SAFESPILL

WHITE PAPER

CONTAINMENT AND OIL-WATER SEPARATOR OPTIONS FOR ILDFA HANGAR INSTALLATIONS

Audience: Environmental Engineers, Facility Designers, and Hangar Stakeholders
June 2025

Introduction

Ignitable Liquid Drainage Floor Assemblies (ILDFA) are the only fire protection systems currently approved for aircraft hangars that are truly environmentally safe. Unlike legacy systems that rely on PFAS-laden AFFF or synthetic firefighting foams like SFFF (F3), ILDFA uses no chemicals—only water and gravity. As a result, the only substances that require containment or treatment are water and hydrocarbons from potential fuel spills. Although ILDFA runoff typically includes water mixed with hydrocarbons rather than pure oil, the industry-standard term for treatment systems is 'oil-water separator' (OWS).

ILDFA systems enhance environmental safety while also streamlining hangar operations by immediately capturing and draining routine spills—ranging from a few milliliters to several gallons—that commonly occur during maintenance activities such as purging fuel lines, refueling, or replacing components. ILDFA removes these spills at the source, reducing cleanup time and minimizing operational disruptions. Additionally, the system supports in-hangar aircraft washing and other wet maintenance activities, ensuring operational efficiency without compromising safety or compliance.

At the same time, ILDFA must be designed for worst-case scenarios, where large fuel discharges—up to 200 GPM (800 L/min) for smaller jets and 400 GPM (1,500 L/min) for larger aircraft—must be managed, along with an additional 200 GPM (800 L/min) of flushing water flow.

Codes such as UFC, NFPA 409, and FM Datasheet 7-93 dictate how these scenarios are handled. This white paper outlines seven containment and treatment strategies to help environmental and civil engineers evaluate the right approach for their hangar's specific needs—whether military or commercial, new construction or retrofit.

Safespill Mission

PFAS chemicals, known as "forever chemicals," are found in firefighting foam (AFFF) and are extremely harmful to the environment as well as our bodies. AFFF is widely used to fight hydrocarbon fuel fires in aircraft hangars and industrial facilities. When these foam fire suppression systems go off (often by accident, not in response to a fire), the AFFF runs into sewer systems, consequently polluting local drinking water. This problem is more widespread than generally understood and affects tens of thousands of communities.

PFAS exposure has been linked to serious health issues, including birth defects and certain cancers, posing long-term risks to affected communities. At Safespill, we are committed to eliminating this problem by replacing PFAS-based foam systems in aircraft hangars with environmentally safe Safespill flooring systems. Therefore, it is Safespill's mission to transition the world to environmentally safe fire protection.

