

Potential Muck Removal and Disposal Methods

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Background is in various water quality protection programs:

- MDSH, MDPH, MDNR, MDEQ
 - NPDES, NPS, Stormwater, Surface Water, Groundwater, IPP, CSO/SSO, Municipal, Industrial,
 - System Design, Operations, Compliance, and Enforcement
 - Environmental Engineering, Limnology
- Approvals of P removal with physical-chemical and biochemical processes
- Committees for water quality standards, disinfection, microorganism standards



WHMD Programs include....

- ◆ Solid Waste Management
 - Landfills, Transfer Stations, Industrial, Municipal
- ◆ Scrap Tire Management
- ◆ Liquid Industrial Waste Management
 - Transport, Disposal
- ◆ Hazardous Waste Management
 - Transport, Storage, Treatment, Disposal
- ◆ Storage Tank, AST, LPG, UST, H2

Assistant to note parked innovative ideas..

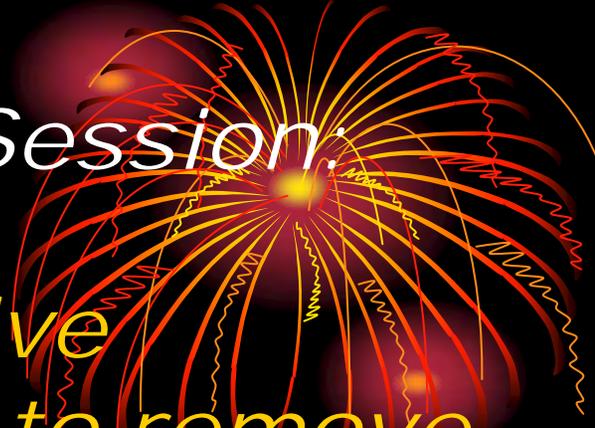
- We haven't had proposals or requests to evaluate removal and disposal methods. Therefore, we aren't recommending specifically one muck removal or disposal method is better than another.
 - So far, there have not been many large projects to observe and evaluate
 - We are all encouraging private innovations
- There are no pilot or large scale proposals for removal or disposal under DEQ review at this time
 - Difficult to explain hypothetical

Property owners have been performing a variety of innovative approaches, all of which work to some extent:

- Hand rakes
- Barber Surf Rake at Bay City State Recreation Area
- Disposal on site in gardens, burial, garbage bags, and probably some compost piles
- Excavators and dozers used on larger sites

This is a Brainstorming Session:

- *DEQ encourages innovative thinking and approaches to remove, and reuse materials as a resource, or dispose of muck. Partnerships.*
 - *May be challenging and complicated, but WHMD is keeping disposal aspects simple*
 - *Opportunities for partnerships and companies, e.g., waste companies*
- *Removal methods and disposal endpoints go hand-in-hand! (as a Liquid Slurry, or Solid), so we'll discuss all !*



Topics



- *A. Potential Methods to Remove Muck*
 - *1. Remove muck at the Beach*
 - *2. Not Removal, but boom off the Beach*
 - *3. Remove muck from the water*
 - *4. Remove muck & sand mixtures*
- *B. Methods of Disposal : as Liquid*
- *C. Methods of Disposal : as Slurry or Solid*

A. Potential Methods of Removal:

- Large projects will need state and federal review.
- Large projects will need permitting by one or more divisions of DEQ and potentially the United States Army Corps of Engineers (USACE).
- Small residential lot-sized projects will need a DEQ LWMD shoreline management permit for mechanized muck removal (not the vegetation removal question) below the Ordinary High Water Mark (OHWM)
 - whether below or above the existing water line
 - with or without discharges or offsite disposal

1. Potential Methods involving: Removal at Beach (in Water or on Shore):

- **When remove, do not cause any of the following:**
 - Significant releases of wastewaters or pollutant or nutrient loads to surface waters while storing at site--or will potentially need permits/authorizations
 - Any releases while transporting solids and liquids on public roads to another site for disposal
 - Nuisances*, e.g., nuisance odor, vectors, pest animals
 - Fugitive dust problems
 - Violations of exemption conditions
 - Impact threatened or endangered species
 - Spread invasive species

Again,

- A State DEQ Land and Water Management Division and/or a federal USACE permit is needed for any mechanized “Work” on the beach or in the water, below the OHWM, e.g., from a boat:
 - More concerns if disturb and/or remove soil sediments from the water or beach areas

Discharges to surface water or groundwater from significantly sized dewatering processes will likely need to be authorized by a permit or other type of authorization from the DEQ.

