**COASTAL PROTECTION ENGINEERING**
5301 N. FEDERAL HWY, SUITE 335
BOCA RATON, FL 33487
561-565-5100

May 24, 2021

*Sent via Email*

Mr. Robert Weber, Coastal Program Manager
Town of Palm Beach Public Works Department
951 Old Okeechobee Road
West Palm Beach, Florida 33401
Submitted via email to:

**Re: Proposal for the 2021 FDEP Beach Management Agreement Cell-Wide Hardbottom Monitoring and 2021 Hardbottom Map**

Dear Mr. Weber,

This proposal is being provided to the Town of Palm beach (Town) for Coastal Protection Engineering LLC (CPE) to provide professional environmental services in support of the Beach Management Agreement (BMA) annual monitoring and reporting. This proposal has been divided into two tasks that will result in the creation of the 2021 BMA Hardbottom Map and production of the 2021 BMA Annual Hardbottom Monitoring Report.

**Scope of Services**

The scope of services outlined below will include creation of the 2021 hardbottom map based on delineation of exposed hardbottom in aerial photography and nearshore edge mapping of the entire BMA cell, participation in one public meeting, biological monitoring of transects and offshore stations, data analysis, and reporting required by the BMA. The specific scope of work to be implemented is described in the BMA, Appendix B– Cell-Wide Monitoring and Mitigation Plans. Language repeated directly from the BMA is shown in italics.

**Task 1. 2021 Hardbottom Mapping and Creation of 2021 BMA Hardbottom Map**

Task 1 includes digitization of exposed hardbottom from aerial photographs, in situ hardbottom edge mapping, and development of the 2021 BMA hardbottom map.

**Aerial Delineation of Exposed Hardbottom.** Exposed hardbottom will be digitized from one set of 2021 aerial photography (Town's boundaries) provided by the Town using ArcGIS, including inter-observer QA-QC, following the standards used to develop the Town's historic hardbottom GIS database in the BMA. The area south of the Town's boundaries will be digitized using aerial imagery from the County-wide aerial photographs, if acceptable.

**In situ Nearshore Hardbottom Edge Mapping.** The nearshore hardbottom edge from R-76 to R-87 and from R-110 to R-151 will be mapped by divers. The hardbottom edge in the Mid-Town Project area between R-87 and R-106 will be mapped by others (under separate contract) and the resulting shapefiles will be provided to CPE for inclusion in BMA cell-wide maps. The nearshore hardbottom edge is defined as the western border of exposed hardbottom areas, or the position of the landward most visible border

between sand and hardbottom defined by emergent biota. A two-person dive team will follow the nearshore edge while towing a buoy with a survey-grade DGPS, which transmits continuous positions to ArcGIS or HYPACK hydrographic survey software on board the survey vessel with correction from a U.S. Coast Guard Navigational Beacon. The divers will follow the inshore contour of the hardbottom-sand interface. The buoy shall be on the shortest possible tether, such that the buoy is directly over the diver. In areas where the nearshore edge is located in the intertidal/subtidal zone, the nearshore edge will be mapped by qualified biologists using a handheld Trimble Geo 7x DGPS (or comparable) system. The biologists will carry the DGPS unit as they walk/wade around the hardbottom features at the sand/rock interface. The DGPS unit shall collect data every second during edge mapping. Photographs will be taken when it is not possible to record video. Survey mapping methods are compliant with the BMA cell-wide monitoring plan for mapping of the nearshore hardbottom edge.

During the edge mapping, divers will take periodic relief measurements or assign a relief category along segments with obvious changes in relief along the hardbottom edge. The coordinates of each relief point will be recorded by signaling to the vessel to take a GPS position. The relief features will be included in the geodatabase and BMA maps. As conditions allow, digital video will be recorded to document the nearshore edge for descriptive analysis of relief, benthic communities, and sediment condition. The camera system is integrated with DGPS and provides an overlay of the coordinates on the video screen. The final video record will be hyperlinked to the hardbottom edge shapefile in GIS.

**2021 BMA Hardbottom Map. T**he delineation of exposed hardbottom from the 2021 aerial photographs and the in situ hardbottom edge mapping will be used to generate the final 2021 BMA hardbottom map. A geodatabase with relief points, hardbottom edge, and hyperlinked video files will also be submitted to the Florida Department of Environmental Protection (FDEP) and the Town on an external hard drive.

Task 1 corresponds to the BMA requirements as presented below in italics.