Option 1 :
Underground Containment Tank

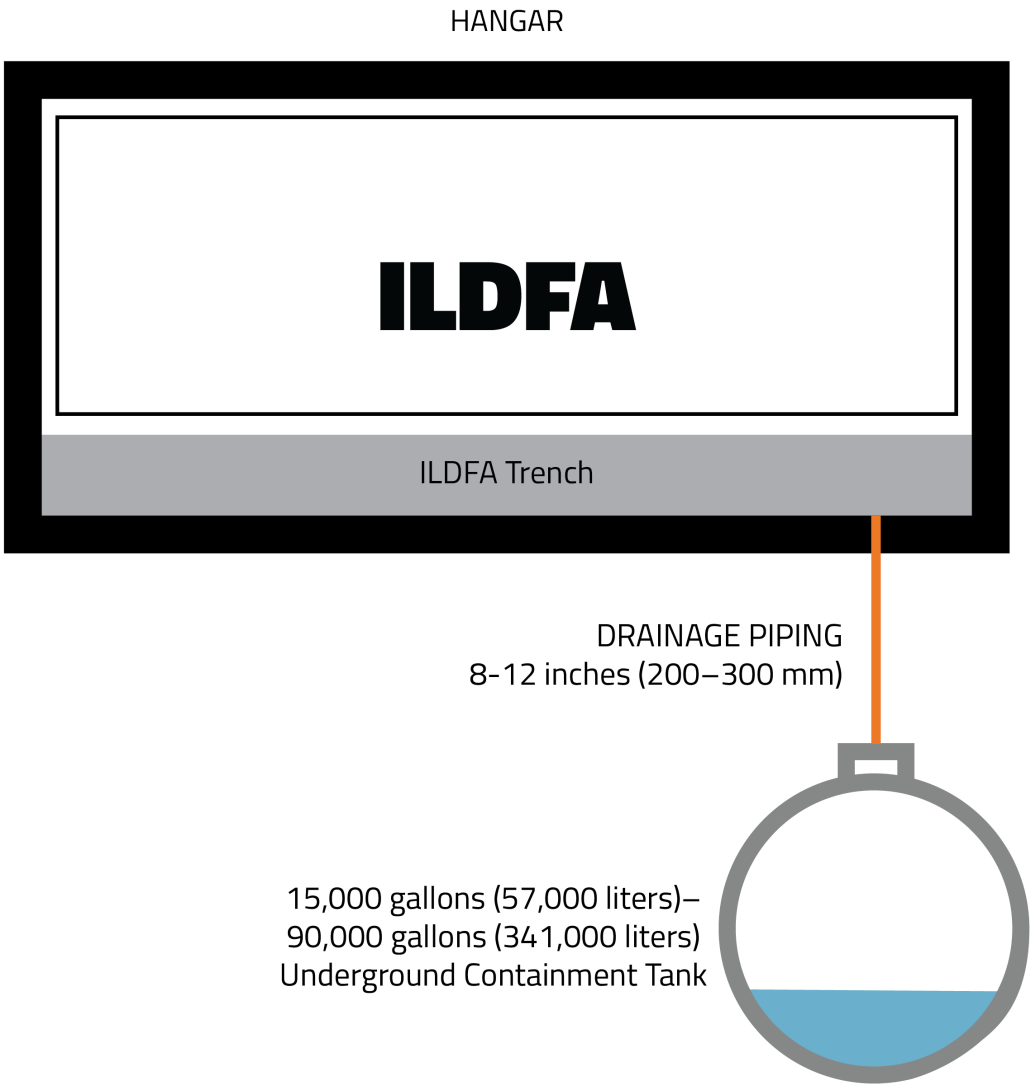
Design Considerations:

Tank Sizing:
Minimum 15,000 gallons (57,000 liters) for UFC; larger tanks up to 90,000 gallons (341,000 liters) required for NFPA 409 and FM 7-93 compliance.

Monitoring:
Should include vapor-tight seals, leak detection, and level sensors.

Pros:
- Straightforward hydraulic design and flow management

Cons:
- High excavation and installation cost
- Requires regular emptying and hauling
- PFAS-contaminated soil from legacy AFFF use may require expensive remediation
- High groundwater or unstable soils may prevent underground tank installation



