APPENDIX H: WVA MODEL ASSUMPTIONS

APPENDIX H

Plaquemines New Orleans to Venice (NOV) and Non Federal Levee (NFL) Mitigation:
WETLAND VALUE ASSESSMENT (WVA) MODEL ASSUMPTIONS AND RELATED GUIDANCE
(Revised/Updated: 31 January 2017)

PREFACE

Several of the assumptions set forth in this document are based on mitigation implementation schedules. Many sections include specified WVA model target years (TYs) and calendar years applicable to assumptions, and a few sections outline anticipated mitigation construction (i.e. mitigation implementation) schedules. It is critical for the WVA analyst to understand that this document has not been revised to account for changes to the mitigation implementation/construction schedules. It is therefore imperative for the analyst to obtain the most recent mitigation implementation/construction schedule for a particular mitigation project from CEMVN prior to running WVA models. The analyst may then need to modify some of the WVA model assumptions and guidelines presented herein to account for differences between the present mitigation implementation/construction schedule and the schedule(s) that were assumed in generating this document.

This document should be applied when conducting WVA analyses for the Engineering Alternatives Report and the Tentatively Selected Plans (TSPs) selected for meeting Plaquemines NOV and NFL mitigation needs.

1.1 BOTTOMLAND HARDWOOD MODEL – GENERAL ASSUMPTIONS

<u>V1 – Tree Species Association/Composition (in canopy stratum – percentage of trees that are hard mast or other edible-seed producing trees and percentage that are soft mast, non-mast/inedible seed producing trees)</u>

BLH-Wet restore, FWP scenario:

- Of the total trees initially planted, 60% will be hard mast-producing species and 40% will be soft mast-producing species. Assume this species composition ratio (i.e. 60% of trees are hard mast-producing and 40% are soft mast-producing) will remain static over the entire period of analysis (i.e. remains the same from time of planting throughout all subsequent model target years).
- Assume Class 5 is achieved once the planted trees are 10 years old. This class remains the same thereafter (i.e. Class 5 for all subsequent target years). Note that trees will be approximately 1 year old at the time they are initially planted. Thus, Class 5 is achieved 9 years after the time of initial planting.

General Notes:

- Do not classify Chinese tallow as a "mast or other edible-seed producing tree". Consider it a non-mast producing tree. Although it is an invasive species, one must still include this species regarding its contribution to percent cover in the canopy, midstory, and ground cover strata when it is present on a site (applicable to FWP scenario at TY0 and applicable to FWOP scenario for all model target years).

<u>V2 – Stand Maturity (average age or density breast height (dbh) of dominant and codominant canopy trees)</u>

BLH-Wet and BLH-Dry restore, FWP scenario -----

- Guidance as to how factors like subsidence and sea level rise might affect this variable (especially if the mitigation site becomes flooded for long durations, since the growth of trees may be adversely affected and certain tree species could die) -----
  If the mitigation feature (polygon) is designed such that flooding at the end of the project life will not impact tree survival, i.e. flooding is <12% of the growing season (33 days) and is no more than 20% to 30% of the non-growing season, then trees should not be adversely affected. However, if the site design does not achieve this goal, then adjust the tree growth spreadsheet such that typical growth is reduced by at least 10% once flooding exceeds 20-30% of the non-growing season or is 12% or more of the growing season (Conner et al.; Francis 1983).

General Notes:

- Include the DBH of Chinese tallow when working with this variable (for FWOP scenario in all model target years and for FWP scenario at TY0). The same guidance would apply to other invasive species in the canopy stratum.
- For planted trees – You can use the age of the trees in lieu of their DBH when running the model (applies to all target years from time of planting throughout model run). Assume trees planted will be approximately 1 year old when they are first installed.

<u>V3 – Understory/Midstory (percent cover)</u>

BLH-Wet and BLH-Dry restore, FWP scenario --
Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades:

TY	Year	Assumption

0	2019	Understory = 0% // Midstory = 0%
		Refer to Note 1

1	2020	Understory = 0% // Midstory = 0%
2	2021	Understory = 100% // Midstory = 0%
20	2039	Understory = 25% // Midstory = 60%
50	2069	Understory = 35% // Midstory = 30% Refer to Note 2

Notes:

1. This assumption is applicable to restoration features built in existing open water areas. For restoration polygons built in other areas that are not open water or are only partially open water, values for cover in the understory and midstory strata must be based on site-specific conditions existing prior to the start of construction.
2. The specified values are based on the assumption that normal flooding conditions are present (i.e. desirable depth and duration of inundation). These values will need to be adjusted if sea-level rise is anticipated to increase flooding of the particular mitigation polygon to a degree whereby growth and/or survival of plant species in the understory and/or midstory strata are adversely impacted.
3. Keep in mind that canopy and midstory species will not be planted in restoration features built in open water areas until 1 year after the initial fill (borrow) has been placed in the mitigation feature. This allows 1 year of fill settlement prior to plantings.

BLH-Wet restore and BLH-Dry restore, FWP scenario --
Assumptions applicable to restoration features that do <u>not</u> require deposition of fill to achieve target grades:

TY	Year	Assumption
0	2019	Refer to Note 1
1	2020	Understory = 100% // Midstory = 0%
20	2039	Understory = 25% // Midstory = 60%
50	2069	Understory = 35% // Midstory = 30% Refer to

		Note 2

Notes:

1. Values for cover in the understory and midstory strata must be based on site-specific conditions existing prior to the start of construction.
2. The specified values are based on the assumption that normal flooding conditions are present (i.e. desirable depth and duration of inundation). These values will need to be adjusted if sea-level rise is anticipated to increase flooding of the particular mitigation polygon to a degree whereby growth and/or survival of plant species in the understory and/or midstory strata are adversely impacted.

General Notes:

- Cover accounted for by Chinese tallow and other invasive and nuisance plant species must be included in the percent cover data (applicable to FWOP scenario in all model target years and to FWP scenario at TY0).
- Changes in hydrology could result from factors such as sea-level rise and subsidence. An increase in the duration of flooding will typically decrease the understory cover and, to a lesser degree, decrease the midstory cover.

V4 – Hydrology (flooding duration and water flow/exchange)

BLH-Wet restore, FWP scenario -----
Assumptions applicable to restoration features built in existing open water areas and for restoration features that require deposition of fill to achieve target grades.

TY	Year	Assumption
0	2019	Baseline conditions (score based on existing hydrology)
1	2020	Duration = dewatered // Exchange = none
2	2021	Duration = temporary Refer to Note 1
20	2039	Duration = temporary Refer to Note 1
50	2069	Duration = temporary Refer to Notes 1 and 2

Notes:

1. Scoring of water flow/exchange component of hydrology must be based on site-specific conditions anticipated.
2. The specified value for flooding duration is based on the assumption that normal flooding conditions are present (i.e. desirable depth and duration of inundation). This value will need to be adjusted if sea-level rise is anticipated to significantly increase the duration of flooding in the particular mitigation polygon. In many cases, it is probable that the duration may shift from temporary to seasonal.

BLH-Wet restore, FWP scenario -----
Assumptions applicable to restoration features that do not require deposition of fill to achieve target grades and to BLH-Wet enhancement features where hydrologic enhancement is a component of the mitigation design.

