

## Overview

We understand that AMBAG is seeking a Regional Sediment Management Plan for southern Monterey Bay that is driven by public and private stakeholder consensus and provides guidance and policy on ways to reduce beach erosion through implementation of regional sediment budget management and beneficial reuse of sediment. Techniques being considered include beach and dune restoration, and beach nourishment practices. The Management Plan will be produced within the framework of the California Coastal Sediment Management Plan, a larger study with a broader mission and set of strategies to alleviate erosion along the State's shoreline.

The Management Plan will integrate an understanding of sedimentary processes between the Salinas River and Wharf II in Monterey with economic, environmental, and societal considerations. The Southern Monterey Bay Coastal Erosion Workgroup (SMBCEW) and the CSMW have compiled information on zones where coastal sediment is in short supply and the erosion or erosion potential is at a critical level. The PWA team will review these data, alongside other data sets, reports, and ongoing data collection initiatives (including California Beach Restoration Survey, Regional Sand Budgets, Sand Compatibility and Opportunistic Use Program, Beach Restoration Reference Guide) and provide data files for input to a user-friendly GIS interface from which to delineate these zones and identify potential sources of sediment for use to counteract erosion. This project approach assumes use of existing data only, with no new survey work or field data collection.

The technical basis for the Management Plan will be an understanding of the local sediment and morphodynamic processes, and sediment budget. Recent studies by Dr. Ed Thornton and his team describe large sediment inputs from dune erosion, and large sediment losses from sand mining at Marina. Successful implementation of the beach management practices outlined in the Management Plan will require addressing some important questions about the sediment budget of southern Monterey Bay. These questions include:

- What are the long-term dune erosion rates?
- How much beach sand-size sediment does the Salinas River contribute to the system?
- What is the direction and magnitude of sediment transport along the shoreline?
- What is the impact of continued sand mining at Marina?
- How will sea-level rise impact erosion mitigation measures?

The study will answer these questions through an investigation of existing data resources, and the local experience and knowledge provided by our team.

Public comment and input on the Management Plan will be conducted through outreach comprising two components: Public Outreach Program and Community Outreach Plan. The former will concentrate on a program of dissemination of the Plan structure and content, including web sites, flyers, contact lists, and other forms of media. The latter will focus on the longer-term through a series of public meetings and workshops.

## Revised Detailed Work Plan

The original proposal was submitted to AMBAG on July 9, 2007. The scope of work provided herein has been revised from the original scope after negotiations between PWA and AMBAG at a meeting held July 17, 2007 at the AMBAG offices in Marina.

### **GIS and metadata format**

For all subtasks described below that relate to GIS database development, the PWA team will develop a metadata format for the approval of AMBAG and stakeholders. The metadata will include, but not be limited to:

- Projection and units of the map coordinate system
- Spheroid, datum, vertical datum
- Extent of the data - maximum and minimum values in north-south, and east-west directions
- Source scale, provenance of source data, media, etc
- Attribute table fields, field types, and explanatory information about the included data
- Structure of the data - raster or vector, cell size if raster, etc
- Method of data acquisition

The metadata will include appropriate keywords and other indexes so that it can be efficiently retrieved with database queries (this capability is included with ESRI© ArcGIS ArcCatalog and other vendors' packages). Many metadata templates are in use within the GIS community; the PWA team will select one that is compatible or identical to formats used elsewhere in the coastal management profession in California. Federal Geographic Data Committee (FGDC) metadata standards are an excellent candidate for adoption. Although data may be developed in a variety of environments, including CAD, the PWA team will deliver spatial data in a single format that is compatible with ArcGIS and a variety of other GIS applications. All attribute data will be preserved in the case of translation from CAD or other formats to the final deliverable.

### **Task 1: Governance Structure**

**Subtask 1.1: Structure.** The PWA team will draw upon our experience in coastal management planning to review alternative governance structures for the Management Plan. Our recommendations for the preferred structure (involving AMBAG, the Monterey Bay National Marine Sanctuary, and other regional entities with authority over coastal issues) will use examples of frameworks that have been developed and implemented in similar multi-agency initiatives elsewhere, for consideration by the AMBAG management team.