– Examples:

- Lagoons
- Machinery
- Watercraft discharges or hopper overflows
- Other Innovations?

Discharges to groundwater from significantly sized **disposal operations**, e.g., land application, will likely need to be authorized by a permit or other DEQ approval.

- Permit
- Letter of approval or authorization
- Exemption

2. Some Potential Methods to keep muck off the Beaches!

- Silt screens, booms, baffles, e.g., “Gunderboom”, to keep algae/weeds out of swim areas and off beach:
 - Muck might accumulate in boomed area or near it
 - Method might consume less energy than removing, transporting, and disposal
 - Control screens, booms, etc. will need maintenance after storms
 - May work best in calm areas, e.g. in lakes, not a large bay
 - Might reduce transport and disposal challenges



3. Potential Methods to Remove Muck Only from the Water:

– Harvest aquatic weeds and algal mats directly from the swim zone waters:

- Use machines in the water
 - Travel on bottom in shallow areas, must be sufficiently solid and not rocky bottom)
 - Floating watercraft, or cabled
- Advantages:
 - Don't need riparian land access along shores
 - May disturb less sediment and beach sand



Advantages, cont'd:

- Advantages for corporate ventures:
 - If large scale, might be able to recover C:N:P and other nutrient resources more efficiently from the solely algae and macrophyte vegetation, and limit mixture of soil sediments
 - Could convert nutrients to energy, heat, fertilizer & compost materials, or to animal feed ingredients (various methods in later slide)
 - Potential **sustainable** cost recovery revenue? (This can be **crucial** due to ongoing and repeated muck accumulations on beaches.)

Conditions of Potential Methods to Remove Muck Only from the Water:

– Conditions and Factors:

- Must prevent plant parts from restarting more growth
- May need to be repeated more frequently (after wind storms) than methods that effectively keep muck out of public swim and beach areas
- May help if removal operations are performed during the calmest wave conditions, e.g., during some morning hours
- Algal mats may be difficult to remove after start to decay



Hydraulic pumping of muck and liquids (various “muck sucking machines”)

– Large Scale Handling Options:

- Pump to lagoon ashore for:
 - Settling of organic materials and sands
 - Water overflow back to bay or a wetland
 - Dewatering and drying of solids in lagoon, test as needed, pile & remove
 - Potentially use muck sands for beach nourishment, if not contaminated
 - Limit pile to 90 days to avoid waste piles
 - may reuse sands and organic materials



Hydraulic pumping of muck and liquids, Large Scale Handling Options, cont'd:

- Pump to mechanical dewatering machinery or processes ashore (would likely include polymer additions), with overflow, decant, or filtrates returned to surface waters (requires a NPDES discharge permit)
- Options needing power or pumping, but feasible:
 - Rotary Drum Thickener machine
 - Belt press machine
 - Gravity Thickener tank
 - Centrifuge, or vortex separator
 - Clarifier, or upflow clarifier

Hydraulic pumping of muck and liquids, Pump to Non-Machines:

Not as much power need:

- **Geo-tube** (“sock”), e.g., used for lagoon and river dredging projects
- **Sand drying bed**, dewater, scrape & haul solids to agricultural land as a resource



- Hydraulic dredge, pump to
 - Isolated areas:
 - Overflow Waters: route to coastal wetlands
 - Solids: test solids, as needed
- What other methods?

