (# and length)	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
Pools/Ponds (# and size)			**Open and accessible to bats?**				
Wetlands (approx. ac.)	**Permanent**		**Seasonal**				

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	15	30	10
Dominant Species of Mature Trees	LIST: Honeylocust, Callery Pear, PIVI, PRSE2		
% Trees w Exfoliating Bark	5	10	5
Size Composition of Live Trees (%)	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
	20	60	20
No. of Suitable Snags	~~IIII~~ 1		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? V

Northern Long-eared Bats? V Marginal

Tricolored Bats? V Good

Additional Comments

Riparian edge habitat @ Mezick Ponds, dense phragmites beyond fenceline (~50ft before opens to pond)
Understory most maintained, so open Moving east, large open field
Heavy vine cover on fence, ~~6ft~~ of dense vine
Some large, mixed oaks at pond perimeter
Far better TCB habitat due to oak assemblage [illegible] water/wetlands

Sample Site No.(s): BFS-32

Water Resources at Sample Site							
Stream Type	**Ephemeral**		**Intermittent**		**Perennial**		**Describe existing condition of water resources:**
(# and length)							
Pools/Ponds			**Open and accessible to bats?**				
(# and size)							
Wetlands	**Permanent**		**Seasonal**				
(approx. ac.)							

Forest Resources at Sample Site			
Closure/Density	**Canopy (>50')**	**Midstory (20-50')**	**Understory (<20')**
	10	35	40
Dominant Species of Mature Trees	QUPH, PITA		
% Trees w Exfoliating Bark	0	5	5
Size Composition of	**Small (3-8")**	**Med (9-15")**	**Large(>15")**
Live Trees (%)	20	70	10
No. of Suitable Snags	11		

1 = 1-10%; 2 = 11-20%; 3 = 21-40%; 4 = 41-60%; 5 = 61-80%; 6 = 81-100%

Is the habitat suitable f Indiana Bats? V

Northern Long-eared Bats? V Mod

Tricolored Bats? ✓ Mod

Additional Comments

Vine load heavy throughout midstory

APPENDIX D: SITE PHOTOGRAPHS

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Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 1. Representative photo of suitable bat habitat in a sweet cherry and white mulberry fencerow forest (BFS-1)



Photo 2. Representative photo, farther east, of suitable bat habitat in a sweet cherry, black walnut, and white mulberry fencerow forest (BFS-1).



Photo 3. Representative photo of suitable bat habitat in a row of sweetgum, silver maple, eastern redcedar, black locust (BFS-2).



Photo 4. Representative photo of suitable bat habitat in a row of sweetgum, silver maple, eastern redcedar, black locust (BFS-2).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 5. Representative photo of suitable bat habitat in a sweetgum, black walnut, black gum, silver maple forest (BFS-3).



Photo 6. Representative photo of suitable bat habitat in a sweetgum, black walnut, black gum, silver maple forest (BFS-3).



Photo 7. Representative photo of suitable bat habitat in a sweetgum, black walnut, black gum, silver maple forest (BFS-3).



Photo 8. Representative photo of suitable bat habitat in a common persimmon, sweetgum, and eastern redcedar cluster (BFS-4).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 9. Representative photo of suitable bat habitat in a common persimmon, sweetgum, and eastern redcedar cluster (BFS-4).

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Photo 10. Representative photo of suitable bat habitat in a sweetgum, loblolly pine, red maple, and silver maple forest (BFS-5).



Photo 11. Representative photo of suitable bat habitat in a sweetgum, loblolly pine, red maple, and silver maple forest (BFS-5).



Photo 12. Representative photo of suitable bat habitat in a sweetgum, loblolly pine, red maple, and silver maple forest (BFS-5).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 13. Representative photo of suitable bat habitat in a cluster of sweetgum and unknown ornamental trees (BFS-6).



Photo 14. Representative photo of suitable bat habitat in a sweetgum and white oak forest (BFS-7).



Photo 15. Representative photo of suitable bat habitat in a sweetgum and white oak forest (BFS-7).



Photo 16. Representative photo of suitable bat habitat in a sawtooth oak, Callery pear, loblolly pine, and sweetgum forest (BFS-8).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 17. Representative photo of suitable bat habitat in a red maple, pin oak, willow oak, and American holly (BFS-9).



Photo 18. Representative photo of suitable bat habitat in a red maple, pin oak, willow oak, and American holly (BFS-9).



Photo 19. Representative photo of suitable bat habitat in a Callery pear, sweetgum, and black locust forest (BFS-10).



Photo 20. Representative photo of suitable bat habitat in a Callery pear, sweetgum, and black locust forest (BFS-10).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 21. Representative photo of suitable bat habitat in a Callery pear, sweetgum, and black locust forest (BFS-10).



Photo 22. Representative photo of suitable bat habitat in a Callery pear, white mulberry, and mixed oak forest (BFS-11).



Photo 23. Representative photo of suitable bat habitat in a Callery pear, white mulberry, and mixed oak forest (BFS-11).



Photo 24. Representative photo of suitable bat habitat in a red maple, sweetgum, sawtooth oak, and tuliptree forest (BFS-12).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 25. Representative photo of suitable bat habitat in an American sycamore, sweetgum, and eastern redcedar forest (BFS-13).



Photo 26. Representative photo of suitable bat habitat in an American sycamore, sweetgum, and eastern redcedar forest (BFS-13).



Photo 27. Representative photo of suitable bat habitat in a sweetgum, northern red oak, and black cherry forest (BFS-14).



Photo 28. Representative photo of suitable bat habitat in a sweetgum, northern red oak, and black cherry forest (BFS-14).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 29. Representative photo of suitable bat habitat in a tuliptree, Callery pear, and black locust forest (BFS-15).



Photo 30. Representative photo of suitable bat habitat in a mixed deciduous forest (BFS-16).



Photo 31. Representative photo of suitable bat habitat in a planted mixed deciduous forest (BFS-17).



Photo 32. Representative photo of suitable bat habitat in a mixed oak cluster (BFS-18).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 33. Representative photo of suitable bat habitat in a honey locust and sweetgum forest (BFS-19).



Photo 34. Representative photo of suitable bat habitat in a eastern redcedar, Callery pear, and pin oak forest (BFS-20).



Photo 35. Representative photo of suitable bat habitat in a small cluster of American sycamore (BFS-21).



Photo 36. Representative photo of suitable bat habitat in a eastern redcedar, willow oak, Callery pear, and bitternut hickory forest (BFS-22).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 37. Representative photo of suitable bat habitat in a mixed deciduous forest (BFS-23).



Photo 38. Representative photo of suitable bat habitat in a sweetgum, loblolly pine, red maple, and mixed oak forest (BFS-24).



Photo 39. Representative photo of suitable bat habitat in a Callery pear, loblolly pine, and sawtooth oak forest (BFS-26).



Photo 40. Representative photo of suitable bat habitat in a Callery pear, loblolly pine, and sawtooth oak forest (BFS-26).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 41. Representative photo of suitable bat habitat in a sweetgum, willow oak, and Japanese zelkova forest (BFS-27).



Photo 42. Representative photo of suitable bat habitat in a sweetgum, willow oak, and Japanese zelkova forest (BFS-27).



Photo 43. Representative photo of suitable bat habitat in a mixed oak and loblolly pine forest (BFS-28).



Photo 44. Representative photo of suitable bat habitat in a mixed oak and loblolly pine forest (BFS-28).

Appendix D: Chesapeake Bay Crossing Study Bat Habitat Assessment Photograph Log



Photo 45. Representative photo of suitable bat habitat in a loblolly pine, sweetgum, and sawtooth oak forest (BFS-29).



Photo 46. Representative photo of suitable bat habitat in a red maple and sweetgum forest (BFS-30).



Photo 47. Representative photo of suitable bat habitat in a mixed deciduous forest (BFS-31).



Photo 48. Representative photo of suitable bat habitat in a willow oak and loblolly pine cluster (BFS-32).

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APPENDIX E: BAT HABITAT SUITABILITY DATA

Bat Habitat Data

			Quality				Canopy Density (%)			Size Composition (%)			Acres
Stand Code	**NLEB**	**TCB**	**NLEB**	**TCB**	**Forest Type**	**Dominatnt Tree Species**	**Understory**	**Midstory**	**Canopy**	**Small**	**Medium**	**Large**	
BFS-1	Yes	Yes	Mod/Good	Moderate	Deciduous	Sweet Cherry, White Mulberry, Black Walnut, Elm sp.	35	50	40	60	35	5	2.55
BFS-2	Yes	Yes	Moderate	Mod/Good	Mixed	Sweetgum, Silver Maple, Eastern Redcedar, Black Locust	15	45	50	15	70	15	0.86
BFS-3	Yes	Yes	Good	Moderate	Deciduous	Sweetgum, Black Walnut, Black Gum, Silver Maple	15	40	30	25	65	10	4.29
BFS-4	Yes	Yes	Moderate	Moderate	Mixed	Common Persimmon, Sweetgum, Eastern Redcedar	30	10	0	90	10	0	0.28
BFS-5	Yes	Yes	Good	Moderate	Mixed	Sweetgum, Loblolly Pine, Red Maple, Silver Maple	20	55	50	50	40	10	1.36
BFS-6	Yes	Yes	Moderate	Moderate	Deciduous	Sweetgum, Unknown Ornamental	15	85	10	50	45	5	0.06
BFS-7	Yes	Yes	Mod/Good	Good	Deciduous	Sweetgum, White Oak	35	50	40	20	70	10	0.34
BFS-8	Yes	Yes	Moderate	Moderate	Mixed	Sawtooth Oak, Callery Pear, Loblolly Pine, Sweetgum	20	30	25	50	40	10	1.92
BFS-9	Yes	Yes	Moderate	Moderate	Deciduous	Red Maple, Pin Oak, Willow Oak, American Holly	25	45	15	30	40	30	4.96
BFS-10	Yes	Yes	Moderate	Moderate	Deciduous	Callery Pear, Sweetgum, Black Locust	60	60	35	65	30	5	2.24
BFS-11	Yes	Yes	Moderate	Moderate	Deciduous	Callery Pear, Northern Red Oak, White Mulberry, Willow Oak, Sawtooth Oak	30	15	20	65	30	5	0.48
BFS-12	Yes	Yes	Moderate	Moderate	Deciduous	Red Maple, Tuliptree, Sawtooth Oak	60	30	10	10	80	10	0.95
BFS-13	Yes	Yes	Mod/Good	Good	Mixed	American Sycamore, Sweetgum, Eastern Redcedar	35	5	0	80	20	0	0.47
BFS-14	Yes	Yes	Moderate	Moderate	Deciduous	Sweetgtum, Northern Red Oak, Black Cherry	45	50	35	40	55	5	1.54
BFS-15	Yes	Yes	Moderate	Moderate	Deciduous	Tuliptree, Callery Pear, Black Locust	50	30	0	40	60	0	0.36
BFS-16	Yes	Yes	Moderate	Moderate	Deciduous	Red Maple, Tuliptree, Sweetgum, Black Cherry, American Holly	65	30	20	30	60	10	1.12
BFS-17	Yes	Yes	Moderate	Mod/Good	Mixed	Japanese Zelkova, Loblolly Pine, Callery Pear, Black Willow, Sawtooth Oak, Crape-Myrtle	20	45	0	10	65	20	4.74
BFS-18	Yes	Yes	Moderate	Mod/Good	Deciduous	Willow Oak, Sawtooth Oak, Northern Red Oak	30	20	5	5	55	40	6.59
BFS-19	Yes	Yes	Mod/Good	Good	Deciduous	Honey Locust, Sweetgum	40	10	0	65	35	0	3.2
BFS-20	Yes	Yes	Good	Mod/Good	Deciduous	Eastern Redcedar. Callery Pear, Pin Oak	40	30	0	55	40	5	2.49
BFS-21	Yes	Yes	Moderate	Moderate	Deciduous	American Sycamore	10	10	0	0	100	0	0.09
BFS-22	Yes	Yes	Moderate	Moderate	Mixed	Eastern Redcedar, Willow Oak, Bitternut Hickory, Callery Pear	60	10	5	70	25	5	0.66
BFS-23	Yes	Yes	Mod/Good	Mod/Good	Mixed	Black Walnut, Red Maple, Eastern Redcedar, Sweetgum, Pin Oak	15	20	10	35	60	5	2.54
BFS-24	Yes	Yes	Moderate	Mod/Good	Mixed	Sweetgum, Loblolly Pine, Red Maple, Crape-Myrtle, Mixed Oaks	60	30	5	30	60	10	3.11
BFS-25	Yes	Yes	Moderate	Moderate	Deciduous	Callery Pear	25	20	5	60	35	5	3.86
BFS-26	Yes	Yes	Mod/Good	Moderate	Mixed	Sawtooth Oak, Callery Pear, Loblolly Pine	15	40	15	45	45	10	5.49
BFS-27	Yes	Yes	Moderate	Moderate	Deciduous	Japanese Zelkova, Sweetgum, Willow Oak	30	15	10	60	30	10	2.7
BFS-28	Yes	Yes	Good	Good	Mixed	Loblolly Pine, Sawtooth Oak, Pin Oak, Willow Oak	15	50	40	20	30	50	4.58
BFS-29	Yes	Yes	Moderate	Moderate	Mixed	Loblolly Pine, Sweetgum, Sawtooth Oak	50	55	20	15	60	25	2.2
BFS-30	Yes	Yes	Moderate	Mod/Good	Deciduous	Red Maple, Sweetgum	20	40	30	25	60	15	4.19
BFS-31	Yes	Yes	Mod/Good	Good	Mixed	Sweetgum, Honey Locust, Callery Pear, Virginia Pine, Black Cherry	10	30	15	20	60	20	2.46
BFS-32	Yes	Yes	Moderate	Moderate	Mixed	Willow Oak, Loblolly Pine	40	35	10	20	70	10	0.87

APPENDIX D

BAT BRIDGE AND CULVERT ASSESSMENT

DRAFT

MEMORANDUM

DATE: OCTOBER 16, 2025

TO: RAY LI, USFWS

FROM: GAVIN STUDDS, COASTAL RESOURCES, INC.

SUBJECT: CHESAPEAKE BAY CROSSING STUDY TIER 2 NEPA PROJECT BRIDGE AND CULVERT BAT SURVEY

DRAFT

1.0 Introduction

Coastal Resources, Inc. (CRI), sub-consultant to Rummel, Klepper, & Kahl, LLP (RKK), under contract with Maryland Transportation Authority (MDTA), conducted a bridge and culvert bat survey for the Chesapeake Bay Crossing Study Tier 2 NEPA Project, in Anne Arundel and Queen Anne's Counties, Maryland (**Figure 1 – Vicinity Map)**. The study area is comprised of approximately eight miles of MDTA right of way spanning across the Chesapeake Bay from west of Oceanic Drive in Annapolis to east of Cox Creek in Chester. As part of coordination with U.S. Fish and Wildlife Service (USFWS), CRI conducted bridge and culvert surveys for evidence of roosting bats during the fall of 2025. Three bridges, thirteen (13) culverts, and three buildings were surveyed on September 19, October 7, and October 16, 2025, for evidence of roosting bats. Due to safety concerns, culverts less than three feet in diameter or that were otherwise inaccessible were not entered. Due to access constraints for private property, the three buildings were assessed using publicly available photographs. Coordinated with USFWS, the overpass of Oceanic Drive was also surveyed using publicly available imagery. Finally, due to its large size and primarily steel design, the Bay Bridge was assessed for viable roosting habitat using MDTA inspection reports. No bats were observed in any of the surveyed bridges, culverts, or buildings during the bridge and culvert survey.

Figure 1: Vicinity Map


ANNE ARUNDEL COUNTY
Revell Hwy E
Sandy Point State Park
Love Point
Chester River
Chesapeake Bay
Bridge View
50
William Preston Lane Jr Memorial Brg
Stevensville
QUEEN ANNE'S COUNTY
Main St
Chesapeake Bay
Kangaroo Beach
MDTA RPA Limit of Disturbance
County Boundary
0 0.5 1 2 mi
1 inch = 1 mile
N
MDTA
Maryland Transportation Authority
Chesapeake BAY CROSSING STUDY
TIER 2 NEPA
Vicinity Map

2.0 Methodology

Nineteen (19) structures were surveyed in the fall of 2025 for presence of day- roosting bats or evidence (e.g., guano or urine staining) of night roosting bats. Characteristics such as approximate length, height, and material were recorded for each of the structures assessed in the field on a datasheet provided by USFWS and are included in **Appendix B**.

Field maps on an aerial base image were prepared that highlighted each of the 19 selected bridges, culverts, and buildings to be surveyed (**Appendix A**). Equipment used in the visual assessments and for safety included an infrared camera, a borescope, high powered spotlights, binoculars, hardhats, high visibility vests, and iPads connected to a Global Positioning System (GPS) to record survey data and take photographs. Surveyors also carried guano collection kits and decontamination equipment, if bats were observed or evidence of roosting was detected.

Systematic visual surveys of bridges, culverts, and structures were conducted during daylight hours on September 19, October 7, and October 16, 2025. Each bridge, culvert and structure survey was carried out by two surveyors, at least one of which was certified to conduct bridge and culvert assessments for bats in Maryland. Surfaces beneath the bridges were assessed across their entire span from the junction of each abutment with the bridge deck. Inspections included visual surveys of all abutments, decks, piers, and other structures associated with each bridge. Suitable roosting habitat for bats on bridge structures includes cracks or crevices formed from spalling concrete, junctions of the bridge abutment with the bridge deck, expansion joints, and other cave-like areas associated with bridges. Surveys for the presence of day roosting bats typically began at each abutment with surveyors shining bright spotlights into dark spaces across the entire width of each bridge. The assessment focused its greatest attention on spaces generally less than two inches in width. Following the investigation using a spotlight, a borescope, attached to a 20- foot pole, was then used to more closely assess these areas, especially spaces smaller than two inches in width and four or more inches in depth. After using the borescope, an infrared camera was used to assess each of these areas of interest for heat signatures associated with roosting bats. In addition to looking for the visual presence of day roosting bats, evidence of bats was also assessed by listening for high pitched squeaking sounds of day roosting bats and searching for guano or urine staining or odor that may indicate use by day or night roosting bats. This same protocol was followed to sample all culverts as well, with the exception that culverts smaller than three feet in diameter or that had covered entrances, such as grates or debris, were not to be entered and had to be assessed from the outside. Based on coordination with USFWS, it was decided that the Bay Bridge will be visually assessed by inspection reports for evidence of bat use. Assessments were conducted using inspection reports due to constraints operating drones in the area. Three buildings and the Oceanic Drive overpass were assessed for evidence of bats using publicly available imagery.

As noted above, USFWS Bridge/Culvert Assessment Forms (USFWS, 2024, Appendix K) were completed for each bridge, culvert, and structure surveyed in the field. Data collected included associated date and time of assessment, location, facility carried, structure height and length, structure type and material, crossings traversed, surrounding habitat, names of inspectors, and any documented evidence of the presence of bats. The forms also provide a checklist of types of potential bat roosting habitat present for each structure, including:

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- All vertical crevices sealed at the top that are 0.5-1.25” wide and ≥4” deep
- Concrete surfaces
- Spaces between concrete end walls and the bridge deck
- Crack between concrete railings on top of the bridge deck
- Vertical surfaces on concrete I-beams
- Spaces between walls, ceiling joists
- Weep holes, scupper drains, and inlets/pipes
- All guiderails
- All expansion joints

Completed data forms are included in **Appendix B**. Photographs were also taken of each assessed bridge and culvert; representative of the potential habitat checklist provided in the datasheets. These are included in a photographic log in **Appendix C**. Other representative photographs were taken using the borescope camera and infrared camera as appropriate.

3.0 Results

During the visual assessments of the bridges, culverts, and buildings, none were found to have evidence of bat use, including visual confirmation of bats, guano, or staining. Of the 13 culverts to be surveyed, 11 of them were not entered, due to steel grates or being mostly filled with water or sediment, so were surveyed from the outside. Of these, Culvert 50 was not surveyed as it was fully submerged.

The Bay Bridge was surveyed using MDTA inspection reports, which included detailed photographs of cracks and crevices. Viewing these reports yielded no evidence of bats, including visible staining or guano. Of the three buildings surveyed using publicly available imagery, none showed obvious evidence of bats from the exterior.

4.0 Discussion and Conclusions

During the visual assessments of bridges, culverts, and buildings from September 19, October 7, and October 16, 2025, no evidence of bat roosting was found and there were no observations of roosting bats.

Of the three bridges surveyed, Cox Creek bridge, the Oceanic Drive overpass, and the Bay Bridge, neither were found to contain evidence of roosting bats. The Bay Bridge, being mostly composed of steel, lacked plentiful quality roosting habitat. Of the available concrete surface, most cracks and crevices were less than four inches deep, and those that exceed four inches in depth were not sufficiently sealed to provide a cave-like environment. The concrete railings present along the Bridge are also reinforced with steel, reducing the viability of these features as bat summer roosting habitat. Similarly, the Oceanic Drive overpass is also primarily steel design with some concrete elements. However, assessment of these elements shows that they are mostly pristine,

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with no evidence of guano or staining. The Cox Creek bridge, despite a greater percentage of concrete surface, contained metal I-beams and also lacked deep, sealed concrete crevices. The lack of these concrete crevices reduces protection from the elements and predators and does not allow for a stable thermal regime. These bridges may also be lower quality bat habitat due to the high volume of vehicular traffic and distance from forested resources. The Cox Creek bridge and portions of the Bay Bridge are within 1000 feet of suitable forested bat habitat, indicating that the lack of bats detected in the bridges may be due to higher quality habitat nearby.

Within the LOD, 13 culverts with a minimum width of three feet were targeted for survey. Culverts greater than three feet are the minimum size for tricolored bat occupancy, four feet for Indiana bat, and four and a half feet for northern long-eared bat (USFWS, 2024, Appendix K). Despite meeting the minimum size preference for bat use and primarily composed of concrete, more than half of the culverts were blocked to bats via grating or debris, heavily reducing available roosting habitat from these structures. Furthermore, five of the targeted culverts were also drains within or adjacent to the shoulder of the highway, meaning that bats seeking to roost within them would be exposed to greatly increased noise, light, and collision risk associated with highway traffic.

Each of the buildings surveyed using publicly available images are commercial buildings, which draw pedestrian and vehicular traffic. This increased noise may be a deterrent for bats looking to roost within human structures. These buildings are also well lit, providing a risk of potential roost entombment to bats within, which acts as another potential deterrent. All buildings proposed for take are also in close proximity to the highway and forested habitat patches. Again, proximity to the highway would increase the exposure of bats to high levels of noise, light from vehicles, as well as risk of collision. This, in conjunction with proximity to forested resources, may mean that bats in the area have better habitat alternatives than the four structures proposed for take.

As no bats were observed, nor was any evidence of bats detected at any of the bridges, culverts, and structures surveyed, another summer visual assessment will not need to be completed for two years.

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5.0 Literature Cited

United States Fish and Wildlife Service (USFWS) 2022. Species Status Report (SSA) Report for the Northern Long-eared Bat (Myotis septentrionalis). https://www.fws.gov/sites/default/files/documents/Species%20Status%20Assessment%20Report%20for%20the%20Northern%20long-eared%20bat-%20Version%201.1%20%282%29.pdf

United States Fish and Wildlife Service (USFWS) 2021. Species Status Report (SSA) Report for the Tricolored Bat (Perimyotis subflavus). https://ecos.fws.gov/ServCat/DownloadFile/221212

United States Fish and Wildlife Service (USFWS) 2024. Range-wide Indiana Bat & Northern Long-eared Bat Survey Guideline. https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines

APPENDIX A: SURVEY MAP

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Source: Large-scale map: Maryland iMAP, DoIT. Imagery flown in 2022 (Eastern Shore) and 2020 (Western Shore). Received December 2024. Small-scale map: Esri, HERE, Garmin, FAO, NOAA, USGS, OpenStreetMap contributors, and the GIS user community. Received December 2024.



MDTA RPA Limit of Disturbance

Map Sheet

County Boundary

Impacted 36-Inch Culvurt

Impacted Building



0 0.01 0.03 0.05 mi

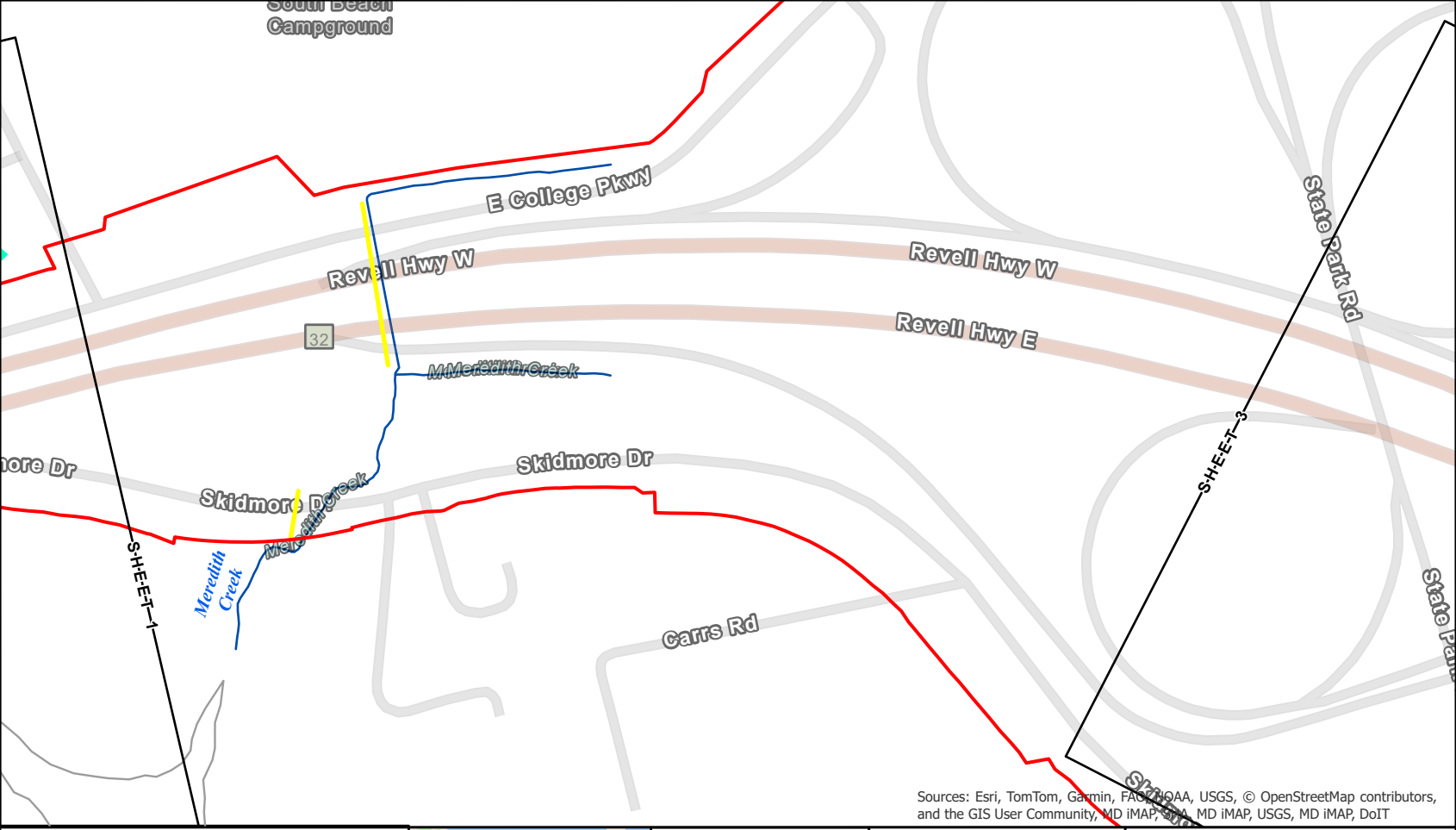
1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

MDTA RPA Impact Maps



MDTA RPA Limit of Disturbance

Map Sheet

County Boundary

Impacted 36-Inch Culvurt

Impacted Building

Location Overview

Chesapeake Bay

0 1 2 4 mi

0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

MDTA RPA Impact Maps



MDTA RPA Limit of Disturbance

Impacted 36-Inch Culvurt

Map Sheet

County Boundary

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

MDTA RPA Impact Maps



MDTA RPA Limit of Disturbance

Impacted 36-Inch Culvurt

Map Sheet

County Boundary

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA
Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

MDTA RPA Impact Maps



MDTA RPA Limit of Disturbance

Impacted 36-Inch Culvurt

Map Sheet

County Boundary

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

MDTA RPA Impact Maps



MDTA RPA Limit of Disturbance

Map Sheet

County Boundary

Impacted 36-Inch Culvurt

Impacted Bridge

Location Overview



0 0.01 0.03 0.05 mi

1 inch = 0.05 mile

N

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

MDTA RPA Impact Maps

APPENDIX B: COMPLETED DATASHEETS

DRAFT

Sherman Dr.