**Subtask 1.2: Littoral Cell Boundary.** An essential first step for making decisions on mitigation measures for erosion is to set the regional geographic boundary within which the analysis will take place. Based on our broad understanding of the local sediment and morphodynamic processes, stakeholder consultation, published reports and databases, the PWA team will assess the appropriateness of the presently defined southern Monterey Bay littoral cell. We will recommend this boundary or a modification of it as the bounding area for the GIS database for AMBAG to approve.

**Subtask 1.3: Agreed Boundary (GIS).** The cartographic representation of the littoral cell boundary will be based on the outcome of subtask 1.2. Before we commit to a final boundary digital map, we will submit hardcopy output for review so that no sub-cell features (inlets, jetties, discharges, etc.) have been improperly included or excluded from the area. As part of this subtask, we will select a suitable base map, in the required projection, on which to locate the littoral cell boundary and other features of interest. The base map will accurately depict the coastline and the regional hydrologic network at a scale appropriate to the analytical work required.

**Subtask 1.4: Jurisdictional Boundaries (GIS).** Adopting the data formats described above, the PWA team will collate existing jurisdictional boundary datasets, as identified by CSMW, SMBCEW, and AMBAG, and complement these with the creation of new GIS data layers for those jurisdictional and regulatory themes not currently available in GIS format.

**Subtask 1.5: Additional Issues.** As part of the Public Outreach Program (Task 1, subtask 1), the PWA team will consult with public and private sector entities to obtain a set of local views on additional local or regional issues related to regional beneficial reuse of sediment. We will also use our work on gathering and assessing available data (Task 3, subtask 1) to overview generic issues that may relate specifically to the southern Monterey Bay coastline.

**Subtask 1.6: Acceptance/Adoption.** Upon agreement of a governance structure, PWA will provide a supporting role to AMBAG to gain acceptance of the Management Plan by the structure, on an as-needs basis, to the limit of a fixed budget (approximately 8 hours work).

## **Task 2: Outreach**

**Subtask 2.1: Public Outreach.** We understand that the progress of the Management Plan will be reported to the public through a Public Outreach Program. PWA will develop existing resources including the wider CSMW contact lists and brochures to provide a more focused outreach campaign to encourage discussion amongst the SMBCEW and other southern Monterey Bay agencies and individuals. Public input and consensus will be incorporated into the final Management Plan.

**Subtask 2.2: Community Outreach.** We understand that in the longer term there will be consultation with local public user and stakeholder groups, and local agencies through a Community Outreach Plan. This will entail a series of public meetings in which AMBAG will seek public input and consensus to guide the implementation of the Management Plan. The PWA team will assist AMBAG to define the Plan, organize and present at public meetings, support the publication of brochures, and provide information for input to web pages. PWA will present their findings at two Board of Director meetings and attend the quarterly SMBCEW meetings (up to four).

## **Task 3: Coastal Regional Sediment Management Plan**

**Subtask 3.1: Bibliography/Data Collation.** Building upon the information compiled by the SMBCEW and the CSMW, the PWA team will compile relevant coastal references and sediment information for the southern Monterey Bay coast in a format compatible with AMBAG and the CSMW reference database. We will review and assess the status of existing compilations and resources including the CSMW web site. We will compile a list of the peer-reviewed literature, much of which has already been cited in recent publications by our team member, Dr. Ed Thornton. Data collated as part of this subtask will provide the framework for creation of the GIS data files of subtasks 3.2, 3.3, and 3.4.

