ATTACHMENT III

SWEET LAKE/WILLOW LAKE PROJECT

# PROJECT COMPLETION REPORT

# PROJECT COMPLETION REPORT[1]

**PROJECT NAME** Sweet/Willow Lake CU #1

**CWPPRA/STATE PROJECT NO.** CS 11B

**Report Date:** May 16, 2001 **BY:** USDA-NRCS

**1. Project Managers/Contracting Officer:**

| | | | |
|---|---|---|---|
| **DNR Project Manager** | **Mel Guidry** | **Telephone** | (337) 893-7947 |
| **DNR Construction Project Manager** | **Mel Guidry** | **Telephone** | (337) 893-7947 |
| **DNR Monitoring Manager** | **Troy Mallach** | **Telephone** | (337) 898-1151 |
| **Federal Agency Project Manager** | **Marty Floyd** | **Telephone** | (318) 473-7690 |
| **Federal Agency Contracting Officer** | **Charles Phillips** | **Telephone** | (318) 473-7796 |

**2. Location and description of projects as approved for construction by Task Force.**
This project will be completed in multiple contracts. This completion report is representative of only that portion of work completed in Construction Unit #1.

The work in this phase included placement of rock riprap dike along the north bankline of the Gulf Intracoastal Water Way (GIWW) in Cameron Parish. The rock riprap dike will stabilize approximately 14,300 linear feet of shoreline at Sweet Lake and approximately 4,200 linear feet of shoreline at Willow Lake along the GIWW by breaking navigation-induced waves. Where flotation dredging was required, the dredge material excavated from the flotation channel was placed on the inside of the rock riprap dike. The rock riprap dike was joined to the existing shoreline.

**3. Final, as-built features, boundaries and resulting acreage.**
The completed work under Construction Unit #1 consisted of the installation of 17,460 linear feet of foreshore rock dike along the Gulf Intracoastal Waterway. The dike was constructed as a peaked dike with 2 horizontal to 1 vertical side slopes. The finished elevation of the top of the dike was +4.0 NAVD 88. A Class I woven geotextile was placed under the rock riprap dike. Settlement plates were placed in the rock dike at 1000 foot intervals.

Further information is available on the previously submitted "As Built" drawings.

**Actual Benefited Acres** 189

**4. Key project cost elements**

| | **CWPPRA Project Cost Estimates**** | **Cost Incurred as of Construction Completion** |
|---|---|---|
| **Construction (includes S&I)** | **THIS INFORMATION WILL BE COMPLETED AT THE TIME WHEN ALL PHASES OF CONSTRUCTION ARE COMPLETED** | |
| **E & D** | | |
| **Landrights** | | |
| **Monitoring** | | |
| **O & M** | | |
| **Total** | | |

****Most recent estimate from CWPPRA Project estimates Report produced by USACOE.**

[1]To be filled out at construction completion by either the DNR Construction Project Manager or the Federal Agency Contracting Officer depending on which organization had lead role for construction of project. (Except for some items under # 13).

| SCHEDULE OF ITEMS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Item No. | Work | Est. Quantity | Unit | Est. Unit Price | Estimated Amount | Final Quan. | Bid Unit Price | Final Amount | % Over or Under |
| | Mobilization and Demobilization | 1 | Job | $40,000.00 | $40,000.00 | 1 | $20,000.00 | $20,000.00 | 0% |
| 2 | Geotextile | 47,000 | S.Y. | $ 2.00 | $94,000.00 | 49,438 | $ 2.00 | $98,876.00 | 5% |
| 3 | Rock Riprap* | 55,550 | Tons | $21.00 | $1,166,550.00 | 81,562 | $ 22.50 | $1,835,145.00 | 47% |
| 4 | Metal Fabrication & Installation, Settlement Plates | 20 | Each | $1,000.00 | $20,000.00 | 21 | $500.00 | $10,500.00 | 5% |
| 5 | Timber Piles | 4 | Each | $ 500.00 | $2,000.00 | 4 | $1,000.00 | $4,000.00 | 0% |