TY	Year	Assumption
0	2019	Baseline conditions (score based on existing hydrology)
1	2020	Duration = temporary Refer to Note 1
2	2021	Duration = temporary Refer to Note 1
20	2039	Duration = temporary Refer to Note 1
50	2069	Duration = temporary Refer to Notes 1 and 2

Notes:

1. Scoring of water flow/exchange component of hydrology must be based on site-specific conditions anticipated.
2. The specified value for flooding duration is based on the assumption that normal flooding conditions are present (i.e. desirable depth and duration of inundation). This value will need to

be adjusted if sea-level rise is anticipated to significantly increase the duration of flooding in the particular mitigation polygon. In many cases, it is probable that the duration may shift from temporary to seasonal.

3. For BLH-Wet enhancement features that do not include measures to enhance existing hydrology as part of the mitigation design, the scoring of variable V4 must be based on site-specific conditions hence no general assumptions are applicable.

BLH-Dry restore or enhance, FWP scenario -----

- Score flooding duration as "dewatered" during all target years used in the model.

<u>V5 – Size of Contiguous Forested Area</u>

BLH-Wet & BLH-Dry restore, FWP scenario:

- Do not consider the mitigation polygon to classify as "forested" until the planted trees are 10 years old. Remember that trees will be 1 year old when they are first installed; hence, the mitigation polygon would classify as forested 9 years following the year of initial planting. Prior to this target year, the trees initially planted in the mitigation polygon will be considered as either understory or midstory cover. For the target year when the planted trees reach 10 years old and for all model target years thereafter, the planted trees will be considered large enough for the mitigation polygon to be considered a forest. Hence at the target year planted trees reach 10 years old and all target years thereafter, the mitigation polygon can be included in the calculation of forested acreages (along with contiguous forested areas outside the mitigation polygon).

BLH-Wet and BLH-Dry restoration, FWP and FWOP scenarios:

- For areas outside the mitigation polygons, assume the conditions present at TY0 will remain unchanged throughout the life of the mitigation project. As used here, the term "mitigation polygons" refers to all proposed mitigation polygons regardless of the target habitat proposed. For example, a particular mitigation site could contain both a BLH-wet restoration polygon and a swamp restoration polygon. Under the FWP scenario, one would assume that the 2 restoration polygons would become forested over time but existing forested areas outside the limits of these polygons would remain forested throughout the period of analysis. Under the FWOP scenario, existing conditions would prevail in both the 2 restoration polygons and in the areas outside the limits of these polygons throughout the period of analysis.

General Notes:

- When scoring this variable for the FWP scenario, the area within the mitigation polygon itself as well as the adjacent "non-mitigation" areas are combined to generate the total forested acreage. However, remember the assumption that planted trees in restoration features will not be considered large enough for the feature to classify as a forest until the planted trees are 10 years old.
- When evaluating the size of contiguous forested areas, non-forested corridors <75 feet wide will not constitute a break in the forest area contiguity.

<u>V6 – Suitability and Traversability of Surrounding Land Uses (within 0.5 mile of site perimeter)</u>

BLH-Wet and BLH-Dry restoration, FWP scenario:

- When scoring a given BLH mitigation polygon, include the nearby or adjacent mitigation polygons in your assessment of land use types by assuming their land use type is the habitat type proposed (i.e. the target habitat type). However, one must consider the TY that the nearby/adjacent mitigation polygon will actually shift from its existing habitat type to the target habitat type. For example, if the adjacent mitigation polygon is a marsh restoration feature then the change from the existing habitat type (open water typically) to the target marsh habitat would not occur until TY2 (2020).

BLH-Wet and BLH-Dry restoration, FWP and FWOP scenarios:

- When evaluating this variable, typically assume that land uses in lands outside the mitigation polygons will score the same under the FWP and FWOP scenarios. In other words, typically assume that the existing conditions present in TY0 will remain unchanged over the life of the mitigation project. One would typically not consider potential future land development rates when scoring this variable due to the uncertainty of long-term development trends. Exceptions to this general approach would include:
    - Situations where there is a high level of confidence that a particular area is slated for a significant change in land use (ex. construction of I-49 through the Dufrene Ponds mitigation site).
    - Situations where it is anticipated that the "land use" (habitat type) will significantly change over time due to the effects of sea-level rise and land loss (ex. existing adjacent marsh lands rated as highly suitable/traversable changing to open water, a much lower score, due to shoreline erosion or other land loss factors).

<u>V7 – Disturbance (sources of disturbance vs. distance from site perimeter to disturbance source)</u>

BLH-Wet and BLH-Dry restoration, FWP and FWOP scenarios:

- For consistency purposes, assume baseline conditions affecting the scoring of this variable will not change over time. In other words, typically assume that the existing conditions present in TY0 will remain unchanged over the life of the mitigation project. For the WBV mitigation alternatives, there will be two exceptions to this general approach:
    - Segnette – The variable score will need to change over time to account for building the nearby racetrack project.

General Notes:

- When scoring this variable, all distances are measured from the perimeter of the BLH mitigation polygon itself.

1.2 NOTES REGARDING CONSTRUCTION & PLANTING OF BLH MITIGATION AREAS

Typical Estimated Project Construction Timelines -----

All projects – Begin construction around June 2019.

For BLH restoration areas built in existing open water features and for any other BLH restoration areas that require deposition of fill material as part of the construction process:

- June. 2019 – Begin construction.
- Feb 2020 – Complete construction.
- Feb 2021 – Initial grade settles to desired target grade (1 year after end of construction). If applicable, perimeter dikes constructed are degraded or gapped at this time.
- Sept. 2021 – Install plants

For BLH restoration that do not require deposition of fill as part of the construction process:

- June 2019 – Begin construction.
- Nov. 2019 – End construction (but could be as late as March or April of 2014 if much is earthwork required).
- Dec. 2019 – Install plants (earliest scenario for site requiring minimal earthwork).
- Sept. 2020 – Install plants (earliest scenario for site requiring substantial earthwork).

For BLH enhancement areas:

- June 2019 – Begin construction (includes start of invasive plant eradication).
- Oct. 2019 – End construction.

- Dec. 2019 – Install plants.

Notes:
1. All of the above timelines are preliminary and are subject to refinement as plans are refined for a particular mitigation site.
2. Planting of canopy and midstory species in March should be avoided if possible since conditions could be adversely dry, thereby decreasing the survival of plantings.
3. Chemical eradication of invasive/nuisance hardwood species such as Chinese tallow should be done during the growing season. Greatest effectiveness may be realized if chemical treatment is applied from August through October when most energy is being used for root development.

Planting of BLH-Wet and BLH-Dry Restoration Areas -----

Initial plantings will be:
- Canopy species: plant on 9-foot centers (538 trees/acre); of total trees planted, 60% will be hard mast-producing species and 40% will be soft mast-producing species.
- Midstory species (shrubs and small trees): plant on 20-foot centers (109 seedlings per acre).
- Stock size (canopy and midstory species): 1 year old, 1.5 feet tall (minimum).