***Aerial Photo Survey and Analysis of Hardbottom Distribution***

*Biannual aerial photography will be used to map the hardbottom along the BMA area twice a year and will serve as a data comparison for the in situ nearshore hardbottom edge mapping work in the summer. Having the additional aerial photo survey during the winter months will provide information on seasonal variability of hardbottom exposure. Department approved aerial photographic methods will be employed to collect aerial photography sufficient for analysis and delineation of hardbottom distribution within the cell. The acreage of exposed hardbottom in the specified zones of the cell area will be estimated and followed by a field verification of the outlined hardbottom areas, specifically on the shoreward edge (through the hardbottom edge mapping, as described in B.2.c.ii. below) and then the hardbottom will be digitally mapped using GIS. The acreage of exposed hardbottom in the specified zones of the cell area will be based primarily on aerial imagery that may be adjusted using diver observations conducted as close as possible to the imagery flight.*

## Task 2. BMA Biological Monitoring (Transects and Offshore Stations) and Annual Data Analysis/ Report Development

Task 2 includes biological monitoring of the BMA transects and offshore stations, along with data analysis and report development of the 2021 Annual Hardbottom Monitoring Report.

**BMA Biological Monitoring – Transects and Offshore Stations.** CPE will monitor the BMA transects, offshore stations, and Mid-Town transect extensions as shown in Table 1. If exposed hardbottom is observed seaward of the BMA transects listed in Table 1 during the 2021 survey, the transects will be extended to the length of exposed hardbottom, and sediment depth and line intercept monitoring will be performed across the full cross-shore extent of the hardbottom. The seaward end of exposure in 2021 will be marked with a 6-inch PK nail, and DGPS coordinates will be recorded. The BMA biological monitoring corresponds to the BMA requirements as presented below in italics.

**Table 1.** BMA transects, offshore stations, and Mid-Town BMA extensions to be monitored in 2021.

| Transect | Length (m) | Date of Installation | Baseline Survey Date |
|---|---|---|---|
| R-80.5 | 150 | 6/22/2015 | 8/13/2015 |
| R-83 | 156.8 | 6/22/2015 | 7/16/2015 |
| R-90 ext. | 82 | 10/20/2014 | 12/16/2014 |
| R-91 ext. | 108 | 10/3/2014 | 12/16/2014 |
| R-92 ext. | 125.6 | 10/17/2014 | 12/15/2014 |
| Station R-92 | 22 | 6/22/2015 | 7/16/2015 |
| Station R-94 | 22 | 6/22/2015 | 7/16/2015 |
| R-103 | 151 | 10/29/2014 | 12/17/2014 |
| R-113 | 2.2 | 10/30/2014 | 12/18/2014 |
| R-115 | 15.5 | 10/30/2014 | 12/18/2014 |
| R-116 | 29.5 | 10/30/2014 | 12/18/2014 |
| R-132 | 117 | 10/30/2014 | 12/18/2014 |
| R-133 | 143 | 10/30/2014 | 12/18/2014 |
| R-136 | 137 | 6/19/2015 | 7/16/2015 |
| R-139 | 67 | 6/19/2015 | 7/16/2015 |
| R-142 | 125.5 | 6/19/2015 | 7/15/2015 |
| R-145 | 157.4 | 6/19/2015 | 7/15/2015 |

***Environmental Monitoring Survey Methods***

*During the monitoring event, the transect shall be set up (plotted) by a diver extending a measuring tape the distance of the transect, with each end secured to the end of the transect by a permanent pin. Sediment measurements shall be made, a video survey shall be conducted, and benthic quadrat sampling shall occur along the transect to measure the types and distribution of the benthic communities, as well as the relief and sedimentation features of the hardbottom. The sediment measurements shall be the first data collection event to occur following set up of the transect in order to have the least sediment disturbance. Video data and benthic quadrat surveys will follow sediment measurements. Transects include all data*

*collections listed below, unless specified to be "sedimentation only" transects. If "sedimentation only" transects are specified, only that protocol shall be utilized.*

