Attachment J-3:
Summary Table of Sediment Management Alternative Evaluation

Summary of Sediment Management Alternative Evaluation
Lower Susquehanna River Watershed Assessment

		Description	*Fatal Flaw?*	*Evaluation*								*Alternative Development*			*Water Quality results*	
Strategy No.	**Sediment Management Strategy**			**Acreage**	**Lifespan (years)**	**Capacity in Cubic Yards (CY) Yearly/Lifespan Volumes**	**Access**	**Tipping fee ($)**	**Distance from Reservoirs**	**Pros**	**Cons**	**Alternative Developed?**	**Sediment impacts**	**Cost**	**Modeling Run Completed?**	**TMDL Impacts**
	WATERSHED STRATEGIES (Reduce Sediment Yield from the Watershed)															
1	Agricultural BMP's	See Attachment J-1 for full suite of Ag BMP's. There are 37 CBP approved BMP's. LSRWA team utilized results of BMP evaluation done for TMDL process.	No	Variable	N/A	N/A	Variable	N/A	N/A	Low environmental impacts	Few opportunities available above WIP Implementation	Yes. See Factsheet 4 of Attachment J-2 and more description in Attachment J-1. Combination of Strategy 1 and 2.	Strategy is part of "E3" Scenario (Alternative). Maximum available load of sediment per year available to be reduced above WIPS is 197,500 tons (244,000 cy/395 million pounds) of sediment annually (NY, PA, MD).	Average annual unit costs estimated to be $357/acre/year for Ag BMP's and $2781/$/acre/year for Urban/Suburban BMP's. See J-1 for full discussion of costs. $1.5B-$3.5B Total cost for implementation.	No. This Alternative was not modeled. Sediment reduction is about 1/7 what is estimated to flow over Conowingo Dam into Chesapeake Bay on an average annual basis (1 million tons).	
2	Urban/Suburban BMP's	See Attachment J-1 for full suite of BMP's. There are 20 CBP approved BMP's. LSRWA team utilized results of BMP evaluation done for TMDL process.	No	Variable	N/A	N/A	Variable	N/A	N/A	Low environmental impacts	Few opportunities available above WIP Implementation	Yes. See Factsheet 4 of Attachment J-2 and Attachment J-1. Combination of Strategy 1 and 2.	Strategy is part of "E3" Scenario (Alternative). Maximum available load of sediment per year available to be reduced above WIPS. Reduction in 197,500 tons (244,000, 395 million pounds) of sediment annually (NY, PA, MD)	Average annual unit costs estimated to be $357/acre/year for Ag BMP's and $2781/$/acre/year for Urban/Suburban BMP's. See J-1 for full discussion of costs. $1.5B-$3.5B Total cost for implementation.	No. This Alternative was not modeled. Sediment reduction is about 1/7 what is estimated to flow over Conowingo Dam into Chesapeake Bay on an average annual basis (1 million tons).	
	MINIMIZE SEDIMENT DEPOSITION WITHIN RESERVOIRS (Route Sediments Passively through Reservoirs)															
3	Flushing/empty Flushing	Flushing re-mobilizes sediments previously deposited in a reservoir by drawing down the water level and letting the water flow out through low-level outlets in the dam. Water flowing through the reservoir scours sediments and passes them through the dam.	Yes. Competing water uses, operational limitations, structural constraints, and safety considerations.													
4	Density Current Venting	Gravity flow of turbid waters of different density. The density difference being a function of the differences in temperature, sal content or silt content of the two fluids. Density currents occur when sediment laden water enters an impoundment, plunges beneath the clear water and travels downstream to the face of the dam. When the density current is strong enough and lasts long enough, the sediment laden water can be discharged through low-level outlets. Methoc only applicable in reservoirs where, and when, such density currents occur, and their high carrying capacity can be used to pass sediment through reservoirs.	Yes. Competing water uses, operational limitations, structural constraints, and safety considerations.													