Pump into a silt screen zone in water or geonet area on land that concentrates muck:

- In water, a moderate distance away from swimming zones
- Ashore, which could be built with sand berms
 - Ought to evaluate N, P, and bacterial indicators in drainage back to bay



Pull “screen filters”, or “algae nets” through the muck that screen/filter the water and drag muck ashore to dewater.

- After dewatering ashore, then load and transport muck away as a solid, if no free liquids in trucks
- If there is free liquids, then transport in lined-bed trucks or tankers, to **prevent releases**
- **Soils/sediments may need to be tested from some areas.** Note: testing can utilize data already available from DEQ, Local Health Depts, NOAA, universities, etc.

4. Potential Methods to Remove Muck and Sediment/Soil Mixtures:

- These methods are less efficient
- Need more Permits from LWMD and USACE
- **Mechanical bucket, scoop**, try to lift out only muck solids (difficult without removing a mixture of muck and soils)
- **Hydraulic dredging**, sometimes hard to control depths, might accidentally go deeper:
 - Control along shoreline
 - If on wheels/tracks, then function of machine depends on weight and the solidity of the sand/silt bottom in the littoral zone, and beach.



Methods to Remove Muck and Sediment/Soil Mixtures, cont'd:

- Must handle and dispose of both sediments and algal muck together.
 - Probably land apply solids
- Potentially pump water to nearby isolated channels
- **Avoid nuisances: dewater and dry out quickly**
- Similar discharge evaluations and permitting requirements as above.

B. Potential Methods of Disposal: Liquids

- **Liquids:** i.e. free liquids
 - must be contained, no releases
 - minimize direct contact exposures to workers
- Liquids Disposal Options/Recommendations:
 - Discharge Liquids (after separating solids) to:
 - Surface Waters (may need NPDES Permit)
 - Wetlands (may need NPDES Permit)
 - Land application, with a groundwater discharge approval if < 1% total solids concentration
 - injection is best for odorous materials
 - surface application, mix in within 48 hr

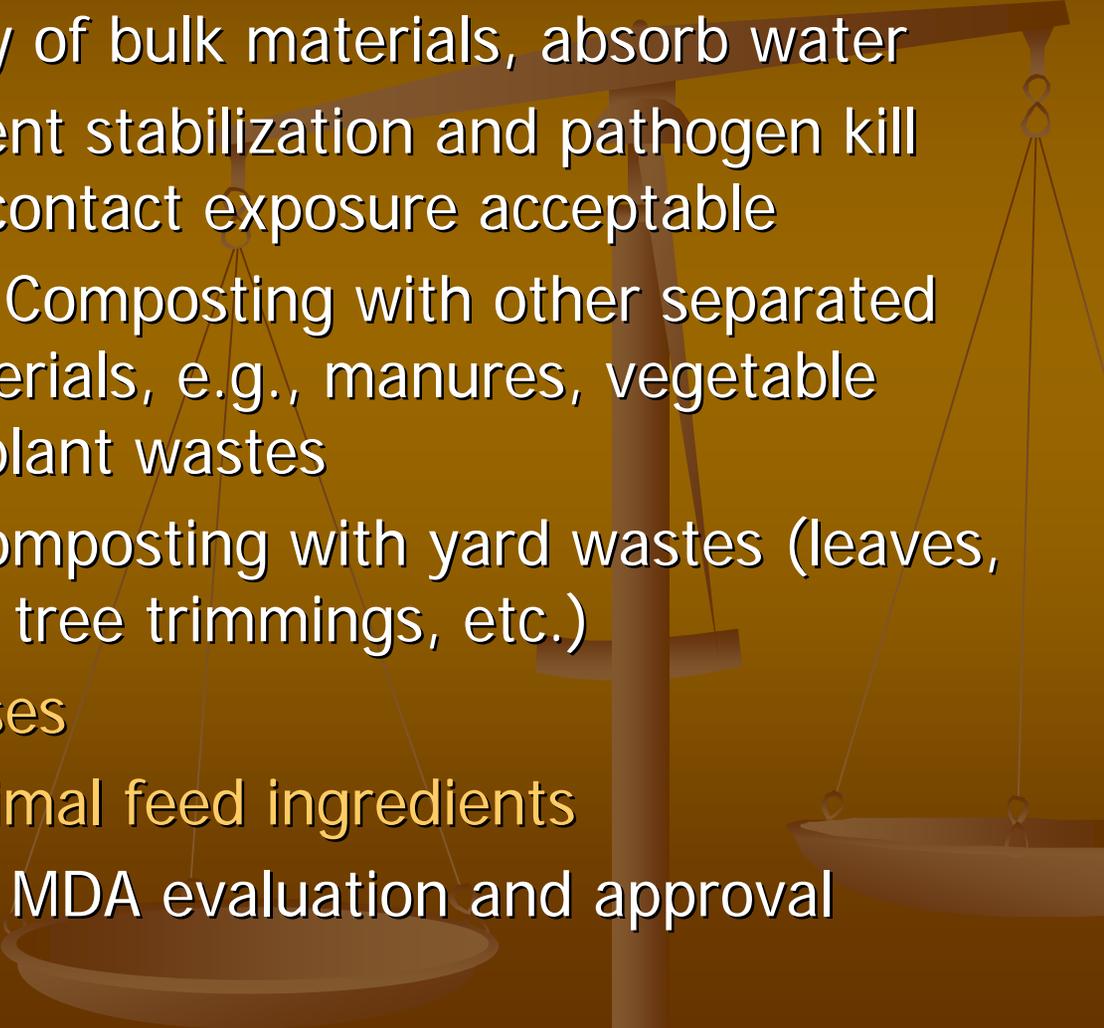
Methods of Disposal: Liquids, cont'd:

- Livestock Manure Lagoon
 - liability and responsibility for material must be accepted by the lagoon owner
 - land apply agronomically with manure
- Anaerobic Digester
 - Can be mixed with other organic liquid wastes
 - generate methane gases for heat or energy
 - land apply solid residuals
- WWTPs – if accepted; but costly to treat
- Note: burial of muck < 1% solids (99%+ water) -- is not allowed w/o a groundwater discharge permit and will probably cause problems

C. Potential Methods of Disposal: Slurries and Solids

- **Solids** (slurries > 1% total solids concentration; solids > 20-25% solids)
 - Beach sand nourishment, in other areas, if sand content of mixture is high (~95%) and material is not contaminated
 - Landfill Solids if no free liquids; test by LF
 - Land application of slurry or solids on farmland, if apply at agronomic rates:
 - If slurry, then injection method is usually best
 - If solid, (e.g., > 25% total solids concentration) then use manure spreader and mix into soils within 24 - 48 hrs
 - **Aquatic plants** are exempt from “solid wastes”, if apply at agronomic rates.

Methods of Disposal: Solids (cont'd)

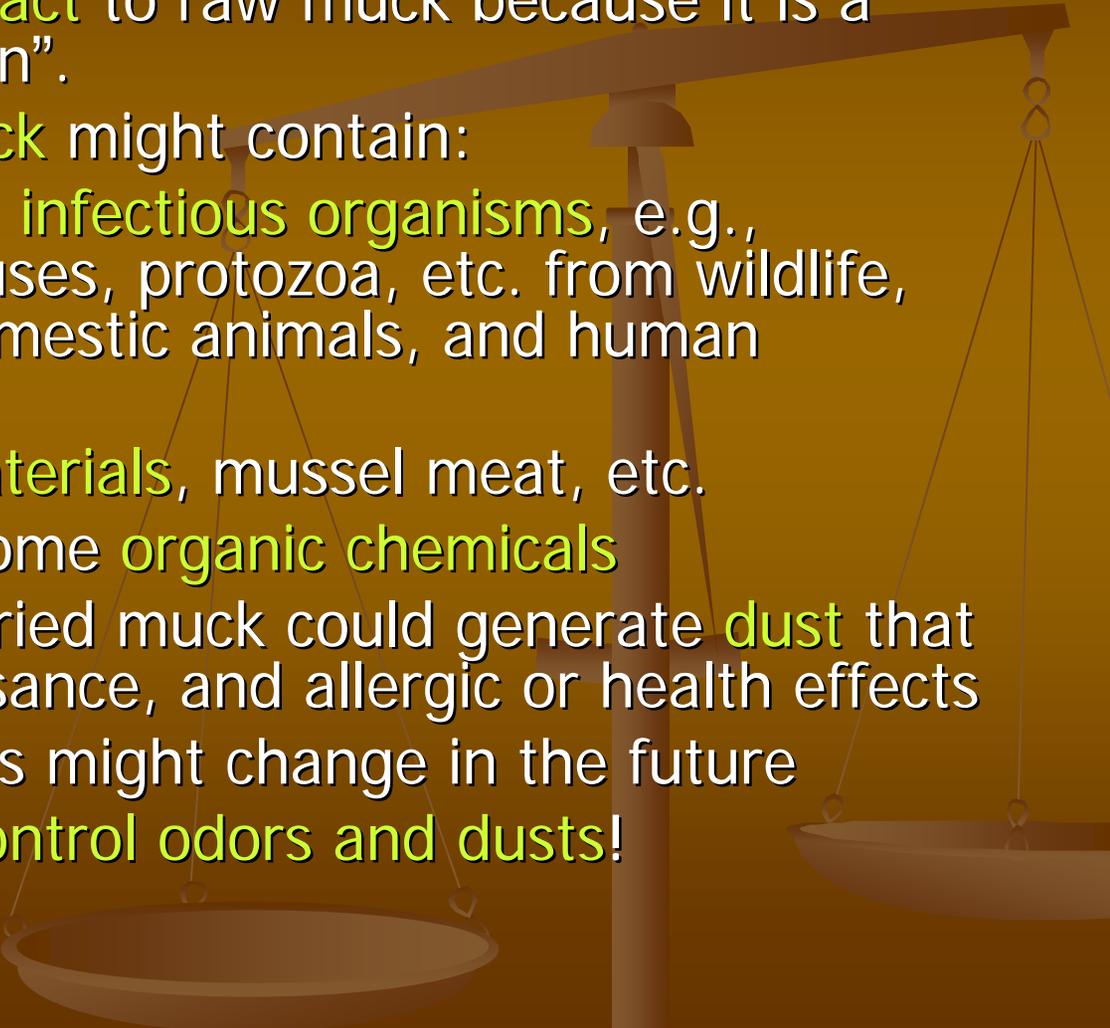
- Registered yard waste compost facility
 - Mix in plenty of bulk materials, absorb water
 - After sufficient stabilization and pathogen kill then direct contact exposure acceptable
 - Commercial Composting with other separated organic materials, e.g., manures, vegetable processing plant wastes