Particular attention will be paid to data relating to the sand mining operation at Marina and its impact on the sediment budget and coastal erosion processes. Southern Monterey Bay continues to be an intensively mined area where sand is directly mined from the surf zone. The amount of sand mined was deemed proprietary by the courts and was unknown until very recently. The amounts reported yearly to State Lands Commission starting in 1965 are now available and we will integrate these data into our assessment. The timelines of sand mining losses will provide insights into the sediment budget process. Critical to any mitigation decision is an understanding of the role that the continuing hydraulic mining at Marina by CEMEX plays in the sedimentary processes along the southern Monterey Bay coast. Dr. Ed Thornton and Bob Battalio have previously analyzed the impacts of sand mining on long-term erosion rates in southern Monterey Bay.

**Subtask 3.2: Coastal Erosion/Sediment Deficit Data Files (GIS).** Areas of sediment deficit and coastal erosion will be mapped as lines or areas. Linear mapping indicates that the boundary between two adjacent areas is of concern, while polygonal mapping (area) indicates that concern applies to any point or points within it. Mapped lines and areas will be attributed with information on the source of the designation, intensity, material quality, etc. By depicting the features on the approved base map, they will be automatically georeferenced. We will use work carried out by the Naval Postgraduate School, SMBCEW, and the CSMW, as a starting point for our mapping. PWA has developed GIS maps of the sewer facilities operated by MRWPCA, which are expected to be key elements of the erosion Management Plan.

**Subtask 3.3: Sediment Source Areas Data Files (GIS).** This subtask will be executed in the same manner as subtask 3.2, but with a greater variety of data involved. Areas where sediment may be removed will be represented as polygons on the base map. Attribute data will indicate the nature of the area. Flood control projects will be represented as points, lines, or areas depending on the size of the features at the base map scale, and on their physical configuration. Similarly, the representation of offshore sand locations and sources of opportunity will be depicted as areas or points and lines depending on their size and the precision of the source data. All features, by virtue of being presented on the base map will be georeferenced to the correct datum and projection, and all will have appropriate attributes and metadata.

**Subtask 3.4: Potential Receiver Sites Data Files (GIS).** The PWA team will compile sediment quality data from source and receiver sites, and incorporate them into the spatial database. Data of this kind is usually of two types. The first is at a general level of detail, where significant areas that are sediment sources or reception sites may be characterized with a variety of parameter values. These values would all be attributes of the site features. The second is on a more detailed level, where sediment quality data may be available from multiple samples, perhaps at different times or different depths, perhaps even as a result of assay borings. These data are more complex and cannot be presented as single-record attributes of a feature, but must be incorporated into a relational database table that is linked (with a unique site ID#) to the specific location from which the sample was taken. All GIS applications have the ability to support these links.

**Subtask 3.5: Beach Restoration Technologies.** At the request of AMBAG this subtask has been removed from the scope of work.

**Subtask 3.6: Cost/Benefit.** The PWA team will undertake a review of the relative costs and benefits of using the identified potential sediment sources for beach nourishment purposes. Recent work such as the Economics of Regional Sediment Management (RSM) in Ventura and Santa Barbara Counties and NOAAs Southern California Beach Valuation Study, provide data on the potential economic benefits of beach restoration in other areas of California. We will also seek to utilize the outputs of the prototype ArcGIS Decision Support Tool for RSM developed by USC GIS Research Laboratory, as this provides standard values for estimating costs and benefits of alternative nourishment scenarios. Drawing on Halcrow's experience in economic analysis of beach management in the US and abroad, and utilizing these existing California valuation tools, the economic feasibility of potential sources can be estimated. This will include review of benefits values defined for other California beaches and their potential for transfer to the southern Monterey Bay beaches.

**Subtask 3.7: Source/Site Compatibility (GIS).** Using the Sand Compatibility and Opportunistic Use Program (SCOUP) protocols for sediment characterization and comparison, we will collate available information regarding the physical and chemical compatibility of the sediments between the identified potential source and receiver sites. The essential data include particle size, and chemical signatures (metals and other analytes). In order to assess compatibility, we will also investigate the sampling protocols for consistency between potential source and receiver sites. Once the data are assembled we will determine appropriate transport routes, placement options and generalized protocols.

