Sanitation Safety Plan

Ratmalana Moratuwa

Description of the locality and sanitation systems

1. Background information

1.1 Location and Geographic Context

The Moratuwa–Ratmalana area lies along the **southwestern coastal plain of Sri Lanka**, directly facing the Indian Ocean and forming part of the Colombo metropolitan region. **Moratuwa** occupies approximately **23.4 km²**, while **Ratmalana** covers an additional **13 km²**, creating a continuous urban–industrial corridor. The coastline is characterized by flat low-lying terrain, with several natural and semi-natural water bodies intersecting the landscape.

Prominent among these is **Lunawa Lagoon**, a central ecological and cultural feature in Moratuwa. As highlighted on the Moratuwa municipal website, the lagoon offers "a picturesque view of the city" and functions as an ecological buffer between dense residential areas. To the east lies the **Bolgoda Lake–River** system, the largest natural freshwater body in Sri Lanka, which supports fishing, boating, and domestic livelihoods and has historically shaped the settlement patterns around Moratuwa. Ratmalana, located immediately north of Moratuwa, is integrated into the Dehiwala–Mount Lavinia Municipal Council and is centered around the Ratmalana Airport, one of Sri Lanka's most historically significant aviation hubs.

Both localities are linked by the **Colombo–Galle A2 road**, multiple bridges crossing Bolgoda Lake, and the coastal railway line, with stations at Angulana, Lunawa, Moratuwa, Koralawella, and Egodauyana. This high level of connectivity has contributed to dense urban development and significant daily commuter flows.

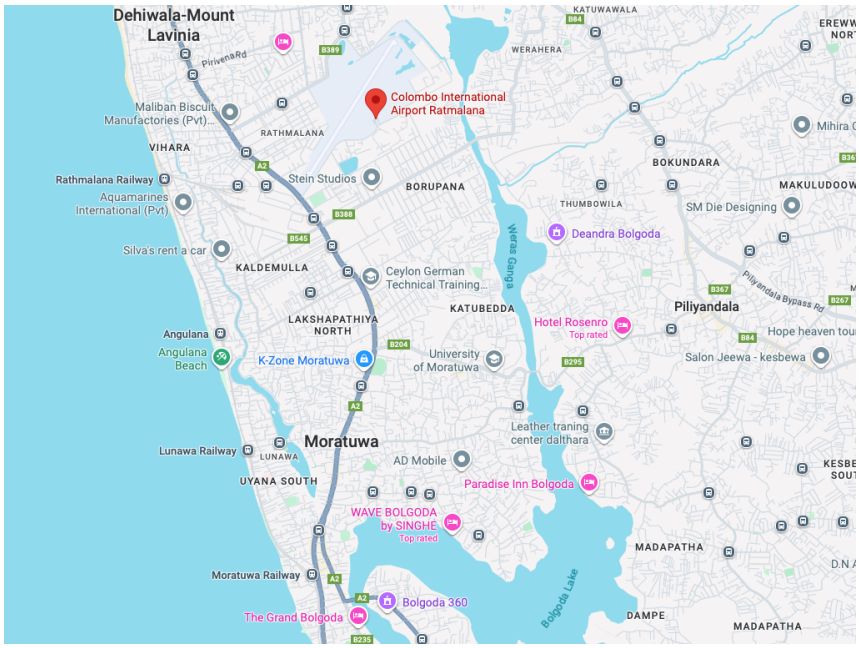


Figure 1: Location of Moratuwa and Ratmalana

Population and Demographics

The Moratuwa–Rathmalana area is a **densely populated urban corridor** in the Colombo District, shaped by long-standing industrial activity and limited land availability. **Moratuwa had 179,398 residents in 2022** (up from 166,857 in 2011), while **Ratmalana recorded 95,506 residents in the 2012 census**, together forming a compact, continuously urbanized region. Most people live in small housing plots, multi-storey buildings, or informal clusters along the coast, canals, and lagoon edges, where many neighborhoods lie only a few meters above sea level.

The population is predominantly Sinhalese, with Tamil and Muslim communities forming significant minorities. Religious affiliation mirrors this diversity, with Buddhists as the majority, followed by Catholics, other Christians, Muslims, and Hindus. The socioeconomic profile includes both **middle- and lower-income households**, many of whom work in manufacturing, carpentry, aviation-related industries, small enterprises, and the service sector.

