Functional Assessment

In accordance with the Compensatory Mitigation for Losses of Aquatic Resources (73 Fed. Ref. 19594, 10 April 2008) the Galveston District Corps has developed a functional assessment method, known as the Galveston District Corps Standard Operating Procedures (SOP) approach. The SOP implements the use of Hydrogeomorphic Approach for Assessing Wetland Functions (HGM) to determine the potential wetland functions and the appropriate compensatory mitigation for unavoidable wetland impacts. The Interim-HGM (iHGM) model was developed in order to efficiently assess specific priority wetland functions.

The results of these models are a number called a functional capacity index (FCI). This FCI is a quantitative number that estimated the capacity of the wetland to perform a function as it related to the adjacent water body. A FCI is calculated for three wetland perimeters; 1) Temporary Storage and Detention of Storage Water (TSSW), 2) Maintain Plan and Animal Community (MPAC), and 3) Removal and Sequestrian of Elements and Compounds (RSEC). In determining the amount of mitigation required, the functional capacity units (FCU) are calculated by multiplying the FCI by the acreage of the wetland. Functional capacity is defined as the degree to which an area of wetland performs a specific function. Below is a table summarizing the functional capacity of the emergent and forested wetlands located onsite.

Riverine Forested FCI Equations:

Temporary Storage & Detention of Storage Water:

$$\sqrt{\left[\sqrt{(V_{dur} * V_{freq})} * \frac{(V_{topo} + V_{cwd} + V_{wood})}{3}\right]}$$

Maintain Plant and Animal Community:

$$\frac{\left[V_{tree} + V_{cwd} + V_{rich} + \frac{[V_{basal} + V_{density}]}{2} + \left[\frac{(V_{mid} + V_{herb})}{2}\right] + V_{connect}\right]}{6}$$

Removal & Sequestrian of Elements & Compounds:

$$\frac{\left[V_{wood} + V_{freq} + V_{dur} + \left[\frac{(V_{topo} + V_{cwd} + V_{wood})}{3}\right] + \left[\frac{(V_{detritus} + V_{redox} + V_{sorpt})}{3}\right]\right]}{5}$$

Riverine Herbaceous FCI Equations:

Temporary Storage & Detention of Storage Water:

$$[\{V_{dur} \times V_{freq}\}^{1/2} \times \{V_{topo} + \{V_{herb} + V_{mid/2}\}/2] \; 1/2$$

Maintain Plant and Animal Community:

$$\{V_{mid} + V_{herb} + V_{connect}\}/3$$

Removal & Sequestrian of Elements & Compounds:

$$[[V_{wood} + V_{freq} + V_{dur} + [\{V_{topo} + V_{herb} + V_{mid}\}/3] + [\{V_{detritus} + V_{redox} + V_{sorpt}\}/3]]/5$$

Forested Wetland 1

Galveston District
Riverine Forested HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.25
Vfreq	0.25
Vtopo	0.40
Vcwd	0.30
Vwood	0.25
Vtree	0.30
Vrich	0.60
Vbasal	0.40
Vdensity	0.60
Vmid	1.00
Vherb	0.30
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.2814
post 0.0000

Maintain Plant & Animal Communities

pre 0.5583
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.2733
post 0.0000

FCU; FCI x wetland acres per WAA: acres= 0.10

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.03	0.00
Maintain Plant & Animal	0.06	0.00
Removal of Elements	0.03	0.00

WAA 1: Post-Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vcwd	0.00
Vwood	0.00
Vtree	0.00
Vrich	0.00
Vbasal	0.00
Vdensity	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.03
Maintain Plant & Animal	-0.06
Removal of Elements	-0.03