Bridge/Culvert Bat Assessment Form

Culv D

Date & Time of Assessment: 9/19/25 9:24	DOT Project Number or IPaC Code: 2024-0014247	Route/Facility Carried: US50	County: Queen Anne's
Federal Structure ID: N/A	Structure Coordinates (latitude and longitude): 38.9743863 -76.3009492	Structure Height (approximate): 36"	Structure Length: 77"

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss (Side View)		Covered
	Parallel Box Beam		Other:

Culvert Type

	Box
✓	Pipe/round
	Other:

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	Concrete
Concrete	Concrete	Timber
Timber	Steel	Stone/Masonry
Open grid	Timber	Other
Other	Other	

Creosote Evidence

	Yes	No
	Unknown	

Culvert Material

	Metal
✓	Concrete
	Plastic
	Stone/masonry
	Other

NOTES:

Crossings Traversed (check all that apply)

✓	Bare ground		Open vegetation
	Rip-rap		Closed vegetation
	Flowing water		Railroad
	Standing water		Road/trail - Type:
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
✓	Residential-urban		Riparian/wetland
	Residential-rural		Mixed use
✓	Woodland/forested		Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	☐ Not present Pipe filled w/ sediment not explored. Assessed w/ IR and spotlight	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Concrete surfaces (open roosting on concrete)	☐ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	☒ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☒ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	☒ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☒ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Weep holes, scupper drains, and inlets/pipes	☐ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	☒ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☒ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Gavin Stubbs

Signature: Gavin Stubbs

Bridge/Culvert Bat Assessment Form

Culv 1

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/16/25 10:00	2024-0014247	US50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	38.9748389 -76.2993161	48	235

Structure Type (check one)

Bridge Construction Style

- [ ] Cast-in-place
- [ ] Flat Slab/Box
- [ ] Truss
- [ ] Parallel Box Beam
- [ ] Pre-stressed Girder
- [ ] Steel I-beam
- [ ] Covered
- [ ] Other:

Culvert Type

- [ ] Box
- [x] Pipe/round
- [ ] Other:

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
[ ] Metal	[ ] None	[ ] Concrete
[ ] Concrete	[ ] Concrete	[ ] Timber
[ ] Timber	[ ] Steel	[ ] Stone/Masonry
[ ] Open grid	[ ] Timber	[ ] Other
[ ] Other	[ ] Other	

Creosote Evidence

- [ ] Yes
- [ ] No
- [ ] Unknown

Culvert Material

- [ ] Metal
- [x] Concrete
- [ ] Plastic
- [ ] Stone/masonry
- [ ] Other

NOTES: Pipe sit below grade inaccessible

Crossings Traversed (check all that apply)

- [ ] Bare ground
- [ ] Rip-rap
- [ ] Flowing water
- [ ] Standing water
- [ ] Seasonal water
- [ ] Open vegetation
- [ ] Closed vegetation
- [ ] Railroad
- [ ] Road/trail - Type:
- [ ] Other:

Surrounding Habitat (check all that apply)

- [ ] Agricultural
- [ ] Commercial
- [ ] Residential-urban
- [ ] Residential-rural
- [ ] Woodland/forested
- [ ] Grassland
- [ ] Ranching
- [ ] Riparian/wetland
- [ ] Mixed use
- [ ] Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
[ ] All crevices and cracks **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	[ ] Not present Evidence of [illegible]	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] Concrete surfaces (open roosting on concrete)	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] Spaces between concrete end walls and the bridge deck	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] Crack between concrete railings on top of the bridge deck (Gap / Railing)	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] Vertical surfaces on concrete I-beams	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] Spaces between walls, ceiling joists	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] Weep holes, scupper drains, and inlets/pipes	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] All guiderails	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species
[ ] All expansion joints	[ ] Not present	Visual - live # dead #; Guano; Staining; [ ] Audible; [ ] Odor; [ ] Photos; [ ] Species

Name: Gavin Shields

Signature: [signature]

Bridge/Culvert Bat Assessment Form

Culv 2

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/16/25 0955	2024-0014247	US50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A		48	294

Structure Type (check one)

Bridge Construction Style

☐	Cast-in-place	☐	Pre-stressed Girder
☐	Flat Slab/Box	☐	Steel I-beam
☐	Truss (Side View)	☐	Covered
☐	Parallel Box Beam	☐	Other:

Culvert Type	*Other Structure*
☐ Box	
☐ Pipe/Round	
☐ Other:	

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	☐ Concrete
☐ Concrete	☐ Concrete	☐ Timber
☐ Timber	☐ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Culvert Material

☐ Metal
☐ Concrete
☐ Plastic
☐ Stone/Masonry
☐ Other:

Creosote Evidence

☐ Yes ☐ No
☐ Unknown

NOTES: Pipe SFT below grade Inaccessible

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
☐ Flowing water	☐ Railroad
☐ Standing water	☐ Road/trail - Type:
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

☐ Agricultural	☐ Grassland
☐ Commercial	☐ Ranching
☐ Residential-urban	☐ Riparian/wetland
☐ Residential-rural	☐ Mixed use
☐ Woodland/forested	☐ Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	☐ Not present: Assessed w/ borescope + IR	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☑ Concrete surfaces (open roosting on concrete)	☐ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ Spaces between concrete end walls and the bridge deck	☑ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☑ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ Vertical surfaces on concrete I-beams	☒ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ Spaces between walls, ceiling joists	☒ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ Weep holes, scupper drains, and inlets/pipes	☒ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ All guiderails	☒ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining
☐ All expansion joints	☒ Not present:	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Photos ☐ Guano ☐ Staining

Name: Gavin Studels **Signature:** Gavin Studels

Bridge/Culvert Bat Assessment Form

Culv 3

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/19/25 10:10	2024-0014247	US50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	38.9748317 -76.3001396	42	215

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss		Covered
	Parallel Box Beam		Other:

Culvert Type

	box
✓	pipe/round
	Other:

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	Concrete
Concrete	Concrete	Timber
Timber	Steel	Stone/Masonry
Open grid	Timber	Other
Other	Other	

Creosote Evidence

	Yes	No
	Unknown	

Culvert Material

	Metal
✓	Concrete
	Plastic
	Stone/Masonry
	Other

NOTES: Pipe 5ft below grade. Inaccessible

Crossings Traversed (check all that apply)

	Bare ground		Open vegetation
	Rip-rap		Closed vegetation
	Flowing water		Railroad
	Standing water		Road/trail - Type:
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
	Residential-urban		Riparian/wetland
	Residential-rural		Mixed use
	Woodland/forested		Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

	Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☐	All crevices and cracks **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present Access with borescope	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	Concrete surfaces (open roosting on concrete)	☐ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	Spaces between concrete end walls and the bridge deck	✓ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	Crack between concrete railings on top of the bridge deck (Gap / Railing)	✓ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	Vertical surfaces on concrete I-beams	✓ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	Spaces between walls, ceiling joists	✓ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	Weep holes, scupper drains, and inlets/pipes	☐ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	All guiderails	✓ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐	All expansion joints	✓ Not present	Visual - live # dead #; Guano; Staining; ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Gavin Studds

Signature: Gavin Studds

Culv 4

Bridge/Culvert Bat Assessment Form

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
10-15	2024-0014247	US50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	38.9744730 -76.3066922	42	130

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss (Side View)		Covered
	Parallel Box Beam		Other:

Culvert Type	*Other Structure*
✓ Box	
Pipe/round	
Other:	

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	Concrete
Concrete	Concrete	Timber
Timber	Steel	Stone/Masonry
Open grid	Timber	Other:
Other:	Other:	

Culvert Material

Metal	
✓ Concrete	
Plastic	
Stone/masonry	
Other:	

Creosote Evidence

Yes	No
Unknown	

Notes: Filled over ½ with water, did not enter

Crossings Traversed (check all that apply)

Bare ground	Open vegetation
Rip-rap	Closed vegetation
Flowing water	Railroad
Standing water	Road/trail - Type:
Seasonal water	Other:

Surrounding Habitat (check all that apply)

Agricultural	Grassland
Commercial	Ranching
Residential-urban	Riparian/wetland
Residential-rural	Mixed use
Woodland/forested	Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
✓ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	Not present: Assessed w/ IR camera + boroscope	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
✓ Concrete surfaces (open roosting on concrete)	Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ Spaces between concrete end walls and the bridge deck	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ Vertical surfaces on concrete I-beams	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ Spaces between walls, ceiling joists	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ Weep holes, scupper drains, and inlets/pipes	Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ All guiderails	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species
☐ All expansion joints	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos; Species

Name:	Signature:
Gavin Stubbs	Gavin Stubbs

Bridge/Culvert Bat Assessment Form

Culv 5

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9:30 2/14/25	2024-0014217	US50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	38.97499062 -76.2973296	9?	330

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss		Covered
	Parallel Box Beam		Other:

Culvert Type

	Box
✓	Pipe/round
	Other:

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	Concrete
Concrete	Concrete	Timber
Timber	Steel	Stone/Masonry
Open grid	Timber	Other:
Other	Other:	

Culvert Material

	Metal
✓	Concrete
	Plastic
	Stone/masonry
	Other

Creosote Evidence

Yes	No
Unknown	

Notes: Pipe 5ft below grade

Crossings Traversed (check all that apply)

	Bare ground		Open vegetation
	Rip-rap		Closed vegetation
	Flowing water		Railroad
	Standing water	✓	Road/trail - Type:
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
	Residential-urban		Riparian/wetland
	Residential-rural		Mixed use
	Woodland/forested		Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	☐ Not present: Pipe inaccessible; assessed w/ borescope	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Concrete surfaces (open roosting on concrete)	☐ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	✓ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	✓ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	✓ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	✓ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☐ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	✓ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	✓ Not present:	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Lauren Shields

Signature: Lauren Shields

Culv 6

Bridge/Culvert Bat Assessment Form

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/11/25 9:15	2024-0014247	US 50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	39.9750671 -76.2969612	93"	95"

Structure Type (check one)

Bridge Construction Style

☐	Cast-in-place	☐	Pre-stressed Girder
☐	Flat Slab/Box	☐	Steel I-beam
☐	Truss	☐	Covered
☐	Parallel Box Beam	☐	Other:

Culvert Type

☐	Box
☑	Pipe/round
☐	Other:

Other Structure

☐	

Structure Material (check all that apply)

Deck Material		*Beam Material*		*End/Back Wall Material*	
☐	Metal	☐	None	☐	Concrete
☐	Concrete	☐	Concrete	☐	Timber
☐	Timber	☐	Steel	☐	Stone/Masonry
☐	Open grid	☐	Timber	☐	Other:
☐	Other	☐	Other		

Culvert Material

☐	Metal
☐	Concrete
☐	Plastic
☐	Stone/masonry
☑	Other: CMP

Creosote Evidence

☐	Yes
☐	No
☐	Unknown

NOTES: Pipe, 2ft below grade inaccessible

Crossings Traversed (check all that apply)

☐	Bare ground	☐	Open vegetation
☐	Rip-rap	☐	Closed vegetation
☐	Flowing water	☐	Railroad
☐	Standing water	☐	Road/trail - Type:
☐	Seasonal water	☐	Other:

Surrounding Habitat (check all that apply)

☐	Agricultural	☐	Grassland
☐	Commercial	☐	Ranching
☐	Residential-urban	☐	Riparian/wetland
☐	Residential-rural	☐	Mixed use
☐	Woodland/forested	☐	Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	☐ Not present Pipe accessible but not within boat scope	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Concrete surfaces (open roosting on concrete)	☐ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☑ Not present	Visual - live # dead # Guano Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Gavin Studds

Signature: Gavin Studds

Bridge/Culvert Bat Assessment Form

Culvert 45

Date Time of Assessment	10/7/25	ject Number / IPaC Code	2024-0014207	ute/Facility Carried	Cox Creek	ty	Queen Anne's
tructure ID		Structure Coordinates (latitude and longitude)	38.9753473 -76.3074356	Structure Height (approximate)		Structure Length	80ft

tructu y (ch k ne

ndge ction tyle

- Cast-in-pl ce
- at Slab/Bo
- russ (Side View)
- Parallel Box Beam
- Pre-stre Gir
- Stee beam
- Covere
- Othe

Structure Material ch a at p

Deck Material	*Beam M*	*d/Ba W Ma*
Metal	None	Co te
Concrete	Concrete	imber
imber	Stee	Stone/Mason
Open grid	Timber	Other
Other	Other	

Creosote Evidence: es / No / Unknown

Culvert Material: Metal; ✓ Concrete; Plastic; Stone/Masonry; Other

Notes

Culvert Type: box; ✓ Pipe/round; Other

Other Structure:

Crossings Traversed (check all that apply)

Bare ground	Open vegetation
Rip-rap	Closed vegetation
Flowing water	Railroad
✓ landing wate	Road/trail Type
Seasonal water	Other:

Surrounding Habitat (check all that apply)

Agricultural	Grassland
Commercial	anch
Residential	Riparian/wetland
Residential-rural	Mixed use
Woodland/forested	Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	☐ Not present	Visual - live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☑ Concrete surfaces (open roosting on concrete)	☐ Not present	Visual - live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☐ Spaces between concrete end walls and the bridge deck	☒ Not present	Visual - live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☒ Not present	Visual live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☐ Vertical surfaces on concrete I-beams	☒ Not present	Visual live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☑ Spaces between walls, ceiling joists	☐ Not present	Visual live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☑ Weep holes, scupper drains and inlets/pipes	☐ Not present	Visual live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☐ All guiderails	☒ Not present	Visual live # dead # / Guano / Staining; Audible / Odor / Photos; Species
☐ All expansion joints	☒ Not present	Visual - live # dead # / Guano / Staining; Audible / Odor / Photos; Species

Name: Gavin Studds **Signature:** Gavin Studds

Bridge/Structure Bat Assessment Form C

Date & Time of Assessment: 9/19/25 12:00	DOT Project Number: 2024004 47	Route/Facility Carried:	County: Anne Arundel
Federal Structure ID: 4	Structure Coordinates (latitude and longitude): 39.0206873 -76.4185329	Structure Height (approximate): 36	Structure Length: 264

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ○ Steel I-beam
- ○ Covered
- ○ Other:

Culvert Type

- ○ Box
- ⊗ Pipe/Round
- ○ Other:

Other Structure

- ○

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	☐ Concrete
☐ Concrete	☐ Concrete	☐ Timber
☐ Timber	☐ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Creosote Evidence

○ Yes ○ No ○ Unknown

Culvert Material

- ☐ Metal
- ✓ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Notes: entrance cracked + falling / full of water

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
☐ Flowing water	☐ Railroad
✓ Standing water	☐ Road/trail - Type:
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

☐ Agricultural	☐ Grassland
☐ Commercial	☐ Ranching
☐ Residential-urban	✓ Riparian/wetland
☐ Residential-rural	☐ Mixed use
✓ Woodland/forested	☐ Other: Highway

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
✓ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
✓ Concrete surfaces (open roosting on concrete)	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	✓ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	✓ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	✓ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	✓ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
✓ Weep holes, scupper drains, and inlets/pipes	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	✓ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	✓ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Gavin Studds

Signature: Gavin Studds

Bridge/Structure Bat Assessment Form

Date & Time of Assessment	DOT Project Number	Route/Facility Carried	County
9/2	1424	US50	Mesa
Federal Structure ID	Structure Coordinates (latitude and longitude)	Structure Height (approximate)	Structure Length
	76	6	2

Structure Type (check one)

Bridge Construction Style

- ○ Cast-in-place
- ○ Flat Slab/Box
- ○ Truss (Side View)
- ○ Parallel Box Beam
- ○ Pre-stressed Girder
- ○ Steel I-beam
- ○ Covered
- ○ Other:

Culvert Type

- ○ Box
- ◉ Pipe/Round
- ○ Other:

Other Structure

- ○

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
☐ Metal	☐ None	☐ Concrete
☐ Concrete	☐ Concrete	☐ Timber
☐ Timber	☐ Steel	☐ Stone/Masonry
☐ Open grid	☐ Timber	☐ Other:
☐ Other:	☐ Other:	

Creosote Evidence

- ○ Yes ◉ No
- ○ Unknown

Culvert Material

- ☐ Metal
- ☑ Concrete
- ☐ Plastic
- ☐ Stone/Masonry
- ☐ Other:

Notes:

Crossings Traversed (check all that apply)

☐ Bare ground	☐ Open vegetation
☐ Rip-rap	☐ Closed vegetation
☐ Flowing water	☐ Railroad
☑ Standing water	☐ Road/trail - Type:
☐ Seasonal water	☐ Other:

Surrounding Habitat (check all that apply)

☐ Agricultural	☐ Grassland
☐ Commercial	☐ Ranching
☐ Residential-urban	☑ Riparian/wetland
☐ Residential-rural	☐ Mixed use
☑ Woodland/forested	☐ Other: Hay

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☐ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☑ Concrete surfaces (open roosting on concrete)	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between concrete end walls and the bridge deck	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Crack between concrete railings on top of the bridge deck (Gap, Railing)	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Vertical surfaces on concrete I-beams	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Spaces between walls, ceiling joists	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ Weep holes, scupper drains, and inlets/pipes	☐ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All guiderails	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species
☐ All expansion joints	☑ Not present	☐ Visual - live # dead # ☐ Guano ☐ Staining ☐ Audible ☐ Odor ☐ Photos ☐ Species

Name: Gavin Stuedle

Signature: Gavin Stuedle

Bridge/Culvert Bat Assessment Form

Culv 87

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/9/25 1:00	2024-0014247	US50	Anne Arundel
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	39.0138176 -76.4079599	36"	105"

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss		Covered
	Parallel Box Beam		Other:

Culvert Type

	Box
✓	Pipe/round
	Other:

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	Concrete
Concrete	Concrete	Timber
Timber	Steel	Stone/Masonry
Open grid	Timber	Other:
Other	Other	

Creosote Evidence: Yes / No / Unknown

Culvert Material

	Metal
✓	Concrete
	Plastic
	Stone/Masonry
	Other

Notes: Pipe not located, seemingly buried

Crossings Traversed (check all that apply)

✓	Bare ground	✓	Open vegetation
	Rip-rap		Closed vegetation
	Flowing water		Railroad
	Standing water	✓	Road/trail - Type: Paved
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
	Residential-urban		Riparian/wetland
	Residential-rural		Mixed use
	Woodland/forested		Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☐ All crevices and cracks **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ Concrete surfaces (open roosting on concrete)	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ Spaces between concrete end walls and the bridge deck	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ Vertical surfaces on concrete I-beams	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ Spaces between walls, ceiling joists	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ Weep holes, scupper drains, and inlets/pipes	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ All guiderails	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species
☐ All expansion joints	✓ Not present:	Visual - live # dead # / Guano / Staining / Audible / Odor / Photos / Species

Name: Gavin Studds **Signature:** Gavin Studds

Bridge/Culvert Bat Assessment Form

Culv 89

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/19/25 12:20	8034-0014847	Skidmore Dr	Anne Arundel
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	39.019273 -76.415055	36"	745"

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss (Side View)		Covered
	Parallel Box Beam		Other:

Culvert Type

	pipe
✓	pipe/round
	Other:

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	Concrete
Concrete	Concrete	Timber
Timber	Steel	Stone/Masonry
Open grid	Timber	Other
Other	Other	

Creosote Evidence

	Yes	X	No
	Unknown		

Culvert Material

	Metal
✓	Concrete
	Plastic
	Stone/Masonry
	Other:

NOTES: Culvert 1/3 filled with water. Piped cracked & separated

Crossings Traversed (check all that apply)

	Bare ground	✓	Open vegetation
	Rip-rap		Closed vegetation
	Flowing water		Railroad
✓	Standing water		Road/trail - Type:
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
	Residential-urban	✓	Riparian/wetland
	Residential-rural		Mixed use
✓	Woodland/forested		Other:

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☑ Concrete surfaces (open roosting on concrete)	Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☐ Spaces between concrete end walls and the bridge deck	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	X Not present:	Visual - live # dead # Guano Staining; Audible Odor ✓ Photos Species
☐ Vertical surfaces on concrete I-beams	X Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☐ Spaces between walls, ceiling joists	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☑ Weep holes, scupper drains, and inlets/pipes	Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☐ All guiderails	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species
☐ All expansion joints	✓ Not present:	Visual - live # dead # Guano Staining; Audible Odor Photos Species

Name: Gavin Studdz

Signature: Gavin Studdz

Bridge/Culvert Bat Assessment Form

Cox Creek Bridge

Date & Time of Assessment	DOT Project Number or IPaC Code	Route/Facility Carried	County
9/19/25 10:45	2024-0044247	US 50	Queen Anne's
Federal Structure ID	**Structure Coordinates (latitude and longitude)**	**Structure Height (approximate)**	**Structure Length**
N/A	38.974719 -76.302504	10ft	65ft

Structure Type (check one)

Bridge Construction Style

✓	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box		Steel I-beam
	Truss (Side View)		Covered
	Parallel Box Beam		Other:

Culvert Type

	Box		
	Pipe/round		
	Other:		

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
Metal	None	✓ Concrete
✓ Concrete	Concrete	Timber
Timber	✓ Steel	Stone/Masonry
Open grid	Timber	Other:
Other:	Other:	

Culvert Material

- Metal
- Concrete
- Plastic
- Stone/Masonry
- Other:

Creosote Evidence

Yes | X No | Unknown

Notes:

Other Structure

Crossings Traversed (check all that apply)

	Bare ground	✓	Open vegetation
	Rip-rap		Closed vegetation
✓	Flowing water		Railroad
	Standing water		Road/trail - Type:
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
	Residential-urban		Riparian/wetland
	Residential-rural		Mixed use
	Woodland/forested	✓	Other: Road/Water

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts**: rough surfaces or imperfections in concrete **Other structures**: soffits, rafters, attic areas	Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☑ Concrete surfaces (open roosting on concrete)	Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☐ Spaces between concrete end walls and the bridge deck	Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☐ Crack between concrete railings on top of the bridge deck (Gap / Railing)	X Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☐ Vertical surfaces on concrete I-beams	X Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☐ Spaces between walls, ceiling joists	X Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☑ Weep holes, scupper drains, and inlets/pipes	Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☑ All guiderails	Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species
☑ All expansion joints	Not present:	Visual - live # dead # · Guano · Staining · Audible · Odor · Photos · Species

Name: Gavin Stubbs **Signature:** Gavin Stubbs

Bridge/Culvert Bat Assessment Form

Date & Time of Assessment: 10/6/25 13:35	DOT Project Number or IPaC Code: 2024-0014207	Route/Facility Carried: Oceanic Dr	County: AnneArundel
Federal Structure ID:	Structure Coordinates (latitude and longitude):	Structure Height (approximate): 35ft	Structure Length: 350ft

Structure Type (check one)

Bridge Construction Style

	Cast-in-place		Pre-stressed Girder
	Flat Slab/Box	✓	Steel I-beam
	Truss		Covered
	Parallel Box Beam		Other:

Culvert Type

	Box		
	Pipe/Round		
	Other:		

Other Structure

Structure Material (check all that apply)

Deck Material	*Beam Material*	*End/Back Wall Material*
✓ Metal	None	✓ Concrete
Concrete	Concrete	Timber
Timber	✓ Steel	Stone/Masonry
Open grid	Timber	Other
Other:	Other:	

Creosote Evidence: Yes | X No | Unknown

Culvert Material: Metal; Concrete; Plastic; Stone/Masonry; Other:

Notes:

Crossings Traversed (check all that apply)

	Bare ground		Open vegetation
	Rip-rap		Closed vegetation
	Flowing water		Railroad
	Standing water	✓	Road/trail - Type: US 50
	Seasonal water		Other:

Surrounding Habitat (check all that apply)

	Agricultural		Grassland
	Commercial		Ranching
	Residential-urban		Riparian/Wetland
	Residential-rural		Mixed use
	Woodland/forested	✓	Other: Transportation

Areas Assessed (check all that apply)

Check all areas that apply. If an area is not present in the structure, check the "not present" box.
Document all bat indicators observed during the assessment. Include the species present, if known, and provide photo documentation as indicated.

Area (check if assessed)	Assessment Notes	Evidence of Bats (include photos if present)
☑ All crevices and cracks: **Bridges/culverts:** rough surfaces or imperfections in concrete **Other structures:** soffits, rafters, attic areas	☐ Not present	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
☑ Concrete surfaces (open roosting on concrete)	☐ Not present	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
☑ Spaces between concrete end walls and the bridge deck	☐ Not present: Viewed as best as possible in street view	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
☑ Crack between concrete railings on top of the bridge deck (Gap / Railing)	☐ Not present: 11	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
☐ Vertical surfaces on concrete I-beams	✓ Not present	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
☐ Spaces between walls, ceiling joists	X Not present	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
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☑ All guiderails	☐ Not present	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining
☑ All expansion joints	☐ Not present: 4	Visual - live # dead # ☐ Audible ☐ Species ☐ Odor ☐ Guano ☐ Photos ☐ Staining

Name: Gavin Studds

Signature: Gavin Studds

APPENDIX C: PHOTOGRAPH LOG

DRAFT

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 1. Looking at the outside of Culvert 0.



Photo 2. Looking inside of Culvert 0.



Photo 3. Looking at the steel grate covering Culvert 1.

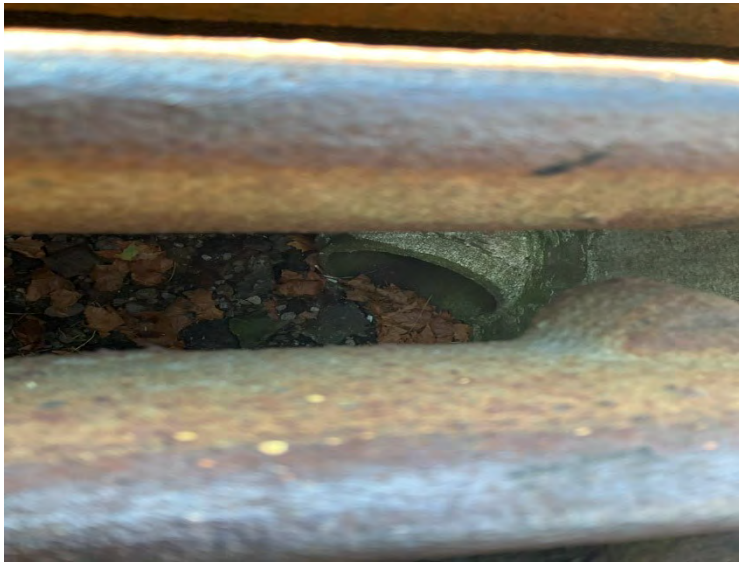


Photo 4. Looking through the steel grate to Culvert 1.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 5. Looking down at the steel grate covering Culvert 2.

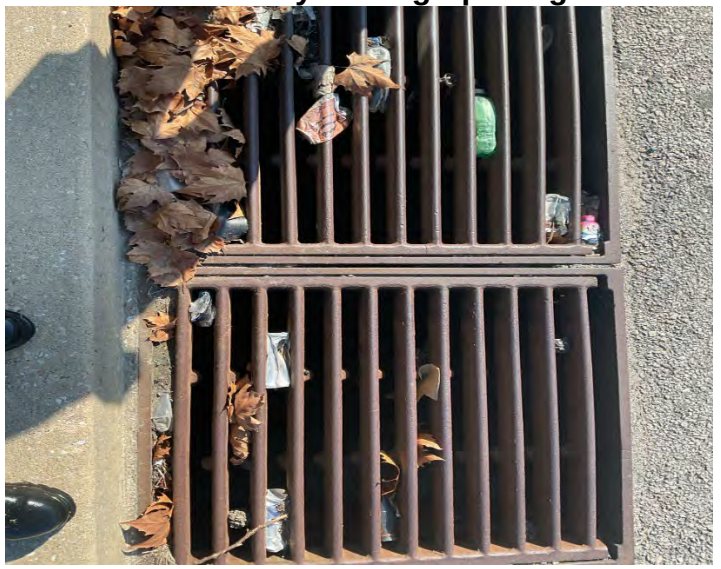


Photo 6. Looking down at the steel grate covering Culvert 3.



Photo 7. Looking through the steel grate to Culvert 3.



Photo 8. Looking at the headwall of Culvert 4.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 9. Looking inside of Culvert 4.

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Photo 10. Looking at the steel grate covering Culvert 5.

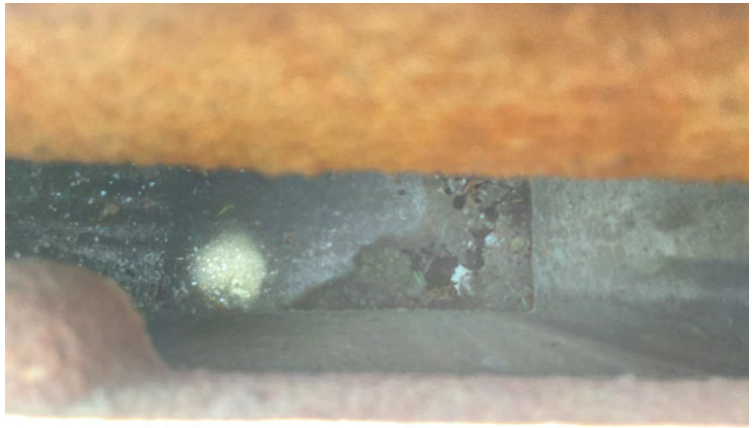


Photo 11. Looking through the steel grate at the concrete surface surrounding Culvert 5.



Photo 12. Looking at the steel grate covering Culvert 6.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 13. Looking through the steel grate to Culvert 6 below.



Photo 14. Looking at the headwall of Culvert 45.



Photo 15. Looking north at the headwall of Culvert 62.



Photo 16. Looking inside of Culvert 62.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 17. Looking at a representative crack inside of Culvert 62.



Photo 18. Looking south at the headwall of Culvert 62.



Photo 19. Looking at the exterior of Culvert 82.



Photo 20. Looking at the interior of Culvert 82.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 21. Looking through steel grate at Culvert 87.



Photo 22. Looking at cracked exterior of Culvert 89.



Photo 23. Looking at the interior of Culvert 89.



Photo 24. Looking at steel I-beams, decking, and piers of the Oceanic Drive overpass.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log



Photo 25. Looking at the south abutment of the Oceanic Drive overpass.



Photo 26. Looking west at the concrete parapet and fencing of the Oceanic Drive overpass.



Photo 27. Looking northeast at the eastbound span of the Cox Creek bridge.



Photo 28. Looking east at the deck, I beams and drains approaching the Cox Creek Bridge abutment.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log

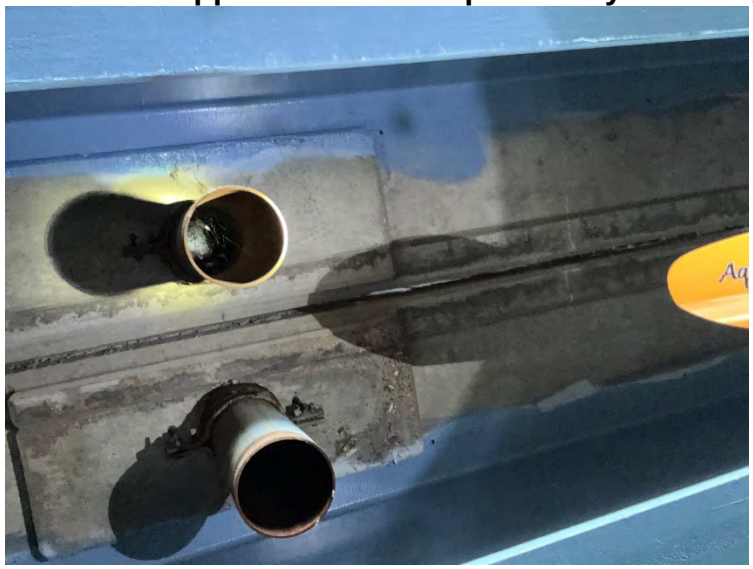


Photo 29. Looking into a drain under the eastbound span of the Cox Creek Bridge.



Photo 30. Looking northwest at the exterior of 1046 E College Parkway, a building proposed for take.



Photo 31. Looking southwest at the exterior of 1001 Skidmore Dr, a building proposed for take.



Photo 32. Looking south at the side and front of 1598 Whitehall Rd, a building proposed for partial take.

Appendix C: Chesapeake Bay Crossing Study Bridge and Culvert Bat Survey Photograph Log

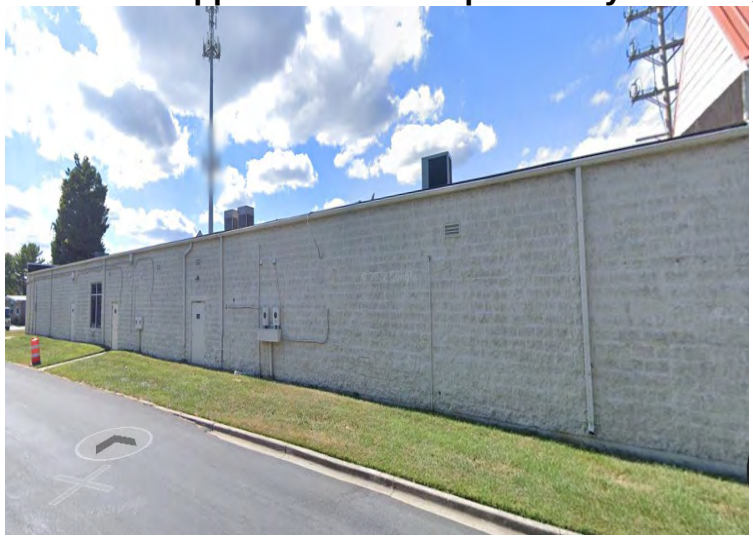


Photo 33. Looking west at the rear of 1598 Whitehall Rd, a building proposed for partial take.