*Sediment Measurements: Line Intercept and Sediment Depth Measurements.*

*In order to track changes in sediment cover over and across the hardbottom within the cell, line intercept and sediment depth measurements will be conducted along each transect. These surveys shall be conducted first, after the transect is set up, in order to measure undisturbed sediments. These surveys provide documentation of sediment cover and movement over the hardbottom, as well as information about where sediment accumulation is occurring over hardbottom.*

i. *Interval sediment depth measurements document sediment movement and dynamics within each transect. Sediment depth shall be measured and recorded to the nearest centimeter, at every other meter mark (0m, 2m, 4m, etc.). For the measurement, a stainless-steel ruler, graduated in centimeters (0 cm to 30 cm), shall be pressed through the sediments until the ruler reaches surface of hard substrate or totally immersed in sand. Sand thickness of less than 0.5 cm will be recorded as 0, more than 0.5 cm but equal or less than 1 cm will be recorded as 1cm, etc. Measurements greater than 30 cm will be recorded as >30 cm. Measurements shall follow the entire length of the transect excluding sand patches over 0.5m that would be recorded in the line intercept survey, as described below. Measurements would be recorded in a table printed in waterproof paper, labeled in 2m increments with the transect number. For reporting purposes, results will be summarized in a Microsoft Excel format spreadsheet. Annual reports shall include average sediment depths for each transect, the entire monitoring area, and for zones 0-30m; 30m-60m; 60m- 100m; and 100m -150 (200) m, or more detailed if necessary.*

ii. *The line-intercept survey would be used to document larger areas of uninterrupted sand (patches and troughs over 0.5m measured width along the transect). Sediment dynamics within the monitoring area are characterized by changes in dimensions of such sand patches. The western and eastern edge of each sand patch/trough will be recorded during the line-intercept survey.*

*Sediment depth will be measured at one point, in the middle of the patch, if the patch is 0.5 m to 1.5 meters wide, and at three points if the patch width is over 1.5 m (0.5m from each edge into the patch and in the middle of the patch). For reporting purposes, patches will be graphically displayed in a bar graph of each transect for the comparison of their dynamics over time.*

*Video Surveys of Transects*

*The video survey of the transect serves as an archived data set for reference or resolution of unclear data from the quadrat and sediment surveys. As mentioned above and prior to the survey, a measuring tape should be extended along the length of the transect, in order to clearly mark the location along the transect in meters for accurate video reference. The video of hardbottom along each transect will be taken using a digital camera, with the videographer swimming at a rate no faster than five (5) meters per minute, and holding the camera at a height of forty (40) centimeters above the hardbottom. A convergent laser guidance system shall be utilized to indicate the precise height of the camera at 40 cm from the bottom. Prior to commencement and at the end of each transect line documentation, an underwater display containing the transect number, depth, and date will be videotaped and integrated directly onto the digital video record; additionally, a 360$^{o}$ panoramic view will be recorded both at the beginning and at the end of*

*each transect from the elevation of about 1m above bottom and at the angle about 30$^{o}$ to the horizon. Geographic Positioning System (GPS) navigational coordinates (Florida State Plane Coordinate System, East Zone NAD 83) of the video transect locations will be overlaid on recent aerial photography and included in the project monitoring reports.*

*Quadrat Data Collection Along Transects*

*Benthic communities and their habitats will be characterized quantitatively using the quadrat method, which samples quadrat areas of habitat at certain points along a transect*. The intent of the sampling is to sample the same quadrat areas in each annual survey to be able to document changes in communities over time.*

*The northeast† corner of the quadrat will align with a particular meter mark of transect, and a nail will be installed to mark the location of this meter mark, in order to facilitate repeat sampling of the same quadrat in successive surveys. Quadrats shall be plotted avoiding areas of sand cover. Enough quadrats must be used to sample a 10 $m^2$ sampling area for each 150 meters of transect. Quadrats 1.0 $m^2$ or 0.5$m^2$ in size can be used to sample the hardbottom community along each transect to make at least 10 $m^2$ sampling area per transect** (if the larger quadrat sizes are selected, fewer samples will be required). Quadrats will be distributed along the transect to have at least 2.5$m^2$ to 3.5$m^2$ sampling area (enough to characterize) for the following zones 0-30m; 30m-60m; 60m- 100m; 100m to 150m (or up to 200m if longer) and 200m-300m (or up to 400m if longer).*

*Quadrat monitoring includes the following measurements:*

i. *Hardbottom relief measurements;*
ii. *Species documentation (this shall include functional groups including algae and benthic sessile organisms, % cover of these groups if >1%, and octocorals and stony coral specific measurements);*
iii. *Sediment depth; and*
iv. *Percent cover by sediments*

**Benthic quadrat surveys are subject to revision and development of finer details prior to implementation.*
*** Statistical analysis of data collected during the Habitat Mapping will assist in estimation of the sampling area for particular type of community.*
† The southwest corner of the quadrats aligns with the transect meter mark. An additional pin is installed at the northeast corner of the quadrat.