Forested Wetland 1

Riverine Forested HGM Interim

Variable	Subindex	Description	Observations
Vdur	0.25	In an average year at 25-50% of the WAA either floods and/or ponds for at leaset 7 consecutive days	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 125-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. WAA appears to be located in a deprssional area.
Vfreq	0.25	Floods or ponds less than 2 out of 5 years (100-500 yr floodplain grey w/out elevations)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 125-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. WAA appears to be located in a deprssional area.
Vtopo	0.40	Less than 15% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vcwd	0.30	Less than 3 pieces of cwd greater than 3" diameter along 100' transect	Within the WAA, 2 pieces of cwd, greater than 3-in. in diameter, were observed along a 100-ft transect.
Vwood	0.25	11 to 33% of the WAA is covered with woody vegetation	Within the WAA, tree stratum was observed and ranged from 20-25% in cover.
Vtree	0.30	Less than 20% of the stand is oak, hickory, cypress, maple and/or elm.	Oak, hickory, maple, and elm make up less than 20% of the stand. Tallow and black willow make up more than 15% of the stand.
Vrich	0.60	Three tree species present	Three tree species were observed within the WAA. The species observed included American elm, black willow, and Chinese tallow.
Vbasal	0.40	The average basal area of the WAA is less than 60 square ft /acre	The average basal area, observed using a 10 factor prism, was approximately 30 square ft/acre.
Vdensity	0.60	The WAA averages a tree density of 250-500 trees/acre OR 50-100 trees/acre	Approximately 60 trees/acre were observed in the field, only including trees with a 3-inch diameter or greater
Vmid	1.00	Midstory coverage of the WAA is more than 50%	Within the WAA, midstory coverage was limited, and ranged from 40-45%.
Vherb	0.30	Herbaceous cover in the WAA is less than 5% or greater than 50%	Within the WAA, midstory coverage was dense, and ranged from 80-90%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, less than 10% of the WAA contained detritus in the upper soil layers.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was 5-10%.
Vsorpt	0.50	WAA is dominated by loamy (silt loams, very fine sandy loams, loam) or non-montmorillonitic clays	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, and lawn (residential).

Forested Wetland 2

Galveston District
Riverine Forested HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.50
Vfreq	0.50
Vtopo	0.40
Vcwd	0.30
Vwood	0.75
Vtree	0.30
Vrich	0.80
Vbasal	0.80
Vdensity	0.60
Vmid	0.75
Vherb	0.30
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

WAA 1: Post-Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vcwd	0.00
Vwood	0.00
Vtree	0.00
Vrich	0.00
Vbasal	0.00
Vdensity	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

Temporary Storage & Dentention of Storage Water

pre 0.4916
post 0.0000

Maintain Plant & Animal Communities

pre 0.6042
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.5067
post 0.0000

FCU; FCI x wetland acres per WAA: acres= 0.09

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.04	0.00
Maintain Plant & Animal	0.05	0.00
Removal of Elements	0.05	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.04
Maintain Plant & Animal	-0.05
Removal of Elements	-0.05

Forested Wetland 2 **Riverine Forested HGM Interim**

Variable	Subindex	Description	Observations
Vdur	0.50	In an average year at 50-79% of the WAA either floods and/or ponds for at least 7 consecutive days	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vfreq	0.50	Floods or ponds 2 out of 5 years (100- year floodplain)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vtopo	0.40	Less than 15% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vcwd	0.30	Less than 3 pieces of cwd greater than 3” diameter along 100’ transect	Within the WAA, 2 pieces of cwd, greater than 3-in. in diameter, were observed along a 100-ft transect.
Vwood	0.75	67 to 90 % of the WAA is covered with woody vegetation	Within the WAA, tree stratum was observed and ranged from 75-80% in cover.
Vtree	0.30	Less than 20% of the stand is oak, hickory, cypress, maple and/or elm.	Oak, hickory, maple, and elm make up less than 20% of the stand. Tallow and black willow make up more than 15% of the stand.
Vrich	0.80	Four tree species present	Four tree species were observed within the WAA. The species observed included American elm, Chinese tallow, black willow, and green ash.
Vbasal	0.80	The average basal area of the WAA is between 80-100 square ft/acre	The average basal area, observed using a 10 factor prism, was approximately 90 square ft/acre.
Vdensity	0.60	The WAA averages a tree density of 250-500 trees/acre OR 50-100 trees/acre	Approximately 80 trees/acre were observed in the field, only including trees with a 3-inch diameter or greater
Vmid	0.75	Midstory coverage of the WAA is between 31-50 %	Within the WAA, midstory coverage was limited, and ranged from 35-40%.
Vherb	0.30	Herbaceous cover in the WAA is less than 5% or greater than 50%	Within the WAA, midstory coverage was dense, and ranged from 70-80%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, less than 10% of the WAA contained detritus in the upper soil layers.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was 5-10%.
Vsorpt	0.50	WAA is dominated by loamy (silt loams, very fine sandy loams, loam) or non-montmorillonitic clays	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, and lawn (residential).