Literacy levels are comparatively high, and residents benefit from good access to schools and health services. The presence of the University of Moratuwa, one of South Asia's leading technological institutions, reinforces the area's strong educational foundation and its long-standing role as an industrial and economic center.

Governance and Institutional Set-up of Sanitation Services

In the Moratuwa–Rathmalana area, **Moratuwa** is governed by the **Moratuwa Municipal Council (MMC)**, while **Rathmalana** falls under the **Dehiwala–Mount Lavinia Municipal Council (DMMC)**. Both municipalities operate within the authority of the **Western Provincial Council** and receive administrative oversight from the **Colombo District Secretariat**, which helps coordinate planning, waste management, drainage, public health, and urban development. This governance structure supports both day-to-day municipal services and the regulation of the area's significant industrial activities.

Sanitation and wastewater management extend beyond municipal responsibilities. The **National Water Supply and Drainage Board (NWSDB)**, through its Water Reclamation and Sewerage Division, is the main agency responsible for operating and maintaining the sewerage network, pumping stations, customer sewer connections, and the Ratmalana–Moratuwa Wastewater Treatment Plant along with its sea outfall.

Environmental compliance is supervised by the **Central Environmental Authority (CEA)**, which regulates effluent discharge and issues approvals for wastewater facilities, while the **Urban Development Authority (UDA)** and the **Coast Conservation and Coastal Resources Management Department** guide land-use planning and coastal-zone decisions relevant to sewer and treatment-plant infrastructure. **Local Medical Officer of Health (MOH)** units oversee sanitation inspections, vector control, and monitoring of sanitation-related diseases.

The private sector—particularly **vacuum-truck operators**—plays a key role in emptying septic tanks and pits, though these operators are only lightly regulated and not formally recognized as sanitation-service providers. Together, these institutions create a **multi-layered governance system** in which centralized wastewater treatment is managed by NWSDB, while onsite sanitation, environmental regulation, public health, and land-use decisions rely on coordinated action among municipal, provincial, and national authorities.

Economic Activities

The **Moratuwa–Rathmalana** area forms one of the **most active urban–industrial belts in Sri Lanka**, with an economy shaped by a long history of craftsmanship, coastal livelihoods, and modern manufacturing. **Moratuwa** is especially renowned for its centuries-old **furniture and carpentry industry**, once carried out under coconut-palm sheds along the Bolgoda Lake and still flourishing today through a mix of artisanal woodworking and mechanized production. This industry remains a major source of employment for skilled workers in neighborhoods such as Indibedda, Koralawella, and Rawathawatte. Alongside carpentry, Moratuwa hosts a **broad range of industries producing rubber goods, batteries, transformers**, and other manufactured products, while **fishing**—both coastal and freshwater— continues to support local markets and household livelihoods.

Rathmalana, immediately to the north, contributes its own industrial strength. Its long-standing industrial zones accommodate **plastics and rubber factories, metal workshops, light manufacturing,** and **various chemical** and **food-processing industries**. The presence of **Ratmalana Airport** adds a distinctive economic dimension, supporting aviation training, aircraft maintenance, and related services. Across both municipalities, small and medium enterprises, retail shops, and service activities such as transport, education, repairs, and logistics reinforce a diversified local economy.

The combined region benefits greatly from its **proximity to Colombo** and its excellent transport links through the Galle Road, multiple bridges across the Bolgoda Lake, and the coastal railway line. These connections facilitate daily commuter flows, strengthen trade links, and support the movement of goods and labor.

Climate and Environmental Factors

The **Moratuwa–Rathmalana** area is located in Sri Lanka's **low-country wet zone** and experiences a tropical rainforest climate characterized by warm temperatures of about **26–27 °C** throughout the year. Rainfall is high, averaging roughly **2,500 mm annually**, with the **heaviest rains** occurring in **October and November** and a shorter **dry period in January and February**. Humidity remains consistently high, and the landscape naturally supports dense vegetation, although rapid urbanization and expanding industrial activity have altered drainage patterns and placed pressure on water bodies such as Bolgoda Lake.