Final Contract Amount $ 1,968,521.00

* Modification #1

**6. Construction and construction oversight (Construction Unit #1 Only)**

| | |
|---|---|
| **Prime construction contractor** | **Luhr Brothers Inc.** |
| **Subcontractor** | **None** |
| **Subcontractor** | |
| **Original construction contract** | **$1,377,875.00** |
| **Change orders** | **$ 505,125.00** |
| **Over/(Under) Runs** | **$ 85,521.00** |
| **Final construction contract** | **$1,968,521.00** |

| | | | |
|---|---|---|---|
| **Const. oversight contractor** | **None** | **Const. amt.** | **$** |
| **Cons. O.S./Admin. agency** | **NRCS** | **Est. amt.** | **$** |

**7. Major equipment used.**

Spud barge with Bucyrus Erie 88B dragline
2. Spud barge with Vicon 4600 dragline
3. Tug boat – Albob

**8. Discuss construction sequences and activities, problems encountered, solutions to problems, etc.**

Upon mobilization to the site the contractor began placement of the rock dike on the east end of the Sweet Lake portion of the contract. The contractor proceeded westerly placing the rock dike. On December 10, 1999, the Contractor's Superintendent brought to the attention of the COTR that the estimated quantity of rock in the original contract appeared to be low. An assessment of the initial settlement and a review of the surveys from which the estimated contract quantities were developed was made. It was determined that settlement in excess of the design estimate was partially the cause of the quantity over run. Also it appeared that the elevation at the centerline of the dike alignment had eroded slightly from ıe time of the design surveys to the time of construction. These two items combined to cause the overrun of quantities. The quantities were recomputed using new survey data and the settlement that was occurring. A modification was issued ɔ increase the quantity of rock within the contract from 55,550 tons to 74,000 tons.

Placement of the dike continued from east to west. Upon completion of placement of the dike to the westerly end, the contractor then proceeded back east recapping low areas in the dike.

9. **Construction change orders and field changes.**

Only one modification was issued during the contract. This modification increased the quantity of Bid Item 3, Rock Riprap from 55,550 tons to 78,000 tons for an increase of 22,450 tons. The modification also included the requirement to leave an 80 foot gap in the rock dike from station 94+20 to station 95+00 to allow for barge access to the west side of Sweet Lake. The cost of the modification was $505,125.00. Also the performance time was extended by 22 days.

10. **Pipeline and other utility crossings.**

| Structure | Owner | Rep. To Contact |
|---|---|---|
| No construction was performed over or within the ROW of any pipelines. | | |

11. **Safety and Accidents.**

There were no reported accidents during construction of the project. Overall the work was carried out in a safe manner, and the contractor was safety conscientious.

12. **Additional comments pertaining to construction, completed project, etc.**

The work was accomplished in an orderly fashion, producing a quality finished product.

Other comments can be found on the Continuation sheets.

13. **Significant Construction Dates: To be filled out by DNR Construction Project Manager or Contracting Officer for construction for Agency responsible for construction.**

| | Date | Bid I.D. |
|---|---|---|
| **Bid I.D. (Construction, Vegetation, etc.)** | | **50-7217-9-17** |
| **Bid Opening** | **7/22/99** | |
| **Construction Contract Award** | **8/16/99** | |
| **Preconstruction Conference** | **10/6/99** | |
| **Notice to Proceed** | **11/01/99** | |
| **Mobilization** | **11/29/99** | |
| **Construction Start** | **12/02/99** | |
| **Construction Completion** | **1/27/00** | |
| **Final Acceptance** | **1/27/00** | |

**If different bids are taken, repeat this table to individually reflect each bid and attach tables.**

**Other significant Project Dates**

| | Date |
|---|---|
| **Project Implementation closeout**** | **This will be done after completion of CU#2** |
| **Start of Preconstruction Monitoring***** | |
| **Preconstruction Aerial Photography Acquisition***** | |
| **Monitoring Plan Completion***** | |