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5	Agitation Dredging	Removal of bottom material by using equipment to raise it temporarily in the water column and currents to carry it away via various methods of dredging. Once the fine sediment is suspended in the water column, it can be transported downstream via stream flow and passed through the dam by way of release operations.	Yes. Competing water uses, operational limitations, structural constraints, and safety considerations.													
6	Sluicing	Removal of sediments from a reservoir bypassing water and sediments through outlets located at a low level of the dam. Sluicing also removes sediment by either completely scouring deposited sediment in th vicinity of the sluice gates or lowering the general level of deposits upstream. Sluicing requires timing of the release to periods of high volume, high sediment concentration inflows to the reservoir.	Yes. Competing water uses, operational limitations, structural constraints, and safety considerations.													
	INCREASE OR RECOVER VOLUME (Includes placement options)															
7	Dam Removal	Remove one or all three dams	Yes. This strategy was deemed impractical, infeasible, with little benefit due to multiple uses of dams to Chesapeake Bay population.													
8	Enlarge Dams/Construct New dams	Larger Dam/more dams	Yes. This strategy was not evaluated any further. Deemed impractical, infeasible, with little benefit and simply kicks the can down the road and would have environmental impacts.													
9	Tunnel By-pass	Pass course sediment around the dam by tunnel	No	N/A	N/A	Lifespan Capacity Variable Yearly Capacity Variable	N/A	0	Variable	Potential for long term management, supply of course, medium, and fine-grained sediment to replenish downstream habitats, deliver sediment at less ecologically critical times of year, i.e. winter.	Tunnel abrasion, incurring maintenance)e, high cost for installation (80-160 million) and high annual maintenance (1 million).	No. No further evaluation done due to rarity of such a strategy and high costs.				

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10	Beneficial Reuse (Lightweight Aggregate)	This evaluation focus on light-weight aggregate. LWA can be sold commercially fo construction use. Harbor Rock estimates that a facility to process the dredged material would vary in size depending on the amount of material requiring processing on a daily basis; for efficiency purposes, the facility would require year-round operation. The unit cost for the operation would benefit from economies of scale (larger facilities would have lower unit cost values); however, the ability of the lightweight aggregate market to absorb increased production may reduce the viability of large operations. Other commercial uses for dredged material include landfill capping, and cement blocks.	No	50-100	Greater than 40 yrs	Lifespan Capacity -- Yearly Capacity 1 Kiln handles 1Mil. tons per year. Can have Multiple Kilns	Road, barge	20-25	10 to 15	40 yr Plant lifespan; beneficial use of material	Material must be dried, high cost; have to build plant; Limited by amount dredged; Material will need to be dried	Yes. See Factsheet 1 of Attachment J-2. Looked at removal of 1,3,5 million cy annually. Similar sediment and water quality effects would be anticipated as laid out in Strategies 25, 34 and 38.	Strategy was developed into an Alternative looking at Dredging/processing 1, 3 and 5 mcy per year. Modeling simulated one time removal of 3 mcy and selected an area behind Conowingo. Determined to be an ideal location due to high deposition rate. Removing 2.4 million tons resulted in a reduction of 300,000 tons sediment available for scour. Approximately a 3% reduction in sediment available for scour during a storm event for every 1 mcy removed.	1 mcy annually-$39-50 cy; 3mcy annually- $29-$39 cy; 5mcy annually-26$-39cy.		
11	Biological Dredging/Floating Wetlands (Brinjac)	Artificial wetland matrix made of inert recycled plastic; compacts sediment potentially making sediments less likely to move during storm events. Could be constructed in the river as islands. The wetlands would require regular harvesting and annual maintenance.	No	Variable	Indefinite	Lifespan Capacity is variable requires annual maintenance and harvesting of plants.	N/A	0	N/A-Technology is mobile	No tipping fee low environmental impact potential to offset dredging impacts.	Annual maintenance, doesn't reduce sediment, not a stand alone strategy would need to be implemented with another strategy to have benefits. Would not withstand extreme storm events.	No. Since this could only be done in conjunction with dredging (i.e. doesn't reduce sediment avaialble for scour) a representative alternative was not developed.				
12	Island Creation in Susquehanna River or upper Bay.	Placement site. "Tear drop" islands in Susquehanna river and upper Bay.	No	Variable	Indefinite	Lifespan Capacity Variable, until island is filled. Yearly Capacity Volume depends on island size and volume dredged per year.	Pipeline, barge	0	Max. 75	Material can be wet; no tipping fee; beneficial use; more flexibility in amount of material that can go to this site .	Environmental hurdles; state law forbids island creation in the Bay; material must be sandy or contained; barges with associated load and unload fees; Environmental regulations; erosion.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				