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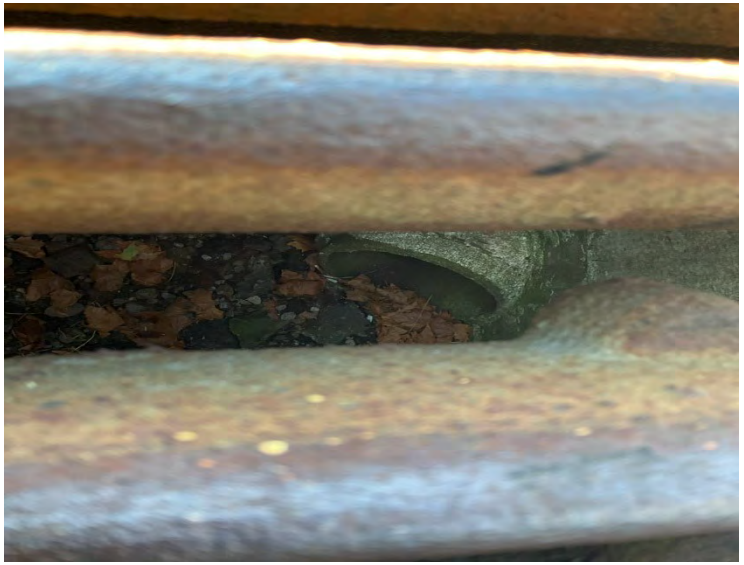


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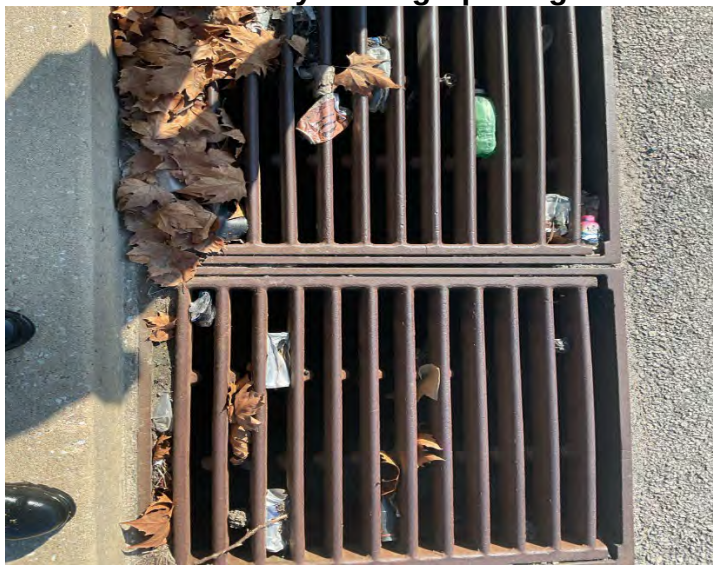


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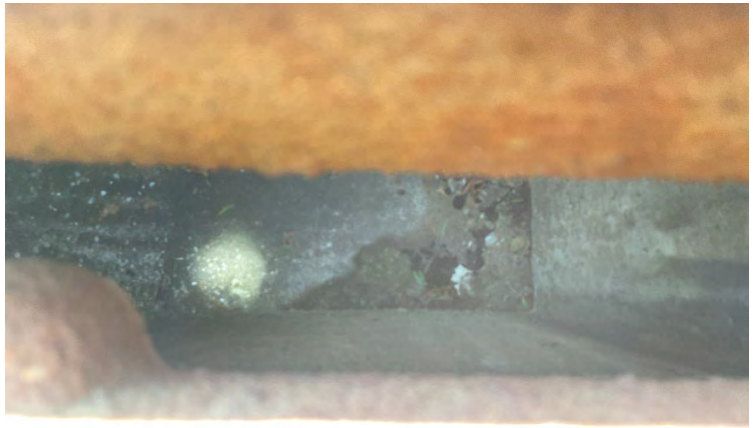


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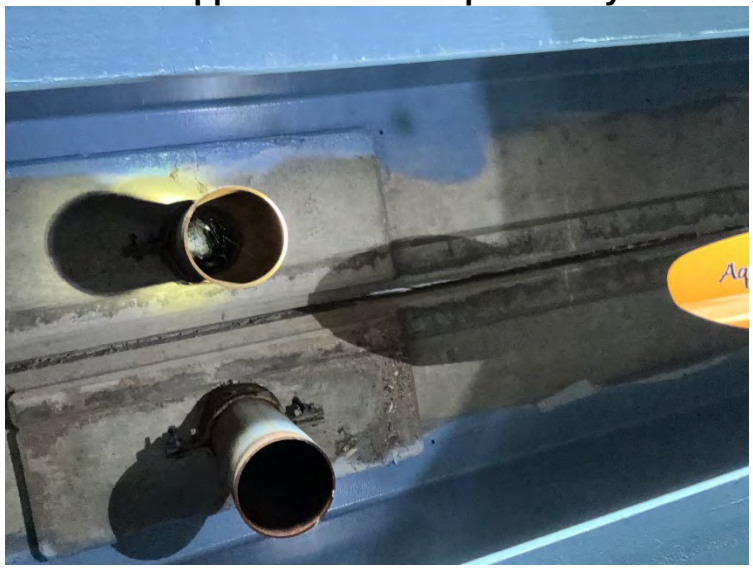


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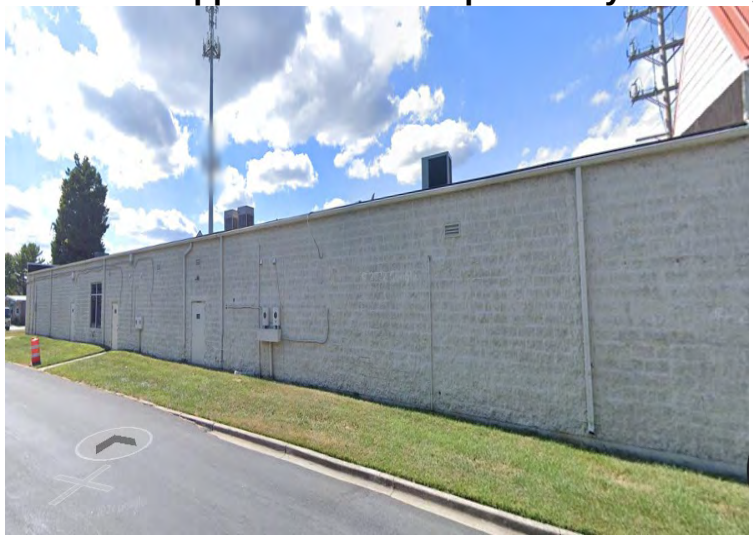


Photo 33. Looking west at the rear of 1598 Whitehall Rd, a building proposed for partial take.

APPENDIX R: BIOLOGICAL ASSESSMENT, ATLANTIC AND SHORTNOSE STURGEON AND SEA TURTLES

U.S. Department of Transportation
Federal Highway Administration

Maryland Division

31 Hopkins Plaza, Suite 1520
Baltimore, Maryland 21201
(410) 962-4440
(410) 962-4054

November 26, 2025

In Reply Refer To:
HDA-MD

Mr. Michael Pentony
Regional Administrator
Greater Atlantic Regional Fisheries Office
NOAA Fisheries Service
55 Great Republic Drive
Glouchester, MA 01930

Subject: Chesapeake Bay Crossing Study Tier 2 Environmental Impact Statement
Anne Arundel and Queen Anne Counties, Maryland
Initiation of Formal Section 7 Endangered Species Act Consultation
Initiation of Essential Fish Habitat Consultation

Dear Mr. Pentony:

The Federal Highway Administration (FHWA) is the lead federal agency for the Maryland Transportation Authority (MDTA) preparation of a Tier 2 Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA) for the Chesapeake Bay Crossing Study (CBCS). This letter is to initiate Section 7 Formal Consultation (50 CFR §402.14) under the Endangered Species Act (ESA) and Essential Fish Habitat (EFH) Consultation under the Magnuson-Stevens Fishery Conservation and Management Act for the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) in Anne Arundel and Queen Anne Counties, Maryland.

The Bay Bridge is a two span bridge each 4.3-miles in length over the Chesapeake Bay on U.S. 50/301 connecting Anne Arundel County on the Western Shore to Queen Anne's County on the Eastern Shore. The original span opened in 1952 with the second span opening in 1973. The proposed action involves constructing two new spans and demolishing the two existing spans with a proposed sequencing of build first new span, demolish first original span, build second new span, demolish second original span.

In-water work associated with both the construction of new spans and removal of the original spans has the potential for both lethal and non-lethal take of individuals of listed species under the ESA. A review of the National Oceanic and Atmospheric Administration (NOAA) Fisheries Greater Atlantic Region ESA Section 7 Mapper indicated that the federally listed Atlantic sturgeon (*Acipenser oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) may be present within the Tier 2 EIS area. In addition, four species of federally listed sea turtles occur seasonally in the waters of the Chesapeake Bay from late April to mid-November of each year:

loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*). Designated critical habitat for listed species is not present within the project limits.

In-water work associated with both the construction of new spans and removal of the original spans has the potential to affect EFH protected under the Magnuson-Stevens Fishery Conservation and Management Act. NOAA Fisheries has indicated that the following federally managed fish species occur within the Tier 2 EIS area: Atlantic butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), clearnose skate (*Raja eglanteria*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), and windowpane flounder (*Scophthalmus aquosus*).

In accordance with Section 7 of the ESA, a Biological Assessment (BA) to analyze the potential affects on sturgeon and turtle species listed or eligible for listing under the ESA and designated critical habitat for such species has been prepared and is transmitted with this letter. In accordance with the Magnuson-Stevens Fishery Conservation and Management Act, an EFH Assessment was prepared and is transmitted with this letter as well.

FHWA in coordination with MDTA has determined that the action is likely to adversely affect Atlantic sturgeon, shortnose sturgeon, loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, and leatherback sea turtle. The action is also determined to have an adverse indirect effect to submerged aquatic vegetation as well as adversely affect Habitat Area of Particular Concern for summer flounder.

Thank you in advance for working with the FHWA and for your continued support with this Tier 2 EIS. If you have any questions or concerns, please contact Alexander Bienko, FHWA Maryland Division Environmental Specialist, at alexander.bienko@dot.gov.

Sincerely,

Valeriya Remezova
Division Administrator

cc:
Karen Greene, NOAA Fisheries
Brian Hopper, NOAA Fisheries
Jonathan Watson, NOAA Fisheries
Melissa Williams, Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY
TIER 2 NEPA

Biological Assessment
Atlantic Sturgeon, Shortnose Sturgeon and Sea Turtles

Maryland Transportation Authority
MDTA

October 2025

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Appendix B ACTION AREA MAP
Appendix C TELEMETRY DATA
Appendix D PILE DRIVING NOISE ISOPLETH MAPS
Appendix E NOAA FISHERIES GARFO MULTI-SPECIES PILE DRIVING CALCULATOR OUTPUT

ABBREVIATIONS AND ACRONYMS

ARDS	Alternatives Retained for Detailed Study
BA	Biological Assessment
CBBMP	Chesapeake Bay Benthic Monitoring Program
CBP	Chesapeake Bay Program
DEIS	Draft Environmental Impact Statement
DPS	Distinct Population Segments
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
IBI	Index of Biotic Integrity
LOD	Limit of Disturbance
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MDTA	Maryland Transportation Authority
MLLW	Mean Lower Low Water
NEPA	National Environmental Policy Act
NETR	Natural Environment Technical Report
NOAA Fisheries	NOAA National Marine Fisheries Service
NOB	Natural Oyster Bars

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NWQMC	National Water Quality Monitoring Council
ROD	Record of Decision
RPA	Recommended Preferred Alternative
SAV	Submerged Aquatic Vegetation
SUP	Shared Use Path
SWM	Stormwater Management
TOYR	Time of Year Restriction
VIMS	Virginia Institute of Marine Science

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1 INTRODUCTION

The Chesapeake Bay Crossing Study (Bay Crossing Study) is a two-tiered engineering and environmental study being advanced by the Maryland Transportation Authority (MDTA) and Federal Highway Administration (FHWA). The Bay Crossing Study is addressing existing and future transportation issues at the William Preston Lane, Jr. Memorial Bridge (Bay Bridge) and its approaches along U.S. 50/301. Each tier of the Bay Crossing Study involves development of an Environmental Impact Statement (EIS), in compliance with the National Environmental Policy Act (NEPA), to describe potential significant environmental effects and inform the evaluation of alternatives. Tier 1 of the Bay Crossing Study (Tier 1 Study) was completed in April 2022. At that time, FHWA issued a Final Environmental Impact Statement /Record of Decision (FEIS/ROD) identifying Corridor 7, the corridor that includes the Bay Bridge and its approaches, as the Selected Corridor Alternative for further evaluation. Tier 2 of the Bay Crossing Study (Tier 2 Study) was launched in June 2022 to focus on a project-level (site-specific) analysis within the Tier 1 Selected Corridor Alternative (Corridor 7). In December 2024 the MDTA identified the Alternatives Retained for Detailed Study (ARDS), which are the NEPA range of reasonable alternatives for evaluation in the Tier 2 Study EIS. Since then, the MDTA Recommended Preferred Alternative (RPA) has been identified as Alternative C, a Build Alternative that includes construction of two new spans as well as demolition of the existing bridge spans. A Natural Environment Technical Report (NETR) and Draft EIS (DEIS) are currently being prepared by MDTA and FHWA and are expected to be made available for the public in January 2026.

This Biological Assessment (BA) evaluates the potential effects of the MDTA RPA on aquatic species under NOAA National Marine Fisheries Service (NOAA Fisheries) jurisdiction that are federally listed under the Endangered Species Act (ESA). A review of the NOAA Fisheries Greater Atlantic Region ESA Section 7 Mapper on December 5, 2023 indicated that the federally listed Atlantic sturgeon (*Acipenser oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) may be present within the Tier 2 Study area. In addition, four species of federally listed sea turtles occur seasonally in the waters of Chesapeake Bay from late April – mid November of each year: loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*). Designated critical habitat for listed species is not present within the Tier 2 Study area; therefore, critical habitat is not discussed further in this BA.

The MDTA RPA is in the early stages of preliminary engineering. As the design progresses through NEPA and into final design, the MDTA, in coordination with FHWA, will continue to consult with NOAA Fisheries to develop a bridge design and construction means and methods that avoid and minimize impacts and ensure the protection of listed species.

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 United States Code [USC] 1531 *et seq.*), the MDTA has prepared this Biological Assessment (BA) to analyze the potential effects on sturgeon and turtle species listed or eligible for listing under the ESA and designated critical habitat for such species.

2 CONSULTATION HISTORY

Early coordination with NOAA Fisheries has been conducted throughout the Tier 2 Study. Additional Tier 2 Study coordination and regular interagency coordination meetings have been occurring with NOAA Fisheries and other resource agencies before and during development of the DEIS, since July 2022. Coordination history for the Tier 2 Study is summarized in **Table 2-1**, and copies of correspondence are provided in **Appendix A**.

Table 2-1 NOAA Fisheries Coordination History – Tier 2 Study

Date	Coordination
June 30, 2023	NOAA Fisheries accepted FHWA's invitation to be a Cooperating Agency on the Tier 2 Study.
December 5, 2023	A list of federally listed species under NOAA Fisheries jurisdiction with the potential to occur in the vicinity of the Tier 2 Study area was obtained from the NOAA Fisheries Greater Atlantic Region ESA Section 7 Mapper.
March 2024	NOAA Fisheries reviewed the Notice of Intent (NOI) for FHWA to prepare an EIS for the Tier 2 Study.
January 13, 2025	NOAA Fisheries provided comments on the NOI.
February 5, 2025	The NOAA Fisheries Greater Atlantic Region ESA Section 7 Mapper was reviewed again to confirm no changes occurred to the species list obtained on December 5, 2023.
April 30, 2025	A draft of the NETR was provided to the Cooperating and Participating Agencies, including NOAA Fisheries, for review. (NOAA Fisheries provided comments on the NETR that were addressed in subsequent drafts of the NETR and DEIS.)
August 11, 2025	A draft of the DEIS was provided to the Cooperating and Participating Agencies, including NOAA Fisheries, for review. (Comments have been considered and incorporated in the DEIS, as well as this BA and the NETR.)

Additional coordination with NOAA Fisheries will occur for species and habitat protected under the Marine Mammal Protection Act (MMPA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA). In accordance with the MMPA, the MDTA will coordinate with NOAA Permits and Conservation Division to secure an Incidental Harassment Authorization (IHA) for impacts on bottlenose dolphins. The IHA will include appropriate BMPs to minimize harassment to the extent practicable. The MSA is the primary Federal law that governs fisheries resources and management in the United States. NOAA Fisheries regulates essential fish habitat (EFH) and habitat areas of particular concern (HAPC). Pursuant to section 305(b)(2) of the MSA, FHWA and the MDTA, acting as FHWA's designated non-Federal representative, have prepared an EFH Assessment. MMPA and EFH coordination are discussed further in the DEIS and the NETR, and the impacts to EFH and HAPC are evaluated in the EFH Assessment.

3 PROPOSED PROJECT

The Bay Bridge is a two-span structure that crosses the Chesapeake Bay from Anne Arundel County on the Western Shore to Queen Anne's County on the Eastern shore. The original span opened in 1952, and the second span opened in 1973. Today, the two-lane original span typically carries eastbound traffic, and the three-lane second span typically carries westbound traffic. However, lanes on the bridge can be reversed to accommodate periods of heavy traffic. The approaches along U.S. 50/301 on each shore have six lanes (three lanes for each travel direction). The Bay Bridge has become one of Maryland's most iconic and recognizable landmarks, used by millions of Maryland residents and other travelers every year.

A wide range of engineering and environmental considerations were evaluated for the ARDS, which included one no-build alternative and six build alternatives as detailed in the DEIS. Alternative A (the no-build alternative) is not the MDTA RPA because it would not increase roadway capacity or mobility, correct roadway deficiencies, or provide the navigational clearance established by the U.S. Coast Guard. Alternative A would also require substantial maintenance and related lane closures that would worsen congestion over time and compound existing traffic congestion, mobility, and roadway deficiency issues. Each of the six build alternatives meets the Tier 2 Study's purpose and need and would therefore be reasonable to implement. However, the build alternatives differ in the degree of transportation benefit they would provide as well as the likely environmental impacts and cost. The MDTA RPA, Alternative C (6-8-6 South), would have the least impact to natural, cultural, and socioeconomic resources compared to the other build alternatives. Therefore, this BA considers impacts as a result of the construction and operation of Alternative C.

The MDTA RPA (**Figure 3-1**) would replace the existing Bay Bridge spans with two new bridge spans and would consist of six lanes along U.S. 50/301 on the Western Shore (three per direction), eight lanes on a new bridge (four per direction), and six lanes along U.S. 50/301 on the Eastern Shore (three per direction). Construction activities would include, but are not limited to, pile driving; dredging; placement of fill/structure for piers, pier protection systems, and pier islands; increased vessel traffic; and demolition (including blasting) and removal of existing structure. Further detail on construction activities are discussed in **Section 3.1**. The two new bridge spans would include one span to the south and one span in between the location of the existing bridge spans. The approach roadways would remain on the existing roadway alignment, except where necessary to connect to the new bridge spans. Thus, the five existing bridge lanes would be increased to eight bridge lanes; however, the number of lanes on the Western Shore and Eastern Shore would not change and would remain at six total travel lanes beyond the immediate tie-ins to the new bridge spans. The MDTA RPA could include a bicycle/pedestrian shared use path (SUP) along a new bridge. The MDTA has identified SUP connections to existing and proposed trails and recreational facilities on the Eastern Shore and Western Shore. Though the SUP is only an option at this time, the impacts discussed in this BA include those anticipated from both the construction of the new bridge and the optional SUP, in order to account for all possible impacts to listed species.

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Figure 3-1: Vicinity Map



3.1 Construction Methods

The MDTA RPA is currently in preliminary engineering and as such, design, construction, and demolition means and methods are based on preliminary assumptions. It is anticipated that construction of the new bridge spans would occur in multiple phases. Phasing of the MDTA RPA may involve building one span at a time: the first new bridge span may be built, then one existing bridge span could be demolished, and the new bridge span would be in use while the second new bridge span is built. Once both new bridge spans are complete, the second span of the existing bridge could be demolished. The exact order and timing of construction have yet to be determined; however, a preliminary construction sequence is found in **Table 3-1**.

Table 3-1 Preliminary Construction Sequence

Construction Activity	Construction Years
Construction of Bridge 1 (eastbound) – Occurring during years 1 through 5	
Start Construction, Bridge 1	1
Construct landings (work completed on land)	1-4
Constructing approaches and main span	1-5
Trestles and water access construction	1
Dredging for eastbound bridge	1-2
Transport and disposal of dredge	1-2
Substructure/pier protection construction	1-3
Superstructure construction	2-5
Complete construction, Bridge 1	5
Demolition of existing eastbound bridge – Occurring during years 6 through 7	
Start demolition, existing eastbound bridge	6
Blasting (total of 9 blast events)	6-7
Cantilever Deck Truss Spans (3 spans and 4 piers)	
Cantilever Deck Truss Spans (9 spans and 8 piers)	
Through Truss Spans (3 spans and 4 piers)	
250' Simple Deck Truss Spans (4 simple spans/4 piers)	
300' Simple Deck Truss Spans (6 simple spans/5 piers)	
Suspension Spans (3 suspension spans/4 piers)	
Dismantling	6-7
Complete demolition, existing eastbound bridge	7
Construction of Bridge 2 (westbound) – Occurring during years 7 through 13	
Start construction, Bridge 2	7
Construct landings (work completed on land)	7-13
Constructing approaches and main span	7-13
Trestles and water access construction	7
Dredging for westbound bridge	7-8
Transport and disposal of dredge	7-8
Substructure/pier protection construction	7-12
Superstructure construction	8-13

Construction Activity	Construction Years
Complete construction, Bridge 2	13
Demolition of existing westbound bridge – Occurring during years 14 through 15	
Start demolition, existing westbound bridge	14
Blasting (7 total events)	14-15
Cantilever Deck Truss Spans (3 spans and 4 piers)	
Cantilever Deck Truss Spans (9 spans and 8 piers)	
Through Truss Spans (3 spans and 8 piers)	
Suspension Spans (3 suspension spans/4 piers)	
Dismantling	14-15
Complete demolition, existing westbound bridge	15

The following sections include initial assumptions based on the current design and best available information from similar bridge projects including the Francis Scott Key Bridge, Tappan Zee Bridge, and Nice-Middleton Bridge. Information regarding anticipated construction methods and current assumptions of each phase follows.

Based on existing conditions within the Chesapeake Bay, it is expected that dredging would be necessary to create access channels to support demolition and construction activities. Considering input from previous similar dredging efforts, a target depth of nine feet below the mean low water (MLW) level was assumed. The dredging areas were established using the "Maryland bathymetry Chesapeake Bay contours" data at both shores of the Bay (Annapolis, and Kent Island sides). The northern limit of dredging was assumed to have an approximate offset of 50-feet north of the existing piers of the existing westbound span (to be demolished), and the southern limit was assumed to have an approximate offset of 60-feet from the southern edge of the proposed eastbound span.

The total area to be dredged at both shores of the Bay is approximately 50.2 acres (2.2 million square feet), out of which 16.4 acres are on the Annapolis shore and 33.8 acres are on the Kent Island shore. These areas exclude the footprints of the proposed and existing bridge pier footings. The total dredged volume within the dredging area is approximately 308,800 cubic yards. Applying a bulking factor of 1.3 to the dredged volume, the volume of spoil to be hauled is approximately 401,500 cubic yards and is proposed to be hauled via barge. For the eastbound bridge, bucket dredging is anticipated to take 14 days of activity within construction years 1 and 2 and for the westbound bridge bucket dredging is anticipated to take 7 days of activity within construction years 7 and 8.

For access in shallow areas, dredging would need to be wide enough to facilitate equipment mobility, loading and unloading material barges, and erecting structures. Depending on the consistency of bottom materials, additional dredging area may be needed because the sides of dredged areas must be sloped back to prevent the material from sloughing back into the excavation areas. The bottom materials may need to be sloped as much as 3:1 horizontal to vertical. Additionally, based on the greater expanse of shallow water from the eastern shoreline, it is anticipated that more dredging would be required along the eastern shoreline than the western shoreline.

Dredging will occur prior to the construction of trestles that facilitate the loading and unloading of barges and support vessels. Multiple access points (dredged channels or trestles) may be needed depending on the work configuration and the specific construction equipment needed. Access and dredging details will be evaluated and further refined in future design phases.

Potential dredge disposal sites include Masonville Cove and Cox Creek dredged material containment facilities (DMCF). Utilizing Masonville Cove DMCF and Cox Creek DMCF will facilitate safe and efficient loading, transport, and placement of dredge material. Both sites are owned and operated by the Maryland Port Administration (MPA), are adjacent to the Patapsco River, and are accessible by barge for placement operations. Masonville Cove DMCF has a permitted capacity of 10.4 million cubic yards (mcy) on 101 acres. Cox Creek DMCF has a permitted capacity of 14.7 mcy on 241 acres. Both facilities have plans in place to incorporate the creation of wildlife habitat and community access for recreation including birdwatching. The Bay Crossing Study has coordinated with MPA and determined that either DMCF will have the capacity to accommodate the dredging volumes generated by the build alternative. MPA will require that the material suitability and operational plans be approved prior to placement in accordance with their *Right of Entry Application*.

Preliminary engineering assumptions include using a trestle for temporary construction access in waters less than 10 feet deep below MLW. Based on the Francis Scott Key Bridge Rebuild Project design, the MDTA assumes trestle piers will be constructed every 38 feet supported on 36-inch steel pipe piles. Preliminary engineering assumes that bridge piers would be constructed with 36-inch square pre-stressed concrete piles as well as 36-inch, 48-inch, and 96-inch driven steel pipe piles. Pier protection fenders would be supported on 48-inch driven steel pipe piles. Pier protection dolphins are assumed to include 19.6-inch-wide sheet pile, backed by 14-inch steel H-piles. Pier protection would be built with the corresponding bridge span. It is assumed that up to four pile driving rigs may operate concurrently. **Table 3-2** and **Table 3-3** provide the estimated number and type of proposed piles and piers for the eastbound and westbound bridges, respectively.

Table 3-2: Eastbound Bridge – Assumed Pile Summary

Pile Type and Size	Total Piles	Total Piers
Bridge Piers	**1,741**	**77**
36” Pre-stressed Square Piles	132	18
36” Steel Pipe Piles	240	10
48” Steel Pipe Piles	1,231	43
96” Steel Pipe Piles	138	6
Trestle Piers		
36” Steel Pipe Piles	**628**	**157***
Pier Protection	**5,144**	**24**
48” Steel Pipe Piles for fenders	40	2
19.6” Sheet Piles (For Dolphins)	2,552**	22
14” Steel H-Piles (For Dolphins)	2,552**	
Grand Total	**7,513**	**258**

**A trestle pier is anticipated every 38 feet, beginning on land and extending one bridge pier beyond the limits of dredging (extending to 10-feet below MLW). Four 36-inch steel pipe piles are assumed to be required for each trestle pier.*
*** Pier protection dolphins have a diameter of 60’ and a circumference of 188.5’. Sheet piles and Steel H-piles would be constructed around the circumference of each dolphin and therefore, 116 sheet piles and 116 Steel H-piles are required per dolphin.*

Table 3-3: Westbound Bridge – Assumed Pile Summary

Pile Type and Size	Total Piles	Total Piers
Bridge Piers	**2,014**	**60**
36” Pre-stressed Square Piles	203	22
36” Steel Pipe Piles	243	9
48” Steel Pipe Piles	1,412	43
96" Steel Pipe Piles	156	6
Trestle Piers		
36” Steel Pipe Piles	**628**	**157***
Pier Protection	**5,144**	**24**
48” Steel Pipe Piles for fenders	40	2
19.6” Sheet Piles (For Dolphins)	2,552**	22
14” Steel H-Piles (For Dolphins)	2,552**	
Grand Total	**7,786**	**261**

** A trestle pier is anticipated every 38 feet, beginning on land and extending one bridge pier beyond the limits of dredging (extending to 10-feet below MLW). Four 36-inch steel pipe piles are assumed to be required for each trestle pier.*
*** Pier protection dolphins have a diameter of 60’ and a circumference of 188.5’. Sheet piles and Steel H-piles would be constructed around the circumference of each dolphin and therefore 116 sheet piles and 116 Steel H-piles are required per dolphin.*

The following are construction assumptions based on preliminary engineering:

- Multiple foundation types could be used by the contractor; however, to provide the most impactful estimate of noise, currently, the MDTA assumes the main span is by multiple driven steel-pipe piles, which require impact and vibratory hammering, and the approach span piles are assumed to be pre-stressed square concrete piles installed by impact hammer.
    - Noise attenuation in the form of bubble curtains would be used.
- Currently, a cable-stayed or suspension bridge is being considered.
- Piers would have some form of pier protection. Preliminary design assumes 2 fenders and 22 dolphins will be installed on both the eastbound and westbound bridges, respectively, to provide collision protection.
- Trestles would likely be used for construction access to facilitate pier placement for the new bridge within the dredged area. Trestles would be included for both construction and demolition activities. The preliminary design assumes a trestle pier would be constructed every 38 feet, beginning on land and extending one bridge pier beyond the limits of dredging (extending to 10-feet below MLW). Four 36-inch steel pipe piles are assumed to be required for each trestle pier. Trestles would remain in-place until construction is complete, approximately 15 years.
- Other temporary construction methods including cofferdams and other dewatering devices for pile driving may be used.
- Dredging in the shallows up to approximately 9-foot depth is assumed necessary to access areas for pier construction.
- It is assumed, based on the Francis Scott Key Bridge Test Pile Exposure Analysis assumptions, that impact driving would take a maximum of 2 hours per pile.
    - Due to equipment availability, it is assumed that up to 8 96” steel pipe piles may be driven in one day and up to 16 piles of other pile sizes could be driven in one day.
    - For the eastbound bridge, a total of 120 days of pile driving is anticipated throughout years 1-5 of construction.
    - For the westbound bridge, a total of 138 days of pile driving is anticipated throughout years 7-13 of construction.
- Throughout the construction duration an effective 12-hour quiet period of no pile driving will be implemented each day.
- For temporary staging areas, MDTA anticipates using the existing MDTA piers that are currently used for bridge maintenance. Additional staging areas may be needed, which will be determined during final design. Any additional staging areas may include existing public or private industrial locations in the Baltimore Harbor area or along the major rivers that would facilitate material transportation by barge and which would not result in additional environmental impacts. Staging areas may also include mooring locations within the Chesapeake Bay. Temporary mooring locations in the Chesapeake Bay may have additional bay bottom impacts, however MDTA will avoid placing moorings in areas of oyster beds or SAV. The specific locations and number of moorings will be determined in final design and coordinated with NOAA Fisheries.