Forested Wetland 3

Galveston District
Riverine Forested HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.50
Vfreq	0.50
Vtopo	0.40
Vcwd	0.30
Vwood	0.75
Vtree	0.30
Vrich	0.80
Vbasal	0.80
Vdensity	0.60
Vmid	0.75
Vherb	0.30
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.4916
post 0.0000

Maintain Plant & Animal Communities

pre 0.6042
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.5067
post 0.0000

FCU; FCI x wetland acres per WAA: acres= 0.01

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.00	0.00
Maintain Plant & Animal	0.01	0.00
Removal of Elements	0.01	0.00

WAA 1: Post-Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vcwd	0.00
Vwood	0.00
Vtree	0.00
Vrich	0.00
Vbasal	0.00
Vdensity	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	0.00
Maintain Plant & Animal	-0.01
Removal of Elements	-0.01

Forested Wetland 3

Riverine Forested HGM Interim

Variable	Subindex	Description	Observations
Vdur	0.50	In an average year at 50-79% of the WAA either floods and/or ponds for at least 7 consecutive days	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vfreq	0.50	Floods or ponds 2 out of 5 years (100- year floodplain)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vtopo	0.40	Less than 15% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vcwd	0.30	Less than 3 pieces of cwd greater than 3” diameter along 100’ transect	Within the WAA, 1 piece of cwd, greater than 3-in. in diameter, were observed along a 100-ft transect.
Vwood	0.75	67 to 90 % of the WAA is covered with woody vegetation	Within the WAA, tree stratum was observed and ranged from 75-80% in cover.
Vtree	0.30	Less than 20% of the stand is oak, hickory, cypress, maple and/or elm.	Oak, hickory, maple, and elm make up less than 20% of the stand. Tallow and black willow make up more than 15% of the stand.
Vrich	0.80	Four tree species present	Four tree species were observed within the WAA. The species observed included American elm, Chinese tallow, black willow, and green ash.
Vbasal	0.80	The average basal area of the WAA is between 80-100 square ft/acre	The average basal area, observed using a 10 factor prism, was approximately 80 square ft/acre.
Vdensity	0.60	The WAA averages a tree density of 250-500 trees/acre OR 50-100 trees/acre	Approximately 80 trees/acre were observed in the field, only including trees with a 3-inch diameter or greater.
Vmid	0.75	Midstory coverage of the WAA is between 31-50 %	Within the WAA, midstory coverage was limited, and ranged from 40-45%.
Vherb	0.30	Herbaceous cover in the WAA is less than 5% or greater than 50%	Within the WAA, midstory coverage was dense, and ranged from 75-85%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, less than 10% of the WAA contained detritus in the upper soil layers.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was 5-10%.
Vsorpt	0.50	WAA is dominated by loamy (silt loams, very fine sandy loams, loam) or non-montmorillonitic clays	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, and lawn (residential).