 - Municipal Composting with yard wastes (leaves, some grass, tree trimmings, etc.)
 - Silviculture reuses
 - Process into animal feed ingredients
 - Would need MDA evaluation and approval
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Methods of Disposal: Solids (cont'd)

- Burial on site (> 25% total solids concentration)
 - Not recommended for small or large projects
 - Could be a nutrient threat to area wells
 - Nutrients could leach back to the bay
 - Not being regulated now, but might become so
 - Risky. Might need a property deed restriction if muck is contaminated.
- Burial off site: Waste? Probably not approvable.
- Use as Fill Material: muck/sediment disposal as fill would be viewed as waste disposal, not reuse. It is not inert material, no benefits, and would not likely be approved.

Methods of Disposal: Solids (cont'd)

■ Other considerations:

- Limit direct contact to raw muck because it is a form of “pollution”.
 - Unstabilized Muck might contain:
 - Accumulated infectious organisms, e.g., bacteria, viruses, protozoa, etc. from wildlife, livestock, domestic animals, and human sources
 - Decaying materials, mussel meat, etc.
 - Potentially some organic chemicals
 - Stabilized and dried muck could generate dust that could cause nuisance, and allergic or health effects
 - Characterizations might change in the future
 - Remember to control odors and dusts!
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Questions?