**** Final implementation closeout is made by either the DNR Project Manager or the Federal Agency Contracting Officer depending on which organization had lead role for construction of project.**

***** To be completed by DNR Project Manager.**

## NRCS SUPPLEMENT TO COMPLETION REPORT

CONTRACT ADMINISTRATION

List any significant problems encountered in the administration of the construction contract and recommended solution for future contract of like nature.

| DESCRIPTION OF PROBLEM ENCOUNTERED | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| 1. NONE | |

## CONSTRUCTION PLANS

List any items pertinent to the plans that caused problems, need clarification or changes for future contracts of this nature.

| DESCRIPTION OF ITEM IN PLANS | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| 1. The rock required to construct the dike was a Corp of Engineer's R650 gradation. This gradation has the largest stones at approximately 21 inches and the D50 stone at approximately 14 inches. The plans indicate the dike to be constructed with no top width. This is impractical due to the size of the stone specified in the contract. | For future contracts where a rock dike is to be constructed, a minimum top width should be shown on the drawings. The following widths are recommended for stone gradations:<br>R650 3 foot top width<br>R400 2 foot top width |

## GENERAL COMMENTS

List any significant items which worked well and should be repeated or which caused problems, need clarification or changes for future contracts of this nature.

| DESCRIPTION OF ITEM | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| 1. From the time the design surveys were performed to the time the contract was awarded, the channel bottom where the dike was to be placed eroded slightly in some locations. This was in part responsible for the over-run of rock riprap quantities used in the contract. | It is recommended that during the advertisement of the contract that field verifications be performed to assure that no changes to the site has occurred. |

# PROJECT COMPLETION REPORT

**PROJECT NAME** — **Sweet/Willow Lake Hydrologic Restoration Construction Units #2 & #3**

**CWPPRA/STATE PROJECT NO.** — **CS-11b**

**Report Date:** January 27, 2003 **BY:** USDA - NRCS

**Project Managers/Contracting Officer:**

| | | | |
|---|---|---|---|
| DNR Project Manager | Pat Landry | Telephone | (337) 893-8763 |
| DNR Construction Project Manager | Mel Guidry | Telephone | (337) 893-3643 |
| DNR Monitoring Manager | Troy Mallach | Telephone | (337) 898-1151 |
| Federal Agency Project Manager | Marty Floyd | Telephone | (318) 473-7690 |
| Federal Agency Contracting Officer | Charles Phillips (CU #2)<br>Patti Woods (CU #3) | Telephone | (318) 473-7796<br>(318) 473-7645 |
| Federal Agency Design Engineer | Cherie LaFleur | Telephone | (318) 473-7674 |
| Federal Agency Construction Engineer | Wayne Melancon | Telephone | (337) 783-1257 |
| Federal Agency Construction Inspector | Gary Prioux | Telephone | (337) 783-1257 |

2. **Location and description of projects as approved for construction by Task Force.**
The project area is located in southwestern Louisiana in the Calcasieu-Sabine Basin. The project is north of the GIWW and west of Gibbstown in Cameron Parish. This portion of the project (Construction Units #2 & #3) consisted of constructing approximately 76,656 linear feet of shallow water earthen terraces. The shallow water terraces in Sweet Lake and Willow Lakes followed the shoreline contour. Gaps, a minimum of 50 feet in width, were placed at each existing channel openings. The terraces in the open marsh area between the 2 lakes positioned to reduce wave action resulting from long fetch lengths. Each terrace was planned to be 500 linear feet in length with a gap of 50 linear feet between the terraces. Vegetative plantings were installed for all terraces immediately after construction. The plants are giant cutgrass planted on 5' spacing.

3. **Final, as-built features, boundaries and resulting acreage (use attachments if necessary).**
This completion report details the vegetated terrace construction completed in Construction Units #2 and #3. Construction Unit #2 consisted of installation of Terraces 1-8 (25,931 Linear feet) in the open water area north of Sweet Lake plus all of the work performed in Construction Unit #3; however due to complications with the contractor, timing of the installation of the plants, and weather, the contract was terminated after completion of only Terraces 1-8. The Sweet and Willow Lake Terraces were then built the following year in Construction Unit #3. Construction Unit #3 consisted of the installation of the terraces along the rim of Sweet Lake and Willow Lake (50,547 linear feet). See the "As Built" drawings for actual locations and dimensions.