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13	Smith Island Creation	Placement site	No	Variable	Indefinite	Lifespan Capacity Variable, until island is filled. Yearly Capacity Volume depends on island size and volume dredged per year.	Barge	0	128	Material can be wet; no tipping fee; beneficial use; more flexibility in amount of material that can go to this site .	Possible erosion; environmental hurdles; material must be pure sand; barges will be involved and there will be the associated load and unload fees; confinement is necessary; longer transport distance than for man-made islands near the dams; water quality certificate; tidal wetlands permit/authorization required	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
14	Fringe Wetland Creation	Placement site	No	Variable	Indefinite	Lifespan Capacity Variable, until wetland is filled. Yearly Capacity Small volume depends on the wetland size.	Road, pipeline, barge	0	Max. 75	Material can be piped; material can be wet; no tipping fee; beneficial use; more flexibility in amount of material that can go to this site.	Possible erosion of material; material must be sandy or contained by hay bales or coir logs barges will be involved and there will be the associated load and unload fees; confinement is necessary; smaller amounts of material can be placed vs. island creation; water quality certificate; tidal wetlands permit/authorization required.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
15	Manufactured Soil	Dredged material for use as soil or for solid amendments such as (agriculture, mining etc.)	No	Variable	Indefinite	Lifespan Capacity -- Yearly Capacity Variable	Road, pipeline, barge	0	Variable	No tipping fee; volume depends on demand for material; beneficial use.	Material must be dried, high cost; must have other material to mix dredge material with, such as compost; need confinement.	Due to readily available data that has been vetted through Chesapeake Bay community for years as a potentially feasible innovative re-use alternative from Harbor Rock (light weight aggregate) this strategy was not selected as an innovative reuse strategy to be evaluated further. However Similar sediment and water quality effects would be anticipated as laid out in Strategy 11. Costs would vary depending on details of processing.				
16	Dyke Marsh (Potomac, MD)	Placement site	No	245	Indefinite	Lifespan Capacity -- Yearly Capacity 2,000 cy/day; ~700,000 cy/year; dependent on whether they have a placement cell available at needed time.	Pipeline, barge	0	230	Most likely no tipping fee	Barges will be involved and associated load and unload fees; environmental hurdles; longer transport distance than for man-made islands near the dams; erosion; confinement necessary; water quality certificate; tidal wetlands permit/authorization required.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				