Planting of BLH-Wet and BLH-Dry Enhancement Areas -----

Initial plantings will follow the same guidelines as for BLH-Wet and BLH-Dry restoration areas regarding the general density of installed plants and the stock used. Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large “gaps” in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The typical guideline of having 60% of the canopy species planted be hard mast-producing and 40% of the canopy species planted be soft mast-producing may be altered in situations where several native trees remain after eradicating invasive/nuisance species. For example if the remaining native trees are predominantly soft mast-producing species, then a greater proportion of the planted trees would be hard-mast producing. The objective would be to have the ultimate canopy composition (planted trees after reaching canopy strata plus existing trees) be close to a 60%:40% ratio of hard mast to soft mast species.

1.3 BOTTOMLAND HARDWOOD WVA MODEL – TARGET YEARS FOR MODELS

Use the target years specified below when analyzing BLH restoration polygons built in existing open water features and for any other BLH restoration polygons that require deposition of fill material as part of the construction process:

TY	Year	
0	2019	Baseline conditions (assume construction starts in 2020 even though anticipated start is late 2019)
1	2020	Initial construction activities begin and are completed. No plants installed.
2	2021	Restoration feature settles to desired target grade. Any associated perimeter containment dikes are degraded or gapped. Plants installed. Temporary flooding duration (target flooding duration/target hydroperiod) achieved.
11	2030	Class 5 is achieved re V1. Planted areas class as forested re V5.
20	2039	For V3, Understory = 25% // Midstory = 60%
50	2069	End of project life for a HSDRRS mitigation feature.

Use the target years specified below when analyzing BLH restoration polygons that do not require deposition of fill material as part of the construction process, and when analyzing BLH enhancement polygons:

TY	Year	
0	2019	Baseline conditions (assume construction starts in 2020 even though anticipated start is late 2019)
1	2020	Initial construction activities begin and are completed. Initial eradication of invasive & nuisance plant species is started and completed. Plants are installed (either in March or in December depending on construction activities. Appropriate planting season extends from November through February). Temporary flooding duration (target flooding duration/target hydroperiod) achieved.
10	2029	Class 5 is achieved re V1. Planted areas class as forested re V5.
20	2039	For V3, Understory = 25% // Midstory = 60%
52	2071	End of project life for a HSDRRS mitigation feature (adjusted end to be consistent with final TY used in impact WVAs).

NOTE:
The user of these guidelines is cautioned that the construction schedule for proposed mitigation features may not follow the construction schedule assumed in the preceding sections. If this is the case, the model target years and their associated model assumptions may have to be adjusted accordingly.

2.1 SWAMP MODEL – GENERAL ASSUMPTIONS

V1 – Stand Structure (percent closure or Cover: overstory, midstory, herbaceous)

Swamp restore, FWP scenario --
Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades. If construction involves substantial excavation and grading rather than filling, use the next assumptions table rather than this one.

TY	Year	Assumption
0	2019	Baseline conditions (site-specific)
1	2020	Class 1
2	2021	Class 1
3	2022	Class 2
15	2034	Class 6
35	2054	Class 6
50	2069	Refer to Note 1

Notes:

1. Over time, sea-level rise and possibly subsidence could adversely affect the hydrologic regime (increased flooding duration, increased depth of inundation). Salinity could increase in some areas concurrent with sea-level rise. These factors are anticipated to adversely affect plant growth and survival. Thus, cover in the midstory and herbaceous (ground cover) strata are anticipated to decrease over time, as could percent cover in the canopy stratum to a lesser degree. This potential reduction must be evaluated on a site-specific basis, factoring in considerations such as the proposed grade of the mitigation polygon relative to the projected sea-level rise elevation, changes in salinity, etc. As a general "rule of thumb", one may anticipate the stand structure to decrease from Class 6 in TY35 to Class 4 by TY50. However, it is emphasized that the decrease in class score over time must be evaluated on a case-by-case basis.

Swamp restore, FWP scenario --
Assumptions applicable to restoration features involving substantial excavation and grading as part of the initial construction efforts. If fill is required via pumping of sediments into the feature, use the preceding assumptions table.

TY	Year	Assumption
0	2019	Baseline conditions (site-specific)
1	2020	Class 1
2	2021	Class 1
15	2034	Class 6
35	2054	Class 6
52	2071	Refer to Note 1 in preceding assumptions table

General Notes:

- Include the cover accounted for by Chinese tallow and other invasive plant species when working with this variable (for FWOP scenario in all model target years and for FWP scenario at TY0).
- For swamp enhancement features, FWP scenario --- The evaluation of existing canopy, midstory, and understory will be done via field data collection for this variable. The growth of planted species will be estimated from a growth calculator that is based on pertinent research. Assumptions will have to be made about the correlation between plant growth and observed coverage. The values will be averaged to get a single HSI for this variable. Planted canopy species should not be factored into the overstory coverage estimate until TY15. They will be considered either as part of understory cover (earlier) or midstory cover (later) prior to TY15.

V2 – Stand Maturity (average DBH of canopy trees; plus total basal area all trees)

Swamp restore, FWP scenario --
Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades. If construction involves substantial excavation and grading rather than filling, use the next assumptions table rather than this one.

TY	Year	Assumptions – Density of Trees	Assumptions – DBH of Planted Trees
0	2019	Baseline conditions.	N/A
1	2020	0 trees/ac.	N/A
2	2021	538 trees/ac. (trees installed, initial density)	Cypress = 0.2" // Tupelo = 0.3"
3	2022	269 trees/ac. (50% survival of planted trees)	Cypress = 0.2" // Tupelo = 0.5"
4	2023	258 trees/ac. (48% survival of planted trees)	
15	2034	215 trees/ac. (40% survival of planted trees)	Cypress = 3.5" // Tupelo = 4.1"
35	2054	161 trees/ac. (30% survival of planted trees)	Cypress = 8.2" // Tupelo = 9.6"
50	2069	161 trees/ac. (30% survival of planted trees)	Cypress = 11.9" // Tupelo = 14.0"

Swamp restore, FWP scenario --
Assumptions applicable to restoration features, or the portions thereof, involving substantial excavation and grading as part of the initial construction efforts. If fill is required via pumping of sediments into the feature, use the preceding assumptions table concerning tree densities.

TY	Year	Assumptions – Density of Trees	Assumptions – DBH of Planted Trees
0	2019	Baseline conditions.	N/A
1	2020	538 trees/ac. (trees installed; initial density)	Cypress = 0.2" // Tupelo = 0.3"
2	2021	269 trees/ac. (50% survival of planted trees)	Cypress = 0.2" // Tupelo = 0.5"
3	2022	258 trees/ac. (48% survival of planted trees)	
15	2034	215 trees/ac. (40% survival of planted trees)	Cypress = 3.5" // Tupelo = 4.1"
35	2054	161 trees/ac. (30% survival of planted trees)	Cypress = 8.2" // Tupelo = 9.6"
52	2071	161 trees/ac. (30% survival of planted trees)	Cypress = 11.9" // Tupelo = 14.0"

Swamp restore, FWP scenario ---

- Assume 70% of the trees planted will be cypress and that 30% of the trees planted will be tupelo or other non-cypress species. Assume that this ratio will remain constant over time once the trees are planted.

Swamp enhance, FWP scenario ---

- Do not factor planted trees into the site DBH calculations until TY15. Prior to TY15, the planted trees will be considered as being in the understory or midstory strata.

