

Company/organisation: Fortifikationsverket, Swedish
Fortification Agency

Location: Online (Teams)

Date of the innovation workshop: 2026-05-25

Innovative Solutions for Reducing PFAS in Wastewater from Garrison Areas

Summary

The Swedish Fortifications Agency (Fortifikationsverket) seeks innovative solutions to reduce PFAS discharges from garrison areas to the municipal wastewater system. The wastewater contains low but variable PFAS concentrations originating from historically contaminated land, buildings, and activities.

Despite previous measures, the problem remains due to complex and mixed wastewater streams. There is a need to test and develop solutions that can reduce or eliminate PFAS close to the discharge point.

Addressing this challenge is important to reduce impacts on the municipal wastewater system, including risks to REVAQ-certified sludge and regulatory compliance.

1 Problem definition

PFAS (per- and polyfluoroalkyl substances) are spreading from historically contaminated land and buildings within garrison areas into the municipal wastewater system via sewage. The contamination originates from both primary and diffuse sources within properties managed by Fortifikationsverket, where the Swedish Armed Forces are the main operator.

The wastewater consists of a complex mixture of domestic wastewater and operational flows from, for example, workshops, washing halls, aircraft washing facilities, fire stations, and laundry facilities. Concentrations and composition vary over time. In addition, diffuse contamination from pipelines, buildings, and contaminated surfaces further complicates efforts to address the problem. Experience indicates that typical domestic wastewater (e.g. from offices and accommodation) generally contains very low levels of PFAS, while greywater from workshops and industrial activities contributes more significantly to the overall PFAS load.

Despite implemented upstream measures, achieving sufficient reduction at the source is considered difficult in the short term. Therefore, there is a need to develop or test solutions that can reduce PFAS in outgoing wastewater close to the transfer point to the municipal wastewater system.

2 Conditions

To enable innovators to assess potential solutions, information such as flow rates, flow variations, PFAS concentrations and composition, presence of other substances, and available results from previous studies or tests is needed and may be shared where possible.

2.1 Water characteristics

The wastewater leaving the garrisons (from air force wings and other facilities) contains relatively low but measurable levels of PFAS. Average concentrations may range between 200–500 ng/L, but levels of several thousand ng/L can occasionally be measured.

The wastewater is a complex mixture of domestic wastewater (offices, barracks, restaurants) and discharges from workshops, washing halls, aircraft washing facilities, fire stations, and laundry operations. Activities and discharges occur irregularly and are further mixed during transport. Source tracking and treatment are complicated by large variations in PFAS concentrations and composition, as well as the presence of other interfering substances.

Wastewater may also become diffusely contaminated as it flows through the sewer system, due to infiltration and leaching from contaminated surfaces in buildings and pipelines. Measures such as relining (pipe rehabilitation/sealing) have been carried out in some of these pipelines. Other contaminants, such as heavy metals (e.g. zinc, cadmium, and possibly copper), may also be present and may need to be addressed in the treatment process.

2.2 System constraints

Treatment is expected to be located at the transfer point, i.e. the outlet where wastewater is collected and discharged from Fortifikationsverket's property to the municipal wastewater network. At this point, the wastewater is already mixed within the local sewer system, which limits the possibility to separate individual sub-streams.

Fortifikationsverket will provide access to wastewater for testing purposes. Due to administrative and security constraints, pilot installations are preferably located outside the garrison area, for example in manholes or pumping stations.

2.3 Environmental factors and legal aspects

The problem arises in a garrison environment where Fortifikationsverket is the property owner, and the Swedish Armed Forces are the main operator. The wastewater is discharged into the municipal system, meaning solutions must consider downstream impacts.

The regulatory framework is complex and sometimes difficult to interpret in practice. Different guideline, threshold, and limit values apply in different contexts. For example, PFAS concentrations allowed in products may be in the ppm range, while environmental standards for surface water are in the ng/L range. Limits applicable to wastewater are less clearly defined, creating uncertainty for solution design. This means that any solution must function within a regulatory context where requirements may be complex.

3 Previous attempts and challenges

3.1 Implemented measures and projects

Both the Swedish Armed Forces and Fortifikationsverket have taken actions that have reduced, but not solved, the problem. Examples of measures (varying between locations) include:

- All PFAS-containing firefighting foam has been replaced, and infrastructure components have been upgraded, largely stopping contaminations from the primary sources.
- Self-monitoring and sampling campaigns have been established to monitor the emissions.
- Upstream measures including flushing of the sewer pipes to accelerate contaminant removal for upstream measures.
- Mapping and sampling to identify source areas.
- Relining of pipelines to reduce leakage and infiltration.
- Carbon filters are installed for point sources.

3.2 Why the problem is not yet solved

Despite these measures, diffuse contamination continues to sustain PFAS levels, resulting in a slow phase-out and insufficient reduction in concentrations. The major challenge is to separate PFAS from the rest of the domestic and industrial wastewater to reduce the need to treat all water.

We need approaches and technologies capable of treating the water at the discharge point to reach very low limit values without introducing new problems, such as heavy metals or other contaminants.

3.3 Lessons learned and key insights

Implemented measures show that primary sources can be partly controlled, but this is not sufficient to solve the problem. Diffuse contamination and mixed flows remain key challenges. While point sources can sometimes be managed, the overall PFAS load in outgoing wastewater remains difficult to address.

Fortifikationsverket assesses that typical domestic wastewater (e.g. from offices and sports facilities) generally contains no or very low levels of PFAS, while greywater from workshops and industrial activities contributes more significantly to the overall PFAS load.

There is also an interest in better understanding the relationship between PFAS in the water phase and in sludge, in order to support prioritisation of treatment strategies.

4 Desired outcomes

4.1 Functional requirements

The goal is to achieve a long-term, sustainable, and effective solution that reduces PFAS loads in outgoing wastewater from garrison areas.

Fortifikationsverket is primarily seeking:

- A solution enabling centralized treatment at the transfer point to the municipal wastewater system
- Effective reduction of PFAS in large wastewater flows with relatively low concentrations
- Reliable performance under varying conditions (e.g. fluctuations in concentration, composition, and load)
- Compliance with regulatory requirements, including discharge limits and certifications such as REVAQ

4.2 Additional preferences

It is desirable that the solution does not require Fortifikationsverket to manage sludge or particulate residues to any significant extent. Solutions may include destruction technologies, not only separation.

- Minimising residual products
- Integration with municipal wastewater systems for handling regenerated streams or sludge
- Technical and practical feasibility for long-term implementation

4.3 Innovation challenge

We are particularly interested in solutions that:

- go beyond conventional separation techniques
- enable destruction, transformation, or permanent removal of PFAS
- reduce the need to treat the entire wastewater flow
- can operate under variable conditions

Both early-stage and mature solutions are welcome. Solutions do not need to be fully developed but must have a clear pathway toward real-world application. We encourage participation from startups, research groups, and technology developers from different sectors.

4.4 Time aspect

Pilot or development-phase solutions are welcome, provided that the measure can be tested in a real environment.