Appendix G-2
Contaminated Sediment BMP Selection Table

Contaminated Sediment BMP Selection Table

BMP Option	Technical Limitations/ Site Constraints	Potential Advantages	Potential Disadvantages	Effective Applications	Ineffective Applications
Mechanical Dredging, Equipment Selection					
Use environmental bucket (aka closed bucket)	• Typically effective only in loose, unconsolidated material • Ineffective at removing debris	• Some studies have shown that they can reduce sediment resuspension levels	• Variable results on previous projects • Significantly slower production rate • Effectiveness dependent upon sediment characteristics	• Typically used for loose, unconsolidated sediment or for contaminated sediments	• New work dredging • Dredging debris • Dredging medium to highly consolidated sediment
Select appropriate size and type of bucket when using standard bucket	• Dependent upon site conditions and sediment physical characteristics • Requires dredging experience	• Can reduce bucket overfill • Can reduce excessive water in bucket • Can reduce need to take multiple bites	• None	• Any mechanical dredging projects	• None
Use Real Time Kinematic (RTK) positioning	• DGPS coverage area/accuracy • Not all contractors may have equipment	• Better control over dredging location and bucket depth • Can reduce duration of dredging	• More expensive to purchase and operate	• Projects requiring precise vertical and horizontal control during dredging	• Projects where tight positioning control is not required, such as beach nourishment
Mechanical Dredging, Operational Controls					
Use experienced operator (i.e., pre-qualify contractor)	• None	• Experienced dredge operator will be significantly better than inexperienced operator at minimizing resuspended sediments and maintaining an effective production rate	• Experienced dredge operators are not always available and are often employed by the larger dredging companies. Low bidders at times may not be qualified in working with contaminated sediment. Specifying experienced operators may result in no bids.	• Any mechanical dredging project	• None
Avoid tidal extremes	• Site location may have high current velocities at all times	• May reduce the horizontal extent that resuspended sediment travels	• Depending upon season, could significantly increase project duration and cost	• Consider when tidal extremes cause high current velocities that impact water quality • Typically used as contingency measure	• Project schedule is tight and slowing production is not an option (e.g., emergency dredging events)

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BMP Option	Technical Limitations/ Site Constraints	Potential Advantages	Potential Disadvantages	Effective Applications	Ineffective Applications
Slow down production rate (e.g., slow bucket near bottom when lowering and near surface when raising)	• None	• May reduce sediment loading to water column • May reduce sediment resuspended from bucket impact on bottom and drainage at the water surface	• Slower production rate means increased project duration and increased project cost	• Typically used as a contingency measure when water quality criteria can not be achieved during standard dredging	• Project schedule is tight and slowing production is not an option (e.g., emergency dredging events)
Do not allow derrick repositioning using clamshell	• None	• Minimizes resuspension during relocating derrick	• May slow down production since a secondary vessel is required to move the derrick • Increased project cost due to secondary vessel	• Any mechanical dredging project	• None
Mechanical Dredging, Site Containment Options					
Install silt curtain	• Does not extend to bottom of water column • Typically not effective in higher current velocities (>2 knots) • Need to be anchored, causing difficulty in relocating curtain • Interferes with navigation	• Provides visible control measure • Limits and defines potential impact area on the surface • Can reduce resuspended sediment concentrations outside of curtained area, generally limited to surface concentrations	• Typically ineffective in containing dissolved chemicals • Can become fouled with marine organisms and sink • Significant additional cost to project • Awkward to deploy and manage • Increased resuspended sediment concentrations within contained area • Ineffective in areas exposed to wave attack	• Non-navigation locations with infrequent equipment movement and low to moderate current • Nearshore areas where dredge area can be isolated	• Open water areas with deep water, and exposure to waves and high currents • Areas with active navigation • Projects requiring frequent equipment movement
Install Gunderboom (i.e., a type of silt curtain that is designed to extend to the sediment bed)	• Typically not feasible in high current velocities • Need to be anchored, causing difficulty in relocating curtain • Interferes with navigation	• Provides visible control measure • Limits and defines potential impact area • Can reduce resuspended sediment concentrations outside of curtained area throughout water column	• Typically not effective in containing dissolved chemical release • Significant additional cost to project • Awkward to deploy and manage • Increased resuspended sediment concentrations within contained area • Ineffective in areas exposed to wave attack	• Non-navigation locations with infrequent equipment movement and low to moderate current • Nearshore areas where dredge area can be isolated	• Open water areas with deep water, and exposure to waves and high currents • Areas with active navigation • Projects requiring frequent equipment movement