Forested Wetland 4

Galveston District
Riverine Forested HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	1.00
Vfreq	0.50
Vtopo	0.70
Vcwd	0.30
Vwood	1.00
Vtree	0.30
Vrich	0.60
Vbasal	0.80
Vdensity	0.60
Vmid	0.75
Vherb	0.30
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.10
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.6866
post 0.0000

Maintain Plant & Animal Communities

pre 0.5708
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.6667
post 0.0000

FCU; FCI x wetland acres per WAA: acres= 0.45

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.31	0.00
Maintain Plant & Animal	0.26	0.00
Removal of Elements	0.30	0.00

WAA 1: Post-Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vcwd	0.00
Vwood	0.00
Vtree	0.00
Vrich	0.00
Vbasal	0.00
Vdensity	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.31
Maintain Plant & Animal	-0.26
Removal of Elements	-0.30

Forested Wetland 4

Riverine Forested HGM Interim

Variable	Subindex	Description	Observations
Vdur	1.00	In an average year at 80% of the WAA either floods and/or ponds for at least 14 consecutive days	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. Standing water was observed within the WAA.
Vfreq	0.50	Floods or ponds 2 out of 5 years (100- year floodplain)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. Standing water was observed within the WAA.
Vtopo	0.70	15 - 30% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vcwd	0.30	Less than 3 pieces of cwd greater than 3” diameter along 100’ transect	Within the WAA, 2 pieces of cwd, greater than 3-in. in diameter, were observed along a 100-ft transect.
Vwood	1.00	Greater than 90% of the WAA is covered with woody vegetation	Within the WAA, tree stratum was observed in the field and ranged from 90-95% in cover.
Vtree	0.30	Less than 20% of the stand is oak, hickory, cypress, maple and/or elm.	Oak, hickory, maple, and elm make up less than 20% of the stand. Tallow and black willow make up more than 15% of the stand.
Vrich	0.60	Three tree species present	Three tree species were observed within the WAA. The species observed included American elm, black willow, and Chinese tallow.
Vbasal	0.80	The average basal area of the WAA is between 80-100 square ft/acre	The average basal area, observed using a 10 factor prism, was approximately 90 square ft/acre.
Vdensity	0.60	The WAA averages a tree density of 250-500 trees/acre OR 50-100 trees/acre	Approximately 80 trees/acre were observed in the field, only including trees with a 3-inch diameter or greater
Vmid	0.75	Midstory coverage of the WAA is between 31-50 %	Within the WAA, midstory coverage was limited, and ranged from 40-45%.
Vherb	0.30	Herbaceous cover in the WAA is less than 5% or greater than 50%	Within the WAA, midstory coverage was dense, and ranged from 80-90%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, less than 10% of the WAA contained detritus in the upper soil layers.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was 5-10%.
Vsorpt	0.10	The WAA is dominated by sandy soils (sands, loamy fine sands, loamy sands)	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, lawn (residential), and open water.

Forested Wetland 5

Galveston District
Riverine Forested HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.75
Vfreq	0.75
Vtopo	0.40
Vcwd	0.30
Vwood	1.00
Vtree	0.30
Vrich	0.80
Vbasal	0.80
Vdensity	0.40
Vmid	0.25
Vherb	0.30
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.6519
post 0.0000

Maintain Plant & Animal Communities

pre 0.5458
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.6733
post 0.0000

FCU; FCI x wetland acres per WAA: acres= 0.21

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.14	0.00
Maintain Plant & Animal	0.11	0.00
Removal of Elements	0.14	0.00

WAA 1: Post-Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vcwd	0.00
Vwood	0.00
Vtree	0.00
Vrich	0.00
Vbasal	0.00
Vdensity	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.14
Maintain Plant & Animal	-0.11
Removal of Elements	-0.14