**Subtask 3.8: Critical Species (GIS).** Jenifer Dugan will use georeferenced attribute information and metadata products to determine the presence of critical species and habitat within and downdrift of the potential nourishment and disturbance areas. Maps will be created using existing database information provided by agencies including the CDFG and the U.S. Fish and Wildlife Service. Scientific literature, museum records, and agency reports on critical species/habitats in the study area will also be assessed to augment the biological database. The likelihood of occurrence of each species will be established by comparing the geographic ranges and habitat requirements of critical species and habitats in the area to those conditions found at the restoration and/or disturbance areas. We will present measures to avoid impacts to critical

species and habitats (a maximum of 20 species/habitats will be assessed), consisting of general regulatory agency requirements for avoiding or minimizing impacts.

**Subtask 3.9: Data Gaps.** Using the existing data sets and reports as a guide, the PWA team will establish the critical areas where knowledge is insufficient and evaluate where there is a need for further data. These data will likely include beach and dune sedimentological and ecological attributes. To address the gaps we will develop a prioritized list of data collection recommendations that will ultimately lead to improved implementation, and potentially reduce expenditure, on beach restoration initiatives.

**Subtask 3.10: Disposal Sites.** The viability of nearshore disposal sites depends on a number of factors. Sediment compatibility and ecologic impacts are key considerations, along with the completeness of available data and the perceived effectiveness of the sediment placement. PWA will integrate the input from our team members to assess whether one or more sites look potentially feasible. Key to this effort will be a review of efforts by others in other locations, such as Santa Cruz Harbor, San Francisco's Ocean Beach, and San Pablo Bay.

**Subtask 3.11: Regulatory Processes.** Using the Beach Restoration Reference Guide as our framework for the local, state, and federal regulatory process, we will investigate the permits that will be necessary for planning and implementing beach restoration along the southern Monterey Bay shoreline. We will provide an introduction to each of the permits (e.g. Local Coastal Plans, U.S. Army Corps of Engineers, and State Water Resources Control Board) and develop flow charts on how to proceed through environmental review and regulatory compliance.

**Subtask 3.12: Funding Streams.** Building upon the work of the SMBCEW, PWA will identify and assess potential sources of local and regional funding streams for incremental costs associated with managing sediment excess/deficit across the southern Monterey Bay region.

**Subtask 3.13: pEIR.** At the request of AMBAG this subtask has been removed from the scope of work.

#### **Task 4: Draft and Final Plans**

The Draft and Final Plans will contain all of the elements outlined in Task 3 above. The structure and layout of these documents will be determined in consultation with AMBAG.

## **Deliverables**

We envisage the following set of deliverables related to most of the subtasks. Not all subtasks have a tangible deliverable or they may be subsumed in other subtask deliverables. The timing of each deliverable is highlighted in the schedule.

<b>Task/subtask</b>	<b>Deliverable</b>	<b>Format</b>
1.1	Organization chart of the governance structure	PDF, one hard copy
1.2, 1.3, 1.4	Base map, littoral cell and jurisdictional boundaries	GIS georeferenced data files, attribute information/metadata
2.1	Set of public outreach materials and consultation documents	various media
3.1	Annotated bibliography of relevant coastal references and sediment information	format compatible with AMBAG and CSMW's database
3.2, 3.3, 3.4, 3.7, 3.8	Critical erosion/sediment deficit areas, potential sediment sources, sediment quality, source and receiver compatibility, critical species habitat	GIS georeferenced data files, attribute information/metadata
3.6	Cost/benefit analysis	PDF, one hard copy
3.9	Set of identified data gaps and recommendations to address them	PDF, one hard copy
3.11	Descriptions/flow charts of regulatory processes	PDF, one hard copy
3.12	Details of local and regional funding streams	PDF, one hard copy
4	Draft CRSMP	PDF, one hard copy
4	Final CRSMP	PDF, one hard copy