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BMP Option	Technical Limitations/ Site Constraints	Potential Advantages	Potential Disadvantages	Effective Applications	Ineffective Applications
Mechanical Dredging Barge Disposal, Operational Controls					
Use experienced operator (i.e., pre-qualify contractor)	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Control rate of discharge	• Dependent upon barge capability • Difficult to control	• Less impact on bottom, reducing near bottom resuspended sediment	• May increase dispersion within water column • May increase project duration	• Use when controlling bottom impact	• When schedule is critical
Move barge during discharge	• Disposal site boundaries may be limited	• May help reduce impact on bottom	• May increase dispersion within water column • May increase project duration	• Use when controlling bottom impact	• When precise disposal placement is required • When schedule is critical
Mechanical Dredging Barge Transport and Offloading, Equipment Selection					
Select appropriate type of barge (contractor responsibility)	• Select appropriate barge to meet project objectives, and environmental concerns	• Maximize production, minimize potential sediment loss	• Specifying type of barge to be used may limit available contractors	• Any mechanical dredging project	• None
Mechanical Dredging Barge Transport and Offloading, Operational Controls					
Avoid barge overfilling	• None	• May reduce spillage from barge	• Potentially requires either more barges or more barge trips, increasing costs	• Any mechanical dredging project	• None
Use spill plate/apron during offloading	• Wharf configuration/design may preclude this option	• Reduce potential for spillage into water at offload site	• Minimal increased cost	• When mechanically off-loading barges for upland or nearshore confined disposal	• When the elevation difference between the barge and the offloading top of deck are large
Use filter material on barge drainage ports	• Deep hulled barges typically are not used to dewater sediment • Typically used to reduce loss of sediment during dewatering from flat deck barges	• Reduces loss of sediment when free water drains from barge	• Minimal increased costs • May slow down dewatering process	• When using flat deck barges for transport to offload area • When controlled dewatering is preferred	• Bottom dump or split hull barges • When objective is to rapidly dewater the sediment
Mechanical Dredging Barge Transport and Offloading, Site Containment Options					
Install silt curtain	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Install Gunderboom	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description

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BMP Option	Technical Limitations/ Site Constraints	Potential Advantages	Potential Disadvantages	Effective Applications	Ineffective Applications
Hydraulic Dredging, Equipment Selection					
Select appropriate type of hydraulic dredge (suction, cutterhead, dustpan, toyo, etc.)	• Dependent upon site conditions and sediment physical characteristics • Requires dredging experience	• Maximize production, minimize potential sediment loss	• Specifying hydraulic equipment to be used may limit available contractors	• Any hydraulic dredging project	• None
Use Real Time Kinematic (RTK) positioning	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Hydraulic Dredging, Operational Controls					
Use experienced operator (i.e., pre-quality contractor)	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Avoid tidal extremes	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Slow down impeller speed	• Need to understand system limitations (e.g., potential for plugging or cavitation) • Depends on hydraulic pump capability	• Reduces flow rate which may reduce resuspended sediment at point of dredging	• Reduces production rate, increasing cost • May require higher maintenance due to plugging	• Any hydraulic dredging project	• None
Slow down or speed up swing rate	• Thin cuts require faster swing rates to maximize slurry solids concentration	• May reduce resuspended sediment by slowing or speeding up swing rate depending upon cut thickness	• Slowing down swing rate reduces production rate, increasing duration and costs • Potential to plug the discharge line	• Typically used as a contingency measure when water quality criteria can not be achieved during dredging	• Project schedule is tight and slowing production is not an option (e.g., emergency dredging events)
Hydraulic Dredging, Site Containment Options					
Install silt curtain	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Install Gunderboom	• See previous description	• See previous description	• See previous description	• See previous description	• See previous description
Hydraulic Discharge, Equipment Selection					
Use diffuser	• Suitable for open water discharge, but not typically used in settling basins	• Slows down discharge velocity, limiting resuspension impact area	• Higher turbid plume within discharge area • Slightly higher maintenance costs	• Disposal site bathymetry and currents sufficient for adequate dispersal • Dredge material does not contain debris which could clog the diffuser	• Some beach replenishment projects may not support use of diffusers • Large amounts of debris • Projects requiring screening for UXO

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Hydraulic Discharge, Operational Controls					
Adjust flow rate	• Need to understand system limitations (e.g., potential for plugging or cavitation) • Depends on hydraulic pump capability	• Slowing flow rate typically reduces sediment load being discharged, and increases retention time within settling basin	• Increases duration and costs • Potential to plug the discharge line • May required higher maintenance due to plugging	• Any hydraulic dredging project	• None
Adjust slurry solids concentration	• Need to understand system limitations (e.g., potential for plugging or cavitation) • Depends on hydraulic pump capability	• In settling basins, higher solids concentration in slurry may result in less overall resuspended sediment concentration at the effluent discharge location due to higher settling rates associated with higher solids concentration	• In open water discharge, higher solids concentration may result in higher resuspended sediment concentrations	• Settling basin discharge sites • Open water discharge sites • Increasing or decreasing slurry concentration may have variable results at different sites. Laboratory settling tests can assess how a site specific sediment will behave.	• None
Move discharge point to maximize retention time	• Discharge site boundaries limit discharge point location • Hydraulic discharge pipe length is dependent upon pump capability	• Increasing retention time in settling basin will allow more resuspended sediment to settle	• Locating discharge point to maximize retention time may require additional pipeline and booster pumps, increasing cost	• Settling basin discharge sites	• Open water discharge sites
Hydraulic Discharge, Discharge Site Controls					
Size appropriate overflow weir	• Dependent upon flow rate	• Prevents resuspension of settled sediments within settling basin	• None	• Settling basin discharge sites	• Open water discharge sites
Install baffles or other site flow diversion(s)	• Site storage capacity • Site configuration and flow rate	• Increases retention time	• Increased costs for structure(s) • Reduced storage capacity	• Settling basin discharge sites	• Open water discharge sites
Increase ponding depth	• Site storage capacity • Dependent upon flow rate	• Increases retention time • Reduces potential for resuspending settled sediment	• Requires larger containment berms • Potentially reduced storage capacity • Increased costs	• Settling basin discharge sites	• Open water discharge sites