Forested Wetland 5

Riverine Forested HGM Interim

Variable	Subindex	Description	Observations
Vdur	0.75	In an average year at 80% of the WAA either floods and/or ponds for at least 7 consecutive days	A portion of the WAA is located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. The WAA is also adjacent to an open water feature with an elevation of approximately 123-ft.
Vfreq	0.75	Floods or ponds 3 or 4 out of 5 years (elevation data reveals in floodway and mapped w/n 100 yr floodplain)	A portion of the WAA is located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. The WAA is also adjacent to an open water feature with an elevation of approximately 123-ft.
Vtopo	0.40	Less than 15% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vcwd	0.30	Less than 3 pieces of cwd greater than 3” diameter along 100’ transect	Within the WAA, 2 pieces of cwd, greater than 3-in. in diameter, were observed along a 100-ft transect.
Vwood	1.00	Greater than 90% of the WAA is covered with woody vegetation	Within the WAA, tree stratum was observed in the field and ranged from 90-95% in cover.
Vtree	0.30	Less than 20% of the stand is oak, hickory, cypress, maple and/or elm.	Oak, hickory, maple, and elm make up less than 20% of the stand. Tallow and black willow make up more than 15% of the stand.
Vrich	0.80	Four tree species present	Four tree species were observed within the WAA. The species observed included American elm, Chinese tallow, black willow, and green ash.
Vbasal	0.80	The average basal area of the WAA is between 80-100 square ft/acre	The average basal area, observed using a 10 factor prism, was approximately 80 square ft/acre.
Vdensity	0.40	The WAA averages less than 49 trees/acre or greater than 500 trees/acre	Approximately 40 trees/acre were observed in the field, only including trees with a 3-inch diameter or greater
Vmid	0.25	Midstory coverage of the WAA is less than 10%	Within the WAA, midstory coverage was limited, and ranged from 5-9%.
Vherb	0.30	Herbaceous cover in the WAA is less than 5% or greater than 50%	Within the WAA, midstory coverage was dense, and ranged from 80-90%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, less than 10% of the WAA contained detritus in the upper soil layers.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was 2-5%.
Vsorpt	0.50	WAA is dominated by loamy (silt loams, very fine sandy loams, loam) or non montmorillonitic clays	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, forest, and open water.

Forested Wetland 6

Galveston District
Riverine Forested HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.75
Vfreq	0.75
Vtopo	0.40
Vcwd	0.30
Vwood	1.00
Vtree	0.30
Vrich	0.80
Vbasal	0.80
Vdensity	0.40
Vmid	0.25
Vherb	0.30
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

WAA 1: Post-Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vcwd	0.00
Vwood	0.00
Vtree	0.00
Vrich	0.00
Vbasal	0.00
Vdensity	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

Temporary Storage & Dentention of Storage Water

pre 0.6519
post 0.0000

Maintain Plant & Animal Communities

pre 0.5458
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.6733
post 0.0000

FCU; FCI x wetland acres per WAA: acres= 0.12

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.08	0.00
Maintain Plant & Animal	0.07	0.00
Removal of Elements	0.08	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.08
Maintain Plant & Animal	-0.07
Removal of Elements	-0.08

Forested Wetland 6

Riverine Forested HGM Interim

Variable	Subindex	Description	Observations
Vdur	0.75	In an average year at 80% of the WAA either floods and/or ponds for at least 7 consecutive days	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. The WAA is also adjacent to an open water feature with an elevation of approximately 123-ft.
Vfreq	0.75	Floods or ponds 3 or 4 out of 5 years (elevation data reveals in floodway and mapped w/n 100 yr floodplain)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event. The WAA is also adjacent to an open water feature with an elevation of approximately 123-ft.
Vtopo	0.40	Less than 15% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vcwd	0.30	Less than 3 pieces of cwd greater than 3” diameter along 100’ transect	Within the WAA, 2 pieces of cwd, greater than 3-in. in diameter, were observed along a 100-ft transect.
Vwood	1.00	Greater than 90% of the WAA is covered with woody vegetation	Within the WAA, tree stratum was observed in the field and ranged from 90-95% in cover.
Vtree	0.30	Less than 20% of the stand is oak, hickory, cypress, maple and/or elm.	Oak, hickory, maple, and elm make up less than 20% of the stand. Tallow and black willow make up more than 15% of the stand.
Vrich	0.80	Four tree species present	Four tree species were observed within the WAA. The species observed included American elm, Chinese tallow, black willow, and green ash.
Vbasal	0.80	The average basal area of the WAA is between 80-100 square ft/acre	The average basal area, observed using a 10 factor prism, was approximately 80 square ft/acre.
Vdensity	0.40	The WAA averages less than 49 trees/acre or greater than 500 trees/acre	Approximately 40 trees/acre were observed in the field, only including trees with a 3-inch diameter or greater
Vmid	0.25	Midstory coverage of the WAA is less than 10%	Within the WAA, midstory coverage was limited, and ranged from 5-9%.
Vherb	0.30	Herbaceous cover in the WAA is less than 5% or greater than 50%	Within the WAA, midstory coverage was dense, and ranged from 75-85%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, greater than 85% of the WAA contained detritus in the upper soil layers. The WAA did not contain areas 'washed by high velocity flood water'.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was 5%.
Vsorpt	0.50	WAA is dominated by loamy (silt loams, very fine sandy loams, loam) or non montmorillonitic clays	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, forest, and open water.