Climate-change trends are becoming increasingly visible in the area. **More intense rainfall events** combined with **inadequate drainage** lead to **recurrent flooding** in both lagoon-side and coastal neighborhoods. **Sea-level rise** adds further stress, increasing the risk of tidal flooding and erosion in low-lying zones. **Saltwater intrusion** into groundwater is a growing concern, especially in settlements near the shoreline or wetlands. **Higher temperatures and prolonged heat periods** also affect working conditions for sanitation and wastewater staff, and they can influence biological treatment performance by altering microbial activity. Taken together, these climate-related hazards interact with the region's dense urban fabric and limited elevation to create a vulnerable environment where climate extremes directly affect daily life, water quality, and the functioning of sanitation infrastructure.

Drinking Water Supply

Drinking water in the Moratuwa–Rathmalana area is supplied by the **National Water Supply & Drainage Board (NWSDB)**, which treats surface water drawn mainly from the **Kelani River** at the **Ambatale Water Treatment Plant**, the primary source for **Moratuwa** and much of the Colombo

Metropolitan Region. **Rathmalana** also receives treated water from large regional facilities such as **Biyagama**, **Labugama**, and **Kalatuwawa**, all of which produce chlorinated, monitored drinking water for the Western Province. Under normal conditions, the piped supply meets national drinking-water quality standards.

Despite this, residents experience **frequent supply interruptions**, caused by high demand, aging infrastructure, and occasional treatment-plant strain. When the piped supply is disrupted, many households—especially in mixed-income or densely settled neighborhoods—turn to **shallow wells**, private vendors, or stored water, which introduces significant public-health risks.

Groundwater in coastal and low-lying areas is often affected by **fecal contamination, salinity, and pollution** from nearby sanitation systems, making it unsafe for drinking without adequate treatment. Several neighborhoods have reported **coliform contamination in wells**, particularly where septic tanks or pits are densely located or insufficiently maintained. As a result, when residents rely on untreated well water or improperly stored water, the risk of exposure to microbial contamination increases, contributing to periodic drinking-water–related illnesses.

Rising water demand from households and industries adds further pressure, making the reliability and safety of drinking-water access an ongoing challenge for Moratuwa–Rathmalana.

Health Concerns

Moratuwa–Rathmalana faces significant **public-health challenges** linked to industrial activities, poor sanitation in high-groundwater areas, and environmental pollution. In **Ratmalana**, many septic tanks fail because the groundwater table is too high, causing wastewater to leak directly into wells used for domestic purposes. Continuous discharge of untreated or partially treated wastewater has contributed to contamination of both surface and groundwater. Factories and dense traffic also generate **air pollution**, which is associated with respiratory problems among residents. Poor solid-waste management, blocked drains, and stagnant water create conditions that strongly favor vector-borne diseases.

Dengue fever remains the most pressing health issue. The Western Province, including Colombo District, consistently records the highest number of cases. **Sri Lanka reported more than 45,000 dengue cases** in 2024 with 24 deaths, and 89,799 cases in 2023. By October 2025, over 40,000 cases and 22 deaths had already been reported nationwide, with a large share originating from the Colombo region. **Chikungunya** transmission also occurs; between January and mid-March 2025, 151 confirmed cases were reported across three districts, over half of them in the Western Province.

Water- and sanitation-related diseases remain a serious concern. **Leptospirosis (rat fever)** increases sharply during monsoon periods when residents come into contact with contaminated floodwater. Sri Lanka recorded **13,738 leptospirosis cases in 2024**, the highest number ever reported, with a fatality rate of about 2 per 100 cases. **Scrub typhus** is also endemic; Sri Lanka reports **over 1,000 cases annually**, including 1,371 cases in 2024. **Cholera** risk is low nationally, but the local conditions—unsafe alternative water sources, informal sludge disposal, and frequent flooding—create vulnerabilities should contamination occur.

Flood-prone coastal and lagoon-side neighborhoods face additional risks as residents are exposed to contaminated water during heavy rains. Workers involved in desludging, sewer maintenance, and wastewater handling face **occupational hazards**, including contact with faecal sludge and gases such as hydrogen sulfide and methane, often with limited protective equipment.