Temporary lights may be used during construction, including in cases of extended construction day or overnight work, which may impact federally-managed fish and sea turtle species utilization of habitat; however, the use of aesthetic and continuous roadway lighting will be determined in final design. Lighting will include required navigation, aviation, and traffic control lighting.

Following construction, demolition of the existing bridge spans would occur. Removal of the existing bridge piers by means of blasting and manual methods would result in noise and vibration impacts to federally-managed fish and sea turtle species, and are expected to be the most impactful activities during demolition. The following are the demolition assumptions based on preliminary design:

- Manual removal would be employed wherever possible, however blasting may be necessary when water depths or pier element size makes manual removal infeasible, in which case a blasting plan will be developed in coordination with NOAA Fisheries.
- Trestles would be used where water depths are less than 10 feet to perform demolition activities, as needed.
- Marine cranes affixed to barges would be used where water depths are deeper than 10 feet below MLW to perform demolition activities, as needed.
- Steel bracing elements are anticipated to be torch cut and heavy lift marine cranes will be used to maneuver cut pieces.
- Shielding barges are anticipated for the removal and transportation of bridge elements from the water. These barges would be positioned underneath the existing bridge decks to capture any debris that may be released during demolition.
- Terrestrial demolition of bridge decks, girders, substructures, and abutments is anticipated to use saw cutting, excavators, and slab grab buckets. All demolition debris will be disposed of in accordance with regulatory permits and applicable laws and regulations.

3.2 Impacts from the MDTA Recommended Preferred Alternative

The MDTA RPA extends along U.S. 50/301 for approximately 8.3 miles from west of Oceanic Drive to east of Cox Creek. The limit of disturbance (LOD) is the boundary that would include all proposed construction, erosion and sediment control (ESC), stormwater management (SWM), and right-of-way offsets. The impacts to natural resources are summarized in **Table 3-4**. A more detailed discussion of potential impacts from the MDTA RPA to listed species under NOAA Fisheries' jurisdiction and proposed mitigation measures under consideration is included in **Section 5, Effects Determination**.

Table 3-4 Impact Summary

Resource	Impacts
Nontidal and Tidal Wetlands* (Acres)	6.3
Nontidal and Tidal Waterways* (Acres)	1.1
5-Year SAV 2019-2023 (Acres)	0
Historical SAV 2000-2018 (Acres)	0
Natural Oyster Bar (NOB) (Acres)	11.1

Resource	Impacts
Historic Oyster Bottom (Acres)	25.1
Oyster Plantings (Acres)	0
Oyster Sanctuaries (Acres)	0.6
Public Shellfish Fishery Areas (Acres)	6.1
Essential Fish Habitat (EFH)** (Acres)	139.9
Horseshoe Crab Habitat (Linear Feet)	290
Substrate – Dredging Impacts (Acres)	50.2
Substrate – Dredging Impacts (Cubic Yards)	317,400
Chesapeake Bay Tidal Waters (Acres)	133.8

3.3 Avoidance and Minimization Measures

Avoidance and minimization measures will continue to be evaluated for the MDTA RPA during final design. This will include implementation of specialized construction methods to ensure the protection of sensitive resources. The MDTA commits to minimizing all in-water fills, both temporary and permanent. Temporary impacts in place for greater than one year are considered permanent impacts to account for the temporal loss of function in these areas. The MDTA has prepared a hydrodynamic modeling report that evaluates the existing hydrodynamic conditions of the broader study area and the MDTA commits to evaluating they hydrologic implications of the proposed design to maintain hydrodynamic conditions to the greatest extent practicable. Specialized construction methods may include time of year restrictions (TOYR), detailed monitoring plans, and project implementation schedules. It is assumed that in-water nets would not be used during demolition or construction, therefore potential impingement/entrainment BMPs have not been considered. Potential construction methods to minimize impacts to federally-managed fish and sea turtle species (adapted from the *NOAA Fisheries/FHWA BMP Manual* (NOAA Fisheries 2017) and the FHWA Programmatic Essential Fish Habitat Consultation and General Concurrence for Select Transportation Actions in the NMFS Greater Atlantic Region (NOAA Fisheries 2024b)) are summarized in the following sections. The MDTA will commit to the avoidance and minimization methods included in the first list below and will consider all other measures/methods included in the second list below that may or may not be adopted and will be negotiated with the resource agencies.

List of Avoidance and Minimization Commitments:

Underwater Noise/Hydroacoustic Energy

1. Use noise attenuation and minimization measures during pile driving, including:
    a. Surrounding piles with a bubble curtain system.
    b. Using a “soft start” or “ramping up” pile driving (e.g., driving does not begin at 100% energy).

2. Develop an underwater noise monitoring plan to describe the underwater noise generated by project activities and adaptive management measures planned to address the underwater noise.
3. Employ scare charges and fish deterrent boats ahead of blasting activities.
4. Implement an effective quiet time of no pile driving for 12 hours per day.
5. Develop a detailed blast plan with minimization measures, and submit to NOAA Fisheries for review, in advance of any detonation activity.

Turbidity and Sedimentation

1. Limit the amount and extent of turbidity and sedimentation by using appropriate sedimentation and turbidity controls such as silt curtains, settling basins, and cofferdams. The MDTA will specify the measures to be used in the construction plans:
    a. Install erosion control measures prior to ground disturbance;
    b. Inspect daily and maintain continuously in an effective operating condition all ESC measures until such time as they are removed with prior permission from the Maryland Department of the Environment (MDE) inspector;
    c. Upon project completion, remove and stabilize all temporary construction materials with sediment and erosion control measures to prevent reentry into waterways.

2. MDTA commits to the use of mechanical dredging.

Reduced Water Quality

1. Avoid, to the greatest extent practicable, the use of creosote or pressure treated (Chromated Copper Arsenate or Alkaline Copper Quaternary etc.) piles and do not locate any treated piles in areas containing shellfish or in sensitive habitats.
2. Remove cofferdams or other diversion structures only after water quality is consistent with ambient levels outside the structure.
3. Remove contaminants and sediments from water discharge prior to entering aquatic habitats.
4. Evaluate dredge material to determine the appropriate disposal method and location.
5. Manage concrete wash water and cooling water effluent from concrete saw operations to ensure they do not enter the Bay untreated.

Habitat Alteration

1. Remove temporary structures and fills including monitoring devices in their entirety. Return aquatic habitats impacted by temporary activities, fills, or structures to pre-construction or better condition, including contours, elevations, substrate, and vegetation.
2. Include methods to document fish stuns/kills in the Underwater Noise Monitoring Plan and coordinate these methods with NOAA Fisheries Habitat and Ecosystem Services Division.
3. Coordinate with GARFO on specific recommended time-of-year restriction dates, based on the proposed activities and location.
4. Staging of activities to reduce intensity of disturbance.
5. Avoiding areas where protected species congregate for spawning/foraging or overwintering.

Vessel Interaction

1. Do not moor vessels in submerged aquatic vegetation (SAV) or in such a way that could shade SAV.
2. Enforcement of reduced construction vessel speeds (e.g., below 10 knots).
3. Employing species spotters to reduce species/vessel collisions; and keeping appropriate distance from protected species if spotted.

Impingement and Entrainment

1. Use of construction equipment that reduces potential for impingement and entrainment such as utilizing intake screens and using environmental buckets on mechanical dredges.

List of Avoidance and Minimization Considerations:

Underwater Noise/Hydroacoustic Energy

1. Use of mechanical demolition methods, instead of blasting, when possible.
2. Conduct noise-generating work in a way that minimizes acoustic effects and avoids injury to federally-managed fish species. Explore potential attenuation measures based on the Section 7 Acoustic Tool.
3. Use of noise attenuation and minimization measures during pile driving, such as:
    a. Isolation casing or dewatered cofferdam. Contained bubble curtains would be utilized to the extent practicable. Where use of a contained bubble curtain is not feasible, use of an uncontained bubble curtain would be evaluated. There may be some circumstances in which neither a contained nor uncontained bubble curtain would be feasible, in these circumstances rationale would be provided to the resource agencies prior to driving piles.
    b. Using vibratory hammers and construction phasing to minimize acoustic impacts.
    c. Minimizing the number and size of temporary and permanent piles.
    d. Using steel versus concrete piles and pre-cast piles to minimize the use of vibratory hammers and reduce underwater noise.
    e. Driving piles as deep as possible with a vibratory hammer prior to using an impact hammer.
    f. Using cushion blocks when using an impact hammer.
    g. Using drilled shafts instead of hammered piles where appropriate.
4. The detailed blast plan may include measures to:
    a. Stem (cap/fill) each detonation bore hole;
    b. Fire all charges in a single firing circuit with a delayed detonation between each charge;
    c. Focus blast energy towards a solid substrate rather than towards the water column;
    d. Install noise attenuating devices such as bubble curtains;
    e. Conduct the blasting during periods of low water or low tide;
    f. Use rubber blasting mats to reduce debris and acoustic signature;
    g. Use low weight/energy repellant charges that startle fish from the area prior to blasting;
    h. Install appropriate monitoring devices to adaptively manage the blasting plan;
    i. Detonate charges using explosive weights that result in pressure levels less than species injury/mortality and behavioral thresholds. The production of injury/mortality thresholds should remain within 100 feet of the blasting source; and
    j. Place a weighted turbidity curtain around blast areas to act as a barrier. Ensure the area is clear of all ESA-listed species prior to closing the curtain. If injury/mortality thresholds are expected, the turbidity curtain should be placed at a distance from the source beyond where injury thresholds would occur.

Turbidity and Sedimentation

1. Position new structures to avoid altering natural sediment accretion rates and pattern.
2. Use operational modifications such as conducting the work at low tide to limit sedimentation and turbidity.
    a. Prevent sediment and debris from entering the water using geo-textile fabric, hay bales, or other methods. Use nets, tarps, and pans when demolishing bridge superstructures; remove demolition debris that falls into the water.

3. Minimize the suspension of sediments and disturbance of the substrate when removing piles by implementing the applicable techniques:
    a. Remove piles with a vibratory hammer, rather than by direct pull, jetting, or clamshell;
    b. Remove piles slowly to reduce sediment sloughing off in the water column;
    c. Strike or vibrate the pile to break the bond between the sediment and pile to minimize the pile breakage, and reduce the amount of sediment sloughing off the pile during removal;
    d. Cut or drive the piles at least two feet below the mudline and leave the stub in place;
    e. Place piles on a barge equipped with a basin to contain all attached sediment and runoff water after removal.
4. Use operational modifications to minimize turbidity and sedimentation during dredging. This may include using an environmental bucket on mechanical dredges, reducing lift speeds, using small diameter cutterhead dredges, and/or limiting the use of large hopper dredges.
5. Design the dredge footprint to avoid sensitive habitats to the greatest extent practicable and provide appropriate buffers to protect these areas from accretion of sediment resuspended during dredging.
6. Prohibit side-casting or temporary storage of dredged material in the waterway.
7. Prohibit unfiltered or unprocessed overflows from barges into the water and ensure that any barge transfer is accomplished without generating sediment plumes.

Reduced Water Quality

1. Only use clean fill. Place fill so that it is not likely to be eroded by high water flows.
2. Minimize the amount of new impervious surfaces and maintain a vegetated buffer between the water and upland activities.
3. Incorporate stormwater controls to minimize pollutants in aquatic habitats, including determining whether the proposed bridge could include measures to collect runoff and route it to upland features for treatment prior to discharge.
4. Ensure temperature and DO levels remain within the appropriate ranges to reduce any effects to federally-managed fish species.
5. Ensure that raw concrete or grout does not contact the water.

Habitat Alteration

2. Place a geotextile barrier under any temporary platforms and/or access fills to ensure that any fill would be removed completely at the end of construction.
3. Develop a project schedule and plan prior to construction, which avoids or minimizes sediment disturbance, noise, and physical obstruction during sensitive life stages (migration and spawning) of federally-managed fish species. This may include isolating in-water work or implementing time-of-year restrictions.
4. Complete pre- and post-construction monitoring to determine the project was completed as intended to determine fishery resources present, habitat impacts, and mitigation needs.
5. Use multiple-season biological sampling data (pre- and post-construction) to assess the potential and resultant impacts on habitat and aquatic organisms.
6. Conduct post-dredge surveys to ensure targeted depths are reached and to determine benthic recovery.
7. Fill all holes left by the piles with clean substrate appropriate for the site.
8. Orient artificial lighting on crossings to avoid illumination of the surrounding waters at night.
9. Design bridge abutments to minimize disturbances to banks and locate them outside of the floodplain.

10. Incorporate measures that increase the ambient light transmission under the bridge including:
    - maximizing the height of the structure;
    - minimizing the width of the structure; and
    - minimizing the number of instream pilings/piers.
11. Consider beneficial use of suitable sediments and give priority to beneficial uses of material that contributes to habitat restoration and enhancement.
12. Ensure that any proposed dredging is necessary to maintain target depths. Evaluate recent bathymetric surveys to determine the existing depths of the proposed dredge area.
13. Use waterline pile cap/pier footings to avoid dredging to construct footings below the mudline.
14. Avoid and minimize all activities (including work footprint, structures, shading, temporary and permanent fill, excavation, etc.) in shallow water habitats and sensitive habitats such as critical habitat, SAV, mudflats, salt marsh, areas containing shellfish, and intertidal areas.
15. Consult historic SAV surveys and conduct new pre-construction SAV surveys in the growing season due to the spatial and temporal dynamic nature of SAV beds. Have a qualified, professional biologist delineate any SAV in the field prior to the start of any work.
16. Provide compensatory mitigation for all unavoidable impacts to Essential Fish Habitat (EFH) and sensitive habitats.

Fish Passage and Migration Habitat

1. Ensure temporary structures or barriers do not block federally-managed fish species' access to an area, preventing movement in or out of a river or channel.
2. Consider including a Safe Zone of Fish Passage that allows federally-managed fish species, including migratory fish, to safely navigate around undesirable noise and/or turbidity levels, including both shallows and channel edges outside of the estimated isopleth for behavioral modification.
3. Design projects to maintain adequate flow conditions for fish passage, maintain water quality, and to maintain properly functioning channel, floodplain, riparian, and estuarine conditions.

Vessel Interaction

1. Reduce vessel speeds in inshore areas, or otherwise minimize wake damage to shorelines, and consider no-wake zones in highly sensitive areas, such as spawning habitat and SAV beds. Identify appropriate vessel routes in the design process to minimize impacts to shorelines and shallow water habitats.
2. Consider the effects of increased vessel traffic when conducting in-water actions.
3. Ensure that vessels are operated in adequate water depths to avoid propeller scour and grounding at all tides. Use shallow draft vessels that maximize the navigational clearance between the vessel and the bottom in shallow areas.

Impingement/Entrainment and Entanglement

1. Ensure any in-water lines, ropes, or chains are made of materials and installed in a manner (properly spaced) to minimize the risk of entanglement by using thick, heavy, and taut lines that do not loop or entangle. Lines can be enclosed in a rigid sleeve.
2. Attach any cables or utility lines to structures above the water, instead of locating them in water or within the substrate. Bury and prevent cables or utility lines from coming through the substrate if they are necessary to be in the water.
3. Allow all fish to exit an enclosed area prior to any dewatering. Trapped fish greater than 5 inches long, observed during dewatering shall be captured and released from the dewatering area except for invasive species (snakehead, blue catfish, flathead catfish) that will be disposed of.

4. Any water intakes (e.g., pumps) drawing from surface tidal waters should employ screening (1 mm wedgewire or better technology with maximum intake velocity of 0.5 fps) to minimize impingement/entrainment of fish and nekton.
5. Properly secure turbidity control measures and design them in a manner that does not block entry to or exit from critical habitat.
6. Monitor turbidity control measures to ensure aquatic species are not entangled or trapped within them.

4 ACTION AREA

The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). *NOAA Fisheries Section 7 Program Technical Guidance* (NOAA Fisheries, 2024a) provides technical assistance for determining the action area. The action area of the Tier 2 Study includes the Tier 2 Study area and any area where stressors may affect listed species. Potential effects would occur during construction of the new bridge spans and pier protection, and removal of the existing bridge spans. The boundaries of the action area for the project have been determined by the likely extent of sedimentation, turbidity, noise, and construction-related vessel traffic, based on current high-level assumptions. A map of the action area is presented in **Appendix B**.

The action area includes areas within the waterway(s) that would experience temporary increases in sediment from dredging, pile driving, and bridge widening; temporary increases in noise from pile-driving activities; and be affected by construction-related vessels. A 500-foot buffer has been placed around the Bay Bridge to account for sediment and turbidity due to dredging and pile driving. A 500-foot buffer has also been placed from the south side of the U.S. 50 eastbound crossing of Cox Creek to account for sediment and turbidity as result of proposed widening of the single span bridge. It is anticipated that the vessel home port location would be in the Baltimore area, in which case construction-related vessel traffic would travel between the Bay Bridge and the Baltimore area when involved in transport of material. Any vessel traffic to/from home ports is anticipated to be limited to the Federal navigation channel.

4.1 NOAA Fisheries Listed Species in the Action Area

A review of the NOAA Fisheries Greater Atlantic Region ESA Section 7 Mapper and correspondence from NOAA Fisheries shows that the MDTA RPA overlaps Section 7 Consultation Areas for six federally listed species that include two fish and four sea turtle species, as shown in **Table 4-1**.

Table 4-1: Federally Listed Species Under NOAA Fisheries Jurisdiction

Common Name	Scientific Name	Distinct Population Segment (DPS) Potentially Occurring in the Action Area	Behavior in Action Area	Federal Status
Atlantic sturgeon	*Acipenser oxyrinchus*	Gulf of Maine; New York Bight; Chesapeake Bay; Carolina; South Atlantic	Migrating & Foraging	Threatened/ Endangered[1]
Shortnose sturgeon	*Acipenser brevirostrum*	Range-wide[2]	Overwintering; Migrating & Foraging	Endangered
Loggerhead sea turtle	*Caretta caretta*	Northwest Atlantic	Migrating & Foraging	Threatened
Kemp's ridley sea turtle	*Lepidochelys kempii*	Range-wide[2]	Migrating & Foraging	Endangered
Green sea turtle	*Chelonia mydas*	North Atlantic	Migrating & Foraging	Threatened
Leatherback sea turtle	*Dermochelys coriacea*	Range-wide[2]	Migrating & Foraging	Endangered

[1] Gulf of Maine DPS is threatened. New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs are endangered.
[2] DPS has not been designated for this species.

4.1.1 Atlantic and Shortnose Sturgeon

There are four distinct population segments (DPS) of Atlantic sturgeon listed as endangered (New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one DPS listed as threatened (Gulf of Maine) under the ESA. The five DPS were listed on February 6, 2012 (77 FR 5880, 77 FR 5914). The marine range for all five DPSs includes marine waters, coastal bays, and estuaries from the Labrador Inlet in Labrador, Canada to Cape Canaveral, Florida. The presence of Atlantic sturgeon has been documented in the action area. Available information on the distribution of Atlantic sturgeon indicates that a majority of the Atlantic sturgeon in the action area will be from the Chesapeake Bay DPS, though individuals from all five DPSs may be present within the action area.

Juvenile, subadult, and adult Atlantic sturgeon are found migrating and foraging throughout the Chesapeake Bay and its tributaries. Adult and subadult stages are present between mid March and late November, while juvenile stages are present year-round. Telemetry data collected from 2021 to 2024 and provided by NOAA Fisheries indicated the presence of Atlantic sturgeon in the Chesapeake Bay North array (located just south of the Bay Bridge), with detections of Atlantic sturgeon occurring mainly during the warmer months. The telemetry data provided by NOAA Fisheries are included in **Appendix C**. Atlantic sturgeon are bottom feeders, consuming invertebrates and bottom-dwelling fish. In the Chesapeake Bay system, Atlantic sturgeon spawn between late summer and fall. Threats to the species include fisheries interactions and bycatch, habitat degradation, habitat impediments, and vessel strikes (NOAA Fisheries, 2022a; NOAA Fisheries, 2023a).

Shortnose sturgeon are listed as endangered under the ESA throughout their range and occur in rivers and estuaries along the east coast of the U.S. and Canada (SSSRT 2010). Shortnose sturgeon were initially listed as endangered on March 11, 1967, under the Endangered Species Preservation Act and subsequently listed as endangered under the ESA when it passed in 1973. There are three metapopulations of the shortnose sturgeon (Carolinian Province, Virginian Province, and Acadian Province) within which there are 19 documented populations (NOAA Fisheries, 2023b). Available information on the distribution of shortnose sturgeon indicates that a majority of the shortnose sturgeon in the action area will be from the Virginian Province.

Adult stages of shortnose sturgeon are conservatively assumed to be present year-round throughout the Chesapeake Bay and its tributaries (NOAA Fisheries, 2022a). NOAA Fisheries conservatively assumes that shortnose sturgeon could be overwintering anywhere in the Bay or its tributaries from November 1st to February 28th. Shortnose sturgeon are bottom feeders that feed on mollusks as well as benthic crustaceans and insects (Dadswell, 1979). In the mid-Atlantic region, shortnose sturgeon migrate upriver to spawn from April to May and return downstream after spawning. Threats to the species include habitat impediments, habitat degradation, and fisheries interactions and bycatch (NOAA Fisheries, 2023b).

4.1.2 Sea Turtles

There are 11 DPSs of green sea turtle listed under the ESA. Three are listed as endangered and eight are listed as threatened. Green sea turtles potentially occurring in the action area are in the North Atlantic DPS, listed as threatened on April 6, 2016 (81 FR 20058). Nine DPSs of loggerhead turtles are listed under the ESA. Five are listed as endangered and four are listed as threatened. Loggerhead turtles potentially occurring in the action area are in the Northwest Atlantic DPS, listed as threatened on September 22, 2011 (76 FR 58868). The leatherback sea

turtle and Kemp's ridley sea turtle are listed as endangered throughout their ranges and were initially listed under the Endangered Species Conservation Act and subsequently listed as endangered when the ESA was passed in 1973.

Adult and juvenile stages of the loggerhead, Kemp's ridley, green, and leatherback sea turtles are found migrating and foraging in the Chesapeake Bay and its tributaries. These four species of sea turtles migrate north to the mid-Atlantic in the spring, arriving in May, and leave the area generally by the end of November (NOAA Fisheries, 2022b, 2023c, 2023d, and 2023e). Loggerhead sea turtles forage in coastal areas, feeding mostly on bottom dwelling invertebrates. Kemp's ridley sea turtles foraging in coastal areas consume mostly crabs and occasionally discarded bycatch. Green sea turtles are primarily herbivorous, feeding on algae and seagrasses, and occasionally consuming sponges, invertebrates, and discarded fish. Leatherback sea turtles consume soft-bodied prey such as jellyfish. Threats to the loggerhead, Kemp's ridley, green, and leatherback sea turtles include bycatch in fishing gear, loss and degradation of nesting habitat, vessel strikes, direct harvest of the sea turtles and their eggs, and ocean pollution/marine debris. Additionally, threats to the Kemp's ridley sea turtle include predation of eggs and hatchlings, and threats to the green sea turtle include Fibropapillomatosis, a tumor-causing disease (NOAA Fisheries, 2022b, 2023c, 2023d, and 2023e).

4.1.3 Additional NOAA Protected Species and Habitat

4.1.3.1 Mammals

The University of Maryland Center for Environmental Science (UMCES) Chesapeake DolphinWatch program compiles reported sightings of bottlenose dolphins from the public and verifies them. A review of the Chesapeake DolphinWatch website indicates that there were nearly 2,000 dolphin sightings in the Chesapeake Bay in 2022 and about 1,500 dolphin sightings in 2023 (UMCES, 2024). Dolphins are typically seen in the Chesapeake Bay from May through October, including around the Bay Bridge. As noted in Section 2, the MDTA will coordinate with NOAA Fisheries to secure an IHA for impacts on bottlenose dolphins and to determine appropriate BMPs. Bottlenose dolphins are protected under the MMPA and not listed under the ESA; therefore, bottlenose dolphins are not discussed further in this document. Additional information on bottlenose dolphins is included in the DEIS and NETR.

4.1.3.2 EFH and HAPC

EFH and HAPC are included in the Action Area. As noted in Section 2, impacts to EFH and HAPC were evaluated and are presented in the EFH Assessment document. MDTA will continue to coordinate with NOAA Fisheries to determine and implement appropriate avoidance and minimization measures as design progresses. EFH and HAPC are protected under the MSA and not the ESA; therefore, EFH and HAPC are not discussed further in this document. Additional information on EFH and HAPC is included in the EFH Assessment document, the DEIS, and the NETR.

4.2 Habitat within the Action Area

4.2.1 Waterways

Waterways within the MDTA RPA action area include Chesapeake Bay and Cox Creek. These tidal waterways are shaped by the region's geological history and the regular fluctuations of the tides.

The Chesapeake Bay is the largest estuary in the United States and contains a diversity of habitats including shallow waters, open waters, deepwater refuge areas, marshes and wetlands, sandy beaches, mud flats, oyster reefs, and other habitat niches that sustain a wide range of aquatic species. The portion of the Bay crossed by the MDTA RPA is the narrowest point in the mainstem of the Bay, which widens to the north and south where the action area extends up and down the Bay along Federal navigational channels.

The Chesapeake Bay is designated by MDE as a Use II tidal waterway, or tidal waters designated for supporting estuarine and marine aquatic life and shellfish harvesting. North of the bridge, the Bay is identified as within the Upper Chesapeake Bay segment (CB3MH), and south of the bridge, the Bay is identified as within the Middle Central Chesapeake Bay segment (CB4MH). The Chesapeake Bay is a mesohaline system (represented as the MH within the segment identifier above), which means its waters have a low to medium saline content, or are brackish waters, and are typically defined as having salinity between 5 and 18 parts per thousand (Park, 2012).

Cox Creek is a tidal system both north and south of U.S. 50/301 that almost bisects Kent Island. This is a wide system that narrows where it is bridged by U.S. 50/301 and is approximately 575 feet wide north of the roadway and 1,650 feet wide south of the roadway. Although the FEMA 100-year floodplain is associated with this waterway both north and south of the road, there are no vegetated wetlands identified to the north. Large areas of estuarine common reed (*Phragmites australis*) wetland are located along the western bank, on the south side of the road.

4.2.1.1 Water Quality

Water quality data was gathered from MDE, Maryland Department of Natural Resources' (MDNR) Eyes on the Bay Program, and other monitoring programs accessed through the Chesapeake Bay Program (CBP) DataHub to assess water quality during the development of the Tier 2 Study NETR. In addition, water quality data were gathered from the National Water Quality Monitoring Council (NWQMC) database and in situ data were obtained from MDNR's Chesapeake Bay Benthic Monitoring Program (CBBMP). This section summarizes the water quality data for the watersheds within the action area.

Data available within the Chesapeake Bay closest to the Western Shore have sampling locations north of and beyond the action area, however, these locations are along the shoreline of the Chesapeake Bay and flow directly into the action area. Dissolved Oxygen (DO) data for this area reflects existing turbidity and shoreline erosion conditions, since DO and turbidity are inversely related, and provides baseline conditions for the area where the bridge would be constructed.

Recent chemical grab data from this part of the Chesapeake Bay is available for three monitoring locations from the NWQMC database, which indicated approximately 5 percent of pH records, 14 percent of all *Enterococcus* records, and 8 percent of fecal coliform records not meeting COMAR criteria. Values for pH ranged from 6.1 to 9.0, which violated both the low and high COMAR criteria of 6.5 and 8.5, respectively. In general, DO values met COMAR criteria for the various designated habitats and seasons, with records infrequently falling below specific criteria. Salinity ranged from 1.9 to 16 ppt, depending on sampling event.

Sampling data is captured just north of the Bay Bridge landside connection with Anne Arundel County. In situ and grab sample water quality data for two locations in this area were gathered from the CBP DataHub, where approximately 10 percent of surface pH records exceeded the

COMAR criterion of 8.5, with a maximum recorded value of 9.1. All surface DO readings met COMAR criteria for the various designated habitats and seasons, and between 7 percent and 29 percent of bottom DO readings fell below COMAR criteria, depending on the designated habitat and season. The full range of DO values observed across all seasons and habitat types can be found in **Table 4-2**. Chemical grab sample data was available for one monitoring location from the NWQMC database, indicating approximately 8 percent of all fecal coliform records exceeded the most stringent COMAR criterion for shellfish harvesting areas (i.e., ≤14 MPN/100 mL). Recent in-situ water quality data for one location, available from CBBMP, revealed that there were no exceedances of water quality criteria, however, this location is well south of the action area and flowing away from the Bay Bridge. Salinity ranged from 0.61 to 18.48 ppt, depending on the sampling event, location, and depth (**Table 4-3**).

Recent chemical grab sample data from one location in the Northern Eastern Bay MD 12-digit watershed, located downstream of the build alternatives, were available from the NWQMC database. Approximately 30 percent of all fecal coliform records exceed the most stringent COMAR criterion for shellfish harvesting areas (i.e., ≤14 MPN/100 mL).

Additional in situ and grab sample water quality data was retrieved from five sampling sites in the Kent Island True Bay MD 12-digit watershed, within the Chesapeake Bay, just north of the Bay Bridge. Data from two sites in the CBP DataHub and three sites in the NWQMC dataset indicated that approximately 9 percent of in situ surface records for pH and less than 1 percent of bottom records exceeded the upper COMAR criterion of 8.5. All surface DO readings met COMAR criteria for the various designated habitats and seasons. Bottom DO readings frequently fell below COMAR criteria, with 12 percent to 51 percent of readings not meeting COMAR criteria, depending on the designated habitat and season. Approximately 1 percent of all fecal coliform records exceeded the most stringent COMAR criterion for shellfish harvesting areas (i.e., ≤14 MPN/100 mL). Salinity ranged from 0.50 to 22.32 ppt, depending on the sampling event, location, and depth (**Table 4-3**).

