Aegis Station Dossier: Plumbing and Sanitation Infrastructure

Overview
Aegis Station will support a permanent orbital population of up to 10,000 residents, each requiring access to safe, reliable, and Earth-like sanitation facilities. Unlike previous stations relying on vacuum-based or dry-composting toilets, Aegis will feature real, water-flush toilets across all residential and communal modules. This document outlines the infrastructure, layout, and systems that enable such a capability in orbit.

System Commitment
Aegis Station will implement a city-scale plumbing network capable of supporting:

- 10,000 full-flush toilets
- Greywater reuse for flushing
- Closed-loop water recycling with >90% recovery
- Full-scale blackwater treatment with modular redundancy
- Pressure-fed water loops and gravity-assisted waste outflow

Plumbing Infrastructure Zone
The 10-meter envelope between Aegis Station's inner and outer hulls houses all major infrastructure. Within this envelope:

- The outer 3 meters (47m–50m radius) contain the passive water radiation shield
- The inner 7 meters (40m–47m radius) contain:
    - Freshwater and greywater loops
    - Blackwater drainage and pumps
    - Waste processing nodes
    - Plumbing control systems (valves, sensors, heaters)

This zone provides:

- Protected, shielded space adjacent to all habitable decks
- 0.5g artificial gravity (at 47m) to enable gravity-assisted waste flow
- Full access around the station ring for redundancy and maintenance

Plumbing System Layout
Each of Aegis Station’s three rings will feature:

- Circular utility corridors in the 40m–47m radial zone
- Radial feeder pipes from toilets and fixtures inward to drainage loop
- Zoned distribution: ~100 toilets per plumbing node
- Modular recycling units every 500–1,000 residents
- Separate loops for blackwater, greywater, and potable water

Water Usage Estimates
Assuming 5L/flush and 2 flushes/day:

- 10,000 residents → 100,000 liters/day (blackwater volume)
- Greywater reuse (sinks/showers) can offset some flush demand
- Total daily water processing: ~200–250 m^3

Recycling and Treatment
Aegis plumbing infrastructure will support closed-loop water recovery using:

- Membrane and biological treatment modules
- Thermal and pressure-assisted water extraction
- Solid waste capture and compaction
- Zone-isolated failure protection (no cross-contamination)

Comfort and Realism
Aegis Station restrooms will:

- Use Earth-style bowls with water flushing
- Be located on outer gravity decks for best flow performance
- Feature standard partitioned stalls, public and private layouts
- Maintain temperature, airflow, and odor control systems

Conclusion
The plumbing system on Aegis Station represents a significant leap from prior orbital facilities—prioritizing comfort, realism, and capacity at scale. The infrastructure is fully integrated into the ring structure and designed with redundancy, shielding, and sustainability in mind. With the protected 7-meter space between the inner hull and shield layer, Aegis ensures that sanitation needs are met with the reliability expected of any Earth-based city.