*Datasheets will have a standardized layout similar to that used in BEAMR (Baron and Lybolt, 2006), and will simplify data collection and entry for statistical treatment.*

*Visual estimates of percent cover of all sessile benthos shall be pooled to 15 major functional groups. Functional groups are: sediments*, macroalgae**, turf algae***, encrusting red algae****, sponges, hydroids, octocorals, scleractinian corals, tunicates, bare hard substrate, zoanthids, hydrocorals Millepora sp., sessile worms (including wormrock, Phragmatopoma spp.), bivalves, and bryozoans. Each functional group is given a percent cover value (0-100%, with a minimum of 1%; if less than 1%, the functional group or a species is simply listed) and the total cover of all functional groups is 100%. The macroalgae percent cover will be characterized by total cover, and percent cover by the dominant macroalgae (if a particular species/genus has >5% cover). All other macroalgae will be also identified at least to the genus level and*

*listed.*

*The quadrat in situ method is limited to organisms that can be visually recorded and identified in the field, similarly to all other non-invasive and non-consumptive methods of sampling.*

*Each colony of octocoral and scleractinian coral will be identified, as well as the maximum height for octocorals, and the width for scleractinian corals will be measured to the nearest centimeter. The smallest size recorded is one (1) centimeter; for colonies less than one (1) centimeter the record would be <1cm. Octocorals will be identified to at least the genus level, and scleractinian corals will be identified to the species level. Abnormal conditions of each colony will be recorded (e.g., bleaching, disease, predation, etc.).*

*In addition to the species being recorded within the quadrats, all species of benthic invertebrates (identified to at least genus level) will be recorded within a 1 meter belt.*

> ***** *Sediments characterized by circling of the descriptor, or giving short additional characterization (e.g., rubble, or circled descriptor sand and then + shell hash, etc.)*
> ** *Macroalgae include fleshy macroalgae and geniculate calcareous algae, e.g. Halimeda); non-geniculate calcareous branching red algae write separately*
> *** *Turf algae include all algae with thallium less than 10mm and forming dense cover*
> ****Encrusting red algae recorded separately for non-calcareous and calcareous (% + %)*

**Data Analysis and Report Development.** Preparation of the FDEP data deliverables (Microsoft Access database, Excel spreadsheets of monitoring data, and electronic library of raw monitoring data (scanned field datasheets), GIS shapefiles, photographs and video files will be conducted according to the requirements of the BMA cell-wide monitoring plan. The 2021 BMA data will be entered into an Access database with two rounds of QAQC review of all entered data. The data will be exported and summarized in individual Excel spreadsheets. The survey data deliverable shall be submitted to the FDEP and the Town on an external hard drive. Data analyses and statistical treatment will be conducted according to the BMA requirements as presented below in italics.

The 2021 BMA Annual Report will include hardbottom distribution maps based on interpretation of 2021 aerial photography (Mid-Town GIS shapefiles provided by others) with the summer 2021 diver-mapped hardbottom edge survey as an overlay; sediment analyses including bar graphs depicting sediment patch data and average sediment depths of transects and cross-shore zones; benthic community analysis and change, and statistical analyses. All data treatment and statistical analyses will be conducted according to the BMA cell-wide monitoring plan described below. The final report presenting the annual hardbottom survey results, interpretations, and comparison to the 2014/15 baseline survey data in the evaluation of potential project-related effects will be submitted within 120 days of the completion of the 2021 survey. The final report will be submitted as a PDF file to the Town and FDEP.

The commencement dates of the surveys will be reported to the FDEP approximately 7 days prior to beginning the work effort. All raw data (including shapefiles, copies of field data sheets, video and still photos) shall be provided to the FDEP in electronic format upon completion of the survey.