**Actual Benefited Acres** 247

**Key project cost elements**

| | CWPPRA Project Cost Estimates** | Cost Incurred as of Construction Completion |
|---|---|---|
| **Construction** | **$3,848,600.00** | **$2,822,933.27** |
| **E & D** | **$470,552.00** | **$344,333.90** |
| **Landrights** | **$51,552.00** | **$0.00** |
| **Monitoring** | **$146,601.00** | **$0.00** |
| **O & M** | **$478,513.00** | **$0.00** |
| **Total** | **$4,995,818.00** | **$3,167,267.17** |

**** Most recent estimate from CWPPRA Project estimates Report produced by USACOE.**

**5. Items of Work Construction Unit #2**

| Item No. | Work | Est. Quantity | Unit | Est. Unit Price | Est. Amount | Final Quant. | Bid Unit Price | Final Amount | % Over /Under |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Mobilization and Demobilization | 1 | Job | L.S. | $100,000.00 | 1 | $25,000.00 | $20,000.00 | 0.0% |
| 2 | Shallow Water Terraces 1-8 | 25,421 | LF | $10.00. | $254,210.00 | 25,931 | $2.50 | $64,827.50 | 2.0% |
| 3 | Shallow Water Terraces WLT 1-4 | 20,132 | LF | $12.00 | $241,584.00 | -- | $2.50 | -- | |
| 4 | Shallow Water Terraces SLT 1-11 | 31,072 | LF | $11.00 | $341,792.00 | -- | $2.50 | -- | |
| 5 | Vegetative Planting Terraces 1-8 | 10,354 | EA | $8.25 | $85,420.50 | 10,451 | $8.00 | $83,608.00 | 0.9% |
| 6 | Vegetative Planting Old Levee | 402 | EA | $8.25 | $3,316.50 | -- | $8.00 | -- | |
| 7 | Vegetative Planting Willow Lake Terraces | 8,070 | EA | $8.25 | $66,577.50 | -- | $8.00 | -- | |
| 8 | Vegetative Planting Sweet Lake Terraces | 14,874 | EA | $8.25 | $122,710.50 | -- | $8.00 | -- | |

Original Est. Amount $1,195,811.00

Original Bid Amount $ 486,162.50

**Final Contract Amount $168,435.50***

*** There currently is still an outstanding claim on this contract that has not been settled to date. Upon completion of the claim, a revised completion form will be submitted.**

**Items of Work Construction Unit #3**

| Item No. | Work | Est. Quantity | Unit | Est. Unit Price | Est. Amount | Final Quant. | Bid Unit Price | Final Amount | % Over /Under |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Mobilization and Demobilization | 1 | Job | L.S. | $80,000.00 | 1 | $25,283.26 | $25,283.26 | 0.0% |
| 2 | Shallow Water Terraces WLT 1-4 | 20,998 | LF | $4.00. | $83,992.00 | 20,650 | $5.95 | $122,867.50 | -1.7% |
| 3 | Shallow Water Terraces SLT 1-11 | 31,776 | LF | $4.00. | $127,104.00 | 29,897 | $5.95 | $177,887.15 | -5.9% |
| 4 | Vegetative Planting Willow Lake Terraces | 8,418 | EA | $8.25 | $69,448.50 | 8269 | $7.48 | $61,852.12 | -1.8% |
| 5 | Vegetative Planting Sweet Lake Terraces | 12,760 | EA | $8.25 | $105,270.00 | 11987 | $7.48 | $89,662.76 | -6.1% |