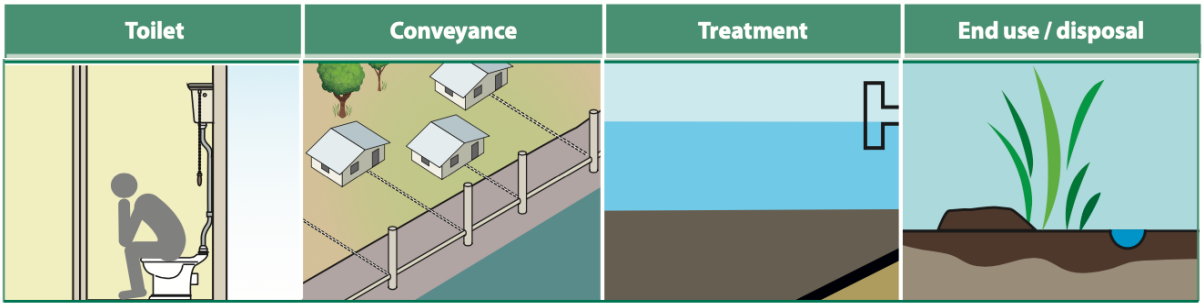
2. Description of the sanitation system

Sanitation services in the Moratuwa–Ratmalana urban area consist of a **dual system**, combining a modern centralized sewerage network with an offsite wastewater-treatment plant, and widespread use of onsite sanitation systems with septic tanks and vaccum trucks. These systems correspond to different zones of the metropolitan area, reflecting historical land development, groundwater constraints, and household income levels.

System 1: Flush toilets with sewerage and offsite wastewater treatment (found mainly in the coastal strip and dense urban-industrial areas of Moratuwa and Ratmalana)

System 2: Flush toilets with septic tanks and infiltration, with offsite fecal sludge treatment (found in mixed residential neighborhoods not yet connected to sewerage)

2.1 System 1: Flush toilets with sewerage and offsite wastewater treatment



Toilet

In Moratuwa–Rathmalana, households and industries in the oldest, most urbanised coastal belt use **flush toilets connected to the sewer network**. There are about **5,200 connections in total**, of which approximately **4,950 are domestic household connections**, corresponding to around **12% of all households in Moratuwa** based on municipal data. The connected neighbourhoods have comparatively reliable piped water, so they generate continuous wastewater flows from domestic use and from industrial and commercial activities.

Conveyance

Wastewater from these toilets flows into a combined **gravity and pressure sewer system** operated by the National Water Supply and Drainage Board (NWSDB), Water Reclamation Division. The network comprises roughly **28.5 km of gravity sewers** (diameters 160–1500 mm), **6.2 km of pressure mains** (250–800 mm), and **five pumping stations** that lift sewage to the Ratmalana–Moratuwa Wastewater Treatment Plant (WWTP).

Flow from households and industries first arrives by **gravity at the inlet channel**, then is pumped into the preliminary-treatment works. According to operator information, the WWTP currently receives around **64,000 m^3 of wastewater per day from domestic connections alone**, in addition to industrial wastewater (93,000 m^3)and fecal sludge delivered by tankers (3,000 m^3).

In practice, the system faces blockages from plastics and other solids, ageing pipes in some sections, occasional pump breakdowns (so three of the five pumps typically run continuously), and odour complaints from residents living near pumping stations and the inlet works.

The sewerage system and the WWTP are operated by the **National Water Supply and Drainage Board (NWSDB)**, Water Reclamation Division, who are responsible for operation, maintenance, customer connections, and handling sewer complaints.