Table 4-2 COMAR Water Quality Parameters within 12-digit Watersheds in the Vicinity of the Action Area

Watershed	Source	Number of Sites	Year	Depth (m)	Parameter				
					Temperature (°C)	pH	DO (mg/L)*	Enterococcus (MPN/100mL)	Fecal Coliform (MPN)
Annapolis Shore	CBBMP	1	2018	0.5 / 9	26.30 / 26.37	7.8 / 7.2	6.35 / **4.20** (ppm)	---	---
	CBP	2 / 1	2013 - 2023	0.5 / 4	3.7 - 30.9 / 1 - 28.3	7.1 - **9.1** / 7.1 - 8.4	**4.6** - 15.1 / **0.28** - 12.6	---	---
	NWQMC	1	2013 - 2019	---	---	---	---	---	1 - **23**
Northern Eastern Bay	NWQMC	1	2013 - 2019	---	---	---	---	10 - **2,010** (2013 - 2022)	1 - **1,100**
Kent Island True Bay	CBP	2	2013 - 2023	0.5 / 6	1.3 - 29.6 / 0 - 28	6.9 - **9.6** / 6.8 - **8.7**	5.1 - 17.8 / **0.09** - 12.7	---	---
	NWQMC	1 - 3	2013 - 2019	---	1.2 - 29	7.4 - **8.8**	**4.1** - 14.5	10 - **1,450** (2013 - 2022)	1 – **23**

*In dilute aqueous solutions, 1 mg/L is approximately equivalent to 1 ppm.

Notes:

1. Red values indicate that they exceed/are below COMAR criteria during the listed time period.

2. Data collected at two depths is shown in the same cell separated by a "/," corresponding to the two depths reported in the Depth column.

3. Not all parameters or sites were monitored in each year within the year range.

4 A range of number of sites is presented to note that not all parameters were assessed at all sites for certain watersheds and datasets.

Table 4-3 Salinity and Conductivity within 12-digit Watersheds in the Vicinity of the Action Area

Watershed	Source	Number of Sites	Year	Depth (m)	Parameter	
					Salinity (ppt)*	Conductivity (UMHO/cm)
Annapolis Shore	CBBMP	1	2018	0.5 / 9	3.26 / 5.83 (PSU)	5,972 / 10,340
	CBP	2 / 1	2013 - 2023	0.5 / 4	0.61 - 16.43 / 3.38 - 18.48	3,100 - 27,000 / 6,640 - 30,000
Kent Island True Bay	CBP	2	2013 - 2023	0.5 / 6	0.5 - 16.56 / 4.75 - 22.32	3,120 - 27,200 / 8,940 - 35,500
	NWQMC	1	2013 - 2019	---	2.8 - 15.2	---

*1 PSU is approximately equivalent to 1 ppt.

4.2.2 Bathymetry

The Chesapeake Bay in the MDTA RPA action area is deepest in the center and east of the county boundary, located within the Chesapeake Bay Bridge Auxiliary Federal navigation channel. As expected, the depth becomes increasingly shallower towards the shorelines. The Chesapeake Bay has an average depth of approximately 40 feet within the action area, with the main channel depth approximately 56 feet, and the Chesapeake Bay Bridge Auxiliary channel depth approximately 92 feet. **Figure 4-1** illustrates the bathymetry of the Chesapeake Bay, with the close contours indicative of varying steep slopes within the deeper areas.

The shallows of the Chesapeake Bay (1 to 3 feet) extend channelward approximately 800 to 950 feet from the western shoreline in Anne Arundel County, and approximately 1,200 to 1,300 feet from the eastern shoreline in Queen Anne's County. Areas with depths from approximately 3 feet to 12 feet generally extend from about 2,100 to 2,200 feet from the western shoreline and 3,900 to 4,700 feet from the eastern shoreline. Based on bathymetric analysis, it is anticipated that

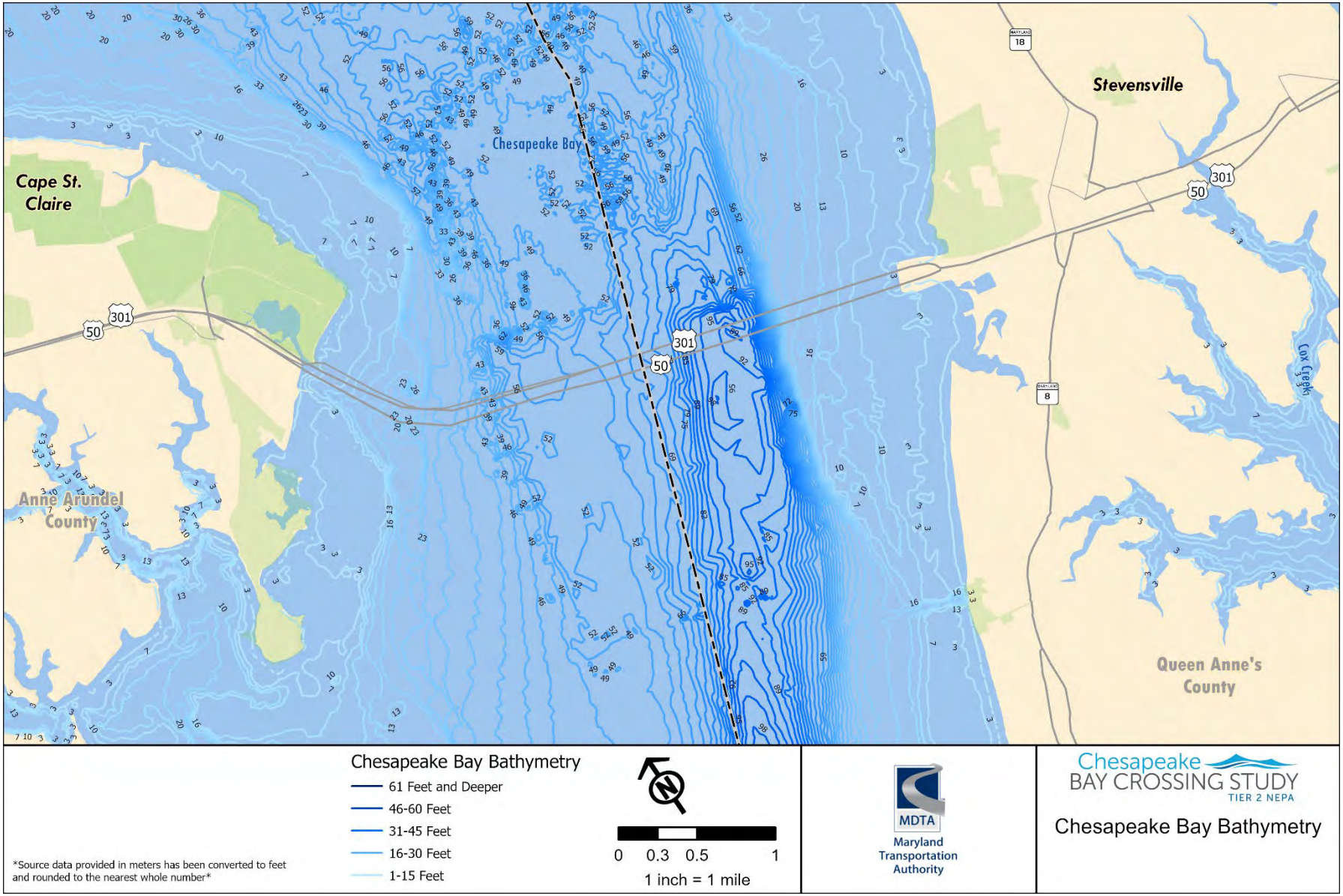
dredging would be required to a depth of 9 feet at mean lower low water (MLLW). Previous agency coordination for other bridge projects that required dredging required mitigation for areas with a water depth of 3 feet or less. Except in the shallow areas along the Anne Arundel and Queen Anne's shorelines, the Chesapeake Bay is deep enough for barge-mounted construction equipment and material barges to perform work adjacent to the existing Bay Bridge.

4.2.3 Bay Depths

The shallowest areas within the action area are along the Anne Arundel County and Queen Anne's County shorelines. From the Anne Arundel County shoreline north of the Bay Bridge, the water depth is approximately 9 feet deep between approximately 1,400 to 1,600 feet channelward. This area is adjacent to the access channel into Mezick Ponds and the Sandy Point State Park marina. The access channel is protected by a 525-foot-long rock groin. From the Anne Arundel County shoreline south of the Bay Bridge, the water depth is approximately 9 feet deep at approximately 2,000 feet channelward. This area is adjacent to the MDTA maintenance yard and dock areas that are used for service vessels.

From the Queen Anne's County shoreline north of the Bay Bridge, the water depth is approximately 9 feet deep at approximately 3,500 to 3,700 feet channelward. This area is adjacent to and north of the peninsula where the Bay Bridge lands and south of the Terrapin Nature Park. From the Queen Anne's County shoreline south of the Bay Bridge, the water depth is approximately 9 feet deep between approximately 3,700 to 4,000 feet channelward. This area is adjacent to the peninsula where the Bay Bridge lands and the Chesapeake Bay Bridge Marina. The channel to access the marina runs southwest away from the Bay Bridge.

Figure 4-1: Chesapeake Bay Bathymetry



4.2.4 Bay Bottom Material

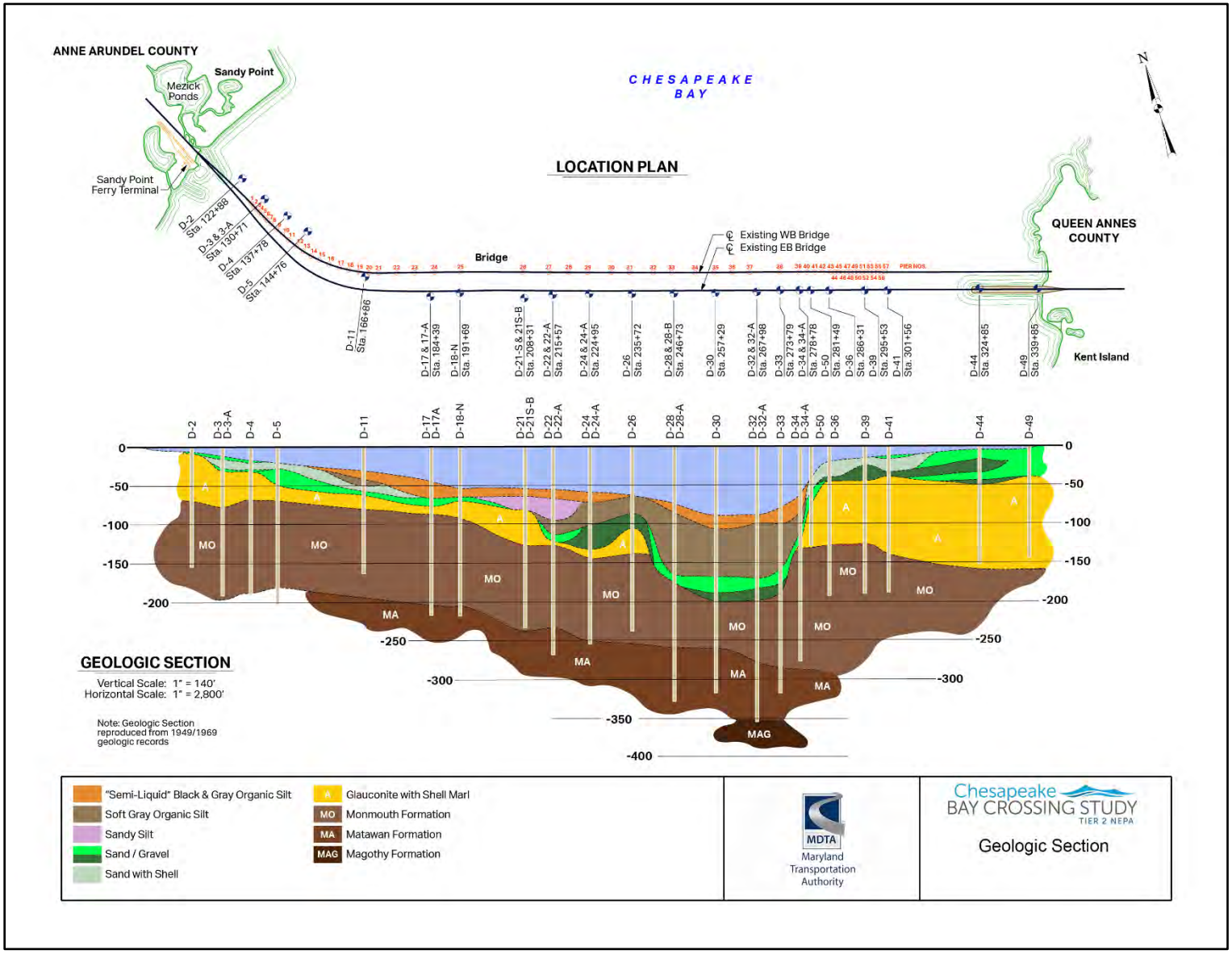
The Chesapeake Bay bottom is primarily formed by layers of Magothy, Matawan, and Monmouth formations, which is overlaid by sandy material in the shallow areas and loose silty clay material in the deeper channels. Surficial sand is generally found in the areas that are most affected by wave action and tidal fluctuations. The waves and tide move fine silt, clay, and organic material out of the sand and deposit them in lower energy areas along the bottom (**Figure 4-2**). Currently there is no indication of contaminated material, as the U.S. Army Corps of Engineers (USACE) 50ft Project has not found contaminated material in the Bay Bridge area (USACE 2017).

Sand: Surficial sand extends approximately 1,100 feet channelward from the Anne Arundel County shore, which corresponds to an approximate 6-foot water depth. Surficial sand extends approximately 4,200 feet channelward from the Queen Anne's County shore which corresponds to an approximate 12-foot water depth. Both shorelines correspond to bottom slopes that are flat (less than 0.5 percent) and near the surface. Geotechnical borings near the shorelines show the Chesapeake Bay bottom is underlain by sand to 50 feet deep where it begins to increase in clay content.

Cultch: Material (such as oyster shells) that has been laid down on oyster grounds and furnishes points of attachment for oyster spat is found in shallower areas (less than 26 feet deep). Cultch areas are generally inclusions in sandy bottom and may be incorporated into organic/silt mud areas.

Silty Clay: Surficial silty clay covers most of the Chesapeake Bay bottom along the action area. Silty clay is generally associated with relatively deep waters (deeper than 6 to 12 feet). Geotechnical borings in the mid-bay show organic silt and silty clay layers from 10 to 50 feet thick, before transitioning to clayey sand below.

Figure 4-2: Geologic Section and Chesapeake Bay Bottom Material



4.2.5 Submerged Aquatic Vegetation (SAV)

Information regarding SAV was obtained from the Virginia Institute of Marine Science (VIMS) SAV monitoring program, which uses multispectral aerial imagery to annually assess the distribution and abundance of SAV in areas including the Chesapeake Bay. Ground surveys are conducted to provide supplementary information, including species data, though not all areas are ground surveyed. This data is then used to develop trends, identify areas of decline and abundance, and to implement strategies of preservation.

The extent of SAV present was determined through an analysis of existing and historical SAV beds documented by VIMS. The 5-year average extents of SAV were determined using a GIS overlay of the action area with the VIMS data from 2019 through 2023. The MDTA analyzed SAV density from year to year, utilizing the annual datasets from VIMS from 2000 to 2022. MDNR considers any area mapped in those 5 years to be habitat that supports SAV, even if SAV is not found there on a given date during the growing season. This analysis revealed historic patterns and trends that enhanced understanding of SAV in the action area. Historical data from 2000 to 2018 were also reviewed to identify areas that could potentially support SAV again in the future, given the right conditions.

SAV habitat exists north of the eastern terminus for the Bay Bridge, to approximately 1,200 feet north, along the Queen Anne's County shoreline. Records show that SAV has been present in this area in 4 of the last 5 years (2023, 2022, 2021, and 2019) of available data. There are no SAV records south of the eastern terminus of the bridge in Queen Anne's County or for either side of the western terminus of the bridge in Anne Arundel County. Most of the SAV beds within this area in 2023 were identified as dense SAV beds (>70 percent cover). There were no SAV beds in the Cox Creek mainstem or in the Chesapeake Bay mainstem within the action area (**Figure 4-3**).

4.2.6 Natural Oyster Bars (NOBs)

Information on the locations of NOBs was obtained through coordination with MDNR. NOBs exist from approximately 1,500 feet to 4,500 feet off the Anne Arundel County shoreline towards the main channel, extending north and south of the Chesapeake Bay Bridge. NOBs exist from approximately 4,100 feet to 6,200 feet off the Queen Anne's County shoreline towards the main channel, extending north and south of the Chesapeake Bay Bridge. Most tidal crossings along Kent Island cross NOBs, including Cox Creek. Historic oyster bottom habitat generally falls in the same areas as NOBs, with differences in specific boundaries. Cultch areas are found in concentrated areas along both the Anne Arundel and Queen Anne's County shorelines. One oyster planting area, Sandy Point South, is located within the action area, in the vicinity of the Chesapeake Bay Bridge and approximately 3,500 feet from the Anne Arundel County shoreline towards the main channel. Oyster sanctuaries are present where the review area crosses Cox Creek. Public Shellfish Fishery Areas overlap NOBs off the Anne Arundel County shoreline towards the main channel and within Kent Island Narrows and adjacent tidal connections. Approximately 124.8 acres of NOB are located within the MDTA RPA LOD and potential turbidity impact portions of the action area (**Figure 4-4**).

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Figure 4-3: Submerged Aquatic Vegetation (SAV) Map

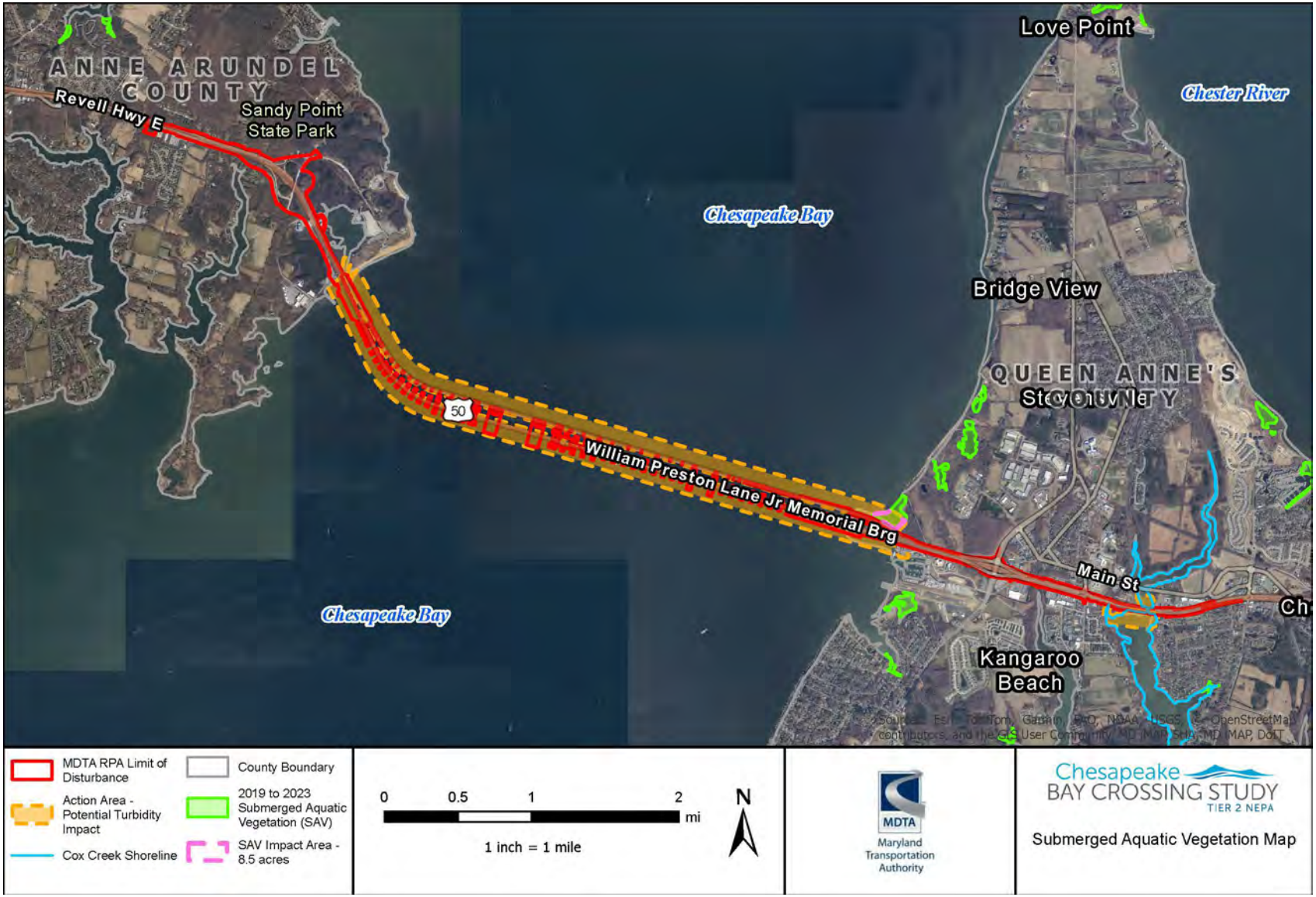
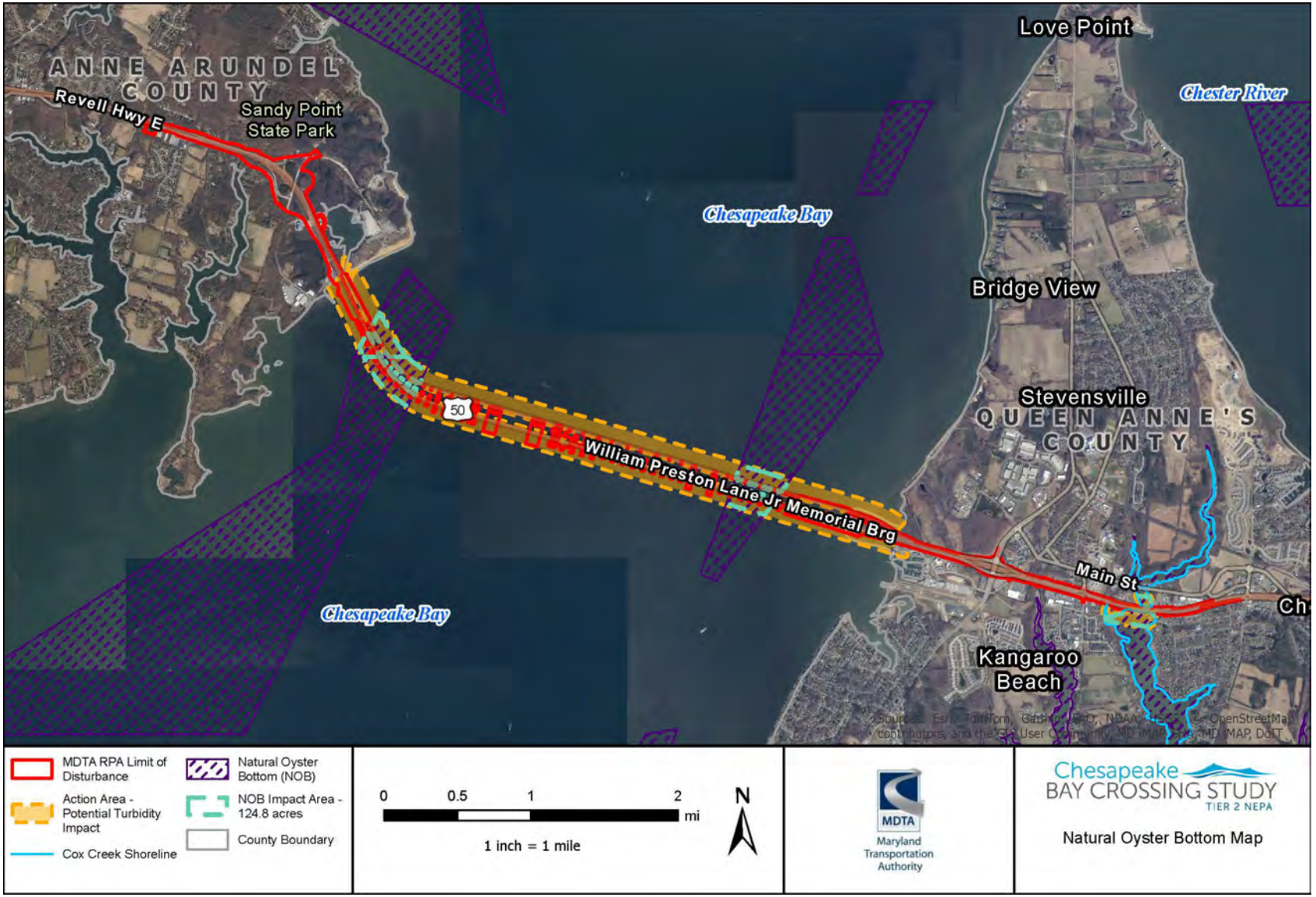


Figure 4-4: Natural Oyster Bars (NOB) Map



4.2.7 Aquatic Habitat and Biota

Within the vicinity of the action area, MDNR CBBMP tidal benthic macroinvertebrate data was available for the Chesapeake Bay. MDNR assessed benthic macroinvertebrate communities at two random sites and one fixed monitoring location, all located upriver of U.S. 50/301. Benthic macroinvertebrate community health varied from "severely degraded" to "meets restoration goals" for these sites, based on benthic index of biotic integrity (IBI) scores. Benthic macroinvertebrate data was not available for Cox Creek.

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5 EFFECTS ANALYSIS

The MDTA is currently in the early stages of preliminary engineering for the MDTA RPA. Specific construction means and methods have not been determined. Therefore, this BA will assess all potential construction means and methods that are being considered and these methods will be further defined during the final design stage. The following sections include initial assumptions based on the current design and best available information from similar bridge projects including the Francis Scott Key Bridge, Tappan Zee Bridge, and Nice-Middleton Bridge.

Currently, two cable-stayed or suspension bridge spans are being considered for the MDTA RPA. To construct the bridge spans, trestles could be used to facilitate pier placement for the new bridge and demolition of the piers from the existing bridge. Piers would have some form of pier protection whether it be an island or fender system. Pile driving, dredging, filling of tidal waters and associated aquatic resources, demolition of the existing structure (including blasting), and land-based activities have the potential to impact Atlantic sturgeon, shortnose sturgeon, and sea turtles. Specialized protection measures will be implemented during construction to avoid and minimize impacts to protected species, as discussed in Section 3.3. The MDTA is committed to building upon the work and lessons learned from other recent bridge projects, including the Nice-Middleton Bridge Project and the Francis Scott Key Bridge Project.

5.1 Pile Driving

Pile driving causes pressure waves and sound waves that impact fish. Pressure waves can kill or seriously injure fish by rupturing their swim bladders. The acoustic effects of pile driving can affect the hearing, swim bladders, and tissue of fish, and can cause behavioral impacts (e.g. changes in foraging or movements) (Popper et al. 2013; Caltrans 2020). Similar to sturgeon species, sea turtle species can be adversely affected by underwater noise; however, sea turtles have a higher threshold for behavior disturbance (NOAA Fisheries 2023b).

The distance of the sound effects would be dependent upon pile size, material, and methods of pile driving (Popper et al. 2013; Caltrans 2020). Though specific construction means and methods have not been developed, estimates of noise levels were calculated based on construction means and methods of similar projects, including Nice-Middleton Bridge and Francis Scott Key Bridge, to provide the most impactful reasonable estimates of impacts. Actual noise levels resulting from pile driving operations for the pile types and sizes assumed during this initial design are not available at this time; therefore, pile installation noise level estimates were calculated using the NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) Multi-Species Pile Driving Calculator (NOAA Fisheries 2025). Calculations were completed for multiple pile driving scenarios for bridge piers based on the current Tier 2 Study high-level assumptions, including: impact hammer installation of 36” square concrete piles; impact hammer and vibratory hammer installation of 36” steel pipe piles; 48” steel shells (for fender installation); 48” steel pipe piles; 96” steel pipe piles; and 14” steel H-piles and 19.6” sheet piles for dolphin pier protection.

Conservative estimates were used for all instances. As unattenuated sound pressure levels associated with construction of the MDTA RPA are unknown, proxy sound levels were used for the Peak, SEL_{ss}, and RMS Unattenuated Single Strike Level, as provided by the Multi-Species Pile Driving Calculator. When a proxy was not available for a specific pile type, a larger pipe proxy was included in the calculations to provide the most impactful estimate of noise impacts.

The MDTA assumes construction of the MDTA RPA would require installation of up to 16 piles per day, 2,500 strikes per pile (impact), and 30 minutes per pile (vibratory), based on the Underwater Noise Monitoring Plan for the Francis Scott Key Bridge Project. The Distance Associated with Single Strike Level/Measurement Distance (meters) and Transmission Loss Constant values were maintained at their default values, 10 and 15, respectively. Attenuation is assumed as bubble curtains would be in place. Calculations were completed with attenuation levels set at 10 dB for most pile types, a conservative estimate based on the 15-20 dB of attenuation attained with pile driving associated with the Nice-Middleton Bridge Project. Dolphin pier protection installation calculations were completed with attenuation levels set at 5 dB based on the assumption that the bubble curtain would be less protective in this scenario.

Pile driving will not be continuous for the duration of bridge construction. Pile driving for construction of the first span and its pier protection is expected to occur for approximately 120 days during year 1 through year 3 of construction. Pile driving for construction of the second span and its pier protection is expected to occur for approximately 138 days during year 7 through year 12 of construction. While pile driving will be protracted, it will not happen on a daily basis and when it occurs, it will not always occur for full days. Exact timing of pile driving has not been determined, but it could possibly take place throughout multiple seasons of the year, with breaks for TOYRs coordinated with NOAA Fisheries and MDNR to protect aquatic species, for adverse weather conditions, to set-up or break-down equipment, and to conduct other construction activities.

Assumptions for pile driving information based on similar projects in the region are presented in **Table 5-1**. Estimated sound levels and distances to sturgeon and sea turtle injury and behavioral effects are presented in **Table 5-2** and **Table 5-3**. Isopleths are shown in the mapping included in **Appendix D**; the NOAA Fisheries GARFO Multi-species Pile Driving Calculator output is included in **Appendix E**. Note that one representative pile driving isopleth is shown for each pier and representative isopleths for every pier are shown. In practice, however, a maximum of sixteen piles would be driven at any given time resulting in sixteen concurrent isopleths or zones of fish injury/behavioral modification. Based on the behavior modification impact isopleths generated from pile driving, it is clear that pile driving activities could be phased to accommodate driving up to sixteen piles at a time while still allowing for fish migration.