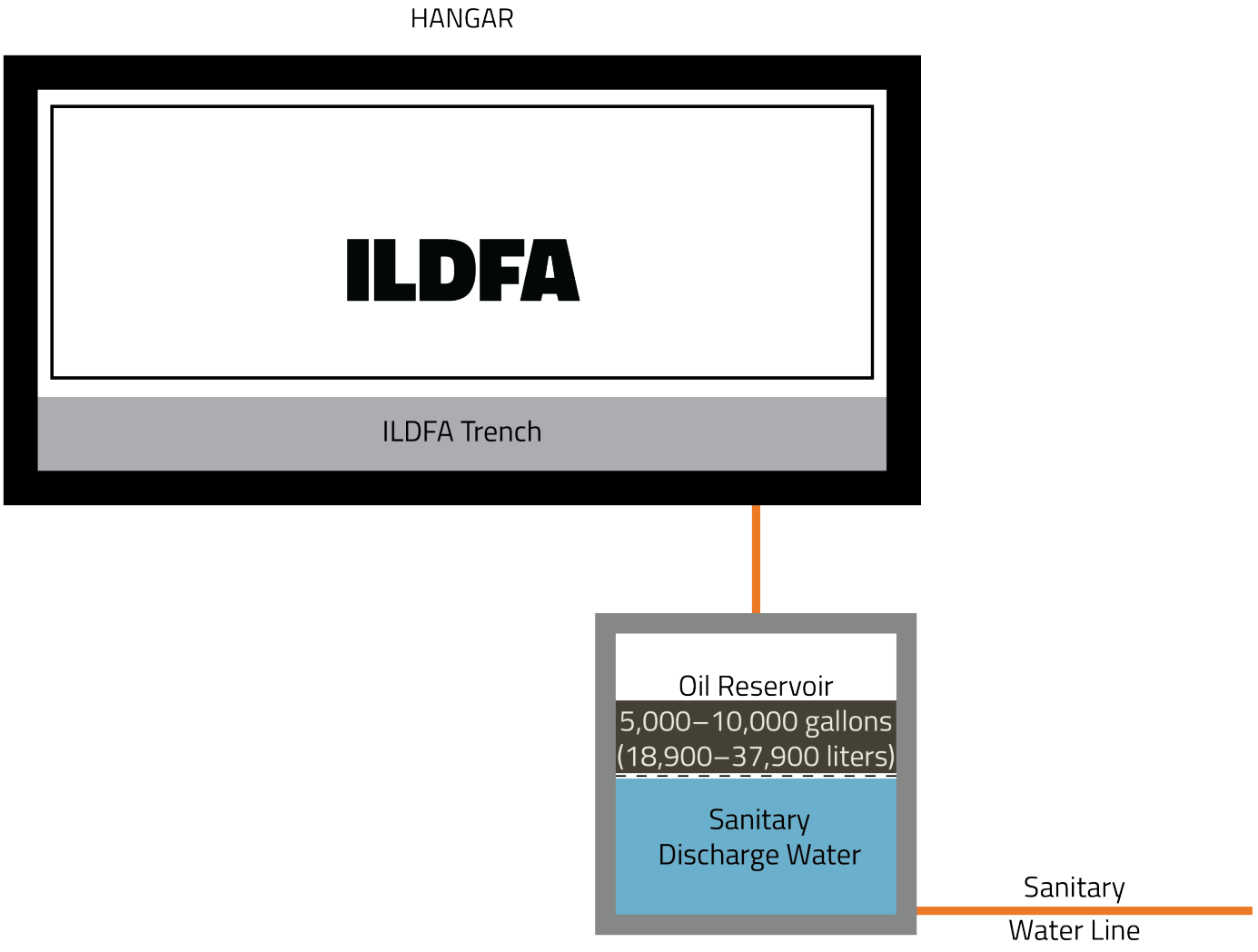
Option 2 :
Large Underground Oil-Water Separator

Overview:
A full-capacity underground OWS system treats ILDFA discharge in real-time during an event, allowing clean water to be discharged to sewer or reused.

Design Considerations:
Must be sized for 200 GPM (800 L/min) flushing + 1,500 GPM (5,700 L/min) discharge = 1,700 GPM (6,400 L/min) peak flow

Pros:
- No haul off container
- Treats water on-site

Cons:
- High capital cost
- Installation and long-term maintenance are complex
- System reliability depends heavily on proactive maintenance
- Requires ongoing maintenance and compliance testing