Original Est. Amount $ 465,814.50

Modification #1 Original Bid Amount $497,700.00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Seeding & Fertilization Willow Lake Terraces | 1 | Job | L.S. | $2,650.00 | 0 | $2,100.00 | $0.00 | 0.0% |
| 7 | Seeding & Fertilization Sweet Lake Terraces | 1 | Job | L.S. | $4,000.00 | 0 | $4,300.00 | $0.00 | NA |
| 8 | Plant Anchors Sweet Lake | 12,760 | EA | $1.50. | $19,140.00 | 11,987 | $1.00 | $11,987.00 | -6.1% |
| | Seed Restocking Fee for seed that could not be used due to high water | | | | | | | $299.12 | |
| | Material Cost of 773 plant anchors that were not used @ $0.37 each | | | | | | | $286.01 | |

Cost of Modification #1 $12,572.13

**Final Contract Amount $490,124.92**

**6. Construction and construction oversight**

| | Construction Unit #2 50-7217-1-4 | Construction Unit #3 50-7217-2-3 |
|---|---|---|
| Prime construction contractor | P & L Contracting, Inc. | M & M Electric |
| Subcontractor | Presco Amphibious | |
| Vegetative Subcontractor | Wetlands Restoration | Danny Broussard Coastal Plants |
| Original construction contract | $486,162.50 | |
| Change orders | Contract Terminated after partial completion $319,778.00 terminated | |
| Over/Under runs (original items) | $2,051.00 | - $20,147.21 |
| Final construction contract | $168,435.50* | |

***There currently is still an outstanding claim on this contract that has not been settled to date. Upon completion of the claim, a revised completion form will be submitted.**

**Oversight & Administration for Construction Units #2 & #3**

Const. oversight contractor N/A. Final amt. $0.00

Cons. O.S./Admin. agency NRCS Est. amt.

**Major equipment used.**

**Construction Unit #2**

- 322B Caterpillar long reach marsh buggy hydraulic excavator
- Two 4300 Link Belt marsh buggy hydraulic excavators
- 270 Kamatsu marsh buggy hydraulic excavator
- 5800 Link Belt marsh buggy hydraulic excavator
- Two airboats

**Construction Unit #3**

- Daewoo 220 marsh buggy long reach hydraulic excavator
- 2800 Link Belt marsh buggy long reach hydraulic excavators
- 5800 Link Belt marsh buggy hydraulic excavator
- Deck Barge and Tug
- Work boat with outboard motor

8. **Discuss construction sequences and activities, problems encountered, solutions to problems, etc.**

**Construction Unit #2**

The contractor began construction of the north terraces (no.'s 1-8). The terrace construction consisted of making two lifts of the earth material. The first lift was placed and allowed to dewater and settle for several days, then a second lift was placed and shaped to the final configuration of the terrace.

The construction start date of the terraces was delayed because the contract required the contractor to install the vegetative plantings within 15 days of completion of each 1000' of terrace. The window for installing the plants was June 1 to October 1. The contractor's plant supplier did not have the plants grown to meet the specifications by the June 1 date, thus delaying the construction of the terraces. The contractor actually began construction of the terraces on August 1, 2001 . After the start of construction, unseasonably high water occurred for a considerable period of time. The contractor could not work in the high water conditions. Also during the terrace construction, only two of the five machines listed above were working at any given time due to breakdowns and lack of operators. Because of all of these conditions combined, there was no way the contractor could complete and vegetate all of the terraces in the contract before the October 1 planting date. Therefore the Government decided to terminate the contract with only the north terraces being completed and re-procure for the remaining work the next year.

**Construction Unit #3**

The contractor began construction of the north Willow Lake Terraces. The contractor began by placing a first lift of material without shaping the terrace for the entire perimeter of Willow Lake. Upon completion of the first lift the contractor started with the second lift, adding material and shaping the terrace into its final configuration. The contractor had his forces installing the plant materials immediately behind the equipment performing the final shaping.