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17	Blackwater	Placement site	No	Variable	Indefinite	Lifespan Capacity Variable, wetland creation, enhancement. Yearly Capacity Volume depends on size of wetland creation and volume dredged per year.	Barge, Road	0	100-125	Wetland creation and beneficial use; Flood protection for refuge;	Barges will be involved and associated load and unload fees; environmental hurdles; longer transport distance than for areas near the dams; water quality certificate; tidal wetlands permit/authorization required .	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
18	Pump Downstream (Active By-passing)	Pass sediments around dams via a bypass during less critical (non-storm, flow) periods so that the reservoirs maintain storage capacity for high-sediment transport storm events to reduce amount of sediment passed during storm event.	No	N/A	N/A	Lifespan Capacity Variable Yearly Capacity Variable	N/A	0	N/A	Lower costs, potential for long term management, supply of course, medium, and fine-grained sediment to replenish downstream habitats, deliver sediment at less ecologically critical times of year, i.e. winter.	Increased turbidity levels downstream, changes in water chemistry, impacts of sediment-removal upstream, consultation with regulatory agencies to develop an upper limit of sediment concentration needs to minimize impacts, out flowing sediment concentration has to be regularly monitored and controlled, regulatory (i.e., permitting) issues, outflow must be in an area of the river where velocities are sufficient to continue to move the material, benthic organism and/or SAV may be covered by release of sediment downstream; Potential impact to existing habitat such as the SAV beds, spawning fish habitat, etc.	Yes. See Attachment J-2 and Factsheet 2B and 2C. Both alternatives looked at hydraulic dredging, pipeline same removal location from Conowingo and placement downstream. 2B is 1,3,5 mcy in winter months and 2B is 1,3 or 5 mcy July-March, 9 months.	1,3,5 mcy or sediment removed for each strategy. Approximately a 3% reduction in sediment available for scour during a storm event for every 1 mcy removed. Modeling of 3mcy for 3 months (variation of 2A) and 9 months (2C) showed that daily loads in Bay increased from 1,940 to 28,607 tons per day if by-passing occurred in 3 winter months and to 10,829 tons per day for 9 months (variation of 2C). See Attachment J-4 for details.	For 1mcy removed annually 2B is $11-17 a cy while 2C is $6-12 a cy. For 3 mcy removed annually 2B is $10-16 a cy while 2C is $5-11 a cy. For 5mcy removed annually 2B is $10-16 a cy while 2C is $5-11 a cy. 2C is cheaper because there is 1 less dredge and pipeline is required. Costs appear cheaper per/cy to remove 1 vs. 3 million a year while costs appear the same between 3 and 5 mcy.	Yes. See Attachment J-4 for details. Modeling looked at annual by-passing (a variation of 2B and 2C) 3mcy, 3 months of the year. Which resulted in widespread diminished water quality from the head of the bay to the mouth of the Potomac river.	2-5% increases in non-attainment for 5 segments of the Bay for deep channel DO and --2% increases in non attainment for 4 segments of the Bay for deep Water DO
19	Pooles Island Placement	Placement site. See Factsheet 2A in Attachment J-5 for more details.	No	1,700	Indefinite	Lifespan Capacity Unknown Yearly Capacity 5,000,000 cy/year	Barge	0	32	Material can be wet; no tipping fee.	Currently cannot place material here legally; if could, material would need to be barged, therefore load and unload fees; environmental hurdles	Yes. See Attachment J-2 and Factsheet 2A. Involved hydraulic dredge and pipeline to a drying site and piping to a barge travel to Poole's island and then pump.	1,3,5 mcy removed annually. Modeling simulated one time removal of 3 mcy and selected an area behind Conowingo. Determined to be an ideal location due to high deposition rate. Removing 2.7 million tons resulted in a reduction of 300,000 tons sediment available for scour. Approximately a 3% reduction in sediment available for scour during a storm event for every 1 mcy removed.	Annualized: 1mcy -$16-23/cy; 3mcy- $16-21/cy; 5mcy- 16-21 mcy	Yes. See Attachment J-4 for details. Effects were most obvious in the summer following a scour event. DO improvements and chlorophyll reduction were observed along the trench of the bay from Baltimore Harbor to the mouth of the Potomac and into the Potomac trench.	Decrease in non attainment by 1% in one segment of the bay in comparison "Base" No action taken modeling scenario.
20	Ocean Placement	Placement site.	No	N/A	Indefinite	Lifespan Capacity Unlimited Yearly Capacity Depends on volume dredged per year	Barge	0	240	Material can be wet; no tipping fee; most likely larger volumes could be acceptable.	Very large distance; environmental hurdles; barges will be involved and there will be the associated load and unload fees must pass bioassay tests.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				