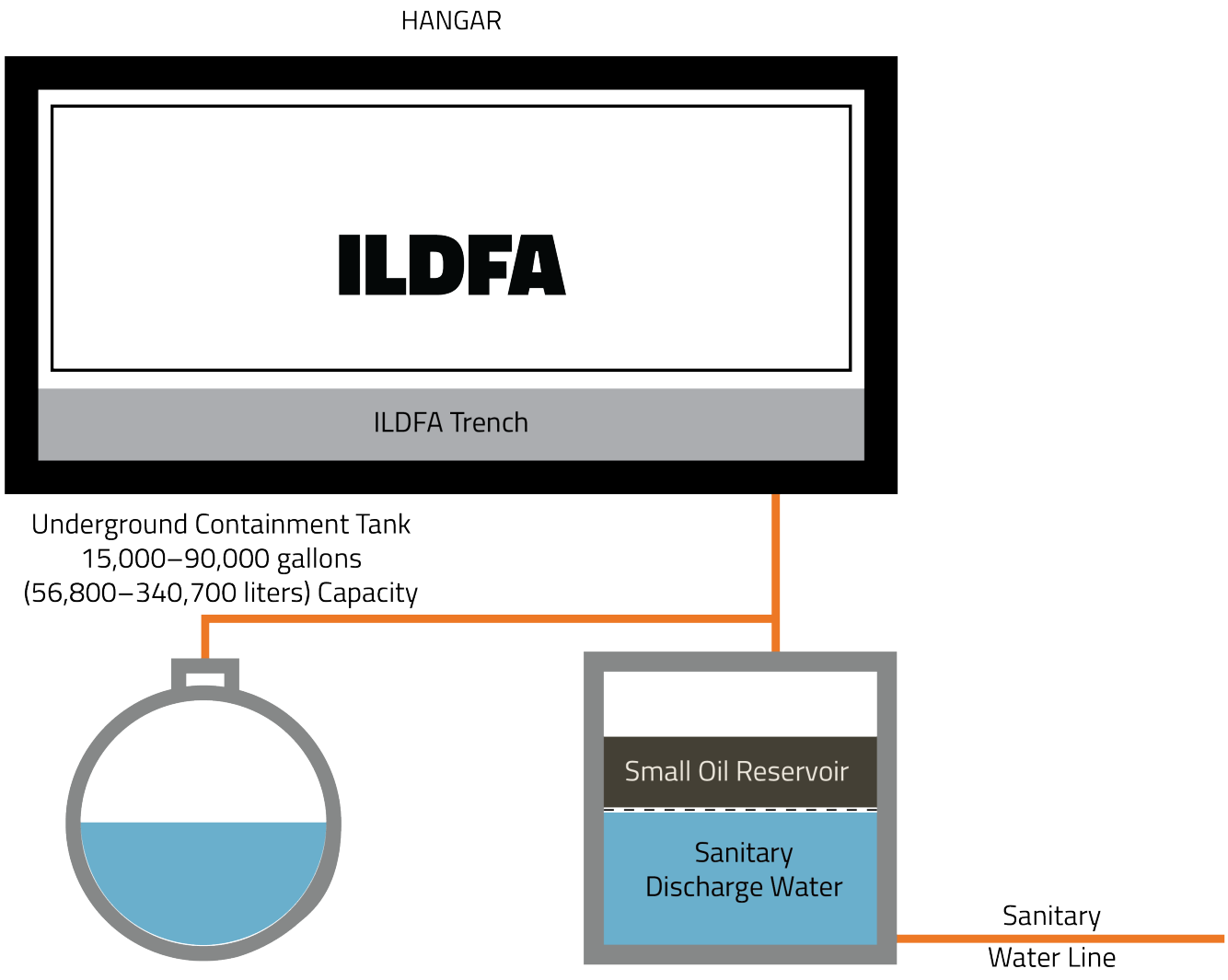
Option 3 :
Hybrid System – Small OWS + Overflow Tank

Overview:
A smaller OWS (e.g., 100 GPM (400 L/min)) handles daily/weekly spills. Overflow from large spills is routed to an underground containment tank.

Design Considerations:
- OWS: Low-cost unit sized for routine activity
- Overflow Tank: Minimum 15,000 gallons (57,000 liters) for major spill events

Pros:
- Low-cost, right-sized OWS
- Reduces reliance on high-maintenance full-capacity systems

Cons:
- Requires both OWS and containment tank
- Still requires OWS maintenance



Option 4 :
Above-Ground Containment Tank Only

Overview:
This configuration pumps ILDFA discharge to a dedicated above-ground containment tank, which holds the entire volume of a worst-case fuel spill and associated flushing water. No treatment occurs during the event—only containment.