*Data Analysis and Product Development*

*Quantitative data on the major benthic biological components, e.g., percent cover, abundance, distribution by size, and species lists as well as a statistical evaluation and comparison (paired or multiple) of the data collected along the permanent transects will help to determine the amount of the hardbottom type and ecological functions over time. This will determine if the ecological functions of the hardbottom habitat are impacted by a beach nourishment project. This database would facilitate efficient QA/QC operations, data management, and will also be filed to a uniform GIS database. The results of these analyses will be included in the yearly reports due to the Department. The following are required.*

i. *Multivariate Benthic Community Analyses and Univariate Analyses of Physical Habitat Data. A table of hardbottom types (according to the classification system for the BMA) will be maintained annually to evaluate and track the changes in communities over time. It will be used to determine 1) if the amount of each type of hardbottom is being maintained over time and the natural variability of the fluctuations of that type; and 2) if a loss is due to a project. Unanticipated project induced impacts will initiate compliance and enforcement action. Once natural variation can be conclusively determined within the cell, this information could be utilized for better resource management in future regulatory actions.*

ii. *Statistical Tests. The following includes a list of suggested statistical tests to be performed with each single survey dataset to compare between annual surveys as well as between annual survey and the Habitat Map of Hardbottom:*

   a. *Percent Cover - Benthic Functional Groups. The simplest and one of the most effective statistical comparisons is provided by the estimations of % changes in cover, biodiversity, size class distribution, area of distribution, sediment cover, and sediment thickness. Changes expressed in percentages provide the clearest picture of the changes occurring in the hardbottom communities as a result of each nourishment or natural event. These results are to be presented in tabulated and graphical form. It is also important to understand that the statistical significance of change in the absolute value of a parameter or in %, does not necessarily reflect a critical threshold e.g. in sediment accumulation that can change the character of hardbottom community; such thresholds can be identified only experimentally.*

   b. *Similarity Analyses.*

      i. *Non-Parametric Statistics using PRIMER-E (v6) (Clark and Gorley, 2006), such as the following listed below:*

         a. *Similarity matrix – Bray-Curtis and/or Euclidean Distance similarity matrices display similarity between samples for further analysis. This should be calculated between every pair of samples.*

         b. *Cluster analysis with Similarity Profile (SIMPROF) – Simple agglomerative, hierarchal clustering which creates a dendrogram from a similarity matrix to display significant differences.*

         c. *MDS ordination – A complex numerical algorithm based on a similarity matrix among samples (transects). This constructs a "map" of the samples which attempts to satisfy all the conditions imposed by the rank similarity matrix.*

d. *Analysis of Similarity (ANOSIM) – Operate on a resemblance matrix and carry out an approximate analogue of the standard univariate 1- and 2-way ANOVA tests. Allows for the test of the null hypothesis that there are no assemblage differences between groups of samples specified by the factors. Generates a histogram and provides R-statistic and p-values.*

e. *Similarity of Percentage (SIMPER) – Looks at the role of individual taxa in contributing to the separation (dissimilarity) between two groups of samples (e.g., Artificial vs. Natural).*

f. *Second Stage Analysis (2STAGE) – Gives a succinct summary in a 2-d picture of the relationship between the multivariate sample patterns under various choices (e.g., a disturbance in the temporal patterns of controls vs. impact could be detected by a 2STAGE analysis). This includes resemblance, MDS and ANOSIM.*

ii. *Parametric Statistics such as the following listed below:*

a. *T-test – used to determine significant differences based on average percent cover, density, richness, etc. Paired, homoscedastic, and heteroscedastic. Provides p-value to compare to pre-determined alpha.*

b. *ANOVA – A test of the statistical significance of the differences among the mean scores of two or more groups on one or more variables. In the event scores differ, non-parametric ANOVA or a generalized linear model may be utilized to account for the nature of this data.*

c. *Shannon Diversity Index (H') – Measures diversity in categorical data. It is simply the information entropy of the distribution, treating species as symbols and their relative population sizes as the probability.*

d. *Pielou's Evenness Index (J') – A measure of biodiversity which quantifies how equal the populations are numerically. Based on Shannon Diversity Index.*

**Cost Estimate**

CPE proposes to provide these services as detailed in Attachment 1 on a Time and Materials basis with the support of our subcontractor Aptim Environmental & Infrastructure, LLC (APTIM) for an estimated Not-To-Exceed amount $146,160.00 to be performed in accordance with this proposal and Professional Services Agreement (PSA) 2020-24 between the Town of Palm Beach and CPE. The compensation for services rendered under this proposal will be based on the Rate Schedule of the PSA as shown in Attachment 1. Although this proposal is detailed by separable items and estimated by specific staff and categories, it is anticipated that some work elements will exceed the estimate while others fall below the estimate to complete. Our staff and sub-consultant will be used as needed to achieve the scope of services and to meet the stated objectives and timelines within the proposed budget. Should the Town desire additional services beyond this scope, CPE will be available to discuss adjustments as appropriate.