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21	Wolf Trap and Rappahannock, VA	Placement site.	No	N/A	Indefinite	Lifespan Capacity -- Yearly Capacity 500,000 cy/year to 1,000,000+ cy/year	Barge	0	155	Larger volumes could be accepted.	Need Virginia approval; large distance; environmental hurdles; barges with associated load and unload fees; maybe not enough barges to do job; material must be dewatered($); currently used by MPA; water quality certificate; tidal wetlands permit/authorization required .	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
22	Purchase Land	Placement site/Staging Area for processing dredged material for final placement.	No	Variable (100+)	Indefinite	Lifespan Capacity Variable, until land is filled. Yearly Capacity Volume depends on land size and volume dredged per year	Road, pipeline, barge	N/A	Variable	Potentially large capacity; could help as a place to dry material for other sites.	Cost; must meet state regulations (PADEP for PA and MDE for MD); transport containers must be watertight; distance; purchase of land will be needed. Maybe zoning hurdles or contamination/groundwater issues, water may need to be decanted, requiring another pipeline to return the effluent to the river	This strategy is discussed as a component of other strategies mainly to be utilized as a dewatering and/or transfer site.				
23	Shirley Plantation	Placement site.	No	1,800	Indefinite	Lifespan Capacity -- Yearly Capacity 500,000 cy/year 1,000,000 +40-60 million in mine reclamation	Road, barge	$50/cy	270	Large capacity; potential to help with reclamation	Must meet VA chemical criteria and regulations; transport containers must be watertight; distance; water may need to be decanted, requiring another pipeline to return the effluent to the river; water quality certificate; tidal wetlands permit/authorization required.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
24	Mines	Placement site.	No	Variable	Indefinite	Lifespan Capacity Variable, until mine is filled. Yearly Capacity Volume depends on mine size and volume dredged per year.	Road, pipeline, barge	Unknown	Variable	Large capacity; reclamation	Must meet regulations; transport containers must be watertight; distance; water may need to be decanted, requiring another pipeline to return the effluent to the river; Mine owners contacted had no interest in sediments because of limitations on their mining permits.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
25	Modern Landfill (York, PA)	Placement site.	No	80	8	Lifespan Capacity 240,000 cy Yearly Capacity TBD	Road, rail	$30/ton	37**	Some capacity; distance	Tipping fees; dry material; high cost; water may need to be decanted, requiring another pipeline to return the effluent to the river; Regulations: PADEP has limits on what sediment can be placed; sediment is either classified as clean or waste based on certain criteria; if material is considered waste special handling is required, which adds more cost.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				