Design Considerations:
- Tank Sizing: Minimum 15,000 gallons (57,000 liters) for UFC 4-211-01 compliance; up to 55,271 gallons (209,000 liters) required under FM 7-93 or 89,771 gallons (340,000 liters) for NFPA 409 when accounting for flushing and sprinkler water
- Containment only: System captures spilled hydrocarbon-water mixture, which is then pumped out by service vehicles or processed off-site
- Above-ground location requires site planning to position tanks safely beyond the hangar footprint and protect them from weather or impact

Pros:
- Simplified system—no need for active treatment during a spill
- Accessible for visual inspection and regular maintenance
- Can be modular and relocated if needed

Cons:
- No in-line treatment—dependent on haul-away or downstream processing
- Requires significant space outside hangar
- Hangar reuse may be delayed while containment tanks are emptied or replaced

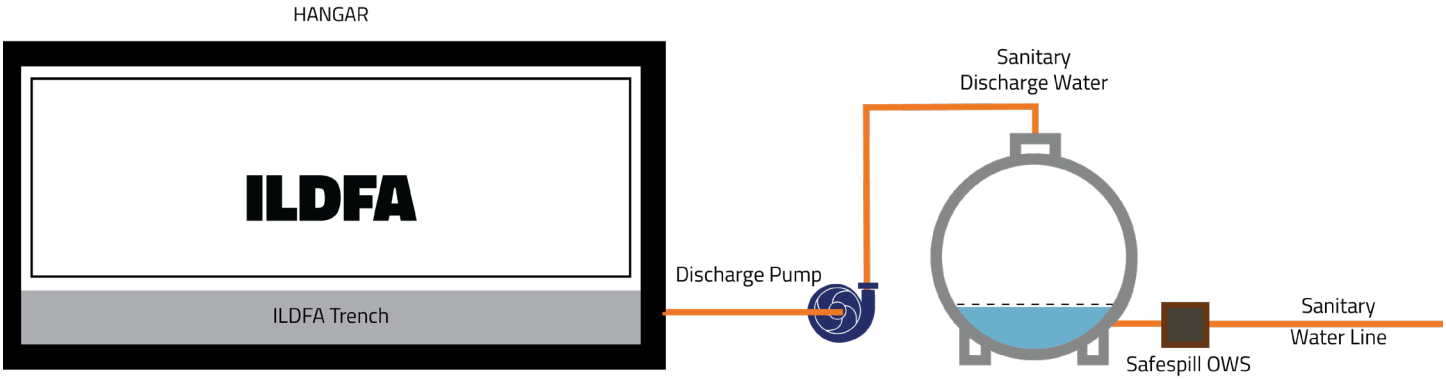
Option 5 :
Above-Ground Containment Tank 1 Safespill OWS Package

Overview:
ILDFA discharge is pumped to an above-ground tank. After a spill, a Safespill OWS skid slowly (approximately 5 GPM (20 L/min)) treats the collected fluid.

Design Considerations:
- Operation: Activated post-spill, independent of ILDFA system
- Output: Treated water may be discharged to sanitary sewer or routed to a recycle tank. Because the OWS package includes a downstream carbon filter, hydrocarbon concentrations in the effluent are typically below 10 parts per million, making this an extremely clean and efficient treatment option.
- Safespill OWS delivered as self-contained skid with a foot front of 8'x10'

Pros:
- Maintenance-friendly above-ground layout
- Effective low-flow rate treatment for post-spill operations
- No treatment required during peak flow
- Discharge water contains less than 10 ppm hydrocarbons, meeting most regulatory thresholds