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Table 5-1: Proxy Levels for Underwater Noise

Type of Pile	Hammer Type	Proxy Type Used	Estimated Peak Noise Level (dB_{Peak})	Estimated Single Strike Sound Exposure Level (dB_{SELss})	Estimated Pressure Level (dB_{RMS})
36" Square Concrete	Impact	30" Square (Type II)	200	166	176
36" Steel Pipe	Impact	36" Steel Pipe	210	183	193
	Vibratory	36" Steel Pipe	N/A	N/A	175
48" Steel Pipe	Impact	48" Steel Pipe	213	179	192
48" Steel Pipe (60" Steel Pipe Proxy)*	Impact	60" Steel Pipe	210	185	195
48" Steel Pipe (72" Steel Pipe Proxy)	Vibratory	72" Steel Pipe	N/A	N/A	180
96" Steel Pipe	Impact	96" Steel Pipe	220	195	205
	Vibratory	72" Steel Pipe	N/A	N/A	180
14" H-Pile	Impact	14" Steel H-Pile	208	177	187
	Vibratory	14" Steel H-Pile	N/A	N/A	150
AZ Sheet Pile	Impact	24" AZ Sheet Pile	205	180	190
	Vibratory	AZ Steel Sheet – Loudest	N/A	N/A	165

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Table 5-2: Estimated Distances to Sturgeon Injury and Behavioral Thresholds

Type of Pile	Hammer Type	Distance (ft) to 206 dB_{Peak}	Distance (ft) to SEL_{cum} thresholds (187 dB; 183 dB)	Distance (ft) to Behavioral Disturbance Threshold (150 dB_{RMS})
36" Square Concrete	Impact	2.8	82.4; 82.4	382.5
36" Steel Pipe	Impact	13.1	1,120.3; 1,120.3	5,199.8
	Vibratory	N/A	N/A	328.1
48" Steel Pipe	Impact	20.7	606.3; 606.3	4,459.8
	Vibratory	N/A	N/A	706.8**
48" Steel Pipe (60" Steel Pipe Proxy)*	Impact	13.1	1,522.8; 1,522.8	7,068.4
	Vibratory	N/A	N/A	706.8**
96" Steel Pipe	Impact	60.6	7,068.4; 7,068.4	32,808.4
	Vibratory	N/A	N/A	706.8**
14" H-Pile	Impact	20.7	960.8; 960.8	4,459.8
	Vibratory	N/A	N/A	15.2
AZ Sheet Pile	Impact	13.1	1,522.8; 1,522.8	7,068.4
	Vibratory	N/A	N/A	152.3

**In order to create an increasing trend in noise effect between all steel pipe pile sizes, two 48" steel pipe proxies were used in order to create a range of likely impacts. The noise proxy levels for a 48" steel pipe did not produce the expected impacts for the SELcum and RMS Threshold and therefore the noise proxy for a 60" steel pipe was used instead.*

***The GARFO tool only includes vibratory proxies for 36" steel pipes and 72" steel pipes. Therefore, for every steel pipe greater than 36" in diameter, 72" steel pipe sound proxy levels were used.*

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Table 5-3: Estimated Distances to Sea Turtle Injury and Behavioral Thresholds

Type of Pile	Hammer Type	Distance (ft) to 232 dB_{Peak}	Distance (ft) to SEL_{cum} threshold (204 dB)	Distance (ft) to Behavioral Disturbance Threshold (175 dB_{RMS})
36" Square Concrete	Impact	0.1	519.5	8.2
36" Steel Pipe	Impact	0.3	7,061.8	112.0
	Vibratory	N/A	193.7	7.1
48" Steel Pipe	Impact	0.5	3,821.6	96.1
	Vibratory	N/A	417.3**	15.2**
48" Steel Pipe (60" Steel Pipe Proxy)*	Impact	0.3	9,599.5	152.3
	Vibratory	N/A	417.3**	15.2**
96" Steel Pipe	Impact	1.5	28,069.2	706.8
	Vibratory	N/A	417.3**	15.2**
14" H-Pile	Impact	0.5	6,056.9	96.1
	Vibratory	N/A	9.0	0.3
AZ Sheet Pile	Impact	0.3	9,599.5	152.3
	Vibratory	N/A	89.9	3.3

**In order to create an increasing trend in noise effect between all steel pipe pile sizes, two 48" steel pipe proxies were used in order to create a range of likely impacts. The noise proxy levels for a 48" steel pipe did not produce the expected impacts for the SELcum and RMS Threshold and therefore the noise proxy for a 60" steel pipe was used instead.*
***The GARFO tool only includes vibratory proxies for 36" steel pipes and 72" steel pipes. Therefore, for every steel pipe greater than 36" in diameter, 72" steel pipe sound proxy levels were used.*

Exposure to underwater noise levels of 206 dB peak and 187 dB SEL_{cum} (cumulative sound exposure level) can result in injury to sturgeon, and levels of 232 dB peak and 204 dB SEL_{cum} (permanent threshold shift or PTS) can result in injury to sea turtles. These noise levels refer to the maximum instantaneous sound pressure in water and the cumulative sound exposure level, respectively, expressed in decibels.

The maximum distance to the 206 dB peak for sturgeon is estimated (based on GARFO model outputs) to be 60.6 feet, and the maximum distance to the 187dB SEL_{cum} isopleth for sturgeon is estimated to be 7,068.4 feet, which would occur during impact pile driving of the 96-inch diameter steel pipe piles. To be exposed to potentially injurious levels of noise during impact pile driving

of the steel piles, a sturgeon would need to be within 60.6 feet of the pile for a single strike or remain within 7,068.4 feet of the pile being driven for a prolonged time period. The expectation is that adult and juvenile sturgeon would modify their behavior and move away from the area upon exposure to underwater noise levels of 150 dB_{RMS} (the sound pressure threshold for causing behavioral effects to sturgeon). Given that sturgeon would be exposed to levels of noise that cause behavioral modification (at 32,808.4 feet for impact pile driving with assumed attenuation of 10 dB from bubble curtains) before being exposed to injurious levels of noise (at 7,068.4 feet), sturgeon would be expected to move away from the sound source and never be exposed to potentially injurious levels of underwater noise. If any sturgeon are within 7,068.4 feet of pile driving operations, injury to sturgeon is still not expected to occur. This is because the SEL_{cum} injury threshold is cumulative (requiring prolonged exposure to the noise at that level). For fishes, the Multi-species acoustic tool indicates that there is no consistent data to support tissue/hearing recovery between pile strikes such that repeated strikes have a cumulative effect that can contribute to injury. However, the Multi-Species Acoustic Tool does assume that a 12-hour period of "effective quiet" resets the accumulated sound exposure level (SEL) such that the accumulated energy from multiple strikes would not contribute to injury. The assumption of cumulative effects during pile driving has resulted in generally larger distances to behavioral and physiological thresholds for fishes compared to the NOAA Fisheries GARFO Acoustic Tool spreadsheet previously used for evaluations of acoustic impacts. Sturgeon would be expected to leave the area in a matter of seconds once pile driving commences. The initiation of daily pile driving with a soft start technique would also give sturgeon in the area time to move out of the range of any injurious sound waves.

While it is anticipated that sturgeon will leave the area following the initiation of pile driving with a soft start, no active removal of sturgeon from the area will occur, and any sturgeon remaining within 7,068.4 feet for a prolonged period during the impact pile driving of the 96-inch diameter steel pipe piles will be at risk for injury. Additionally, it is possible that multiple pile sizes will be driven simultaneously resulting in multiple overlapping isopleths and therefore a larger overall ensonified area than would occur from a single pile being driven. As specific population data are not available at this time, estimates of the number of sturgeon expected to be exposed to injurious levels of noise cannot be determined; however, MDTA will continue to coordinate with NOAA Fisheries and will calculate estimates if specific population data are made available.

For sea turtles, the maximum distance to the 232 dB peak is expected to be 1.5 feet, and the maximum distance to the 204 dB SEL_{cum} isopleth is expected to be 28,069.2 feet, which would occur during impact pile driving of the 96-inch diameter steel pipe piles. To be exposed to potentially injurious levels of noise, sea turtles would need to be within 1.5 feet of the pile for a single strike or remain within 28,069.2 feet of the pile being driven for a prolonged time period. Exposure to the 232 dB peak is unlikely to occur because sea turtles are extremely unlikely to be within 1.5 feet of the pile when pile driving begins. Sea turtles are expected to avoid areas where noise is above 175 dB RMS behavioral threshold, which is an area estimated to extend 706.8 feet from the pile during impact pile driving of the 96-inch diameter steel pipe piles. Sea turtles would be at risk of exposure to injurious levels of noise if they are within 28,069.2 feet of pile driving for a prolonged period of time during impact pile driving of the 96-inch diameter steel pipe piles. Additionally, it is possible that multiple pile sizes will be driven simultaneously resulting in multiple overlapping isopleths and therefore a larger overall ensonified area than would occur from a single pile being driven. As specific population data are not available at this time, estimates of the number of sea turtles expected to be exposed to injurious levels of noise cannot be determined;

however, MDTA will continue to coordinate with NOAA Fisheries and will calculate estimates if specific population data are made available.

As noted above, behavioral effects, such as avoidance or disruption of foraging activities, may occur to sturgeon exposed to noise above 150 dBRMS and to sea turtles exposed to noise above 175 dB RMS. Noise levels are expected to be below 150 dBRMS at distances beyond a maximum of approximately 32,808.4 feet from the pile being installed (during impact pile driving for 96-inch steel pipe piles). Noise levels are expected to be below 175 dB RMS beyond a maximum of approximately 706.8 feet from the pile being installed (during impact pile driving for 96-inch steel pipe piles).

Mitigative measures that will be employed during pile driving include the use of bubble curtains for attenuation; using a "soft start" or "ramping up" pile driving (e.g., driving does not begin at 100% energy) to allow listed sturgeon and sea turtle species to move away from areas that may be ensonified to potentially injurious levels; restricting pile driving activity to no more than 12 consecutive hours per day, to allow for a 12-hour effective rest period; and developing an underwater noise monitoring plan to describe the underwater noise generated by project activities and adaptive management measures planned to address the underwater noise. Additional mitigative measures that could be employed during pile driving are outlined in Section 3.3.

Avoidance of the ensonified area during active pile driving represents a temporary loss of habitat; however, sturgeon and sea turtles are expected to return to the site when pile driving is not occurring (i.e., during breaks, after typical working hours, weekends). Use of soft start pile driving techniques would allow fish and sea turtles to move away from the area at the beginning of a workday and after a break, so they are not exposed to noise levels reaching the thresholds for physical injury under most pile-driving scenarios. Injury to listed species resulting from underwater pile-driving noise may still occur due to large sea turtle injury-threshold isopleths expected during the impact pile driving of the 96-inch diameter steel pipe piles, and as no active sturgeon removal will occur prior to pile-driving.

Based on the information above, the MDTA has determined that noise from pile driving is likely to adversely affect listed sturgeon and sea turtle species in the action area. Further evaluation of potential noise impacts will be conducted during final design, and the effects determination will be re-assessed as more detailed construction means and methods are made available.

The MDTA will continue to coordinate with NOAA Fisheries on mitigative measures through the design process and an Underwater Noise Monitoring Plan will be developed during final design and permitting to ensure that underwater noise thresholds are maintained during construction.

5.2 Dredging

Based on existing conditions within the Chesapeake Bay, it is expected that dredging would be necessary to create access channels to support construction and demolition activities for the MDTA RPA. Considering input from the MDTA and previous similar dredging efforts, mechanical dredging will be used and a dredging target depth of nine feet below water level is assumed. The dredging areas were established using the "Maryland bathymetry Chesapeake Bay contours" data at both shorelines of the Chesapeake Bay (Western and Eastern Shores). The northern limit of dredging is assumed to occur approximately 50 feet north of the existing westbound span piers

(to be demolished) and the southern limit is assumed to be approximately 60 feet from the southern edge of a new eastbound span.

Atlantic and shortnose sturgeon could potentially be affected by dredging activities due to their utilization of the area during seasonal breeding migrations. Their presence may be more often found in deep water habitat such as the federally maintained channels; however, they are bottom feeders and therefore found where suitable forage (e.g., benthic invertebrates such as mollusks and crustaceans) and appropriate habitat conditions (e.g., areas of SAV) are present in shallower waters. The physical disturbance of sediments and entrainment of associated benthic resources could reduce the availability of sturgeon prey species, although recolonization of the opportunistic benthic species would occur relatively quickly. Studies of anadromous fish such as striped bass indicate that adverse effects to fish typically occur at 1,000 mg/L (Burton, 1993), and effects to certain benthic communities could occur at 390 mg/L (EPA, 1986). Both Atlantic sturgeon and shortnose sturgeon are thought to be at least as tolerant of elevated turbidity as other anadromous fish.

Dredges and other mechanisms have the ability to impinge or entrain sturgeon during routine operation. Impingement/entrainment may cause injury or death in certain cases. Sturgeon are not typically susceptible to entrainment in mechanical dredges, because bucket dredges are relatively stationary, and the operation entails lowering the open bucket through the water column, closing the bucket after impact on the bottom, lifting the bucket up through the water column, and emptying the bucket into a barge at a slow pace. Additionally, mechanical dredging lacks suction, and the culmination of these factors allows fast, strong swimming sturgeon to move away from dredging activities. The risk of capture by mechanical dredges is higher in areas where large numbers of sturgeon may aggregate, such as overwintering sites or foraging areas. Additionally, overwintering sturgeon may be less responsive to stimuli and more at risk. Overwintering sturgeon in the action area include juvenile Atlantic sturgeon and adult shortnose sturgeon.

Sturgeon species may be susceptible to entrainment or impingement by dredge equipment used for construction. However, the mobility and ability of adult and sub-adult sturgeon to avoid the low intake velocities of the dredge equipment make impingement unlikely, though juvenile sturgeon may be more susceptible. Turbidity effects from dredging are not anticipated to affect sturgeon species, as the life stages most vulnerable to increased sediment are eggs and non-mobile larvae, which would not be present in the action area. Any sturgeon in the vicinity would be sufficiently mobile to avoid any sediment plume or reductions in dissolved oxygen (NOAA Fisheries, 2017).

Sea turtles are typically not susceptible to entrainment in mechanical dredging because bucket dredges are relatively stationary, and the operation entails lowering the open bucket through the water column, closing the bucket after impact on the bottom, lifting the bucket up through the water column, and emptying the bucket into a barge at a slow pace. Additionally, mechanical dredging lacks suction, and the culmination of these factors allows fast, strong-swimming sea turtles to move away from dredging activities (NOAA Fisheries, 2017).

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Sea turtle species could potentially be affected by dredging activities due to their utilization of the area (generally during the warmer months of April to November). Their presence would most likely be where suitable forage (e.g., benthic invertebrates such as mollusks and crustaceans) and appropriate habitat conditions are present (e.g., areas of SAV). The physical disturbance of sediments and entrainment of associated benthic resources could reduce the availability of sea turtle prey, but the impacted benthic habitat represents a minimal amount of the available habitat in the region, and recolonization of the opportunistic benthic species would occur quickly, making these localized impacts to sea turtle habitat and prey too small to be meaningfully measured.

Dredged areas will be in place throughout the construction duration, although the exact timing of the dredging is unknown. An estimated two thirds of the dredging will take place in the first year of construction to accommodate the eastbound bridge span. This initial dredged area will remain in place for up to 15 years. The remaining one third of dredging will take place at the start of construction of the westbound bridge span. It is anticipated that dredging during construction of the first span will take approximately 14 days and will occur during year 1 to year 2 of construction, and dredging during construction of the second span will take approximately 7 days and will occur during year 7 to year 8 of construction.

The MDTA will continue to coordinate with NOAA Fisheries regarding mitigative measures through the design process. Avoidance and minimization measures that will be employed include evaluating dredge material to determine appropriate disposal method and location and use of mechanical dredging methods. MDTA will commit to the use of an observer during mechanical dredging in case of an accidental capture. Additional avoidance and minimization measures that could be employed to address potential impacts related to dredging are outlined in Section 3.3, and include implementing TOYRs to avoid impacts during sensitive life stages.

The MDTA will prepare a Dredge Material Management Plan, which will include final dredging methods proposed, minimization measures specific to dredging operations, and detailed information regarding the transport and disposal of dredged materials. Required TOYRs for dredging will also be coordinated with the resource agencies. Conditions would include:

- Dredging will be prohibited during certain times of the year to protect shellfish, including oysters. Mechanical dredging within 500 yards of shellfish areas will be prohibited from December 16 through March 14 and from June 1 through September 30 of any year. Hydraulic dredging (which includes hopper dredging and cutterhead pipeline dredges) within 500 yards of shellfish areas will be prohibited from June 1 through September 30. (COMAR 26.24.02.06)
- Dredging within 500 yards of SAV beds will be prohibited between April 15 and October 15 of any year.

Based on the foregoing, MDTA has determined that dredging may affect but is not likely to adversely affect listed sea turtle species, and is likely to adversely affect listed sturgeon species within the action area. Further evaluation of potential dredging impacts will be conducted during final design, and the effects determination will be re-assessed as more detailed construction means and methods are made available.

5.3 Turbidity and Habitat Modification

Turbidity due to new bridge construction, existing structure demolition, and land-based activities such as clearing, culvert replacements or in-water fill is expected to occur. Fill will be placed in-water to accommodate the roadway widening along the south side of the approach to the Cox Creek bridge (approximately 0.6 acres) and the abutments supporting the extension of the widening of the existing bridge (approximately 2.9 acres). Turbidity curtains will most likely be used during construction to prevent sediment plumes and sediment movement downstream. Construction timing will be coordinated with the resource agencies with the goal implementing the TOYR for Use I and II streams.

Permanent impacts within the Chesapeake Bay are anticipated to occur in areas of permanent fill within the substrate from bridge substructure elements including piers and pier protection systems (e.g. islands, dolphins, or fender system), as well as any impacts that last longer than one year. Final design will dictate the size and type of piles or footings proposed for pier construction and impacts will be calculated based on the area of new structure/fill at or below the mudline. Estimates of the number of piers, pier size, and area of construction are preliminary but have been developed to provide a conservative estimate of potential impacts. At this preliminary stage of design, quantitative impact calculations include both permanent and temporary effects to the Chesapeake Bay as a total combined impact. Temporary impacts may include geotechnical investigations, temporary mooring piles or mooring ball anchors to stabilize the barges and vessels at the staging areas, in-river BMPs, and removal of existing bridge piers/piles. Approximately 134.8 acres of tidal water bottom impacts are expected due to construction impacts associated with the MDTA RPA. Anticipated turbidity impacts specific to pier placement, clearing, and dredging include:

- The generation of suspended solids/turbidity and the resultant degradation of surface water quality and sediment quality.
- A decreased photic zone due to increased turbidity.
- Elimination of benthic populations within the dredging zone.
- Deposition of dredge-induced suspended sediment on benthic populations downstream of the dredging zone.

While the temporary increase in suspended sediments may cause Atlantic and shortnose sturgeon to alter their normal movements, these minor movements would be too small to be meaningfully measured or detected. Turbidity is most likely to affect sturgeon if a plume causes a barrier to normal behaviors. However, it is expected that sturgeon would swim through the plume to avoid the area with no adverse effects.

Increased turbidity effects from dredging are not anticipated to affect sturgeon species, as the life stages most vulnerable to increased sediment are eggs and non-mobile larvae, which would not be present in these areas. Any sturgeon in the vicinity would be sufficiently mobile to avoid any sediment plume or reductions in dissolved oxygen. Changes in water quality parameters resulting from discharges, construction activities, and demolition may adversely affect sturgeon. Both species of sturgeon are similarly sensitive to certain water quality parameters. Dissolved oxygen levels below 4.0 mg/L have been shown to have deleterious effects on sturgeon. Likewise, temperatures above 28 degrees C have also been demonstrated to be harmful. Lowered DO, changes in temperature, addition of pollutants, and increased sedimentation may interrupt the

basic life functions of sturgeon such as their behavior, foraging ability, migration, and reproduction (NOAA Fisheries 2017)

Turbidity effects to sea turtles from bridge expansion due to in-water fill are not anticipated. One major issue associated with suspended sediments is its effect on the respiration of marine fauna. However, sea turtles breathe air and increased suspended sediments are not likely to affect turtle respiration. The most likely effect is if a sediment plume causes a barrier to normal behaviors. As sea turtles are highly mobile, they are likely to be able to avoid any sediment plumes, which typically only last for a short duration near the bottom (NOAA Fisheries 2017).

Sea turtles can be affected by impaired water quality through their inability to forage due to sedimentation of their food sources. Sedimentation can bury benthic organisms and SAV and suspended sediments reduce the availability of sunlight to SAV. Because sea turtles breathe air, direct effects of elevated turbidity levels are not likely as many pollutants are not absorbed through sensitive gill structures or during development phases as is the case for fish; however, low DO levels, high temperatures, or release of pollutants that do not adhere to water quality standards may all detrimentally affect benthic communities and small pelagic fish that serve as forage. As noted in **Section 5.2**, recolonization of the opportunistic benthic species would occur relatively quickly (NOAA Fisheries 2017).

The MDTA will continue to coordinate with NOAA Fisheries on mitigative measures through the design process. Avoidance and minimization measures that will be employed for in-water activities to address potential impacts related to turbidity and habitat modification include limiting the amount and extent of turbidity and sedimentation by using appropriate sedimentation and turbidity controls such as silt curtains, settling basins, and cofferdams; removal of cofferdams or other diversion structures only after water quality is consistent with ambient levels outside the structure; removal of contaminants and sediments from water discharge prior to entering aquatic habitats; evaluate dredge material to determine appropriate disposal method and location; manage concrete wash water and cooling water effluent from concrete saw operations to ensure they do not enter the Bay untreated; remove all obsolete and temporary structures and fills including monitoring devices in their entirety; and return aquatic habitats impacted by temporary activities, fills, or structures to pre-construction or better condition, including contours, elevations, substrate, and vegetation. Additional avoidance and minimization measures that could be employed to address potential impacts related to turbidity and habitat modification are outlined in Section 3.3.

The MDTA will approach design and development with the goal of minimizing and further mitigating potential impacts to water quality associated with the MDTA RPA. Typically, the most important and easily attainable minimization efforts during construction include successful implementation of strict ESC measures and SWM techniques, which can reduce both impacts to a waterway and its water quality. The MDTA will coordinate with the regulatory agencies regarding any required water quality monitoring program associated with the MDTA RPA. Development and implementation of a water quality monitoring plan prior to construction will provide real-time comparable data to support consistent management and attainment of water quality standards.

Based on the information above, the MDTA has determined that turbidity and habitat modification may affect but is not likely to adversely affect listed sturgeon and sea turtle species in the action

area. Further evaluation of potential turbidity and habitat modification impacts will be conducted during final design, and the effects determination will be re-assessed as more detailed construction means and methods are made available.

5.4 Increased Vessel Traffic

During construction of the MDTA RPA, an increase in vessel traffic in the Chesapeake Bay will occur (i.e., barges, support vessels, etc.). The approximate size and type of vessel, travel routes, and number of trips is currently unknown. Sturgeon may be injured or killed as a result of being struck by boat hulls or by propellers. The factors relevant to determining the risk to these species from vessel strikes vary, but may be related to the size and speed of the vessels, navigational clearance (i.e., depth of water and draft of the vessel) in the area where the vessel is operating, and the behavior of individuals in the area (e.g., foraging, migrating, overwintering, etc.). Most vessel traffic will be slow moving in the construction area, minimizing potential for collisions with sturgeon. Strikes from construction vessels are possible, but extremely unlikely since construction vessels will be within deeper waters and have shallow drafts, and sturgeon will typically be at greater depths, eliminating construction vessel strike risk (Balazik et al., 2012). In addition to vessel traffic in the immediate Tier 2 Study area, vessel traffic will also result from transportation of dredge material from the Tier 2 Study area to disposal sites. The MDTA has begun preliminary coordination to identify potential dredge disposal sites that may have space for dredge spoils. Dredge spoils associated with the MDTA RPA are anticipated to be 317,400 cubic yards. As noted in section 5.2, potential dredge disposal sites under consideration and likely to be utilized include Masonville Cove in Baltimore County, MD and Cox Creek in Anne Arundel County, MD.

Sea turtles are more susceptible to vessel strikes from construction vessels than sturgeon, since sea turtles spend more time closer to the surface; however, sea turtles are more vulnerable to being struck by faster moving vessels. Typically, dredge equipment, barges, and support vessels that will be used will move at slow speeds (i.e., on average 8 to 10 knots) and have shallow drafts. Thus, it is extremely unlikely for sea turtles to be struck by these vessels during construction.

Transport of dredge material is expected to take 14 days during construction of the first bridge span, to occur during year 1 to year 2 of construction, and seven days during construction of the second bridge span, to occur during year 7 to year 8 of construction. The exact timing of dredging, and therefore the exact timing of transport of material, is unknown. Additionally, specific timing and duration of vessel traffic beyond transport of dredge material is unknown at this time.

The MDTA will continue to coordinate with NOAA Fisheries on mitigative measures through the design process. Avoidance and minimization measures that will be employed are to avoid mooring vessels in SAV or in such a way that could shade SAV. Additional avoidance and minimization measures that could be employed to address potential impacts resulting from increased vessel traffic are outlined in Section 3.3.

Based on the information above, the MDTA has determined that vessel traffic may affect but is not likely to adversely affect listed sturgeon and sea turtle species in the action area. Further evaluation of potential vessel traffic impacts will be conducted during final design, and the effects determination will be re-assessed as more detailed construction means and methods are made available.

5.5 Blasting

With the MDTA RPA, demolition of the existing structure is assumed to occur in two phases. It is anticipated that the first new bridge span will be built, then one existing bridge span will be demolished, and the new bridge span will be in use while the second new bridge span is built. Once both new bridge spans are complete, the second span of the existing bridge will be demolished. It is anticipated that blasting will not occur concurrently with pile driving, based on the expected project phasing.

Demolition of the existing structures may include both mechanical means and blasting. At a minimum, blasting is anticipated to be used for demolition of the large anchor piers. Controlled explosive demolition (blasting) has the potential to impact fish and sea turtles. Negative pressure waves from blasting have been shown to cause swim bladders to rupture, killing fish. Fish species lacking swim bladders are more resistant to explosive pressure waves (Keevin and Hempen 1997). As sturgeon species do contain swim bladders, Atlantic and shortnose sturgeon are susceptible to impacts from blasting. Estimates of fishkills associated with blasting have been made for similar projects (Nice-Middleton Bridge, Tappan Zee Bridge); however, fishkill estimates are not able to be calculated at this time for the Tier 2 Study due to a lack of specific population data available in the vicinity of the Chesapeake Bay Bridge and limited details known regarding demolition plans for the existing structure.

Limited data is available regarding impacts of blasting on sea turtles, though some studies have demonstrated that blasting can result in mortality to sea turtles. The likelihood of nonlethal damage or delayed mortality in sea turtles resulting from blasting is unknown (Keevin and Hempen 1997). Quantification of impacts to sea turtles from blasting is not possible at this time for the Tier 2 Study due to the lack of specific population data available in the vicinity of the Chesapeake Bay Bridge and the limited details known at this time regarding the demolition plans for the existing structure.

Blasting is anticipated to include nine blast events during demolition of the first bridge span, to occur during year 6 to year 7 of construction, and seven blast events during demolition of the second bridge span, to occur during year 14 to year 15 of construction. Any required blasting will take place during times of lower biological activity, from October 1 to December 15. Adult and subadult Atlantic sturgeon, and adult and juvenile green, Kemp's ridley, leatherback and loggerhead turtles may still be present in the action area through November; juvenile Atlantic sturgeon and adult shortnose sturgeon may be present year-round. Therefore, all life stages of the listed species discussed in this BA may be impacted by blasting, including potential for injury or mortality.

For subaqueous blasting, avoidance and minimization measures that will be employed include use of scare charges and fish deterrent boats ahead of blasting activities and developing an underwater noise monitoring plan to describe the underwater noise generated by project activities and adaptive management measures planned to address underwater noise. Additional avoidance and minimization measures that could be employed to address potential impacts resulting from blasting are outlined in Section 3.3.

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Due to the limited availability of specific information regarding demolition/blasting at this time, a lack of population estimates of sturgeon and sea turtles in the vicinity of the Tier 2 Study area, and previous studies demonstrating potential for blasting to impact sturgeon and sea turtle species, MDTA has determined that the demolition of the existing structure is likely to adversely affect listed sturgeon and sea turtle species under NOAA Fisheries jurisdiction in the action area. Further evaluation of potential demolition impacts will be conducted during final design, and the effects determination will be re-assessed as more detailed construction means and methods are made available.

5.6 Cumulative Effects

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they will be subject to separate consultation pursuant to Section 7 of the ESA. Any in-water construction or coastal development projects within the action area are activities that would likely need a permit or authorization from the USACE and would therefore be subject to Section 7 consultation.

MDTA has not identified any future State or private actions that are reasonably certain to occur in the action area that do not have a Federal nexus. Through correspondence with MDE staff, MDE has noted that they are not aware of any state issued projects in the action area that are exempt from Federal authorization. Current conditions include recreational and commercial fishing activities and point and non-point source pollution through the National Pollution Discharge and Elimination System (NPDES) may affect shortnose sturgeon, Atlantic sturgeon, and sea turtle species in the action area. These activities will continue in some form into the future. MDTA does not have information on specific interactions between shortnose sturgeon, Atlantic sturgeon, or sea turtle species and state or commercial fisheries operating and point and non-point discharges in the action area.

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6 CONCLUSION AND EFFECTS DETERMINATIONS

This Biological Assessment evaluated the potential effects of the proposed Chesapeake Bay Crossing project on Atlantic sturgeon, shortnose sturgeon, loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, and leatherback sea turtle based on preliminary design and construction methods. The proposed action is Alternative C from the Tier 2 Study EIS. The project has the potential for both lethal and non-lethal take of individuals of these species in various life stages. Noise generated from pile driving has the potential to cause injury or mortality to shortnose sturgeon, Atlantic sturgeon, and sea turtle species. There is potential for interaction with dredge equipment that could result in injury or mortality to shortnose sturgeon and Atlantic sturgeon. Blasting used for demolition of the existing bridge structures also has the potential to result in injury or mortality to shortnose sturgeon, Atlantic sturgeon, and sea turtle species. Additional project-related impacts include increased vessel traffic and habitat modification, though neither increased vessel traffic nor habitat modification are expected to result in adverse effects to listed sturgeon or sea turtle species in the action area.

FHWA in coordination with MDTA has determined that the action is likely to adversely affect Atlantic sturgeon, shortnose sturgeon, loggerhead sea turtle, Kemp's ridley sea turtle, green sea turtle, and leatherback sea turtle. FHWA, in cooperation with the MDTA, will continue to coordinate with NOAA Fisheries through final design of the project to ensure implementation of appropriate avoidance, minimization, and mitigative protection measures.

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APPENDIX A: AGENCY CORRESPONDENCE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
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June 30, 2023

Valeriya Remezova
Division Administrator
Federal Highway Administration
Maryland Division
31 Hopkins Plaza, Suite 1520
Baltimore, MD 21201

RE: Chesapeake Bay Crossing Study: Tier 2 National Environmental Policy Act Study
Cooperating and Participating Agency Invitation

Dear Ms. Remezova:

Thank you for your June 1, 2022, letter inviting us to be a cooperating and participating agency on the preparation of environmental documents pursuant to the National Environmental Policy Act (NEPA) for the Chesapeake Bay Crossing Tier 2 Study (the Study). The goals of the Study include evaluating the potential alternatives and their associated impacts for a new crossing of the Chesapeake Bay in the vicinity of the U.S. 50/ U.S. 301 corridor near Annapolis, Maryland. This corridor was previously identified as an outcome of the Tier 1 Environmental Impact Statement (EIS) for this project. In accordance with the Council on Environmental Quality's NEPA Implementing Procedures (40 CFR §1501.6, Cooperating agencies), we accept your invitation to participate as a cooperating agency to help foster a collaborative process and interagency coordination on these projects.