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26	Republic Materials Landfill (Conestoga, PA)	Placement site.	No	80	26	Lifespan Capacity 240,000 cy Yearly Capacity TBD	Road, rail	$30/ton	46	Some capacity; distance	Tipping fees; dry material; high cost; water may need to be decanted, requiring another pipeline to return the effluent to the river; Regulations: PADEP has limits on what sediment can be placed; sediment is either classified as clean or waste based on certain criteria; if material is considered waste special handling is required, which adds more cost.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
27	Scarboro Landfill (Aberdeen, MD)	Placement site.	No	106	Unknown	Lifespan Capacity 318,000 cy Yearly Capacity TBD	Road, pipeline	To be determined	13*	Some capacity; distance	Tipping fees; dry material; high cost; water may need to be decanted, requiring another pipeline to return the effluent to the river; PADEP has limits on what sediment can be placed; sediment is either classified as clean or waste based on certain criteria; if material is considered waste special handling is required, which adds more cost.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
28	Stancil Quarry (Perryville, MD)	Placement site.	No	70	Unknown	Lifespan Capacity 9,000,000 cy Yearly Capacity TBD	Road, pipeline	$4/cy	13*	Large capacity; Potential to be pumped directly	Must meet state regulations for MD; tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river; high cost; watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Yes. See Factsheet 3A within Attachment J-2. Involves hydraulic dredging behind Conowingo and piping to dewatering site at Stancil quarry than placed permanently at Stancil's.	1,3,5 mcy removed annually. Modeling simulated one time removal of 3 mcy and selected an area behind Conowingo. Determined to be an ideal location due to high deposition rate. Removing 2.4 million tons resulted in a reduction of 300,000 tons sediment available for scour. Approximately a 3% reduction in sediment available for scour during a storm event for every 1 mcy removed.	Annualized: 1mcy -$23-35/cy; 3mcy- $22-34/cy; 5mcy- $22-33 mcy	Yes. See Attachment J-4 for details. Effects was most obvious in the summer following a scour event. DO improvements and chlorophyll reduction were observed along the trench of the bay from Baltimore Harbor to the mouth of the Potomac and into the Potomac trench.	Decrease in non attainment by 1% in one segment of the bay in comparison "Base" No action taken modeling scenario.
29	Port Deposit Quarry (MD)	Placement site.	No	68	Indefinite	Lifespan Capacity 3,250,000 cy Yearly Capacity TBD	Road, rail, pipeline	0	3.5*	Large capacity; Potential to be pumped directly	Must meet state regulations for MD); tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river ($); watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
30	Penn/MD Materials Quarry (Peach Bottom, PA)	Placement site.	No	60	25-30	Lifespan Capacity 9,000,000 cy Yearly Capacity TBD	Road, pipeline	To be determined	5*	Large capacity; Potential to be pumped directly	Must meet state regulations (PADEP for PA and MDE for MD); tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river ($); watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				

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Strategy No.	**Sediment Management Strategy**			**Acreage**	**Lifespan (years)**	**Capacity in Cubic Yards (CY) Yearly/Lifespan Volumes**	**Access**	**Tipping fee ($)**	**Distance from Reservoirs**	**Pros**	**Cons**	**Alternative Developed?**	**Sediment impacts**	**Cost**	**Modeling Run Completed?**	**TMDL Impacts**
31	Penn/MD Materials Quarry (Skippack, PA)	Placement site.	No	100	Unknown	Lifespan Capacity 300,000 cy Yearly Capacity TBD	Road	To be determined	72	Some capacity	Must meet state regulations for PA, tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river; high cost; watertight transport; long pumping distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
32	Mason Dixon Quarry (Belvidere Plant, MD)	Placement site.	No	565	40	Lifespan Capacity 35,000,000 cy Yearly Capacity TBD	Road, pipeline	To be determined	12.5*	Large capacity; Potential to be pumped directly	Must meet state regulations for MD); tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river ($); watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Yes. See Factsheet 3D within Attachment J-2. 3D involves hydraulically dredging material and pumping direct to quarry downstream.	1,3,5 mcy removed annually. Modeling simulated one time removal of 3 mcy and selected an area behind Conowingo. Determined to be an ideal location due to high deposition rate. Removing 2.4 million tons resulted in a reduction of 300,000 tons sediment available for scour. Approximately a 3% reduction in sediment available for scour during a storm event for every 1 mcy removed.	Annualized cost for 1 mcy for 3B is 53-90/cy; for 3C is $36-50/cy; 3D- $36-50/cy. For 3 mcy 3B is 52-89/cy; for 3C is $36-54/cy; 3D- $36-49/cy. For 5mcy for 3B is $52-88/cy; for 3C is $36-53/cy; 3D-$36-48/cy. 3D appears cheapest than 3C and 3B most expensive. In general values is better the more you remove annually.	Yes. See Attachment J-4 for details. Effects war most obvious in the summer following a scour event. DO improvements and chlorophyll reduction were observed along the trench of the bay from Baltimore Harbor to the mouth of the Potomac and into the Potomac trench.	Decrease in non attainment by 1% in one segment of the bay in comparison "Base" No action taken modeling scenario.
33	Mason Dixon Quarry (Perryville Plant, Perryville, MD)	Placement site.	No	107	40	Lifespan Capacity 21,400,000 cy Yearly Capacity TBD	Road, pipeline	To be determined	12.3*	Large capacity; Potential to be pumped directly	Must meet state regulations for MD); tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river ($); watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
34	Mason Dixon Quarry (Cecil Plant, Cecil County MD)	Placement site.	No	150	40	Lifespan Capacity 0 cy Yearly Capacity TBD	Road, pipeline	To be determined	10*	Large capacity; Potential to be pumped directly	Must meet state regulations for MD); tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river ($); watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Yes see Factsheet 3B and 3C within Attachment J-2. 3B involves mechanical dredging material to barge than offloading to staging area than loading to truck than offloading to permanent quarry. 3C involves hydraulic dredging material and pumping to temporary site to dewater than trucked to quarry.				