Cons:
- Requires above-ground real estate
- Requires OWS Maintenance



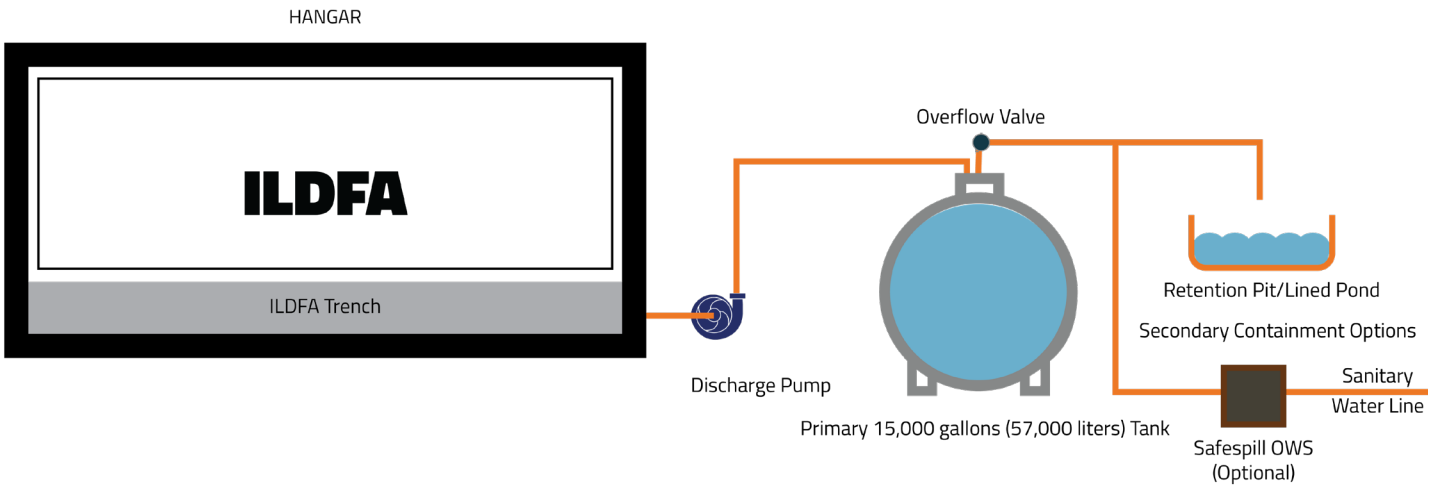
Option 6 :
Hybrid Above-Ground Tank + Overflow Containment

Overview:
This configuration features an 15,000 gallons (57,000 liters) UL-142 above-ground tank for capturing daily ILDFA discharge and small flushing events. The same discharge pump that feeds this primary tank is sized to push overflow directly into a secondary containment area, such as an open pit, lined pond, or frac tanks. Optionally, a Safespill OWS package can be paired with the primary tank for water treatment. An overflow valve diverts flow to secondary containment when the tank reaches capacity.

Design Considerations:
- Primary Tank: 15,000 gallons (57,000 liters) UL-142 above-ground tank sized for routine spill events
- Discharge Pump: Pushes ILDFA discharge into primary tank and, when full, directly into overflow area
- Overflow Containment: External containment such as open pit, lined pond, or frac tanks sized for worst-case fuel + water discharge
- Overflow Valve: Routes excess flow from primary tank to overflow containment
- Optional Treatment: Safespill OWS skid can treat tank contents post-event or during idle times
- Space Requirements: Accessible area next to the hangar for primary tanks. Overflow containment may be located near the hangar; adjacency is not required

Pros:
- Cost-effective balance between routine and worst-case containment
- Eliminates need for large-capacity primary tank or underground systems
- Leverages existing pumping infrastructure (no secondary pump required)
- Modular and adaptable for various site layouts
- Optional OWS unit improves compliance for recurring spills

Cons:
- Multiple components require coordination and space
- Overflow areas must be protected, engineered, and inspected regularly
- Dependent on discharge pump performance and reliable hydraulic routing
- OWS unit still requires maintenance and monitoring



