Iron-Enhanced Sand Filter Workshop

Panel Summary

The following summary encompasses recommendations for Iron-Enhanced Sand Filter (IESF) design and maintenance as discussed at the January 2026 workshop. Every IESF system and site is unique, these recommendations may not be applicable in every situation, but are intended as a guide.

1. Designing for High Water & Floodplains

Designing in high-water areas requires managing "head" (water pressure) and ensuring the system can dry out to maintain aerobic conditions.

- **Manage Head & Drawdown:** Ensure the water depth (head) above the sand filter allows for a full drawdown within **48 hours**.
- **Overflow Structures:** Use internal overflow walls or structures next to the filter to manage extreme high-water levels and prevent the system from being bypassed or damaged from heavy flows.
- **Airlock Prevention**: In low-lying areas, underdrains can become airlocked (full basins with no flow). Install **air vents** on top of the underdrains to allow gravity to pull water through.
- **Floodplain Strategy:** If possible, avoid placing filters in floodplains. If unavoidable, **use waterproof manholes and vaults** and be prepared for high siltation/sedimentation from flood events. Redundancies save money; in addition to a waterproof structure, ensure you have the ability to dewater spaces. Automatic sumps are great but can require more maintenance and are costly, at minimum have an alarm that notifies the correct personnel to manually dewater.
- **Active Controls:** If the budget allows, use **pumps** to control water elevations. This ensures the filter can be taken offline to dry out even if the surrounding water table is high.

2. Media & Pretreatment

- **Iron Mix:** The standard is **5% to 8% iron by weight**. While some research suggests lower percentages work, higher iron content can sometimes "rust" into a solid brick if not maintained.
- **Mixing:** On-site mixing can work, but **pre-mixed, homogeneous blends** with strict specifications are preferred for consistency.

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- **Pretreatment is Essential:** Investing in pretreatment (sediment forebays, manhole sumps, or visible treatment) protects the sand filter from clogging and extends its life.
- **Biochar Innovation:** Using biochar (around 2%) can help with bacteria removal, but it breaks down over time and may reduce the overall iron content.

3. Maintenance and Longevity

The consensus is that **maintenance-heavy designs** fail if access is poor.

- **Design with Maintenance and Monitoring Access in Mind**: If "saving" money upfront means using components without access points, you will pay much more for repairs later.
- **Vegetation Control:** IESF basins should generally not be vegetated. Plants lead to media clogging.
  - **Tilling:** Perform annual shallow tilling and deeper tilling as needed to break up the "skin" on top of the sand and to ensure the media does not "brick".
  - **Plant Removal:** Do not till plants into the filter; they must be removed.
- **Underdrains:** Use dual underdrains for redundancy. If one clogs, you need easy access to clean it.

4. Operational Strategies

- **Contracting:** Use **3-year contracts** for maintenance. This allows contractors to learn the specific quirks of a site.
- **Expertise:** Hire contractors familiar with native vs. invasive plants.
- **Monthly Inspections:** Routine monthly inspections (checking for trash, skimming the surface) are more effective and cheaper than waiting for a major failure.
- **Isolation**: Design the system so specific sections can be isolated (using stop logs or valves) for maintenance without shutting down the entire flow.

5. Monitoring & Data Collection

- **Timeline:** A good data set requires a **10-year window** to account for wet/dry weather cycles and the aging of the BMP. At a minimum, monitor for a **full growing season**.
- **Core Sampling:** Instead of replacing the whole sand bed, take core samples to see if phosphorus is only saturating the top **6 inches**. You might only need to replace the top layer.
- **Sensor vs. Human:** High-tech sensors are difficult to maintain. Partnering with local agencies for manual data collection is often more reliable and cost-effective.