Emergent Wetland 1

Galveston District
Riverine Herbaceous/Shrub HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.75
Vfreq	0.50
Vtopo	0.10
Vwood	0.10
Vmid	0.10
Vherb	1.00
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.4461
post 0.0000

Maintain Plant & Animal Communities

pre 0.7000
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.4100
post 0.0000

WAA 1: Post Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vwood	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

FCU; FCI x wetland acres per WAA: acres= 0.08

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.04	0.00
Maintain Plant & Animal	0.06	0.00
Removal of Elements	0.03	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.04
Maintain Plant & Animal	-0.06
Removal of Elements	-0.03

Variable	Subindex	Description	Observations
Vdur	0.75	In an avg. year at least 80% of the WAA either floods or ponds for 7 consecutive days.	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vfreq	0.25	Floods or ponds less than 2 out of 5 years (100-500 yr floodplain grey w/out elevations)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vtopo	0.10	Smooth, flat or very gentle undulating with little or no topographic features	No significant topographic features were observed in the field. The WAA was smooth.
Vwood	0.25	11 to 33% of the WAA is covered with woody vegetation	A limited tree stratum was observed in the field within the WAA, and ranged from 11-15% in cover.
Vmid	0.25	Midstory coverage of the WAA is between 1-25%	Within the WAA, midstory coverage was limited, and ranged from 5-10%.
Vherb	1.00	Herbaceous cover in the WAA averages greater than 75%	Within the WAA, herbaceous coverage was dense, and ranged from 80-85%.
Vdetritus	1.00	Greater than 85% of the area possesses an O or A horizon	Based on soil samples, approximately 85-90% of the WAA contained detritus in the upper soil layers. The WAA did not contain areas 'washed by high velocity flood water'.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field ranged from 5-15%.
Vsorpt	0.10	The WAA is dominated by sandy soils (sands, loamy fine sands, loamy sands)	Based on soil samples, the WAA was dominated by a combination of sandy loam and silty sandy soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, forest, and lawn (residential).

Emergent Wetland 2

Galveston District
Riverine Herbaceous/Shrub HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.75
Vfreq	0.50
Vtopo	0.40
Vwood	0.10
Vmid	0.10
Vherb	1.00
Vdetritus	0.50
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.5393
post 0.0000

Maintain Plant & Animal Communities

pre 0.7000
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.4433
post 0.0000

WAA 1: Post Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vwood	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

FCU; FCI x wetland acres per WAA: acres= 0.10

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.05	0.00
Maintain Plant & Animal	0.07	0.00
Removal of Elements	0.04	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.05
Maintain Plant & Animal	-0.07
Removal of Elements	-0.04

Variable	Subindex	Description	Observations
Vdur	0.75	In an avg. year at least 80% of the WAA either floods or ponds for 7 consecutive days.	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vfreq	0.50	Floods or ponds less than 2 out of 5 years (100-500 yr floodplain grey w/out elevations)	The WAA is not located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vtopo	0.40	Less than 15% of the WAA is represented by dips, hummocks, channel sloughs and/or other topographic features	Few topographic features were observed in the field. Small dips were observed within the WAA.
Vwood	0.10	11 to 33% of the WAA is covered with woody vegetation	A limited tree stratum was observed in the field within the WAA, and ranged from 11-15% in cover.
Vmid	0.10	Midstory coverage of the WAA is between 1-25%	Within the WAA, midstory coverage was limited, and ranged from 5-10%.
Vherb	1.00	Herbaceous cover in the WAA averages greater than 75%	Within the WAA, herbaceous coverage was dense, and ranged from 80-85%.
Vdetritus	0.50	From 11-84% of the area possesses an O or A horizon	Based on soil samples, approximately 15-25% of the WAA contained detritus in the upper soil layers. The WAA did not contain areas 'washed by high velocity flood water'.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was approximately 5-10%.
Vsorpt	0.50	The WAA is dominated by sandy soils (sands, loamy fine sands, loamy sands)	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, forest, and open water.