It was during the final shaping and plant installation phase of the construction on Willow Lake that a strong storm occurred that caused significant erosion of the newly constructed terrace. The wave energies also washed out many of the recently installed plants on the lakeside of the terrace. It was at this point that the modification was issued to install all of the plants on the protected side of the terrace for Sweet Lake. It became apparent that the life of the earthen terrace would be less than anticipated; therefore by moving all of the plants to the protected side, a more rapid and dense vegetative barrier could be produced before the terrace is eroded.

After completion of the Willow Lake Terraces, the contractor moved to Sweet Lake and began construction of the terraces there. The construction sequence for Sweet Lake consisted of 3 passes to completely form the terrace. The first two passes consisted of placing material to form the foundation of the terrace. The third pass added material as needed and shaped the terrace into its final configuration. Plants were installed immediately behind the equipment performing the final shaping.

9. **Construction change orders and field changes.**

**Construction Unit #2**

1. Modification #1 changed the clay content within the potting media for the plants from 40% to 37% at no cost or time.
2. Modification #2 added the anticipated adverse weather days for August, September and October at no cost or time change.

**Construction Unit #3**

1. Modification #1 added the requirement to seed and fertilize the terraces upon completion, changed the location of the plantings of giant cut grass on Sweet Lake from both sides of the terraces to the protected side of the terrace only, and added the requirement for the use of plant anchors on the Sweet Lake plantings. At the time the terraces were ready to be seeded, there was an extended period of high water. For that reason the terraces were not seeded and the contractor was paid a restocking fee for the seed he had purchased.

10. **Pipeline and other utility crossings.**

| Structure | Owner | Rep. To Contact |
|---|---|---|
| Pipeline | Kinder Morgan | |
| Pipeline | Natural Gas Pipeline Co. | (312) 431-4330 |
| Pipeline | Columbia Gulf Transmission Co. | (337) 824-3592 |
| Powerline | Jefferson Davis Electric Coop | (337) 824-4330 |

11. **Safety and Accidents.**

No accidents were observed or reported during the construction.

12. **Additional comments pertaining to construction, completed project, etc.**

**Construction Unit #2**

There were significant problems with Construction Unit #2. The contractor's plant supplier did not have enough plants that met specifications ready in a timely manner to allow the contractor to begin construction of the terraces. This caused significant delays that rippled throughout the contract. Also unusually high water and continuous equipment breakdowns hampered the contractor's progress in constructing the terraces. For the reasons previously stated, and the fact that the plants had to be installed by October 1, the contract was terminated after completion of only Terraces 1-8.

**Construction Unit #3**

During the construction of the Willow Lake Terraces, considerable erosion due to wave action was continually occurring. Upon completion of the earthwork and installation of the plants, the terraces continued to erode more rapidly than originally anticipated. The life of the terraces for both Sweet and Willow Lakes will be minimal, but should provide protection for the plants on the protected side for a duration long enough to take root and propagate, thus providing the vegetative buffer.

13. Significant Construction Dates: To be filled out by DNR Construction Project Manager or Contracting Officer for construction for Agency responsible for construction.

| Bid I.D. | Construction Unit #2<br>50-7217-1-4 | Construction Unit #3<br>50-7217-2-3 |
|---|---|---|
| [redacted] | Date | Date |
| Bid Opening | 1/25/2001 | 1/31/2002 |
| Construction Contract Award | 2/22/01 | 2/4/2002 |
| Preconstruction Conference | 3/15/2001 | 3/7/2002 |
| Notice to Proceed | 3/19/2001 (growing plants)<br>6/1/2001 (terrace construction) | 4/22/2002 (growing plants)<br>6/18/2002 (terrace construction) |
| Mobilization | 7/30/2001 | 6/24/2002 |
| Construction Start | 8/1/2001 | 6/24/2002 |
| Construction Completion | 10/1/2001 | 10/2/2002 |
| Final Acceptance | 10/1/2001 | 10/3/2002 |

## NRCS SUPPLEMENT TO COMPLETION REPORT

### CONTRACT ADMINISTRATION

List any significant problems encountered in the administration of the construction contract and recommended solution for future contract of like nature.