Our role and degree of involvement is dependent on existing staff and fiscal resources, and our contribution to the process will be limited to participating in project meetings and providing written comments in response to your documents prepared as part of the NEPA process. We will provide technical information identifying aquatic species and habitats of concern, identification of issues to be considered and evaluated during the NEPA process and guidance on evaluating, avoiding, and minimizing project effects to our trust resources. At this time, we are unable to undertake any data collection, conduct analyses, or prepare any sections of the NEPA document as our staff and resources are fully committed to other obligatory programs of NOAA Fisheries.

Please note that our involvement as a cooperating agency does not constitute an endorsement of this project, nor does it obviate the need for consultations required under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Fish and Wildlife Coordination Act (FWCA), and the Endangered Species Act (ESA). As project design moves forward, should adverse impacts to essential fish habitat (EFH) or other NOAA trust resources be anticipated, consultation with us under the Section 305(b) of MSA and FWCA is required. Similarly, potential impacts to species protected under the ESA should be coordinated with our Protected

Resources Division. Please also be aware the proposed timelines for all projects posted on the Permitting Dashboard that include NOAA Fisheries milestones must be provided to us for review and approval prior to their posting.

Consultation Authorities

The estuarine waters in the Study corridor have been designated EFH for several federally managed species. The MSA requires federal agencies such as the U.S. Department of Transportation to consult with us on any action or proposed action authorized, funded, or undertaken by such agency that may adversely affect EFH identified under the MSA. This process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments and generally outlines each agency's obligations in the consultation process. Similarly, the FWCA requires that all federal agencies consult with us when proposed actions might result in modifications to a natural stream or body of water. It also required that they consider the effects that these projects would have on fish and wildlife and must also provide for improvement of these resources. Under this authority, we work to protect, conserve and enhance species and habitats for a wide range of aquatic resources such as shellfish, diadromous species, and other commercially and recreationally important species that are not managed by the federal fishery management councils and do not have designated EFH. Please see our website (https://www.fisheries.noaa.gov/new-england-mid-atlantic/habitat-conservation/essential-fish-habitat-assessment-consultations) for further information regarding your agency's obligations under the MSA and FWCA.

Endangered species under the jurisdiction of NOAA Fisheries may be present in the project area. The federal action agency is responsible for determining whether the proposed action may affect these species. If you determine that the proposed action may affect a listed species, your determination of effects along with justification and a request for concurrence should be submitted to the Section 7 Program email account at nmfs.gar.esa.section7@noaa.gov. Guidance and tools to assist you in your effects determination are available on our website at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultations-greater-atlantic-region.

Conclusion

We look forward to working with you and the Bay Crossing Study team as the Study moves forward. If you have any questions regarding this matter, please contact staff in Annapolis, MD field office. For queries related to the MSA/FWCA, contact Jonathan Watson (jonathan.watson@noaa.gov) in our Habitat and Ecosystem Services Division. For queries regarding threatened and endangered species listed by us under the ESA, contact Brian Hopper in our Protected Resources Division (brian.d.hopper@noaa.gov).

Sincerely,



Louis A. Chiarella
Assistant Regional Administrator
for Habitat and Ecosystem Services

cc: J. Mar (FHWA)
J. DaVia (USACE)
H. Lowe (MDTA)
K. Greene, J. Watson (NMFS HESD)
J. Anderson, B Hopper (NMFS PRD)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
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January 13, 2025

Valeria Remezova
Maryland Division Administrator
USDOT Federal Highway Administration
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Baltimore, Maryland 21201

RE: Docket Number FHWA–2024–0073
Scoping Comments for the Notice of Intent to Prepare an Environmental Impact Statement for the Chesapeake Bay Crossing Study: Tier 2 National Environmental Policy Act (NEPA)

Dear Ms. Pavona:

We have reviewed the March 25, 2024, *Federal Register* Notice of Intent (NOI) for the Federal Highway Administration (FHWA) to prepare an Environmental Impact Statement (EIS) for the Chesapeake Bay Crossing Tier 2 National Environmental Policy Act (NEPA) Study (Study). The goals of the Study are to evaluate the impacts associated with a new crossing of the Chesapeake Bay along the U.S. Route 50/301 corridor (Rte. 50). This corridor, which contains existing Rte. 50 and the associated Gov. William Preston Lane Jr. Memorial Bridge (Bay Bridge), was selected as the Recommended Preferred Corridor Alternative for a new crossing at the conclusion of the Chesapeake Bay Crossing Tier 1 NEPA Study. In the NOI, FHWA proposes to evaluate the impacts associated with seven Alternatives Retained for Detailed Study (ARDS), including the No Action alternative. The ARDS include several different lane configurations for east-bound (EB) and west-bound (WB) sections of Rte. 50 within the defined study corridor.

We are responding to your request for information as a cooperating agency on this project with legal jurisdiction and special expertise over NOAA trust resources and as a consulting agency under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Fish and Wildlife Coordination Act (FWCA), and the Endangered Species Act (ESA). We are also an action agency for the Study to the extent that NMFS may issue Incidental Take Authorization (ITAs) under the Marine Mammal Protection Act (MMPA) in response to a request from the applicant.

Herein, we provide information and technical assistance related to resources in the Study area and recommended analyses for the EIS. We also provide technical assistance specific to consultation and authorization requirements and their respective sufficiency needs.

General Comments

Based on the information presented in the NOI, it is our understanding that there are two anticipated construction phases for the proposed project, as the proposed ARDS only includes two separate bridge crossings to replace the existing two spans of Rte. 50 over the Chesapeake Bay. We understand that certain ARDS, including a double-decker bridge and a tunnel, were

eliminated from further consideration based on various criteria. The double-decker bridge was screened from further evaluation because it would "not provide the redundancy" and "would not be reasonable from a resiliency perspective". Neither of these criteria are specifically highlighted in the Purpose and Need section of the NOI. In addition, a single span bridge with the proposed capacities was not evaluated as part of the ARDS. Because it may present fewer environmental impacts, we recommend that the Project team evaluate the impacts associated with a single bridge span and/or a double-span with shared in-water structures (e.g., similar to Mario M. Cuomo Bridge) in the EIS to compare with the impacts of the ARDS currently proposed in the NOI. This evaluation should include both temporary (e.g., construction infrastructure, underwater noise, turbidity, temporal disturbance) and permanent impacts (e.g., fills). This information and clarification will help inform our recommendations and understanding of feasible and reasonable Project alternatives at an early stage.

There are also several indirect impacts that should be fully described in the EIS, as they are reasonably-foreseeable outcomes resulting from the replacement of the existing Bay Bridge. We note that the study corridor was altered early in the Tier 2 NEPA process and no longer includes the existing Rte. 50 crossing of the Severn River. However, the proposed ARDS include expanding lanes on Rte. 50 immediately adjacent to this crossing. It seems likely that funneling down the proposed four or five WB lanes of traffic into the existing three WB lanes of traffic on the Severn River Bridge, where traffic bottlenecks are presently known to occur, would result in the need for roadway improvements and expansions to accommodate the anticipated traffic. As a result, the Study should consider the indirect impacts associated with expanding capacity (e.g., full bridge replacement) on the Severn River Bridge, as this is a reasonably-foreseeable outcome of expanded traffic capacity in the adjacent study corridor. We also recommend that the expansion (i.e., deepening, widening) of the existing shipping channel be evaluated as an indirect impact resulting from the project. Following the collapse of the Francis Scott Key Bridge in 2024, the existing Bay Bridge is the only major height-restricting structure that remains between the Port of Baltimore and the Atlantic Ocean. We anticipate that new Bay Bridge spans will present greater clearance and therefore will allow larger commercial vessels to call on the Port of Baltimore. This coupled with the proposed expansion of port facilities in the Baltimore area make it likely that the project could induce greater environmental impacts associated with waterborne commerce. Finally, we recommend that a hydrodynamic study be completed to evaluate the indirect effects of additional in-water structures (e.g., pier islands, culverted road crossings) on the movement of water through the Study corridor. This study should be specific to crossings of major tidal waterbodies (e.g., Bay Bridge, Kent Island Narrows) and should consider a range of tidal conditions that can be reasonably anticipated through the life of the project.

Resources under NOAA Fisheries Jurisdiction and for Which it has Special Expertise

The project overlaps with significant resources under NOAA Fisheries jurisdiction, including habitats important for federally managed fish species and protected species. The Study area supports fishery resources and overlaps with important regional commercial and recreational fisheries, including but not limited to striped bass (*Morone saxatilis*) and blue crab (*Callinectes sapidus*). Here we highlight some resources of concern for consideration in the EIS.

Essential Fish Habitat
The Project area includes important habitats for a range of federally managed fish species. Habitats in the Project area include soft bottom to structured habitats (e.g., oyster reef) as well as submerged aquatic vegetation (SAV) and shellfish beds. We provided technical guidance to FHWA as part of the Natural Resources Technical Report (NRTR) methodology document to ensure that these areas are fully described in the EIS.

The study corridor overlaps with designated Habitat Areas of Particular Concern (HAPC) for summer flounder (*Paralichthys dentatus*). The designation of HAPCs highlights the importance of juvenile summer founder rearing habitats and complex habitat in this area and creates an obligation to evaluate potential adverse impact to such habitats and consider measures which would minimize that adverse effect. Areas within the study corridor are also annually colonized by submerged aquatic vegetation (SAV), primarily widgeon grass (*Ruppia maritima*) and horned pondweed *(Zannichellia palustris*). SAV is designated a HAPC for summer flounder because it has been demonstrated to be preferred feeding and resting habitat (Orth and Heck, 1980; Lascara, 1981; Rogers and Van Den Avyle, 1983; Heck and Thoman, 1984) for this recreationally and commercially valuable species. HAPCs are a subset of EFH that are either rare, particularly susceptible to human-induced degradation, especially important ecologically, or located in an environmentally stressed area. Because of this, individual, cumulative and synergistic effects are a particular concern in these habitats. The Mid-Atlantic Fishery Management Council has defined the summer flounder HAPC as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. Because SAV, especially widgeon grass, can exhibit large spatial fluctuations from year to year the widely accepted practice for defining SAV habitat is to consider areas identified by the Virginia Institute of Marine Science (VIMS) as supporting SAV based on surveys conducted in the five most recent years. Any area mapped in those five years is considered to be habitat that supports SAV, even if SAV is not found there on a given date during the growing season. Furthermore, because the VIMS SAV survey does not occur during the height of the growing season for horned pondweed, additional surveys may be warranted to fully describe the occurrence of this species within the study corridor.

The project will likely also result in permanent and/or temporary impacts to other productive aquatic habitats. This includes emergent tidal wetlands, beach strand habitat, intertidal flats, sub-tidal shallows, and oyster reef habitat. Tidal marshes and mudflats are both designated as Special Aquatic Sites under the Clean Water Act due to their unique ecological functions and sensitivity to anthropogenic impacts. The spatial configuration of these habitats and their current habitat functions should be fully described as part of this EIS to allow for impacts associated with the project to be fully disclosed. Field surveys are likely necessary to ensure accurate delineation. This should include delineation of tidal wetlands, including details regarding dominant wetland vegetation type. Furthermore, the NOI details impacts to spawning habitat for horseshoe crab (*Limulus polyphemus*) spawning habitat. The prevalence of spawning activity in these areas should be further defined through surveys during the spawning season.

Protected Species
Threatened or endangered species under our jurisdiction including Atlantic sturgeon (*Acipenser oxyrhynchus*) and shortnose sturgeon (*Acipenser brevirostrum*) may be present in the Project

area. In addition, four species of federally threatened or endangered sea turtles under our jurisdiction occur seasonally in the waters of Chesapeake Bay from late April – mid November of each year: the threatened Northwest Atlantic Ocean Distinct Population Segment (DPS) of loggerhead (*Caretta caretta*), the endangered Kemp's ridley (*Lepidochelys kempii*), and the endangered leatherback (*Dermochelys coriacea*). On April 6, 2016, NMFS published the final rule listing eleven Green sea turtle (*Chelonia mydas*) DPSs. Eight DPSs were listed as threatened and three as endangered. The DPS found in U.S. Atlantic waters, the North Atlantic DPS, is listed as threatened. Due to the inability to distinguish between these populations away from the nesting beach, we consider green sea turtles endangered wherever they occur in U.S. waters.

We have created a new App, the Section 7 Mapper, to assist Federal action agencies in identifying the ESA-listed species and critical habitat in their project action area: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater. Within the Section 7 Mapper, we have included data layers that represent our best estimate of the spatial and temporal range of listed species' life stages, behaviors, and critical habitat in our Region. It is important to note that use of this App does not replace the section 7 consultation process. We are providing the Section 7 Mapper as a technical assistance tool and expect action agencies will use it as a first step in determining if a proposed federal action overlaps with listed species or critical habitat. In addition, NOAA's Chesapeake Bay Office operates and maintains the Chesapeake Bay Interpretive Buoy System (CBIBS) - a network of observing platforms (buoys) that collect meteorological, oceanographic, and water-quality data and relay that information in near real time. There is an active buoy at the mouth of the Severn River, approximately 3.5 miles south west of the Bay Bridge. The latest data from this buoy and key points up and down the Bay is available at a website (https://www.buoybay.noaa.gov/locations/annapolis) or via apps available for Android and iPhone/iPad. Data available at this site and on the mobile apps are "raw" and have not been scrubbed for any anomalies. The buoys also collect data from fish that have been collected and implanted with telemetry tags, including Atlantic sturgeon. This data is not publicly available, but can be accessed by contacting NOAA's Chesapeake Bay Office.

As the lead federal action agency, you are responsible for determining the nature and extent of effects and for coordinating with our Protected Resources Division as appropriate. Our website (https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-consultations-greater-atlantic-region) has guidance and tools to assist action agencies with their description of the action and analysis of effects to support their determination. Should you have any questions about the section 7 consultation process, please contact Brian Hopper at (301) 758-3074 or brian.d.hopper@noaa.gov.

Finally, species protected under the Marine Mammal Protection Act (MMPA) such as common bottlenose dolphin (*Tursiops truncatus*) have been identified in the Project areas. Our website (https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-policies-guidance-and-regulations) has guidance and tools to assist action agencies with this consultation process. Please coordinate with Benjamin Laws (Benjamin.Laws@noaa.gov) at our Headquarters office as necessary to ensure adequate protection for these species.

Avoidance, Minimization, Mitigation and Monitoring Measures

In addition to alternatives, the EIS must evaluate mitigation measures to avoid and minimize adverse impacts to NOAA trust resources. As described in the NOAA Mitigation Policy for Trust Resources (NAO 216-123, Section 3.06) impact avoidance and minimization must be considered and fully and fairly evaluated through the alternative development process before compensatory mitigation is considered; this is known as the mitigation sequence. The mitigation sequence clearly dictates that compensating for unavoidable adverse impacts should be viewed as mitigation of last resort. As described in the NOAA Mitigation Policy, the level and type of uncertainty associated with compensatory mitigation may warrant increased amounts of compensation to assure that impacts are sufficiently offset.

Further, the EIS must clearly identify which mitigation measures are included as part of the proposed action and thus evaluated in the analysis, and the likelihood of selection and implementation of additional proposed measures (e.g., measures are proposed as required; measures are optional and could be implemented by the Project team at their discretion). The document should provide information on how mitigation measures are considered in the context of the effects level (negligible, minor, moderate, major), how mitigation would offset those levels, and the effectiveness of any proposed mitigation.

Conclusion

Thank you for considering our comments during this important scoping process. We will continue to support FHWA's efforts to advance this study through our participation in the regulatory and planning processes. We look forward to continuing to work with you as this study continues.

Should you have any questions regarding these comments and/or the EFH consultation, please contact Jonathan Watson in our Habitat and Ecosystem Services Division at (978) 675-2180 or jonathan.watson@noaa.gov. For questions regarding ESA and Section 7 comments, please contact Brian Hopper in our Protected Resources Division at (301) 758-3074 or Brian.d.Hopper@noaa.gov. For questions regarding MMPA Incidental Take Authorizations, please contact Ben Laws in the Office of Protected Resources at (301) 427-8425 or Benjamin.Laws@noaa.gov.

Sincerely,

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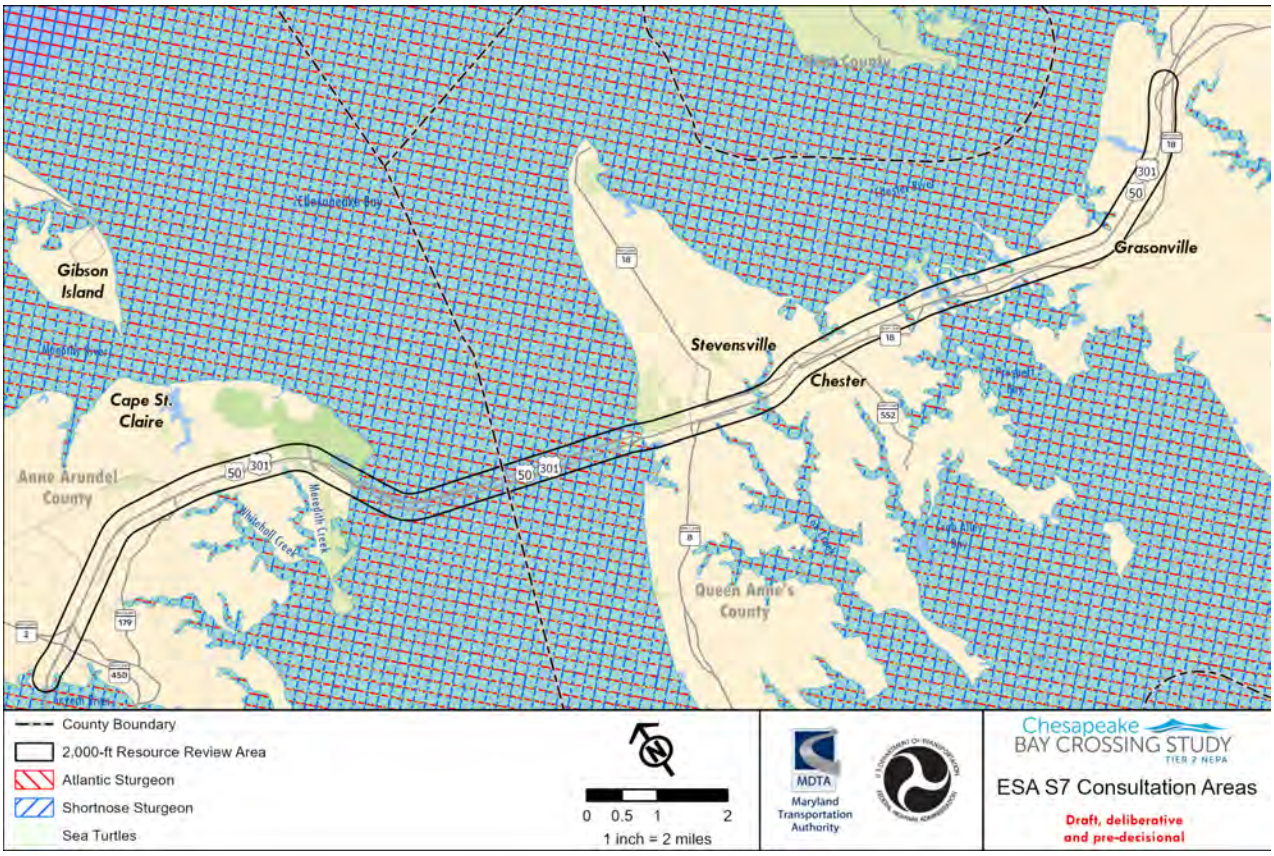
Rogers, S.G. M.J. Van Den Avyle. 1983. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (South Atlantic) – summer flounder. US. Fish and Wildlife Service. FWS/OBS-82/11.15 U.S. Army Corps of Engineers, TR EL-82-4. 14p.

Drawn Action Area & Overlapping S7 Consultation Areas

Area of Interest (AOI) Information

Area : 1,284.82 acres

Feb 5 2025 12:44:02 Eastern Standard Time



Summary

Name	Count	Area(acres)	Length(mi)
BCS 2,000 ft Corridor	1	1,118.33	N/A
Atlantic Sturgeon	3	3,492.69	N/A
Shortnose Sturgeon	2	2,328.46	N/A
Atlantic Salmon	0	0	N/A
Sea Turtles	4	4,656.93	N/A
Atlantic Large Whales	0	0	N/A
In or Near Critical Habitat	0	0	N/A

BCS 2,000 ft Resource Review Area

#	FID	Shape_Leng	BUFF_DIST	ORIG_FID	Shape_Le_1	Shape_Area	Area(acres)
1	0	105638.774992	1000	0	217554.745333	214414913.751	1,118.33

Atlantic Sturgeon

#	Feature ID	Species	Lifestage	Behavior	Zone
1	ANS_CHB_SUB_MAF	Atlantic sturgeon	Subadult	Migrating & Foraging	Chesapeake Bay
2	ANS_CHB_JUV_MAF	Atlantic sturgeon	Juvenile	Migrating & Foraging	Chesapeake Bay
3	ANS_CHB_ADU_MAF	Atlantic sturgeon	Adult	Migrating & Foraging	Chesapeake Bay

#	From	Until	From (2)	Until (2)	Area(acres)
1	03/15	11/30	N/A	N/A	1,164.23
2	01/01	12/31	N/A	N/A	1,164.23
3	03/15	11/30	N/A	N/A	1,164.23

Shortnose Sturgeon

#	Feature ID	Species	Life Stage	Behavior	Zone
1	SNS_CHB_ADU_WIN	Shortnose sturgeon	Adult	Overwintering	Chesapeake Bay
2	SNS_CHB_ADU_MAF	Shortnose sturgeon	Adult	Migrating & Foraging	Chesapeake Bay

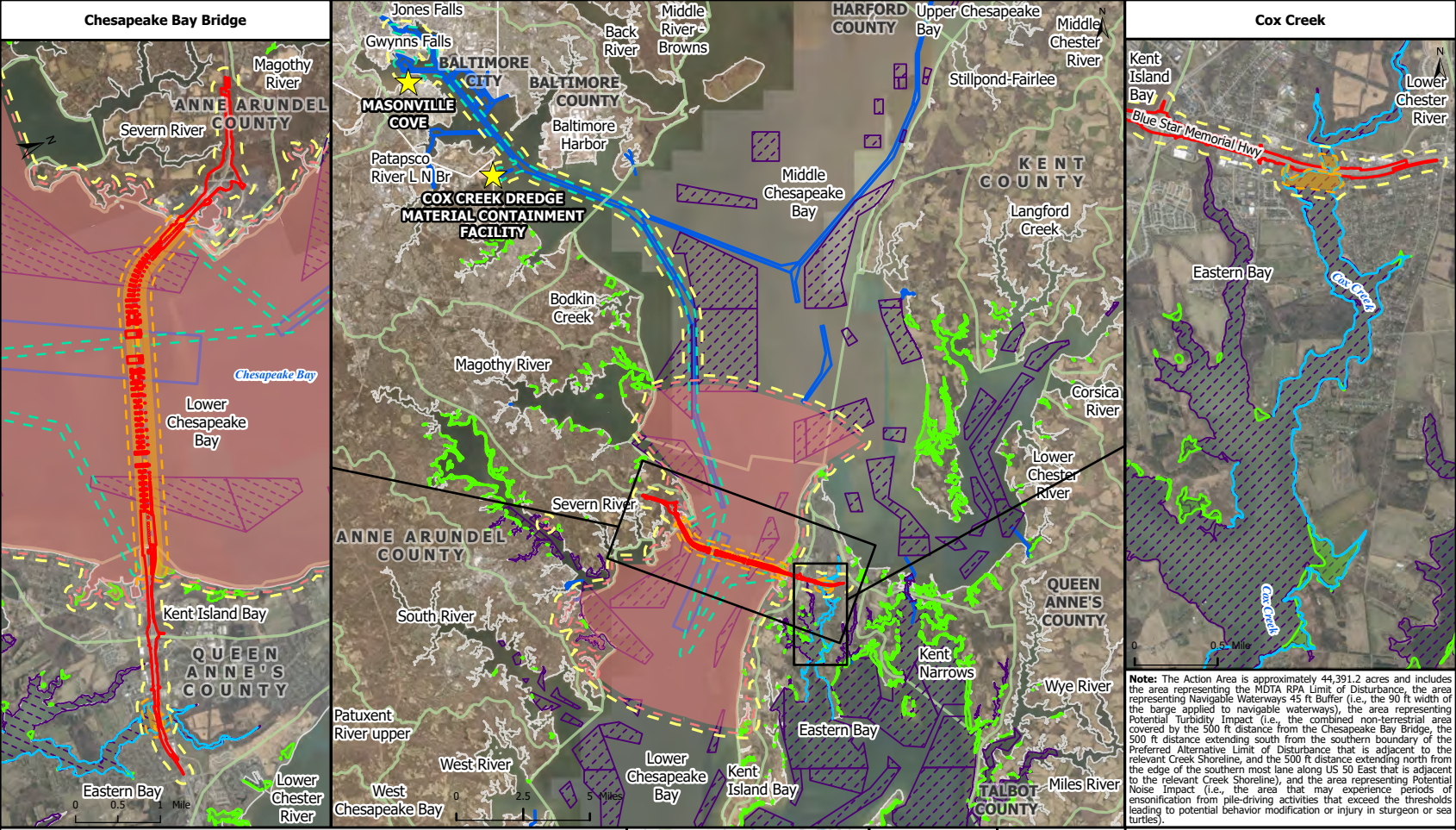
#	From	Until	From (2)	Until (2)	Area(acres)
1	11/01	02/28	N/A	N/A	1,164.23
2	01/01	12/31	N/A	N/A	1,164.23

Sea Turtles

#	Feature ID	Species	Life Stage	Behavior	Zone
1	GRN_STS_AJV_MAF	Green sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia
2	KMP_STS_AJV_MAF	Kemp's ridley sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia
3	LTR_STS_AJV_MAF	Leatherback sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia
4	LOG_STS_AJV_MAF	Loggerhead sea turtle	Adults and juveniles	Migrating & Foraging	Massachusetts (S of Cape Cod) through Virginia

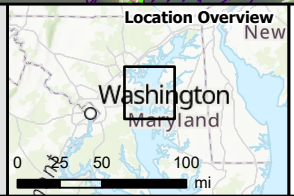
#	From	Until	From (2)	Until (2)	Area(acres)
1	5/1	11/30	*No Data*	*No Data*	1,164.23
2	5/1	11/30	*No Data*	*No Data*	1,164.23
3	5/1	11/30	*No Data*	*No Data*	1,164.23
4	5/1	11/30	*No Data*	*No Data*	1,164.23

APPENDIX B: ACTION AREA MAP



Note: The Action Area is approximately 44,391.2 acres and includes the area representing the MDTA RPA Limit of Disturbance, the area representing Navigable Waterways 45 ft Buffer (i.e., the 90 ft width of the barge applied to navigable waterways), the area representing Potential Turbidity Impact (i.e., the combined non-terrestrial area covered by the 500 ft distance from the Chesapeake Bay Bridge, the 500 ft distance extending south from the southern boundary of the Preferred Alternative Limit of Disturbance that is adjacent to the relevant Creek Shoreline, and the 500 ft distance extending north from the edge of the southern most lane along US 50 East that is adjacent to the relevant Creek Shoreline), and the area representing Potential Noise Impact (i.e., the area that may experience periods of ensonification from pile-driving activities that exceed the thresholds leading to potential behavior modification or injury in sturgeon or sea turtles).

- Potential Dredge Disposal Site
- MDTA RPA Limit of Disturbance
- SAV (2023)
- Natural Oyster Bottom (NOB)
- Action Area
- Action Area - Navigable Waterways 45 ft Buffer
- Action Area - Potential Turbidity Impact
- Action Area - Potential Noise Impact
- Cox Creek Shoreline
- National Channel Framework
- MDE 8-Digit Watershed
- County Boundary



Credits: MD iMAP, DNR, MD iMAP, SHA, MD iMAP, DoIT, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, USGS

MDTA Maryland Transportation Authority

Chesapeake BAY CROSSING STUDY TIER 2 NEPA

Action Area Map

APPENDIX C: TELEMETRY DATA

Telemetry Data

Received from NOAA Fisheries 10/1/2025

We would like to acknowledge the contributions of the Atlantic Cooperative Telemetry Network and the following collaborations for providing fish tagging data: Robert Aguilar (Smithsonian Environmental Research Center), Matthew Balazik (Virginia Commonwealth University), Robert Bourdon and Sheila Eyler (U.S. Fish and Wildlife Service), Wilmelie Cruz Marrero (NOAA Chesapeake Bay Office), Benjamin Gahagan (Massachusetts Division of Marine Fisheries / University of Massachusetts), Craig King (Maine Department of Marine Resources), Patrick McGrath (Virginia Institute of Marine Science), Mike O'Brien and David Secor (University of Maryland Center for Environmental Science), Matthew Ogburn (Smithsonian Environmental Research Center), Ian Park (Delaware Department of Natural Resources), Ethan Simpson (Virginia Marine Resources Commission), Chuck Stence (Maryland Department of Natural Resources), and Bethany Williams (NOAA NCCOS).

From:	Jonathan Watson - NOAA Federal
To:	Jeff Gring
Cc:	Sarah Williamson; Wilmelie Cruz - NOAA Federal
Subject:	Figures for Inclusion in BCST2: Telemetry Data for Bay Bridge Array
Date:	Wednesday, October 1, 2025 9:16:42 AM

Hi Jeff,

Please find attached two figures that we would like to see included in the draft EIS for the Bay Crossing Study. We'd recommend that the following description accompany these figures:

Data collected from passive acoustic telemetry at the Chesapeake Bay Bridge North array (2021-2024) offers valuable insights into fish activity in the area, which may be impacted by bridge construction/demolition activities. This data, provided by 12 collaborating researchers, includes detections of 118 tagged individuals across 10 different species originating from the Chesapeake Bay, Delaware Bay, Maine, Massachusetts, and Virginia. The most commonly detected species near the bridge were striped bass, American eel, gizzard shad, cownose ray, and Atlantic sturgeon. Striped bass exhibited consistent detections throughout the year, indicating their year-round presence in the area (see Figures 1-2). In contrast, American eel detections were primarily concentrated at night, with significant seasonal activity in the spring and late fall to early winter. Atlantic sturgeon and cownose ray were detected mainly during the warmer months, while gizzard shad and white perch appeared less frequently. Daily detection patterns showed that striped bass and American eel were more prevalent during cooler periods, whereas migratory species like sturgeon and cownose ray were more commonly observed in the spring and summer. These findings emphasize that several ecologically and economically significant species, including the federally protected Atlantic sturgeon, actively use habitats near the bridge and may be sensitive to noise, habitat changes, or other impacts from construction activities.