Emergent Wetland 3

Galveston District
Riverine Herbaceous/Shrub HGM Interim

WAA 1: Pre-Construction Scores

Variable	Subindex
Vdur	0.75
Vfreq	0.75
Vtopo	0.10
Vwood	0.10
Vmid	0.10
Vherb	1.00
Vdetritus	0.30
Vredox	0.10
Vsorpt	0.50
Vconnect	1.00

Temporary Storage & Dentention of Storage Water

pre 0.4937
post 0.0000

Maintain Plant & Animal Communities

pre 0.7000
post 0.0000

Removal & Sequestrian of Elements & Compounds

pre 0.4600
post 0.0000

WAA 1: Post Construction Scores

Variable	Subindex
Vdur	0.00
Vfreq	0.00
Vtopo	0.00
Vwood	0.00
Vmid	0.00
Vherb	0.00
Vdetritus	0.00
Vredox	0.00
Vsorpt	0.00
Vconnect	0.00

FCU; FCI x wetland acres per WAA: acres= 0.05

WAA#	Pre-project FCUs	Post Project FCUs
Temp Storage of Water	0.02	0.00
Maintain Plant & Animal	0.04	0.00
Removal of Elements	0.02	0.00

Potential Functional Capacity Impacts or Improvements

Temp Storage of Water	-0.02
Maintain Plant & Animal	-0.04
Removal of Elements	-0.02

Variable	Subindex	Description	Observations
Vdur	0.75	In an avg. year at least 80% of the WAA either floods or ponds for 7 consecutive days.	The WAA is located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vfreq	0.75	Floods or ponds 3 or 4 out of 5 years (elevation data reveals in floodway and mapped w/n 100 yr floodplain)	The WAA is located within the FEMA Mapped 100-year floodplain and the base flood elevation for the nearby waterway is approximately 125-ft (Carters Slough). According to LiDAR (H-GAC 2008, 1-ft contours), the elevation of the WAA is approximately 123-ft. The nearby waterway (Carters Slough) is at an elevation of 120-ft., which suggests that flooding within the WAA could occur during a high rainfall event.
Vtopo	0.10	Smooth, flat, or very gentle undulating with little or no topographic features	No significant topographic features were observed in the field. The WAA was smooth.
Vwood	0.10	11 to 33% of the WAA is covered with woody vegetation	A limited tree stratum was observed in the field within the WAA, and ranged from 11-15% in cover.
Vmid	0.10	Midstory coverage of the WAA is between 1-25%	Within the WAA, midstory coverage was limited, and ranged from 10-15%.
Vherb	1.00	Herbaceous cover in the WAA averages greater than 75%	Within the WAA, herbaceous coverage was dense, and ranged from 75-85%.
Vdetritus	0.30	Less than 10% of the area possesses an O or A horizon	Based on soil samples, less than 10% of the WAA contained detritus in the upper soil layers.
Vredox	0.10	Redox features less than 20%	Based on soil samples, redox composition observed in the field was approximately 2-5%.
Vsorpt	0.50	The WAA is dominated by sandy soils (sands, loamy fine sands, loamy sands)	Based on soil samples, the WAA was dominated by sandy loam soils.
Vconnect	1.00	Wetland plus four habitats and/or surrounded by forested	Based on GIS analysis, the WAA was surrounded by multiple habitats within 600-feet including herbaceous, shrub/sapling, forest, and open water.