General Notes:

- Factors such as sea-level rise and increased salinity over time may adversely affect the growth and/or survival of planted trees and existing trees. These factors must be considered when assessing this variable and may require adjustments to the assumed density of planted trees (as regards survival of trees) and the assumed dbh of planted trees indicated in the preceding tables. The FWS spreadsheet used to predict tree growth (reference the "BLH Site Ingrowth" spreadsheet) includes correction factors used to adjust typical growth rates to account for trees subject to stressors like excessive inundation or salinity. These correction factors should be used for target years in which one anticipates the stress factors may significant enough to affect tree growth. The stage in the project life that the effects become significant must be determined on a case-by-case basis.

V3 – Water Regime (flooding duration and water flow/exchange)

Swamp restore, FWP scenario --
Assumptions applicable to restoration features built in existing open water areas and for any restoration features that require deposition of fill to achieve target grades. If construction involves substantial excavation and grading rather than filling, use the next assumptions table rather than this one.

TY	Year	Assumption
0	2019	Baseline conditions (score based on existing hydrology)
1	2020	Duration = permanent // Exchange = none
2	2021	Duration = seasonal Refer to Note 1
15	2034	Duration = seasonal Refer to Note 1
35	2054	Duration = seasonal or semi-permanent Refer to Notes 1 and 2
50	2069	Duration = semi-permanent or permanent Refer to Notes 1 and 2

Notes:

1. Scoring of water flow/exchange component of hydrology must be based on site-specific conditions anticipated.
2. During the latter portions of the project life, flooding duration may be affected by sea-level rise. Swamp mitigation features are designed to have seasonal flooding once the features are constructed and have reached the desired target grade elevation. Sea-level rise will likely increase the duration of flooding. This effect will be site-specific and must be evaluated on a case-by-case basis. Sea-level rise will also likely affect the water flow/exchange. For a site that has limited exchange during early years, this may actually improve exchange for a period of years (ex. increase from low exchange in TY2 to moderate exchange in TY15). As the sea-level rise continues over time, however, the effect may be to reduce exchange (ex. decrease from moderate exchange in TY35 to low exchange in TY50). The degree to which sea-level rise affects flow/exchange over time must also be evaluated on a case-by-case basis.

Swamp restore, FWP scenario --
Assumptions applicable to restoration features, or the portions thereof, involving substantial excavation and grading as part of the initial construction efforts. If fill is required via pumping of sediments into the feature, use the preceding assumptions table.

TY	Year	Assumption
0	2019	Baseline conditions (score based on existing hydrology)
1	2020	Duration = seasonal Refer to Note 1
2	2021	Duration = seasonal Refer to Note 1
15	2034	Duration = seasonal Refer to Note 1
35	2054	Duration = seasonal or semi-permanent Refer to Notes 1 and 2
50	2069	Duration = semi-permanent or permanent Refer to Notes 1 and 2

Notes:
Notes 1 and 2 are the same as in the preceding table.

V4 – Mean High Salinity During the Growing Season (salinity re baldcypress & other trees)

General Notes:

- For current and near-term salinities, use the Coastwide Reference Monitoring System (CRMS) data (website http://www.lacoast.gov/crms%5Fviewer/) and USGS gage data (website http://waterdata.usgs.gov/la/nwis/rt) where available. Future salinities should be forecast using reasonable estimates and best professional judgment (in the absence of hydrologic and hydrodynamic modeling).

Other WVA Swamp Model Guidance

The WVA procedural manual and Swamp Community Model text advises that habitat classification data and aerial photos should be used to determine a conversion rate of swamp to marsh. Based on this evaluation, the guidance states that areas of swamp converting to fresh marsh should be evaluated as open water habitat using the fresh marsh model. The determination of appropriate conversion rates would be quite complicated in the project area. Hence, this issue will not be addressed as part of the WVA analyses.

2.2 NOTES REGARDING CONSTRUCTION & PLANTING OF SWAMP MITIGATION AREAS

Typical Estimated Project Construction Timelines -----

All projects – Begin construction around June 2019.

For swamp restoration areas built in existing open water features and for any other swamp restoration areas that require deposition of fill material as part of the construction process:

- June 2019 – Begin construction.
- Feb. 2020 – Complete construction.
- Feb. 2021 – Initial grade settles to desired target grade (1 year after end of construction). If applicable, perimeter dikes constructed are degraded or gapped at this time.
- Sept. 2021 – Install plants.

For swamp restoration areas involving extensive excavation and earthwork but that do not require deposition of fill as part of the construction process:

- June. 2019 – Begin construction.
- Dec. 2019 – End construction (, subsequent grading may be required in some areas after an as-built survey completed in order to correct any deficiencies).
- Sept. 2020 – Install plants.

For swamp enhancement areas:

- June 2019 – Begin construction (includes start of invasive plant eradication).
- Oct. 2019 – End construction.
- Dec. 2019 – Install plants.

Note: All of the above timelines are preliminary and are subject to refinement as plans are refined for a particular mitigation site.

Planting of Swamp Restoration Areas -----

Initial plantings will be:

- Canopy species: plant on 9-foot centers (538 trees/acre); of total trees planted, approximately 70% will be cypress while the remaining trees will consist of tupelo and other non-cypress species.
- Midstory species (shrubs and small trees): plant on 20-foot centers (109 seedlings per acre).
- Stock size (minimums): Canopy species = 1 year old, 3 feet tall, 0.5" root collar; Midstory species = 1 year old, 3 feet tall.

Planting of Swamp Enhancement Areas -----

Initial plantings will follow the same guidelines as for swamp restoration areas regarding the general density of installed plants and the stock used. Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or midstory species may remain, but in a spatial distribution that leaves relatively large "gaps" in the canopy stratum and/or the midstory stratum. In such cases, areas measuring approximately 25 feet by 25 feet that are devoid of native canopy species should be planted and areas measuring approximately 45 feet by 45 feet that are devoid of native midstory species should be planted.

The typical guideline of having roughly 70% of the canopy species planted be cypress and 30% of the canopy species planted be tupelo and other non-cypress species may be altered in situations where several native trees remain after eradicating invasive/nuisance species. For example, if the remaining native trees are almost all cypress, then a greater proportion of the planted trees may consist of non-cypress species. Similarly, the composition of the species planted might also be altered to be more representative of the species composition present in nearby healthy swamp habitats.

2.3 SWAMP WVA MODEL – TARGET YEARS FOR MODELS

Typically use the target years specified below when analyzing swamp restoration polygons built in existing open water features and for any other swamp restoration polygons that require deposition of fill material as part of the construction process:

TY	Year	
0	2019	Baseline conditions (assume construction starts in 2014 even though anticipated start is late 2013)
1	2020	Initial construction activities begin and are completed. No plants installed. V1 = Class 1; V3 = permanent duration.
2	2021	Restoration feature settles to desired target grade. Any associated perimeter containment dikes are degraded or gapped. Plants installed. V1 = Class 1; V2 = 538 trees/ac.; V3 = seasonal duration.
3	2022	V1 = Class 2; V2 = 269 trees/ac.; V3 = seasonal duration.
4	2023	V1 = Class 2; V2 = 258 trees/ac.; V3 = seasonal duration.
15	2034	V1 = Class 6; V2 = 215 trees/ac.; V3 = seasonal duration.
35	2054	V1 = Class 6; V2 = 161 trees/ac.; V3 = seasonal or semi-permanent duration.
50	2069	End of project life for a HSDRRS mitigation feature. V2 = 161 trees/ac.; V3 = semi-permanent or permanent duration.