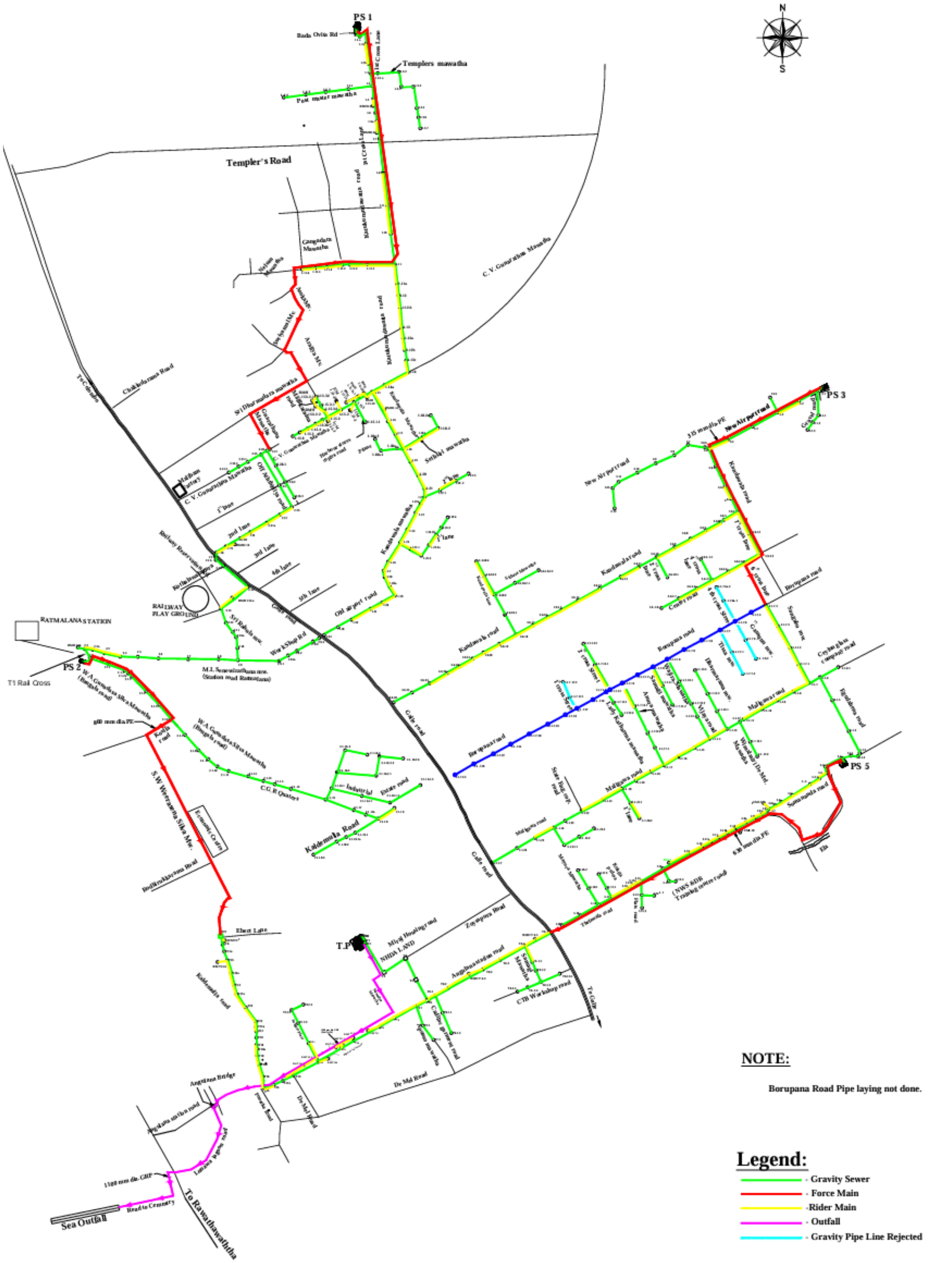


Figure 2: Network diagram

Treatment

The **Ratmalana–Moratuwa WWTP**, commissioned in 2014 with Swedish support, is Sri Lanka's first full-scale **A2/O (anoxic–anaerobic–aerobic) biological nutrient-removal plant**. Its process begins with **inlet pumping** and **coarse screening**, where solids larger than about 40 mm are removed, followed by **mechanical fine screens** that capture 5–40 mm material. The flow then passes through two parallel **grit traps** where sand and grit settle out. After this preliminary treatment, a distribution structure splits the flow into two identical **biological treatment lines**.

Each line consists of an **anoxic tank** for denitrification, an **anaerobic tank** for enhanced biological phosphorus removal, and an **aerobic tank** with diffused aeration where organic matter is oxidised and ammonia is nitrified. The mixed liquor then enters **final clarifiers**, where activated sludge settles and clarified effluent is withdrawn. Part of the settled sludge is recycled as return activated sludge to maintain biomass in the reactors, while excess sludge is removed as waste activated sludge.