(NOTE: Bold scores represent those that have been "flagged" to receive particular consideration because of significant interest or impact)

Summary of Sediment Management Alternative Evaluation
Lower Susquehanna River Watershed Assessment

		Description	*Fatal Flaw?*	*Evaluation*								*Alternative Development*			*Water Quality results*	
Strategy No.	**Sediment Management Strategy**			**Acreage**	**Lifespan (years)**	**Capacity in Cubic Yards (CY) Yearly/Lifespan Volumes**	**Access**	**Tipping fee ($)**	**Distance from Reservoirs**	**Pros**	**Cons**	**Alternative Developed?**	**Sediment impacts**	**Cost**	**Modeling Run Completed?**	**TMDL Impacts**
35	Mason Dixon Quarry (Westgate Plant, York County MD)	Placement site.	No	21	Indefinite	Lifespan Capacity 3,060,000 cy Yearly Capacity TBD	Road, rail	To be determined	38	Large capacity; closer to dams	Must meet state regulations for MD); tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river ($); watertight transport; distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
36	Pensy Supply sites quarry (PA)	Placement site.	No	--	Unknown	Initially indicating that they do not have the ability to assist in the disposal of material	Road, rail	--	Up to 100 miles	Large capacity; one company; multiple sites	Must meet state regulations for PA, tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river; high cost; watertight transport; long pumping distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				
37	Eastern Industries Sites, Quarry (PA)	Placement site.	No	--	Unknown	They have not replied to multiple inquiries	Road, rail	--	Up to 100 miles	Large capacity; one company; multiple sites	Must meet state regulations for PA, tipping fees; may only take dry material; drying; water may need to be decanted, requiring another pipeline to return the effluent to the river; high cost; watertight transport; long pumping distance. Potential actions such as: Ground water protection design elements - (1) 4ft unsaturated soil / groundwater tbl. (2) 12" A full sediment characterization must be performed w/ TCLP test impermeable cover material (3) A venting system for the gas (4) a leachate collection system (5) Worst case, a liner.	Not selected as a strategy to be evaluated further as a representative alternative. However similar sediment and water quality effects would be anticipated as laid out in Strategies 11, 20, 29, 33; costs are anticipated to be higher than these strategies.				

* Acceptable Pumping Distance

** 11 Miles from Safe Harbor, Acceptable Pumping Distance

This analysis is based on planning level sediment management concepts.

To fully understand and evaluate effects of any of these concepts detailed designs would be required

Fatal Flaw-Determined by team that strategy should be dropped from consideration.

** A number of factors could be varied to develop alternatives and corresponding concept costs. For example how material is dredged: mechanical or hydraulic. Where material is dredged: behind any three of the reservoirs.

How material is transported to dewatering site and/or placement site: (truck, rail, barge, direct pump); how material is dewatered: rotationally via cells, via equipment. Final placement site: further distance, topography. How much material is removed, how often, and what time of year.

Because of amount of variables, representative alternatives were developed to cover ranges of costs each one of these variables could impact.

(NOTE: Bold scores represent those that have been "flagged" to receive particular consideration because of significant interest or impact)