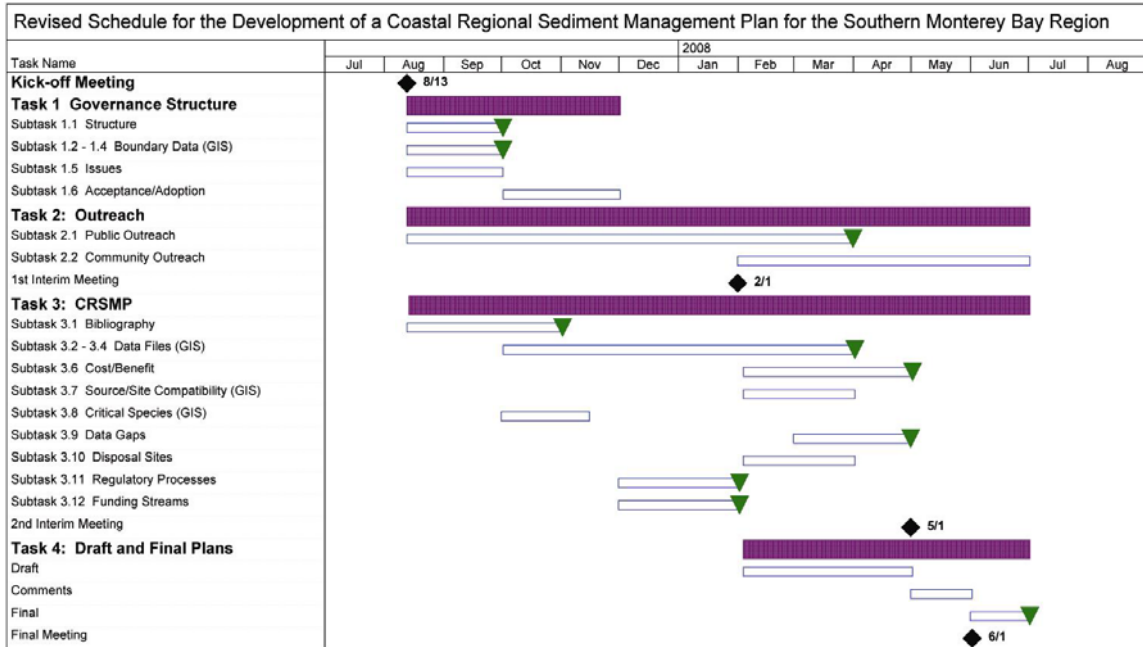
## **Meetings**

The PWA Project Manager will be responsible for ongoing communications and coordination with the Project Management Team (AMBAG and other representatives of the Department of Boating and Waterways, CSMW, and Monterey Bay National Marine Sanctuary). Over and above any outreach meetings, we anticipate four project management meetings with these entities during the project. These are a project kick-off meeting, two interim meetings and a meeting to finalize the Draft Management Plan. The interim meetings will provide a progress update, identify any necessary changes to the project approach to meet the project objectives, and discuss and resolve key issues.

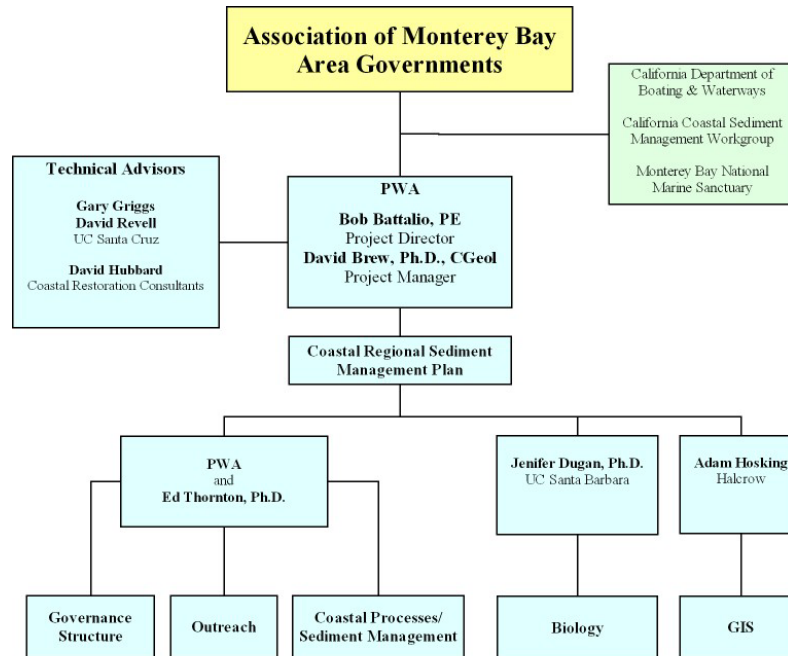
Further meetings can be provided as additional services. We anticipate the additional cost will be approximately \$2,000 per meeting depending on the number of people attending, the meeting location, and the amount of preparation required. If scheduled in advance the cost could be reduced by scheduling to synchronize with other tasks, to optimize time.