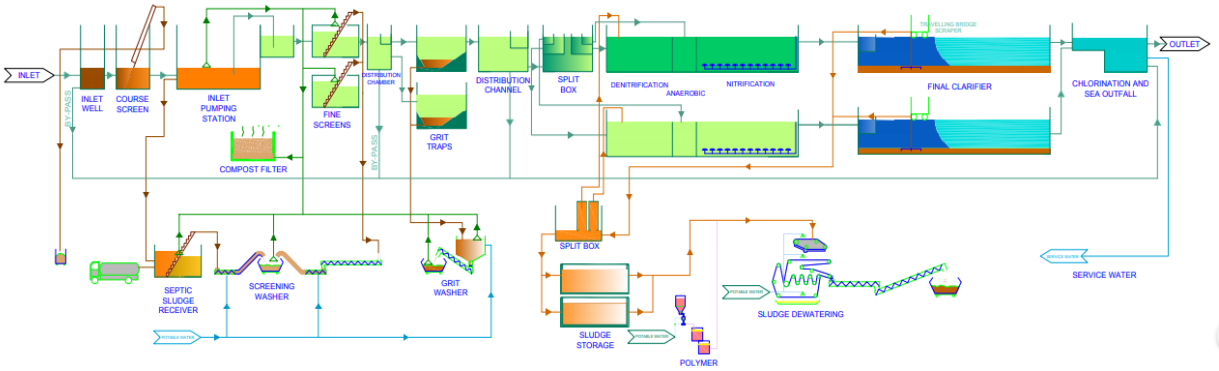


Figure 3: Process diagram

Sludge undergoes further treatment: it is thickened and stored, conditioned with polymer, dewatered in a **belt filter press**, and finally dried on **sludge drying beds** before being transported offsite for disposal. Routine monitoring shows that the plant achieves **high treatment efficiency**, with typical effluent concentrations of about **3 mg/L BOD_5** (well below the 25 mg/L standard), **40 mg/L COD** (standard 120 mg/L), around **7 mg/L total nitrogen** (standard 30 mg/L), and **1–1.2 mg/L total phosphorus** (standard 5 mg/L).

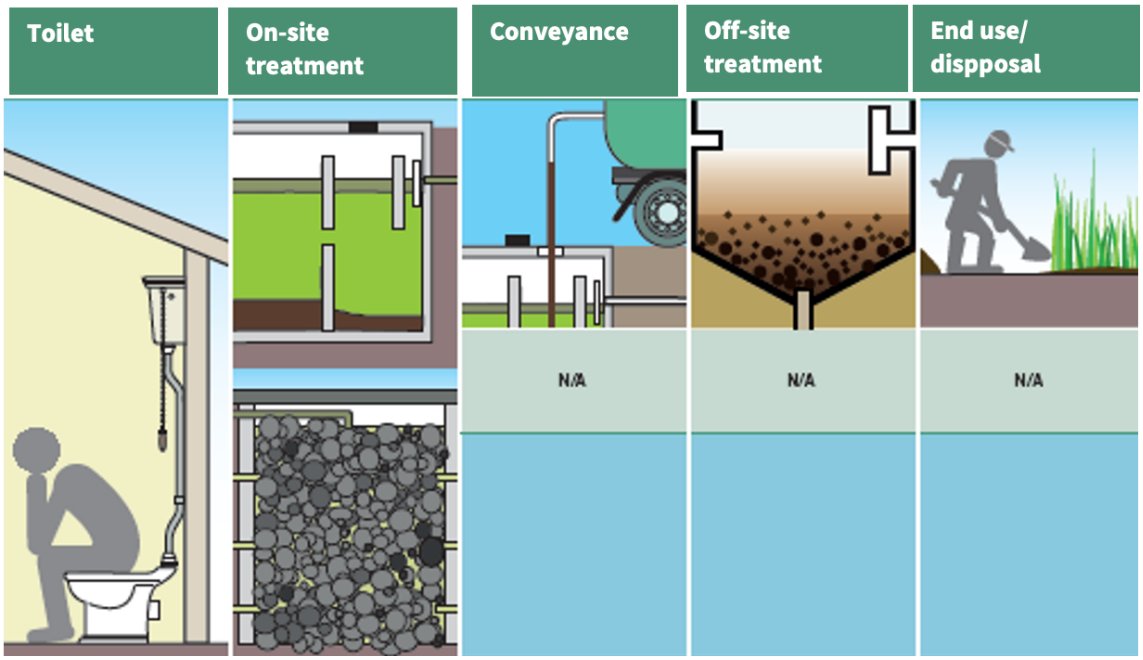
Operationally, staff report persistent problems with **large quantities of plastic waste on the screens**, strong H_2S and methane odours in the machinery areas, and hydraulic stress on the inlet works during intense rainfall.