Typically use the target years specified below when analyzing swamp restoration polygons that do <u>not</u> require deposition of fill material as part of the construction process, and when analyzing BLH enhancement polygons:

TY	Year	
0	2019	Baseline conditions

		(assume construction starts in 2014 even though anticipated start is late 2013)
1	2020	Initial construction activities begin and are completed. Initial eradication of invasive & nuisance plant species is started and completed. Plants are installed (either in March or in December depending on construction activities. Appropriate planting season extends from November through February). V1 = Class 1; V2 = 538 trees/ac.; V3 = seasonal duration.
2	2021	V1 = Class 2; V2 = 269 trees/ac.; V3 = seasonal duration.
3	2022	V1 = Class 2; V2 = 258 trees/ac.; V3 = seasonal duration.
15	2034	V1 = Class 6; V2 = 215 trees/ac.; V3 = seasonal duration.
35	2054	V1 = Class 6; V2 = 161 trees/ac.; V3 = seasonal or semi-permanent duration.
50	2069	End of project life for a HSDRRS mitigation feature (adjusted end to be consistent with final TY used in impact WVAs). V2 = 161 trees/ac.; V3 = semi-permanent or permanent duration.

The user of these guidelines is cautioned that the construction schedule for proposed mitigation features may not follow the construction schedule assumed in the preceding sections. If this is the case, the model target years and their associated model assumptions may have to be adjusted accordingly.

3.1 FRESH MARSH MODEL – GENERAL ASSUMPTIONS

V1 – Percent of Wetland Area Covered by Emergent Vegetation

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2019	Baseline conditions.
1	2020	10% credit.
3	2022	50% credit.
5	2024	100% credit.
6	2025	100% credit.

Note: Assume the created elevation settles to target grade by TY3. After TY5, cover of the land acres after land loss is applied will remain optimal until conditions in the mitigation polygon shift to open water (based on Ronny magic spreadsheet calculations).

FWOP scenario:
2010 land rolled forward by applying 3 years of loss.

General Notes:

1. Typically, no existing project benefits are considered under FWOP. Project sites were typically selected to avoid overlap with existing non-diversion projects. In the case of existing diversions, either the effect of the diversion is assumed to be captured in the historic loss rate or the diversion would have to substantially fill in the project site FWOP to affect the net changes under V1 and V4, plus marsh creation gets optimal credit on its own if or until accretion does not keep pace with RSLR. Doing marsh creation in diversion areas may be more sustainable. However, not capturing that potential higher sustainability effect within the WVA would be more conservative for compensatory purposes (i.e., would generate less AAHUs and require more acres), but would not allow differentiation between sites with or without existing diversion influence where that influence is not captured in the historic loss rate.

   In limited cases, some existing project benefits are indeed considered under FWOP. Coordinate directly with CEMVN to determine whether any benefits from existing projects should be considered under the FWOP scenario.

2. Under the FWP scenario, begin applying land loss once the marsh fill has settled to the desired target grade (i.e. in TY2, one year after completion of initial fill placement). The USGS loss rates derived from a linear regression will be applied using a linear loss rate.
3. For the FWP scenario, one must subtract the acreage of interior borrow areas (borrow used to build dikes) from the total acreage of marsh land to derive the percentage of the total feature acreage that will count as marsh land. These borrow areas will have a greater settlement rate than will other portions of the mitigation feature. Seek engineering input as to what percentage of the borrow area footprint will settle to an elevation whereby the area would be considered as shallow open water rather than marsh land.
4. For the FWP scenario, one must also subtract the acreage of any trenasses initially constructed from the total acreage of marsh land to derive the acreage that will count as marsh land. These trenasses will count as shallow open water areas (assuming they are not excavated over 1.5 feet deep in relation to the marsh surface elevation).
5. For the FWP scenario, only those portions of earthen retention dikes that fall within the intertidal range can be included in the marsh restoration feature acreage. Portions of such dikes that are not degraded such that their crest elevation is equal to the final marsh target elevation cannot be counted in the acreage of the marsh feature, nor can portions of the dikes that will remain underwater. Similarly, the footprints occupied by proposed foreshore dikes (rock dikes) cannot be counted in the acreage of the marsh feature.
6. It is assumed that proposed fresh marsh restoration features will not be planted. Instead, it is assumed that suitable vegetative cover will develop rapidly via natural recruitment and colonization of the feature.
7. For the FWP scenario, land loss will be assumed to begin once the restored marsh feature has settled to the desired target grade. This will occur 1 year after the initial construction (dike construction, placement of fill as slurry) has occurred.

<u>V2 – Percent Open Water Area Covered by Submerged Aquatic Vegetation</u>

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2019	Baseline conditions (existing conditions).
1	2020	0%
3	2022	0%
5	2024	Same as baseline cover by SAV.
6	2025	Increase baseline SAV cover by 15%, then hold this through TY25 (i.e. the SI value plateaus).
25	2044	See guidance for TY6.
50	2069	50% of baseline cover by SAV.

Marsh restore, FWOP scenario:
TY50 (2063) = 30% of baseline

Note:
Base the SAV cover estimates on the average cover during the peak of the growing season. SAVs do not include floating aquatics (but do include floating-leaf aquatics).

General Notes:
Fresh and intermediate marshes often support diverse communities of floating-leaved and submerged aquatic plants that provide important food and cover to a wide variety of fish and wildlife species. A fresh/intermediate open water area with no aquatics is assumed to have low suitability (SI=0.1). Optimal conditions (SI=1.0) are assumed to occur when 100 percent of the open water is dominated by aquatic vegetation. Habitat suitability may be assumed to decrease with aquatic plant coverage approaching 100 percent due to the potential for mats of aquatic vegetation to hinder fish and wildlife utilization; to

adversely affect water quality by reducing photosynthesis by phytoplankton and other plant forms due to shading; and contribute to oxygen depletion spurred by warm-season decay of large quantities of aquatic vegetation. These effects are highly dependent on the dominant aquatic plant species, their growth forms, and their arrangement in the water column; thus, it is possible to have 100 percent cover of a variety of floating and submerged aquatic plants without the above-mentioned problems due to differences in plant growth form and stratification of plants through the water column. Because predictions of which species may dominate at any time in the future would be tenuous, at best, the EnvWG decided to simplify the graph and define optimal conditions at 100 percent aquatic cover.

SAV coverage is site specific and should be considered on a case-by-case basis. However, in an attempt to provide some general assumptions, the following project specific conditions should be considered when assessing SAV coverage for FWP and FWOP:

- Water depth
- Project area location: inland/protected vs. open to lake or bay processes
- Salinity levels
- Nutrient input (e.g. within diversion outfall area)
- Rate of land loss and RSLR

Restoring marsh within open water areas will reduce wave fetch, increase shallow open water and buffer inland areas increasing tidal lag. Generally, SAV coverage should increase as a result. In some cases existing conditions are already optimal for SAV coverage and, therefore, under FWP conditions percent cover should be maintained.