## Schedule

The attached table provides a schedule that specifies completion dates for each task, milestones (deliverable and meeting dates), and a final project completion date (after one year). We have assumed a start date of August 13, 2007. Deliverable dates are shown as green triangles on the schedule and relate to the deliverables described in the table above.



**Project Team Structure**



**Budget and Cost Breakdown**

The attached table provides an estimated budget for the PWA team to perform the tasks described above. We have formulated a detailed work plan and fee estimate that conforms to the anticipated full budget of \$150,000. However, we are happy to negotiate with AMBAG to develop a cost breakdown and work effort that fits your final budget and project task emphasis.



## Budget and Cost Breakdown

The attached tables provide an estimated budget for the PWA team to perform the tasks described above. We have formulated a detailed work plan and fee estimate that conforms to the anticipated full budget of \$150,000. However, we are happy to negotiate with AMBAG to develop a cost breakdown and work effort that fits your final budget and project task emphasis.

Task/subtask	PWA		Thornton		Dugan		Halcrow		Griggs		Revell		Hubbard		Total	
	Hours	Cost	Hours	*Cost	Hours	*Cost	Hours	*Cost	Hours	*Cost	Hours	*Cost	Hours	*Cost	Hours	Cost
<b>1 Governance Structure</b>																
1.1 Structure	8	\$ 1,377		\$ -		\$ -	10	\$ 2,217		\$ -		\$ -		\$ -	18	\$ 3,594
1.2 Littoral Cell Boundary	8	\$ 1,377	8	\$ 1,610		\$ -		\$ -	2	\$ 437		\$ -		\$ -	18	\$ 3,424
1.3 Agreed Boundary (GIS)	6	\$ 833		\$ -		\$ -	14	\$ 2,350		\$ -		\$ -		\$ -	20	\$ 3,183
1.4 Jurisdictional Boundaries (GIS)	6	\$ 833		\$ -		\$ -	26	\$ 4,071		\$ -		\$ -		\$ -	32	\$ 4,904
1.5 Issues	8	\$ 1,111		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	8	\$ 1,111
1.6 Acceptance/Adoption	8	\$ 1,111		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	8	\$ 1,111
<b>2 Outreach</b>																
2.1 Public Outreach	36	\$ 5,363	8	\$ 1,610	8	\$ 1,380		\$ -		\$ -		\$ -		\$ -	52	\$ 8,353
2.2 Community Outreach	84	\$ 13,626		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	84	\$ 13,626
<b>3 Coastal Regional Sediment Management Plan</b>																
3.1 Bibliography/Data Collation	100	\$ 11,563	60	\$ 12,075		\$ -		\$ -	4	\$ 874	6	\$ 690		\$ -	170	\$ 25,202
3.2 Coastal Erosion/Sediment Deficit Data Files (GIS)	26	\$ 3,096	16	\$ 3,220		\$ -	34	\$ 5,218		\$ -	6	\$ 690		\$ -	82	\$ 12,224