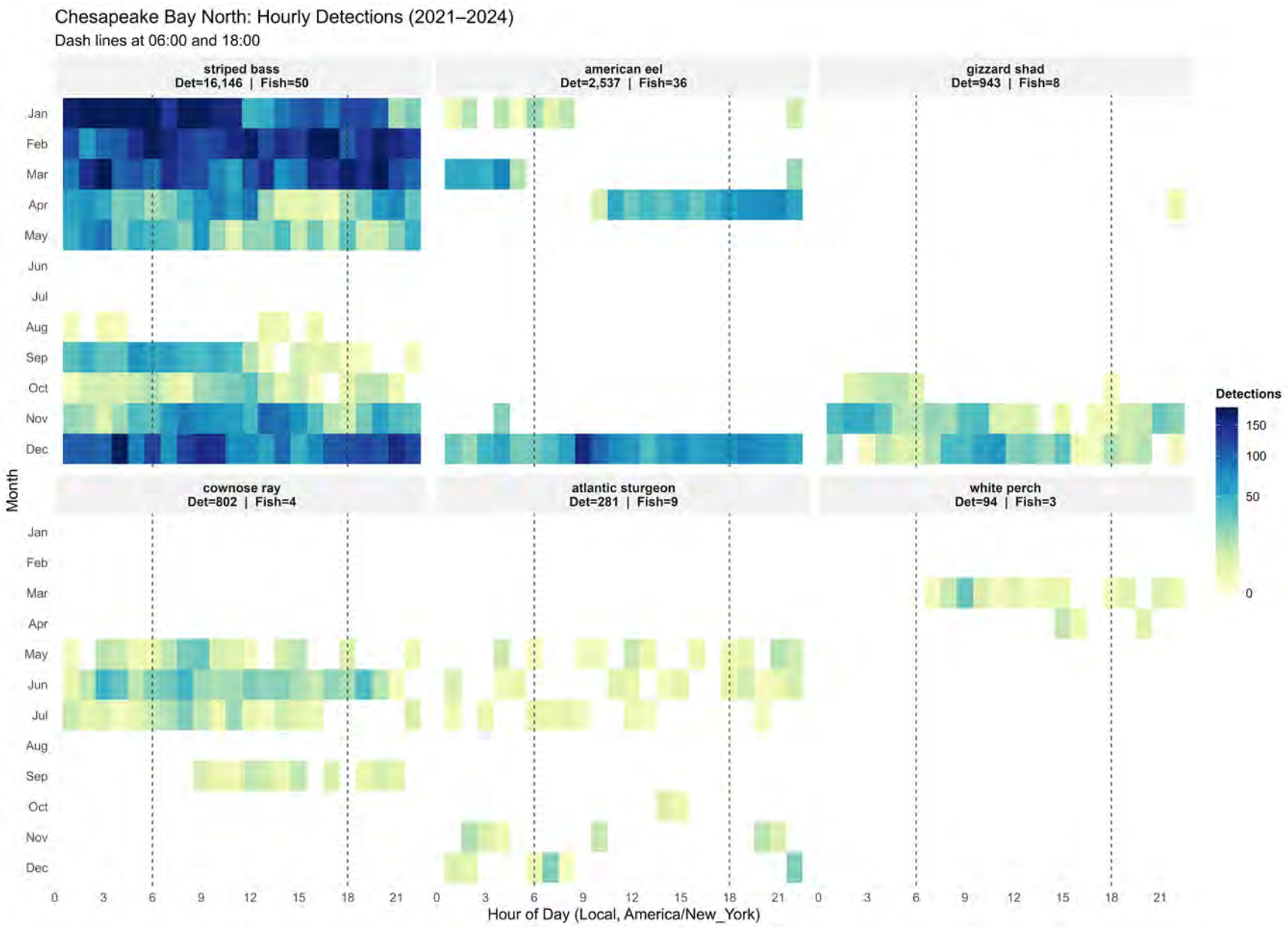
We would like to acknowledge the contributions of the Atlantic Cooperative Telemetry Network and the following collaborations for providing fish tagging data: Robert Aguilar (Smithsonian Environmental Research Center), Matthew Balazik (Virginia Commonwealth University), Robert Bourdon and Sheila Eyler (U.S. Fish and Wildlife Service), Wilmelie Cruz Marrero (NOAA Chesapeake Bay Office), Benjamin Gahagan (Massachusetts Division of Marine Fisheries / University of Massachusetts), Craig King (Maine Department of Marine Resources), Patrick McGrath (Virginia Institute of Marine Science), Mike O'Brien and David Secor (University of Maryland Center for Environmental Science), Matthew Ogburn (Smithsonian Environmental Research Center), Ian Park (Delaware Department of Natural Resources), Ethan Simpson (Virginia Marine Resources Commission), Chuck Stence (Maryland Department of Natural Resources), and Bethany Williams (NOAA NCCOS).

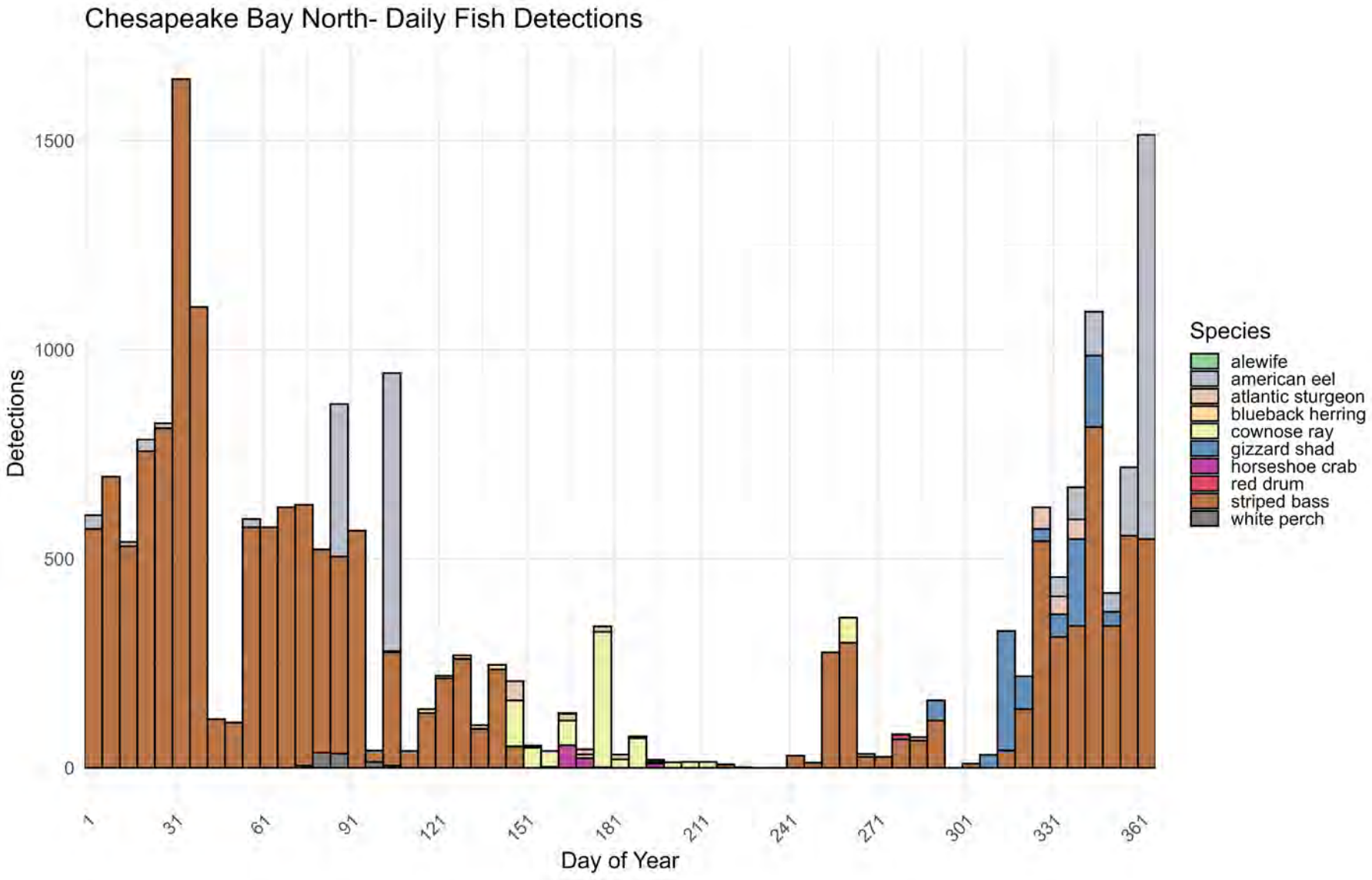
Thanks to both you and Wilmelie for leveraging these very informative data for the NEPA study. Should you have any questions regarding these figures or the accompanying text, please be advised that we will not be able to provide a response until congress appropriates funding.

Jonathan

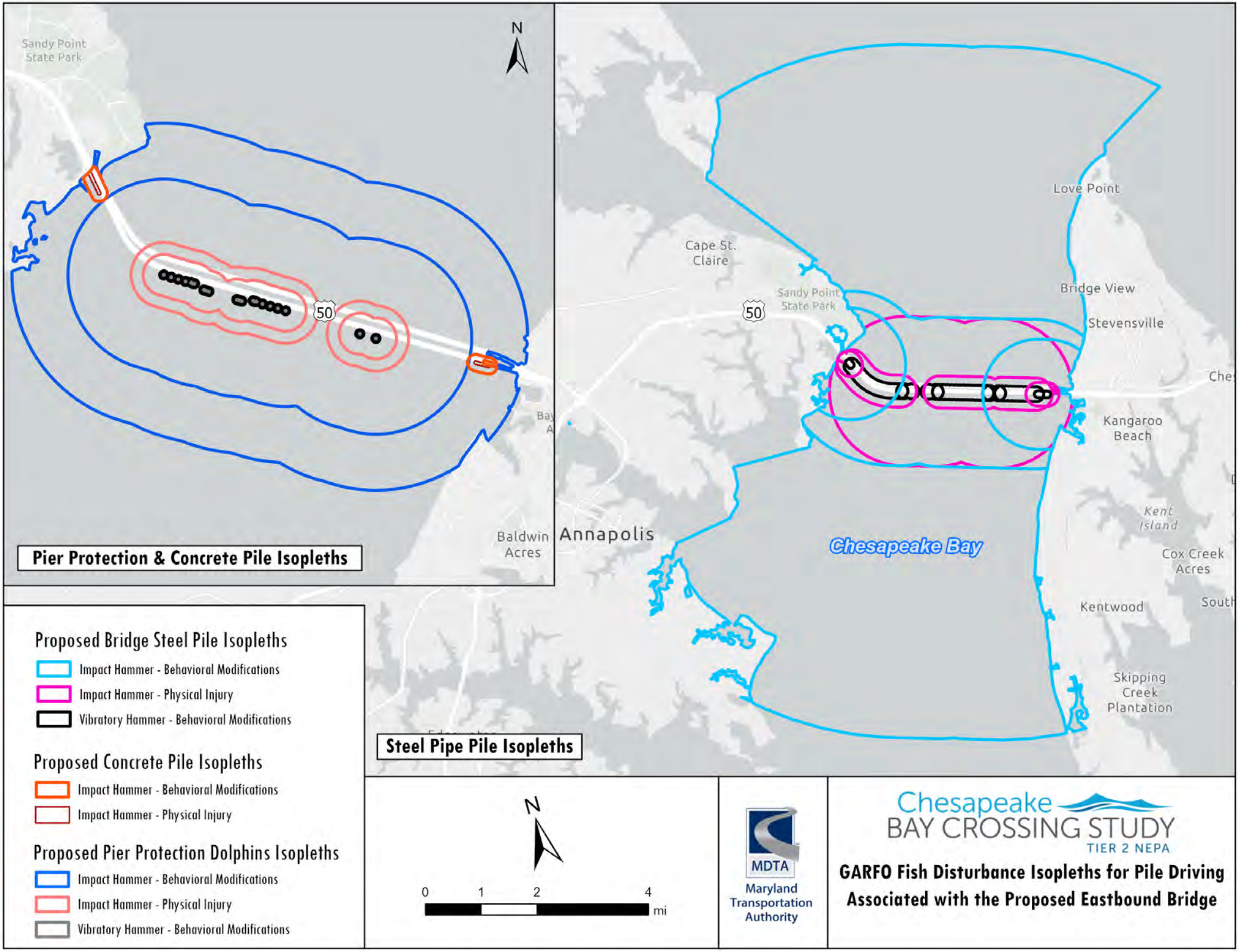
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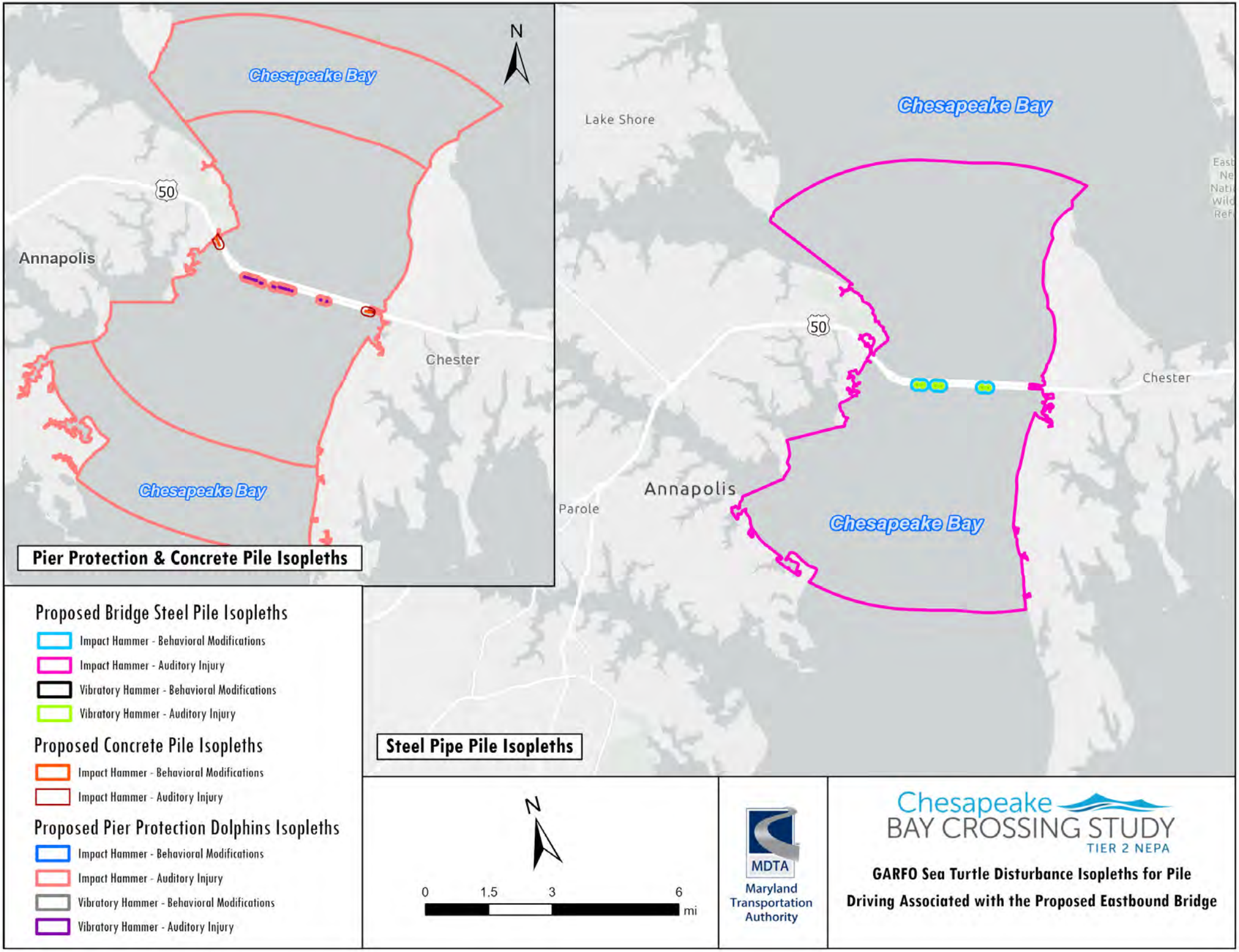
Jonathan Watson
Marine Habitat Resource Specialist, GARFO HESD
NOAA Fisheries | U.S. Department of Commerce
Office: (978) 675-2180
www.fisheries.noaa.gov


Chesapeake Bay North: Hourly Detections (2021–2024)
Dash lines at 06:00 and 18:00
striped bass
Det=16,146 | Fish=50
american eel
Det=2,537 | Fish=36
gizzard shad
Det=943 | Fish=8
cownose ray
Det=802 | Fish=4
atlantic sturgeon
Det=281 | Fish=9
white perch
Det=94 | Fish=3
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0 3 6 9 12 15 18 21
Hour of Day (Local, America/New_York)
Detections
150
100
50
0


Chesapeake Bay North- Daily Fish Detections
Detections
1500
1000
500
0
1
31
61
91
121
151
181
211
241
271
301
331
361
Day of Year
Species
alewife
american eel
atlantic sturgeon
blueback herring
cownose ray
gizzard shad
horseshoe crab
red drum
striped bass
white perch

APPENDIX D: PILE DRIVING NOISE ISOPLETH MAPS


Sandy Point State Park
N
50
Pier Protection & Concrete Pile Isopleths
Baldwin Acres
Annapolis
Cape St. Claire
Sandy Point State Park
Love Point
Bridge View
Stevensville
Kangaroo Beach
Kent Island
Chesapeake Bay
Cox Creek Acres
Kentwood
Skipping Creek Plantation
Steel Pipe Pile Isopleths
Proposed Bridge Steel Pile Isopleths
Impact Hammer - Behavioral Modifications
Impact Hammer - Physical Injury
Vibratory Hammer - Behavioral Modifications
Proposed Concrete Pile Isopleths
Impact Hammer - Behavioral Modifications
Impact Hammer - Physical Injury
Proposed Pier Protection Dolphins Isopleths
Impact Hammer - Behavioral Modifications
Impact Hammer - Physical Injury
Vibratory Hammer - Behavioral Modifications
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MDTA
Maryland Transportation Authority
Chesapeake BAY CROSSING STUDY
TIER 2 NEPA
GARFO Fish Disturbance Isopleths for Pile Driving Associated with the Proposed Eastbound Bridge


N
Chesapeake Bay
50
Annapolis
Chester
Chesapeake Bay
Pier Protection & Concrete Pile Isopleths
Lake Shore
Chesapeake Bay
50
Chester
Annapolis
Parole
Chesapeake Bay
Steel Pipe Pile Isopleths
Proposed Bridge Steel Pile Isopleths
Impact Hammer - Behavioral Modifications
Impact Hammer - Auditory Injury
Vibratory Hammer - Behavioral Modifications
Vibratory Hammer - Auditory Injury
Proposed Concrete Pile Isopleths
Impact Hammer - Behavioral Modifications
Impact Hammer - Auditory Injury
Proposed Pier Protection Dolphins Isopleths
Impact Hammer - Behavioral Modifications
Impact Hammer - Auditory Injury
Vibratory Hammer - Behavioral Modifications
Vibratory Hammer - Auditory Injury
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MDTA
Maryland Transportation Authority
Chesapeake BAY CROSSING STUDY
TIER 2 NEPA
GARFO Sea Turtle Disturbance Isopleths for Pile Driving Associated with the Proposed Eastbound Bridge

APPENDIX E: NOAA FISHERIES GARFO MULTI-SPECIES PILE DRIVING CALCULATOR OUTPUT

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	190	156	166
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	202		

OTHER INFO 0

NOTES 36" Square Concrete Pile - Using Proxy of 30" Square Concrete Pile Tyle II

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	0.9	25.1	25.1	116.6
Isopleth (feet)	2.8	82.4	82.4	382.5

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.0	158.3	2.5
Isopleth (feet)	0.1	519.5	8.2

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.1	0.0	1.6	0.1	0.0
AUD INJ ONSET (Peak isopleth, feet)	0.2	0.1	5.2	0.2	0.1
AUD INJ ONSET (SEL_{cum} isopleth, meters)	184.4	23.5	285.4	163.9	61.1
AUD INJ ONSET (SEL_{cum} isopleth, feet)	605.1	77.2	936.4	537.6	200.4
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	25.1	NO LF CET.			
Behavior (RMS isopleth, feet)	82.4				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	200	173	183
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	219		

OTHER INFO 0

NOTES 36" Steel Pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	4.0	341.5	341.5	1,584.9
Isopleth (feet)	13.1	1,120.3	1,120.3	5,199.8

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.1	2152.4	34.1
Isopleth (feet)	0.3	7,061.8	112.0

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.3	0.1	7.4	0.3	0.1
AUD INJ ONSET (Peak isopleth, feet)	1.1	0.3	24.1	1.0	0.3
AUD INJ ONSET (SEL_{cum} isopleth, meters)	2,507.2	319.9	3,880.0	2,227.3	830.3
AUD INJ ONSET (SEL_{cum} isopleth, feet)	8,225.9	1,049.5	12,729.6	7,307.6	2,723.9
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	341.5	NO LF CET.			
Behavior (RMS isopleth, feet)	1,120.3				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	165
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	210

OTHER INFO 0

NOTES 36" Steel pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	100.0
ISOPLETHS (feet)	328.1

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	59.0	2.2
ISOPLETHS (feet)	193.7	7.1

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	68.2	26.2	55.7	87.7	29.5
AUD INJ ONSET (SELcum isopleth, feet)	223.6	85.9	182.7	287.9	96.9
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	10,000.0	NO LF CET.			
Behavior (RMS isopleth, feet)	32,808.4				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	203	169	182
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	215		

OTHER INFO 0

NOTES 48" Steel Pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	6.3	184.8	184.8	1,359.4
Isopleth (feet)	20.7	606.2	606.2	4,459.8

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.2	1164.8	29.3
Isopleth (feet)	0.5	3,821.6	96.1

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.5	0.2	11.7	0.5	0.2
AUD INJ ONSET (Peak isopleth, feet)	1.8	0.5	38.3	1.5	0.5
AUD INJ ONSET (SEL_{cum} isopleth, meters)	1,356.8	173.1	2,099.7	1,205.4	449.3
AUD INJ ONSET (SEL_{cum} isopleth, feet)	4,451.6	568.0	6,888.8	3,954.6	1,474.1
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	292.9	NO LF CET.			
Behavior (RMS isopleth, feet)	960.8				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	200	175	185
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	221		

OTHER INFO 0

NOTES 48" Steel Pipe - Using proxy for 60" steel pipe to assume higher SELss and RMS values

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	4.0	464.2	464.2	2,154.4
Isopleth (feet)	13.1	1,522.8	1,522.8	7,068.4

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.1	2925.9	46.4
Isopleth (feet)	0.3	9,599.5	152.3

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.3	0.1	7.4	0.3	0.1
AUD INJ ONSET (Peak isopleth, feet)	1.1	0.3	24.1	1.0	0.3
AUD INJ ONSET (SEL_{cum} isopleth, meters)	3,408.2	434.9	5,274.3	3,027.8	1,128.6
AUD INJ ONSET (SEL_{cum} isopleth, feet)	11,181.9	1,426.7	17,304.0	9,933.6	3,702.8
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	464.2	NO LF CET.			
Behavior (RMS isopleth, feet)	1,522.8				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	170
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	215

OTHER INFO 0

NOTES 48" Steel Pipe - Using 72" Steel Pipe Proxy

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	215.4
ISOPLETHS (feet)	706.8

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	127.2	4.6
ISOPLETHS (feet)	417.3	15.2

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	146.9	56.4	120.0	189.0	63.6
AUD INJ ONSET (SELcum isopleth, feet)	481.8	185.1	393.6	620.2	208.8
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	21,544.3	NO LF CET.			
Behavior (RMS isopleth, feet)	70,683.6				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	210	185	195
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	8		
Number of strikes per pile	2500		
Number of strikes per day	20000		
Cumulative SEL at measured distance	228		

OTHER INFO 0

NOTES 96" Steel Pipe

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth	
		Fish ≥ 2 g	Fish < 2 g		
ISOPLETHS (meters)	18.5	2,154.4	2,154.4	10,000.0	Fishes present
Isopleth (feet)	60.6	7,068.4	7,068.4	32,808.4	

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth	
ISOPLETHS (meters)	0.5	8555.5	215.4	Sea Turtles present
Isopleth (feet)	1.5	28,069.2	706.8	

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	1.6	0.5	34.1	1.4	0.5
AUD INJ ONSET (Peak isopleth, feet)	5.2	1.5	112.0	4.5	1.5
AUD INJ ONSET (SEL_{cum} isopleth, meters)	9,965.8	1,271.5	15,422.0	8,853.2	3,300.1
AUD INJ ONSET (SEL_{cum} isopleth, feet)	32,696.1	4,171.6	50,597.2	29,045.9	10,827.1
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	2,154.4	NO LF CET.			
Behavior (RMS isopleth, feet)	7,068.4				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	170
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	8
Duration to drive pile (minutes)	30
Duration of sound production in day	14400
Cumulative SEL at measured distance	212

OTHER INFO 0

NOTES 96" Steel Pipe - Using 72" Steel Pipe proxy

Attenuation 10

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	215.4
ISOPLETHS (feet)	706.8

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	80.1	4.6
ISOPLETHS (feet)	262.9	15.2

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	92.5	35.5	75.6	119.1	40.1
AUD INJ ONSET (SELcum isopleth, feet)	303.5	116.6	247.9	390.7	131.5
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	21,544.3	NO LF CET.			
Behavior (RMS isopleth, feet)	70,683.6				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	203	172	182
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	218		

OTHER INFO 0

NOTES 14" Steel H-pile

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth	
		Fish ≥ 2 g	Fish < 2 g		
ISOPLETHS (meters)	6.3	292.9	292.9	1,359.4	Fishes present
Isopleth (feet)	20.7	960.8	960.8	4,459.8	

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR	
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth	
ISOPLETHS (meters)	0.2	1846.1	29.3	Sea Turtles present
Isopleth (feet)	0.5	6,056.9	96.1	

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.5	0.2	11.7	0.5	0.2
AUD INJ ONSET (Peak isopleth, feet)	1.8	0.5	38.3	1.5	0.5
AUD INJ ONSET (SEL_{cum} isopleth, meters)	2,150.5	274.4	3,327.8	1,910.4	712.1
AUD INJ ONSET (SEL_{cum} isopleth, feet)	7,055.3	900.2	10,918.1	6,267.7	2,336.3
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	292.9	NO LF CET.			
Behavior (RMS isopleth, feet)	960.8				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	145
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	190

OTHER INFO 0

NOTES 14" Steel H-pile

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	4.6
ISOPLETHS (feet)	15.2

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	2.7	0.1
ISOPLETHS (feet)	9.0	0.3

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	3.2	1.2	2.6	4.1	1.4
AUD INJ ONSET (SELcum isopleth, feet)	10.4	4.0	8.5	13.4	4.5
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	464.2	NO LF CET.			
Behavior (RMS isopleth, feet)	1,522.8				

IMPACT PILE DRIVING REPORT

VERSION 2.1-Multi-Species: 2025

Chesapeake Bay Crossing Study - Tier 2 NEPA

PRINT IN LANDSCAPE TO CAPTURE ENTIRE SCREEN

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

PROJECT INFORMATION	PEAK	SELss	RMS
Single strike level (dB)	200	175	185
Distance associated with single strike level (meters)	10	10	10
Transmission loss constant	15		
Number of piles per day	16		
Number of strikes per pile	2500		
Number of strikes per day	40000		
Cumulative SEL at measured distance	221		

OTHER INFO 0

NOTES 24" AZ Sheet Pile

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	ONSET OF PHYSICAL INJURY			BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth		RMS Isopleth
		Fish ≥ 2 g	Fish < 2 g	
ISOPLETHS (meters)	4.0	464.2	464.2	2,154.4
Isopleth (feet)	13.1	1,522.8	1,522.8	7,068.4

Fishes present

SEA TURTLES

	AUD INJ ONSET		BEHAVIOR
	Peak Isopleth	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	0.1	2925.9	46.4
Isopleth (feet)	0.3	9,599.5	152.3

Sea Turtles present

MARINE MAMMALS

	LF Cetacean	HF Cetaceans	VHF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (Peak isopleth, meters)	0.3	0.1	7.4	0.3	0.1
AUD INJ ONSET (Peak isopleth, feet)	1.1	0.3	24.1	1.0	0.3
AUD INJ ONSET (SEL_{cum} isopleth, meters)	3,408.2	434.9	5,274.3	3,027.8	1,128.6
AUD INJ ONSET (SEL_{cum} isopleth, feet)	11,181.9	1,426.7	17,304.0	9,933.6	3,702.8
	ALL MM	HF Cet. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	464.2	NO LF CET.			
Behavior (RMS isopleth, feet)	1,522.8				

VIBRATORY PILE DRIVING REPORT

PRINT IN **LANDSCAPE** TO CAPTURE ENTIRE SCREEN

VERSION 2.1-Multi-Species: 2025

(if OTHER INFO or NOTES get cut-off, please include information elsewhere)

Chesapeake Bay Crossing Study - Tier 2 NEPA

PROJECT INFORMATION	RMS
Sound pressure level (dB)	160
Distance associated with sound pressure level (meters)	10
Transmission loss constant	15
Number of piles per day	16
Duration to drive pile (minutes)	30
Duration of sound production in day	28800
Cumulative SEL at measured distance	205

OTHER INFO 0

NOTES AZ Steel Sheet - loudest

Attenuation 5

RESULTANT ISOPLETHS

(Range to Effects)

FISHES

	BEHAVIOR
Fishes present	RMS Isopleth
ISOPLETHS (meters)	46.4
ISOPLETHS (feet)	152.3

SEA TURTLES

	AUD INJ ONSET	BEHAVIOR
Sea Turtles present	SEL_{cum} Isopleth	RMS Isopleth
ISOPLETHS (meters)	27.4	1.0
ISOPLETHS (feet)	89.9	3.3

MARINE MAMMALS

	LF Cetacean	MF Cetaceans	HF Cetaceans	PW Pinniped	OW Pinnipeds
AUD INJ ONSET (SELcum isopleth, meters)	31.6	12.2	25.8	40.7	13.7
AUD INJ ONSET (SELcum isopleth, feet)	103.8	39.9	84.8	133.6	45.0
	ALL MM	HF CET. present	NO VHF CET.	NO PHOCIDS	NO OTARIIDS
Behavior (RMS isopleth, meters)	4,641.6	NO LF CET.			
Behavior (RMS isopleth, feet)	15,228.3				