Figure 4: Aereal view of the WWTP

End Use / Disposal

The treated effluent is discharged through a **submerged sea outfall near Angulana** into coastal waters; there is **no formal reuse scheme** for this effluent at present. Dewatered sludge from the belt press and drying beds is loaded onto trucks and taken to designated offsite disposal locations, and there is currently **no institutionalised agricultural reuse** of biosolids.

2.2 System 2: Flush toilets with septic tanks and infiltration, with offsite fecal sludge treatment



Toilet

In areas of Moratuwa–Rathmalana not connected to the sewer network, households use **flush toilets discharging to onsite septic tanks and soakaway pits**. With only about 4,950 households connected to the sewer out of an **estimated 42,500–45,000 households in Moratuwa**, sewer coverage is only ≈11–12%. This means that around **88–89% of households**—approximately 37,500 to 40,000 households—depend on onsite sanitation, mostly conventional septic tanks with leach fields or soak pits. These systems receive both blackwater and greywater.

Onsite Treatment (Septic Tanks + Infiltration)

Septic tanks in the Moratuwa–Rathmalana area typically provide **primary settling only**, with partial reduction of solids and pathogens. Effluent infiltrates into the surrounding soil through soakaway pits. Because large sections of Ratmalana and coastal Moratuwa have a **high groundwater table**, many tanks do not function as intended. Effluent frequently mixes with groundwater, causing contamination of wells used for domestic purposes. Tanks vary widely in construction quality, with many lacking watertight chambers. Only about **5% of septic tanks in Sri Lanka are regularly emptied**, meaning sludge often accumulates beyond design levels, increasing leakage, odours, and overflow, particularly during monsoons.

Conveyance (Vacuum Truck Emptying)

Households using septic tanks depend on a combination of **NWSDB-operated vacuum trucks** and a **small number of private service providers** for desludging. The fleet in the Moratuwa–Ratmalana area is limited,

consisting of only a few public trucks and several small private operators, which is far below what would be required to service all onsite systems regularly.

Although modern vacuum trucks are designed for hygienic, sealed handling of faecal sludge, actual field conditions vary: NWSDB crews generally follow standard safety procedures and use personal protective equipment, while private operators often work with inconsistent oversight, sometimes without adequate PPE and with occasional spills or unsafe handling practices.

Because the number of trucks is insufficient for the scale of demand, most households empty their tanks very infrequently—often only when systems overflow, emit odours, or fail during the rainy season. Others postpone desludging simply because trucks are unavailable or because the service is unaffordable at the time it is needed.

Despite this low frequency of formal desludging, the Ratmalana–Moratuwa treatment plant still receives **around 3,000 m^3 of faecal sludge per day**. Based on typical Sri Lankan septic-tank accumulation rates and common desludging intervals, this volume corresponds to the output of approximately 11,000 to 14,000 households. In other words, about **one-third of all households using onsite sanitation in the area rely on formal vacuum truck services** that deliver sludge to the plant, while the remaining two-thirds either empty their tanks very rarely, rely on informal or illegal disposal practices, or have malfunctioning systems that leak directly into the surrounding soil and groundwater. This distribution aligns with national observations showing that **only 5–10% of septic tanks in Sri Lanka receive regular, formal desludging** services, despite the widespread dependence on onsite sanitation.

Offsite Treatment (Ratmalana–Moratuwa WWTP Septage Reception)

Vacuum trucks unload fecal sludge at the **WWTP's septage-reception facility**, where it enters screening and grit removal processes before being co-treated with municipal wastewater. The plant accepts loads only if the sludge is not excessively contaminated with solid waste. Sludge that passes inspection is integrated into the main biological treatment process. The WWTP is designed to manage both sewerage and septage, but large daily volumes (≈3,000 m^3/day) place additional hydraulic and solids-loading stress on the system.

End Use / Disposal

After treatment, sludge is dewatered in **belt filter presses**, dried on drying beds, and transported to designated disposal locations outside the plant. **No formal program for agricultural reuse** of biosolids exists. Treated effluent from septage co-treatment exits the system together with treated sewage through the existing sea outfall at Angulana.