3.3 Sediment Source Areas Data Files (GIS)	2	\$ 411	4	\$ 805		\$ -	34	\$ 5,218		\$ -	6	\$ 690		\$ -	46	\$ 7,124
3.4 Potential Receiver Sites Data Files (GIS)	2	\$ 411	4	\$ 805		\$ -	34	\$ 5,218		\$ -	6	\$ 690		\$ -	46	\$ 7,124
3.5 Beach Restoration Technologies		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	0	\$ -
3.6 Cost/Benefit	2	\$ 278		\$ -		\$ -	32	\$ 6,840		\$ -		\$ -		\$ -	34	\$ 7,118
3.7 Source/Site Compatibility (GIS)	18	\$ 2,632	4	\$ 805		\$ -		\$ -		\$ -		\$ -		\$ -	22	\$ 3,437
3.8 Critical Species (GIS)	10	\$ 1,078		\$ -	26	\$ 4,485		\$ -		\$ -		\$ -	8	\$ 920	44	\$ 6,483
3.9 Data Gaps	12	\$ 1,557	8	\$ 1,610	8	\$ 1,380		\$ -		\$ -		\$ -		\$ -	28	\$ 4,547
3.10 Disposal Sites	14	\$ 2,077	8	\$ 1,610	6	\$ 1,035		\$ -		\$ -		\$ -		\$ -	28	\$ 4,722
3.11 Regulatory Processes	2	\$ 411		\$ -	6	\$ 1,035		\$ -		\$ -		\$ -		\$ -	8	\$ 1,446
3.12 Funding Streams	8	\$ 1,377		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	8	\$ 1,377
3.13 pEIR		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -		\$ -	0	\$ -
<b>4 Draft and Final Plans</b>																
Draft	100	\$ 11,589	24	\$ 4,830	4	\$ 690		\$ -	4	\$ 874		\$ -	4	\$ 460	136	\$ 18,443
Final	40	\$ 5,173	8	\$ 1,610	2	\$ 345		\$ -	2	\$ 437		\$ -	2	\$ 230	54	\$ 7,795
Expenses		\$ 2,505		\$ 500		\$ 500										\$ 3,505
<b>TOTAL</b>	<b>500</b>	<b>\$ 69,789</b>	<b>152</b>	<b>\$ 31,090</b>	<b>60</b>	<b>\$ 10,850</b>	<b>184</b>	<b>\$ 31,132</b>	<b>12</b>	<b>\$ 2,622</b>	<b>24</b>	<b>\$ 2,760</b>	<b>14</b>	<b>\$ 1,610</b>	<b>946</b>	<b>\$ 149,853</b>

\*includes 15% administrative charge on subconsultant labor

## Consultant Rate Schedules

PWA	Direct Labor	*Fully Burdened Labor
Sr. Principal	\$71.08	\$237.88
Principal	\$61.40	\$205.48
Associate Principal	\$48.94	\$163.77
Senior Associate	\$41.48	\$138.81
Associate II	\$35.65	\$119.30
Associate I	\$31.80	\$106.40
Hydrologist II	\$29.41	\$98.42
Hydrologist I	\$25.59	\$85.62
Sr. Hydrographer	\$28.56	\$95.58
Hydrographer	\$21.70	\$72.62
Graphics/CADD Specialist	\$29.89	\$100.04
Desktop Publishing	\$28.93	\$96.83
Admin Support/Clerical	\$23.91	\$80.02

\*Company Overhead Rate 191% (Fringe Benefits 138%, Administrative 153%)

Halcrow	Direct Labor	*Fully Burdened Labor
Vice President	\$86.00	\$266.78
Principal Engineer/Scientist	\$56.19	\$174.31
Senior Engineer/GIS	\$40.20	\$124.69

\*Company Overhead Rate 182% (Fringe Benefits 140%, Administrative 142%)

## Academic Rate Schedules

Ed Thornton	\$175
Jennifer Dugan	\$150
Gary Griggs	\$190
David Revell	\$100
David Hubbard	\$100