Thank you for the opportunity to serve the Town of Palm Beach. If you have any questions, please feel free to contact me directly at 561-632-1210.

Sincerely,

Stacy Buck
Senior Marine Biologist
Coastal Protection Engineering LLC
Mobile: 561-632-1210
sbuck@coastalprotectioneng.com

Cc: Lindino Benedet, PhD, CPE
Thomas Pierro, PE, D.CE., CPE

COASTAL PROTECTION ENGINEERING
5301 N. FEDERAL HWY, SUITE 335
BOCA RATON, FL 33487
561-565-5100

# Attachment 1

## CPE Cost Proposal

**Town of Palm Beach**
**2021 BMA Monitoring**

| CPE Cost Proposal | | LABOR | | | MATERIALS | SUBCONTRACTOR |
|---|---|---|---|---|---|---|
| | | Principal Coastal Scientist Hours | Senior Marine Biologist Hours | Jr. Coastal Scientist Hours | Equipment & Insurance diver/day | APTIM Cost |
| Task 1 | Aerial Delineation | | 128 | | | $ 4,000.00 |
| | Hardbottom Edge Mapping | | 65 | 36 | 6 | $ 14,031.82 |
| | Map | 1 | 40 | | | $ 4,000.00 |
| | Public Meeting | 1 | 24 | | | $ - |
| Task 2 | Transect Monitoring and Offshore Stations | | 56 | | 8 | $ 21,916.36 |
| | Data Entry and Raw Data Submittal | | 76 | | | $ 8,796.36 |
| | Data Analysis and Annual Report | 4 | 100 | | | $ 3,854.55 |
| **TOTAL** | | 6 | 489 | 36 | 14 | $ 56,599.09 |
| **RATE** | | $ 285.00 | $ 159.00 | $ 100.00 | $ 60.00 | $ 1.10 |
| **COST** | | $ 1,710.00 | $ 77,751.00 | $ 3,600.00 | $ 840.00 | $ 62,259.00 |

| | |
|---|---|
| LABOR | $ 83,061.00 |
| MATERIALS | $ 840.00 |
| SUBCONTRACTOR | $ 62,259.00 |
| **TOTAL** | **$ 146,160.00** |

## Subcontractor Cost Proposal

**Town of Palm Beach**
**2021 BMA Monitoring**

| APTIM Cost Proposal | | LABOR | | | | EQUIPMENT | | | | | | MATERIALS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Marine Biologist II Hours | Marine Biologist I Hours | Boat Captain Hours | GIS Operator Hours | Survey Boat (24 ft Privateer) miles | Trimble DGPS days | Hypack days | Underwater Seadrop Integrated Camera days | Underwater Camera days | SCUBA tanks days | Gator week | Equipment & Insurance diver/day |
| Task 1 | Aerial Delineation | | | | 40 | | | | | | | | |
| | Hardbottom Edge Mapping | 60 | | 36 | | 3 | 5 | 3 | 3 | 2 | 36 | 1 | 3 |
| | Map | | | | 40 | | | | | | | | |
| Task 2 | Transect Monitoring and Offshore Stations | 96 | 48 | 48 | | 4 | 4 | 4 | | 4 | 48 | | 12 |
| | Data Analysis and Raw Data Submittal | 68 | 8 | | 24 | | | | | | | | |
| | Annual Report | 40 | | | 4 | | | | | | | | |
| **TOTAL** | | 264 | 56 | 84 | 108 | 7 | 9 | 7 | 3 | 6 | 84 | 1 | 15 |
| **RATE** | | $ 86.36 | $ 65.45 | $ 72.73 | $ 100.00 | $ 718.18 | $ 377.27 | $ 236.36 | $ 27.27 | $ 29.09 | $ 17.27 | $ 540.00 | $ 60.00 |
| **COST** | | $ 22,800.00 | $ 3,665.45 | $6,109.09 | $ 10,800.00 | $ 5,027.27 | $ 3,395.45 | $ 1,654.55 | $ 81.82 | $ 174.55 | $ 1,450.91 | $ 540.00 | $ 900.00 |

| | |
|---|---|
| LABOR | $ 43,374.55 |
| EQUIPMENT | $ 11,784.55 |
| MATERIALS | $ 540.00 |
| **TOTAL** | **$ 55,699.09** |