4.0 Surveys

4.1 PRE-CONSTRUCTION, POST-DREDGE, AND POST-CAP SURVEYS

King County hired an independent hydrographic surveyor (Blue Water Engineering) to perform site surveys at key times during the project. Surveys were performed before construction began at the site, after the dredging was complete, and after capping was complete. These surveys were used to verify that the depths of dredging and elevations for capping were achieved as required in the Contract Documents. These surveys were also used as the basis for dredge quantities for contractor payment. Each survey was performed using a survey grade fathometer with survey lines approximately every 25 feet across the site. Tidal corrections were made based on periodic reading of tide staffs installed at the site. Horizontal location control was provided by using a DGPS that utilized the Coast Guard corrector station and locally surveyed monuments. The horizontal datum used in the surveys was North American Datum of 1983 with the 1991 update (NAD83 [91]) and the vertical datum was the U.S. Army Corps of Engineers' MLLW. Copies of the surveys are included in Appendix E; these surveys function as the as-builts required by MTCA (WAC 173-340-400(b)).

A reconnaissance survey was performed on August 2, 2003. This survey was used to develop the final plans included in the Technical Specifications. A confirmational pre-dredge survey was performed on October 23, 2003. The post-dredge survey was performed for Area B on January 14, 2004, and for Area A on January 21, 2004. The post-cap survey was performed on March 3, 2004. A final confirmation survey was conducted on March 11, 2004.

4.2 CONTRACTOR DAILY PROGESS SURVEYS

The contractor was required to perform daily progress surveys over the entire area dredged to date during dredging operations. Typically, only the area dredged on the given day was surveyed. The contractor used an Ashtek 24 channel dual frequency DGPS receiver for horizontal positioning and a Knudsen 320M survey grade fathometer. Laptop computers with Hypack® software processed the data. Soundings were corrected for the tides based on an on site electronic tide gauge. The contractor performed a pre-dredge survey on the same date that Blue Water Engineering performed King County's pre-dredge survey. The two surveys were in substantial agreement. The contractor's final post-dredge survey was also in substantial agreement with Blue Water Engineering's post-dredge survey.

During capping operations, the contractor's daily surveys were used to determine whether each cap layer had adequate thickness. This was allowed because their history of surveys and their methods were acceptable. This allowed for confirmation of their placement

much quicker and resulted in fewer delays than they would have incurred if an independent surveyor had to be called in and the survey processed over an allowable 5-day period. The contractor's final post-cap survey agreed with the Blue Water Engineering post-cap survey.

4.3 QUANTITIES

A comparison between the pre-dredge survey and the post-dredge survey shows that 68,250 cy were removed during the entire project (including the debris and overdredge quantities). The capping quantities were measured by material type and paid by the ton. The contractor delivered and placed 79,743 tons of base cap, 18,064 tons of habitat mix, 5,529 tons of quarry spall, 7,141 tons of light loose riprap, and 2,371 tons of light loose riprap special (Table 8). These quantities were measured at the quarry based on barge displacement and using certified displacement curves.

Table 8
Quantities of Capping Materials (in tons)

Material Type	Original Bid	Revised Estimate	Final Construction
Base Cap	78,000	80,000	79,743
Habitat Mix	5,400	17,200	18,064
Quarry Spalls	5,600	5,100	5,529
Riprap	7,350	6,600	7,141
Riprap Special	1,875	1,800	2,371