Consideration of the rate of land loss and RSLR for the project life should also be factored in. For FWOP, an area supporting SAV coverage will likely continue to experience subsidence and marsh loss resulting in reduced SAV coverage, and potentially reaching a point of habitat collapse where SAV is not supported. While under FWP conditions the area will continue to experience subsidence and marsh loss, it is assumed that the rate of loss has been reduced as a result of bringing in external sediment.

For sites located in freshwater diversion outfall areas, SAV coverage will likely be maintained for FWP and FWOP conditions due to nutrient input. Consideration should still be given for land loss rates, RSLR, and juxtaposition to and coalescence with large open water areas.

V3 – Marsh Edge and Interspersion

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2019	Baseline conditions (existing conditions).
1	2020	100% Class 5
3	2022	100% Class 3
5	2024	50% Class 3 and 50% Class 1
6	2025	100% Class 1

Notes:
When assigning SI values to variable V3, the percent marsh values (variable V1) should also be considered and interspersion classes developed accordingly. This could result in assumptions that differ from those indicated above.
Between TY6 and TY50, one must use best professional judgment coupled with land loss projections to determine appropriate SI values for variable V3.

V4 – Percent of the Open Water Area ≤ 1.5 Feet Deep (in relation to marsh surface)

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2019	Baseline conditions (existing conditions).
1	2020	Any marsh lost becomes shallow open water.
3	2022	Any marsh lost becomes shallow open water.
5	2024	Any marsh lost becomes shallow open water.
6	2025	Any marsh lost becomes shallow open water.
50	2069	1/6th of the shallow open water becomes deep based on 0.5 feet of subsidence.

Marsh restore, FWOP scenario:

- Marsh lost between TY1 & TY50 becomes shallow open water.
- At TY50, 1/3 of existing shallow water becomes deep (based on subsidence rate used in determining SLR adjustment).

V5 – Salinity

Assume salinity scores will be the same for FWP and FWOP scenarios.

Assume salinity values will not change enough over time to force a shift from the fresh marsh model to the brackish marsh model.

Data Source --
CRMS site http://www.lacoast.gov/crms2/Home.aspx - Click on Basic Viewer under the Mapping link. Click on the nearest data station and then select the Water tab to get the salinities. The data are approximately average annual and most appropriate for the Brackish Marsh and Saline Marsh models if the period of record doesn't have an anomalous event (e.g., drought, unusual FW diversion operation). Average annual salinity may be accepted on a case-specific basis for the Fresh Marsh/Intermediate Marsh model as well.

V6 – Aquatic Organism Access (% wetland accessible & type of access)

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2019	Baseline conditions (existing conditions).
1	2020	0.0001 (supratidal; retention dikes not gapped or degraded)
3	2022	0.0001 (supratidal; retention dikes have been gapped or degraded)
5	2024	1.0 (intertidal)
6	2025	1.0 (intertidal)
50	2069	1.0 (intertidal)

Note:
Suggested minimum standard for "gapping" containment dikes or similar dikes is no less than one 25-foot wide gap (bottom width) every 1,000 feet, with the "gap" excavated to the desired average marsh elevation. The preferred standard is one 25-foot wide gap (bottom width) every 500 feet, with the "gap" excavated to the pre-project elevation (i.e. the water bottom). If the project design does not provide the minimum gapping, then the organism access values indicated above will need to be adjusted accordingly (re the maximum score attained as of TY5).

Marsh restore, FWOP scenario:

The structure rating is based on site specific, existing conditions and how those may change over time with land loss.

3.2 INTERMEDIATE MARSH MODEL – GENERAL ASSUMPTIONS AS THEY DIFFER FROM FRESH MARSH MODEL ASSUMPTIONS

V1 – Percent of Wetland Area Covered by Emergent Vegetation

Marsh restore, FWP scenario:

Calendar Year	TY	Planted Marsh Platform (credit)	50% planting rate (credit)	Unplanted Marsh Platform (credit)
2019	0 (baseline)			
2020	1 (supratidal)	10%	5%	0%
2022	3 (supratidal)	25%	17.5%	15%
2042	5 (intertidal)	100%	50%	50%
2025	6 (intertidal)	100%	100%	100%

Note: Assume 7-ft center planting densities.

3.3 BRACKISH MARSH MODEL – GENERAL ASSUMPTIONS AS THEY DIFFER FROM FRESH MARSH MODEL ASSUMPTIONS

V1 – Percent of Wetland Area Covered by Emergent Vegetation

Marsh restore, FWP scenario:

Calendar Year	TY	Planted Marsh Platform (credit)	50% planting rate (credit)	Unplanted Marsh Platform (credit)
2019	0 (baseline)			
2020	1 (supratidal)	10%	5%	0%
2022	3 (supratidal)	25%	17.5%	15%
2024	5 (intertidal)	100%	50%	50%
2025	6 (intertidal)	100%	100%	100%

Note: Assume 7-ft center planting densities.

V2 – Percent Open Water Area Covered by Submerged Aquatic Vegetation

Marsh restore, FWP scenario:

TY	Year	Assumption
0	2019	Baseline conditions (existing conditions).
1	2020	0%
3	2022	0%
5	2024	Same as baseline conditions.
6	2025	Increase baseline by 10%, then maintain this through TY25 (i.e. SI value plateaus).
25	2044	See guidance for TY6.
50	2069	25% of baseline conditions.

Marsh restore, FWOP scenario:

TY50 (2063) = 15% of baseline conditions.

General Notes:
Brackish marshes also have the potential to support aquatic plants that serve as important sources of food and cover for several species of fish and wildlife. Although brackish marshes generally do not support the amounts and kinds of aquatic plants that occur in fresh/intermediate marshes, certain species, such as widgeon-grass, and coontail and milfoil in lower salinity brackish marshes, can occur abundantly under certain conditions. Those species, particularly widgeon-grass, provide important food and cover for many species of fish and wildlife. Therefore, the V_2 Suitability Index graph in the brackish marsh model is identical to that in the fresh/intermediate model.

3.4 ADDITIONAL GUIDANCE FOR MARSH RESTORATION FEATURES PROPOSED IN AREAS WHERE THERE IS NO SIGNIFICANT LAND LOSS OVER TIME

The guidance provided herein is only applicable to proposed marsh restoration (marsh creation) features located in areas where data indicate no land loss will occur over the life of the mitigation project. For proposed marsh restoration features located in areas where there will be land loss, the general assumptions previously provided for use in running WVA marsh models will remain applicable.

V1 - % of Wetland Area Covered by Emergent Vegetation

Guidance for determining how much of the restored marsh feature will be land and how much will be shallow open water:

- Assume 1% of the total feature acreage will be open water in TY1 and 99% of the total acreage will be land.
- After TY1, increase the open water area by 0.075% each year using the total feature acreage to determine the acreage increase. Decrease the total acreage of land accordingly.

Example Calculation:
Assume the proposed marsh restoration feature encompasses 100 acres that can all be counted as marsh land.
At TY1, the land area will be 99% of the 100 acres while the open water area will be 1% of the 100 acres.
The increase in the open water area per year after TY1 and the decrease in the land area per year after TY1 will be: 0.075% X 100 acres = 0.075 acre per year.