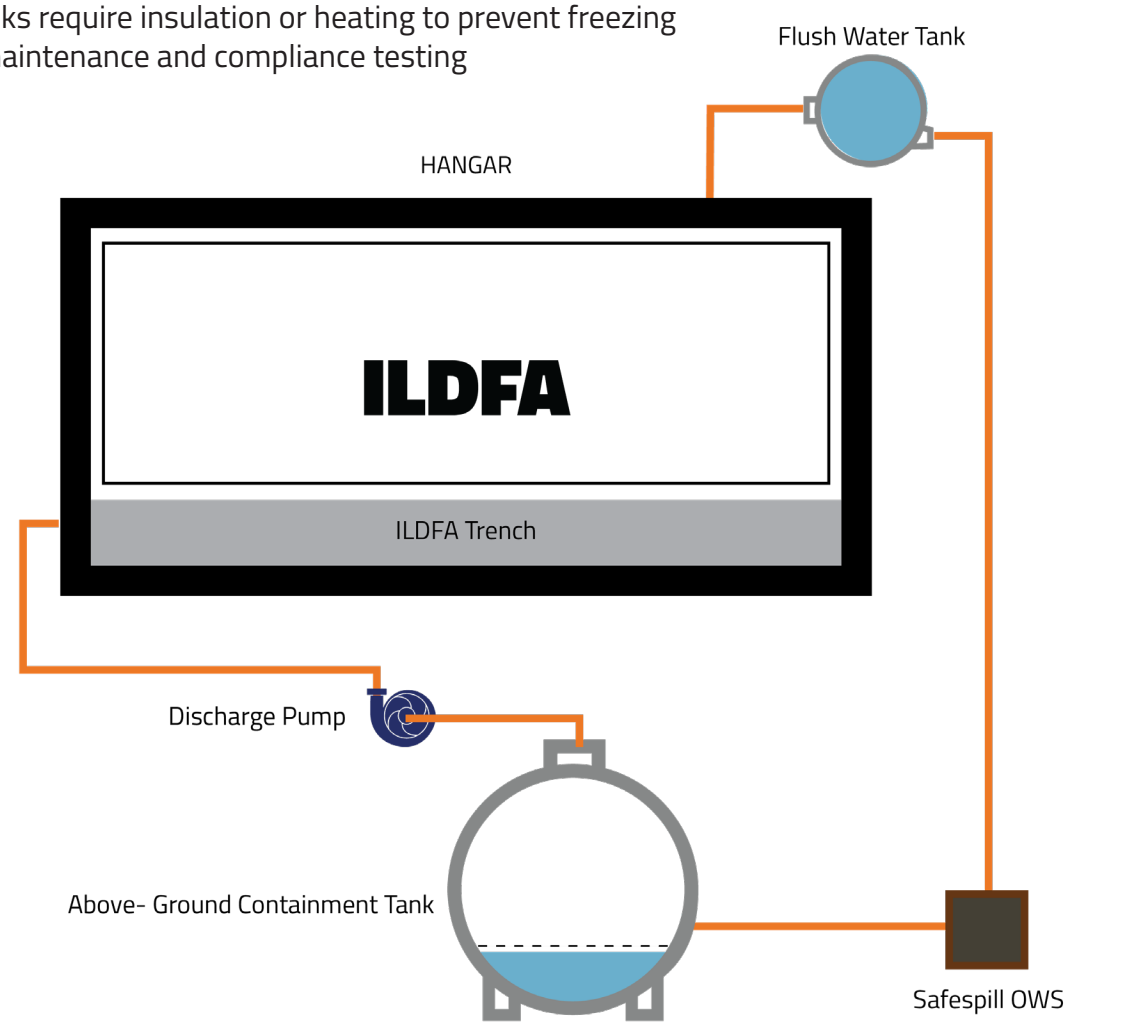
Option 7 :
Closed-Loop Recycle Tank Integration

Overview:
Enhances Option 5 by adding a flushing water recycle tank, enabling 100% reuse.

Design Considerations:
- Flushing Water Tank Sizes
- US Navy (30 min @ 200 GPM (800 L/min)): 6,000 gallons (23,000 L)
- NFPA (45 min): 9,000 gallons (34,000 L)
- FM 7-93 (60 min): 12,000 gallons (45,000 L)
- Make-Up Line: Simple 3/4" domestic water connection
- Cold Climate: Requires insulation or heating

Pros:
- Most sustainable solution
- Supports sustainability goals and may contribute to LEED certification
- Reduces long-term water use

Cons:
- Higher complexity and installation cost
- In cold climates, tanks require insulation or heating to prevent freezing
- Requires ongoing maintenance and compliance testing



Conclusion

Each of the seven containment strategies offers specific advantages depending on facility type, regulatory requirements, and operational priorities. Safespill recommends early collaboration between environmental, fire protection, and civil engineering teams to ensure optimal design integration.

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