GPSD – Industrial Scaling Addendum

Desert Optimization & Brine Salt Triage Architecture

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1. Purpose

This addendum outlines scaling methodologies for the Gravity Pit Sand Desalinator (GPSD) to function as a **regional intake pre-treatment** system in desertic zones or salt-heavy environments, with integrated **salt extraction and triage**.

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2. Desert Deployment Considerations

- **Solar intensity:** enhances passive evaporation in open salt basins
- **Soil composition:** assess for erosion and silt intrusion
- **Wind shear:** requires covered channels or aerodynamic trench walls
- **Water transport:** gravity-fed channels from ocean or borehole intake preferred

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3. Scalable System Layout

Component	Description
Primary Intake Trench	10–20m long, deep-set (2–4m), wide-mouth to accept brine
Sand Channel Filter	Multi-layer filtration, high surface area
Flow Split Junction	Diverts liquid between usable pre-treated water and salt-rich runoff
Solar Drying Basin	Crystallization field, open-air, 10x10m+ panels or trays
Wind-Powered Agitation	Windmill or vent-powered flow regulator for constant feed

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4. Salt Recovery Triage Strategy

> “Separate usable water. Extract valuable salt. Minimize waste.”

Phase 1: Brine Segregation

- **Design inlet tapering** to slow laminar flow and allow sediment sink
- **Install basin skimmers** to collect surface crust mechanically

Phase 2: Controlled Evaporation

- **Flow high-salt output into lined beds**
- **Layered sun trays** (stacked angle planes) for vapor lift

Phase 3: Salt Harvest

- Weekly manual removal or raking
- Potential mechanical harvester in multi-lane setups
- Salt may be reused for:
  - Trade/barter (non-food)
  - Livestock mineral blocks
  - Saltcrete production

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5. Industrial Scaling Tactics

| Element | Scalable Design | |---|---| | **Modular Trenches** | Interconnected 5x5m grid with overflow ports | | **Filtration Units** | Replaceable sand containers or cartridges | | **Salt Vaults** | Central dry domes or tarp-covered heap zones | | **Staffing** | 2–4 operators per hectare cluster |

> Suggested throughput: 15,000–20,000 liters/day across 20–30 trench segments

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⚠ 6. Limitations & Mitigation

- Not suitable for potable water without final RO/membrane filter
- Salt purity varies; requires separation from microdebris
- Heat loss at night—covering or thermal battery may help
- Long-term sand degradation → plan refresh cycles annually

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7. Conclusion

GPSD can be scaled into a **modular, passive desalination system** with **integrated salt recovery** suited for industrial outposts, desert towns, or field research stations. Future extensions may include robotic skimming, solar distillation overlay, or AI flow sensors.

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