Determination of land area and open water area:

TY	Land Acres	Open Water Acres	Open Water Calculation	Land Calculation
1	99.00	1.00	100 ac.*0.01	100 ac.*0.99
3	98.85	1.15	(1.0 ac. at TY1) + (2 yrs * 0.075 ac./yr.) = A	(99.0 ac. at TY1) - A
5	98.70	1.30	(1.0 ac. at TY1) + (4 yrs * 0.075 ac./yr.) = B	(99.0 ac. at TY1) - B
6	98.625	1.375	(1.0 ac. at TY1) + (5 yrs * 0.075 ac./yr.) = C	(99.0 ac. at TY1) - C
21	97.50	2.50	(1.0 ac. at TY1) + (20 yrs * 0.075 ac./yr.) = D	(99.0 ac. at TY1) - D
25	97.20	2.80	(1.0 ac. at TY1) + (24 yrs * 0.075 ac./yr.) = E	(99.0 ac. at TY1) - E
50	95.325	4.675	(1.0 ac. at TY1) + (49 yrs * 0.075 ac./yr.) = F	(99.0 ac. at TY1) - F

Determination of land area covered by emergent vegetation (marsh area):

TY	Land Acres	Marsh Acres	Marsh Area Calculation
1	99.00	9.9	99.0 ac. land * 0.10 (i.e. 10% of land covered by emergent vegetation)
3	98.85	49.425	98.85 ac. land * 0.50 (i.e. 50% of land covered by emergent vegetation)
5	98.70	98.70	98.70 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
6	98.625	98.625	98.70 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
21	97.50	97.50	97.50 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
25	97.20	97.20	97.20 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)
50	95.325	95.325	95.325 ac. land * 1.00 (i.e. 100% of land covered by emergent vegetation)

Notes:

1. Values for TY0 will be based on existing conditions within the marsh restoration features.
2. The general assumptions applicable to determining the percentage of the marsh feature acreage (e.g. land acreage) that is covered by emergent vegetation remain the same as those set forth in the original fresh marsh WVA model guidance. These assumptions are: TY1 = 10%; TY3 = 50%; TY5 = 100%; TY6 = 100%.
3. Refer to the notes under the variable V1 assumptions for fresh marsh models concerning how features such as dikes, interior borrow areas, and constructed trenasses must be handled as regards the acreage of marsh land.

V4 – Percent of the Open Water Area ≤1.5 Feet Deep (relative to marsh surface)

Assume all of the open water areas that develop within the marsh feature (see variable V1 guidance) will be less than or equal to 1.5 feet deep. This assumption is applicable to target years 1 through 50.

3.5 PROJECT CONSTRUCTION NOTES FOR RESTORED MARSHES

The typical anticipated schedule for initial construction associated with the proposed marsh restoration features is as follows:

- June 2019 – Begin construction
- Feb. 2020 – Complete construction

- Feb. 2021 – Initial marsh grade settles to target grade (1 year after end of construction). Degrade containment dikes, and/or install “fish gaps”, and or establish gaps in other dikes.
- 2021 – Install plants (intermediate marsh and brackish marsh features only).

Note that none of the proposed fresh marsh restoration features will be planted. It was assumed that these areas would be sufficiently vegetated via natural recruitment and colonization. Planting would only occur if sufficient vegetative cover (herbaceous) does not develop through natural processes.

Remember that it is very important to review the most detailed design plans available (e.g. initial 35% design plans (drawings), or 65%+ design plans), and the project description narrative associated with these plans. These descriptions and drawings contain important information for specific mitigation features/sites that will affect assumptions used in the WVA models.

3.6 MARSH MODELS – MODEL TARGET YEARS

Typically use the target years specified below when analyzing marsh restoration polygons built in existing open water features:

TY	Year	
0	2019	Baseline conditions (assume construction starts in 2014 even though anticipated start is late 2013)
1	2020	Initial construction activities begin and are completed. No plants installed. V1 = 10% credit (but see calcs for areas where there is no land loss). V2 = 0%. V3 = 100% Class 5. V4 = lost land becomes shallow water. V6 = 0.0001.
3	2022	Restoration feature settles to desired target grade. Any associated perimeter containment dikes are degraded or gapped. Plants installed in intermediate and brackish marsh features (no planting in fresh marsh features since none required). V1 = 50% credit (but see calcs for areas where there is no land loss). V2 = 0%. V3 = 100% Class 3. V4 = lost land becomes shallow water. V6 = 0.0001.
5	2024	V1 = 100% credit (but see calcs for areas where there is no land loss). V2 = baseline SAV cover. V3 = 50% Class 3 and 50% Class 5. V4 = lost land becomes shallow water. V6 = 1.0
6	2025	V1 = 50% credit (but see calcs for areas where there is no land loss). V2 = increase baseline SAV cover by 15%. V4 = lost land becomes shallow water. V6 = 1.0
25	2044	V2 = increase baseline SAV cover by 15%.
50	2069	End project life. V2 = 50% of baseline SAV (FWP). V3 = 100% Class 3. V4 = 1/6th of shallow open water becomes deep (FWP); but if no land loss, all open water remains shallow. V6 = 1.0

The user of these guidelines is cautioned that the construction schedule for proposed mitigation features may not follow the construction schedule assumed in the preceding sections. If this is the case, the model target years and their associated model assumptions may have to be adjusted accordingly.

4.1 RELATED TOPICS – LAND LOSS AND ACCRETION

LAND LOSS RATES

To remain consistent with the WVAs run for the levees (including those for the 57-year period of analysis), the linear loss rates must be calculated in the linear loss spreadsheet. This requires 1984 to 2010 mitigation analysis/land change data from USGS within which a particular time period is chosen depending on water levels taken at that time with efforts to pick years that allow for the greatest time during this range. Data selection is subject to interagency approval. The rate should be calculated in acres/year for integration with below methods on SLR and accretion.

The land loss rate applied to restored marshes will be 50% of the background (FWOP) loss rate. However, land loss rates will revert back to baseline rates after 10 inches of soil have formed/accreted above the initially created marsh platform. Based on input from Dr. Andy Nyman and other academics, plant roots extend downward a maximum of approximately 10 inches below the marsh surface. Consequently, when the plant roots are no longer in contact with the created platform, loss rates revert back to those of the adjoining marshes (i.e., background loss rate).

Derivation and Application of Land Loss Rates

A linear regression is applied to USGS' hyper-year (hyper temporal) data of the extended boundary. The slope of the regression line provides the acres of marsh lost for the extended boundary during the years of USGS analysis. By dividing the slope (marsh lost in acres) by the acreage at the beginning of the USGS evaluation period (e.g. 1984), the percent loss rate is determined for the extended boundary. (Note: USGS provides a percent loss rate by dividing the marsh lost in acres by the total acres of the extended polygon, which is why the percent loss rates are different.)

The project area FWOP loss rate (in acres/year) is determined by applying the extended boundary percent loss rate to the marsh acres in the project area at the beginning of the USGS period of analysis (e.g. 1984 in this case) under FWOP. The project area FWP loss rate is determined by multiplying the acres of the marsh creation area by the percent loss rate and dividing by 2 to apply the 50% reduction in loss for marsh creation.