| DESCRIPTION OF PROBLEM ENCOUNTERED | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| Construction Unit #2: Most of the problems encountered were due to plants not meeting specifications in a timely manner to be installed. This delayed the construction of the terraces and subsequently caused termination of the contract prior to completion. | The specifications were changed after Construction Unit #2 to require a certain percentage of plants to meet specifications by specified dates, or the contract will be terminated. This has helped but not solved all of the problems encountered in vegetative terrace construction. One concern is that if the contract is terminated because the plants do not meet specifications, there is no way to re-procure the work in the same year because of the time needed to produce the plants. Also there are other concerns that will be addressed in the General Comments Section. |

### CONSTRUCTION PLANS

List any items pertinent to the plans which caused problems, need clarification or changes for future contracts of this nature.

| DESCRIPTION OF ITEM IN PLANS | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| The plans had a maximum depth of excavation shown. In some areas there was insufficient mineral soil within the depth specified to construct the terrace. | Unless restricted by permit, allow the contractor to go as deep as necessary to access the best available materials for the terrace construction. When developing the permit application, consideration needs to be given to the soils in the area. The application should be as liberal as possible regarding excavation depth in order to allow the terrace to be constructed of better materials. |
| The plans required the plants to be installed on the front slope of the terraces in the area where organic material rolled up onto the toe of the terrace (mud wave). This material was totally unconsolidated with no strength. In the high energy environment of these terraces, most of the plants were pulled out during a storm. | Some items that may be considered when planting terraces that might be subjected to high energy environments are:<br>• Install plants into the terrace above the mud wave produced during construction.<br>• Use plant anchors<br>• Trim the tops of tall plants to reduce the mast area that would be hit by waves. |

## CONSTRUCTION SPECIFICATIONS

List any significant items in the construction specifications which caused problems, need clarification or changes for future contracts of this nature.

| DESCRIPTION OF ITEM IN SPECIFICATIONS | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| Construction Unit #3: Some controversy arose over the method of sampling plants to determine how many met specifications prior to the start of terrace construction. | The specification needs to clearly state the method, sample size, and rate of sampling that NRCS will use to determine the percentage of plants meeting specifications. |
| Only a minimum requirement for the plants is specified. Either they meet the requirements or not. There was concern that the subcontractor supplying the plants did not have enough plants ready to allow the start of the terrace construction. | Consideration could be given to the possibility of setting up a graduated payment schedule in the specification of the plant materials. Plants meeting the preferred requirements would be paid at full bid price. Some reduced quality of plant could be paid at some percentage of the bid price, and the minimum threshold for acceptable plants could be established. |

## GENERAL COMMENTS

List any significant items which worked well and should be repeated or which caused problems, need clarification or changes for future contracts of this nature.

| DESCRIPTION OF ITEM | RECOMMENDATIONS FOR FUTURE CONTRACTS |
|---|---|
| The depth of water needs to be considered in the planning and design of terraces. | In water depths greater than 2' marsh buggy construction becomes difficult. This consideration should be factored into the design. Also the suitability of terraces is questionable where the water depth exceeds 2' in depth. |
| Construction Unit #2: The spacing between the terraces was too great. The fetch length was not reduced enough to control the wave energies | Currently a review of terrace design and construction is underway to better define the needed section and spacing. This will be accomplished prior to any new terraces construction. |
| Serious problems were encountered on the lake rim terraces due to wave erosion during construction. The terraces were eroding significantly shortly after construction. | Consideration should be given to alternative means of shoreline protection other than terraces in situations where the fetch length cannot be reduced by installation of multiple terraces, such as around lakes. |
| Other items of concern for vegetative terrace construction:<br>• Terrace locations (is the site applicable for terraces?)<br>• Soils<br>• Water depth<br>• Terrace spacing<br>• Terrace cross section and height<br>• Plant materials<br>• Availability of plant materials for large projects<br>• Timing of construction | It is recommended that a meeting with all NRCS personnel involved in the planning, design, and construction of vegetative terraces meet to further discuss these items, and provide recommendations. |