ACCRETION

Utilize the following accretion rates when running WVA models:

- Fresh Marsh and Intermediate Marsh = 7.2 mm/year.
- Brackish Marsh = 7.7 mm/year.

Accretion is incorporated into determining when the background loss rate resumes within a created marsh area. Normally, the loss of mechanically created or nourished marsh is considered to be half of background loss rate. In the year when post-construction accretion exceeds 10 inches, the loss rate returns to the background loss rate. However, when created marshes are higher than natural marshes, there could be a delay in the loss rate change. Depending on the mechanically created marsh elevation post-construction, cumulative accretion assumes a 3-year settling period (marsh creation sites are assumed to achieve full functionality and vegetation coverage 3 years after construction).

Marsh collapse is a 10-year period that begins when the calculated cumulative accretion deficit reaches limits determined by staff working on the modeling for the 2012 Coastal Master Plan (see below). Typically, the collapse criteria are reached only during the High SLR scenario, however this generalization may not hold true in all cases.

Collapse Threshold Ranges Used in Master Plan Work

- Intermediate Marsh (cm): Low = 30.7; High = 38.0; Median = 34.4
- Brackish Marsh (cm): Low = 20.0; High = 25.8; Median = 22.9.
- Saline Marsh (cm): Low = 16.0; High = 25.0; Median = 20.5.

Collapse threshold selected as the median range for type of marsh indicated. First year of collapse is the year when the Cumulative Accretion Deficit (inundation) is equal to or greater than the median range.

Accelerated Sea Level Rise

The land loss rates determined as described above, are for the constant historic or low SLR scenario (1.7 mm/yr). Based on water level gages and known historic SLR rates, the Corps has identified RSLR rates under the historic SLR scenario, and under the intermediate and high SLR scenarios. The intermediate and high SLR scenarios would result in gradually accelerating SLR rates and it is assumed that those scenarios would result in accelerating land loss rates. Using Corps-predicted water level rise, RSLR rates can be determined. RSLR rates are then converted into an annual adjustment factor that increases wetland loss rates in proportion to the magnitude of the RSLR rate. The annual wetland loss rate adjustment factors are based on a positive relationship observed between wetland loss rates and RSLR rates from coastwide non-fresh marshes. In this relationship, RSLR was calculated as the sum of subsidence per statewide subsidence zones (see Figure 1) plus a eustatic SLR rate of 1.7 mm/yr. Recent land loss rates in percent per year were plotted against RSLR determined for those subsidence zones.

Although this is approaching the limits of rigor for WVA, each of the above methods carry substantial averaging and compounding uncertainty. Users should be aware of the general limits of accuracy and avoid adding more complexity unless deemed necessary and reasonable.

4.2 RELATED TOPICS - GENERAL SHORELINE PROTECTION ISSUES

Hard structures (foreshore dikes, rock dikes, breakwaters) get credit for preventing 100% of loss from shoreline erosion as long as the structure is maintained. If it is not maintained, then a linear decrease in effectiveness must be assumed beginning after the end of the maintenance period. For example, if a rock dike is assumed to need a lift every 14 years but the last lift was at year 14 (TY14), then beginning TY28 (for the rock) it would have a linear decrease in effectiveness to the point of not reducing shoreline erosion at all by TY42.

Vegetative plantings get credit for reducing shoreline erosion by 50% until TY20. After TY20, the area would revert to 100% of the shoreline erosion rate.

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
441 G STREET, NW
WASHINGTON, DC 20314-1000

REPLY TO
ATTENTION OF

CECW-P

28 February 2012

MEMORANDUM FOR Director, National Ecosystem Restoration Planning Center of Expertise (ECO-PCX)

SUBJECT: Wetland Value Assessment Models – Coastal Marsh Module Version 1.0 – Approval for Use

1. The Coastal Marsh Community model is one of seven WVA community models that were developed by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Environmental Work Group. Based on information provided by the ECO-PCX, it is the understanding of the HQUSACE Model Certification Panel that this model will be used on the following projects over the next five years:

a. MRGO Ecosystem Restoration
b. Barataria Basin Barrier Shoreline
c. Lake Pontchatrain and Vicinity Hurricane Storm Damage Risk Reduction System (HSDRRS) Mitigation
d. West Bank and Vicinity HSDRRS Mitigation
e. HSDRRS IERS –total number unknown
f. Louisiana Coastal Area (LCA) 4 Davis Pond Modification
g. LCA4 Modification to Caernarvon
h. LCA4 Point Au Fer Island
i. LCA4 Caillou Lake Land Bridge
j. LCA Myrtle Grove
k. LCA White Ditch PED
l. LCA Mississippi River Hydrodynamic and Delta Management
m. LCA Caernarvon
n. Larose to Golden Meadow (LGM) Post-Authorization Change (PAC) Study
o. Larose to Golden Meadow Intracoastal Floodwall Reach 2b (LGM-022C).
p. Larose to Golden Meadow Intracoastal Floodwall Reach 2a (LGM-022B).
q. Larose to Golden Meadow C-North Highway 24 Relocation (LGM-001C).
r. Baptiste Collette Bayou Deepening study
s. Barataria Bay Waterway (CAP 204)
t. Buras Marina (CAP 206)
u. Calcasieu River and Pass (CAP 204)
v. Calcasieu Lock Replacement
w. Morganza to the Gulf PAC
x. Morganza to the Gulf Supplemental NEPA documents –total number unknown
y. Southwest Coastal
z. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) – West Bay Closure
aa. Houma Navigation Canal Deepening
bb. West Shore Lake Pontchartrain Hurricane & Flood Risk Reduction
cc. LCA Terrebonne Basin Barrier Shoreline Restoration
dd. LCA Demonstration Projects Grand Isle and Vicinity Project
ee. CAP 103 Grand Isle Highway 1 Shoreline Stabilization
ff. Donalsonville to the Gulf
gg. NOV Plaquemines Parish
hh. NFL Plaquemines Parish

Printed on Recycled Paper

2. Version 1.0 of the Coastal Marsh Community model is approved for use for the above projects. This approval for use is based on the decision of the HQUSACE Model Certification Panel which considered the ECO-PCX assessment of the model. Adequate technical reviews have been accomplished and the model meets the certification criteria contained in EC 1105-2-412. As indicated by the ECO-PCX, there are a number of unresolved issues related to the form of suitability graphs for Variables 1, 2 and 3 and the aggregation methods used to combine the marsh habitat units and open water habitat units for each sub-model. To increase the understanding of the sensitivity of the model to the unresolved issues and the impact the model differences may have on decision-making, the ECO-PCX is to work with the project delivery teams to conduct sensitivity analyses for each application of the marsh models. A summary of the sensitivity analyses must be presented in the project documentation and Agency Technical Review teams must be charged with reviewing the adequacy and findings of the sensitivity analyses.

3. It is expected that compiliation of the findings of the multiple sensitivity analyses will lead to updates and improvements of the model. As such, version control is imperative. The PCX must ensure that project delivery teams are are utilizing the most appropriate version of the model for their analyses and that they are properly identifiying the version of the model being used.

APPLICABILITY: This approval for use expires 28 February 2017 and is limited to the above studies with the caveat that updated versions of the model be used if appropriate.

HARRY E. KITCH, P.E.
Deputy Chief, Planning and Policy Division
Directorate of Civil Works