

Frog reference	FR3120
Customer	Persimmon Homes
Site	Twyn y Rodyn
Sample	Collected by Natalia Perez del Postigo (frog environmental)
Date	31.07.2023
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Introduction

Testing has been undertaken on a soil & water sample from the above-mentioned site. The testing process examines the rate of natural separation of solid fraction from water and helps inform the type of silt pollution control measures that may be required during Temporary Works.

frog environmental has a protocol in place that we will first examine the possibilities for treating water without the deployment of flocculants. Only when this avenue has been exhausted through testing and site investigation will frog suggest the use of a flocculant. For more information about the use of flocculants on construction sites, please follow the link: <https://www.frogenvironmental.co.uk/pollution-avoidance-and-mitigation/flocculant-use-on-a-construction-site/>

If test result show that a flocculant is required, there is a preference for working with the customer to develop gravity fed treatment systems. Gravity fed systems have several distinct advantages over pumped system:

- Reduced energy and carbon footprint
- Reduced fuel costs
- Reduced pump hire costs
- Reduced risk associated with refueling

A limitation of gravity fed treatment systems can be the effective mixing of flocculant with effluent. In these circumstances, forced mixing using a pumped flow of water can improve reaction times and settlement rates. Gravity fed systems are therefore not appropriate for every site.

About Gel Flocculant

Gel Flocculant is an active silt control product applied in slow-release solid gel blocks. It is designed to separate liquid from solid. Gel Flocculant is stored in dehydrated state and only activates on contact with water. There are several different blends of Gel Flocculant frequently used in the UK and settlement testing establishes the most effective blend for the site in question. In some circumstances a combination of 2 different blends of Gel Flocculant may provide the most effective solid separation.

Gel Flocculant products applied in the UK are synthetic anionic polyacrylamides that also have a coagulating function.

For peer reviewed information regarding the safety of Gel Flocculant and its fate in the environment, a literature review is available from frog environmental upon request.

Management calculations to demonstrate the carry-over concentrations of three key substances; Acrylamide, Polyacrylamide Polyelectrolyte (PP) and Aluminium contained in Gel Flocculant are completed for every project to ensure compliance with relevant Environmental Quality Standards (EQS) for drinking water. These calculations are intentionally conservative and do not account for the factor of the dilution within the receiving waterbody nor any binding to the sediments. It is anticipated that any residual concentrations are present in very small concentrations.

Should there be specific environmental sensitivities, testing for acrylamide and aluminum concentrations in effluent can be undertaken as part of a management system to ensure thresholds are not breached. However, there are no UK laboratory tests available for polyelectrolytes.

Test Process

The aim of testing is to record the natural separation of the solid fraction from water in controlled conditions. The control is tested against different Gel Flocculant blends with reaction times and type of floc produced noted. Where a control shows promise for effective natural settlement this will be recorded in the report and the customer advised of passive silt management interventions.

Once all Gel Flocculant blends have been tested, the most effective blend is photographed and included in the report, with the results of testing from other less effective blends omitted. The control is also photographed for comparison purposes.

Repeated agitation of the same sample gives a good indication for the reaction time required to settle solids from suspension. In each case an NTU reading is taken and shown in the key alongside a photographic record of the test. The level of agitation required for reaction helps to inform a deployment plan.

In some cases, Gel Flocculant will not be effective. Whilst cationic flocculants and liquid products are available, frog environmental do not supply these products for use in 'open' applications, such as surface water drainage from construction sites due to the associated environmental risks.

Where products tested by frog environmental are not effective this will be openly discussed with the client and support provided in objectively reviewing alternative pollution control interventions.

Disclaimer

The use of flocculants on site requires permission from the local regulatory authority. Proceeding with deployment of gel flocculant without regulatory permission is not advised.

Whilst frog environmental provide advice on product specification and deployment, frog environmental is not in control of the construction site or any portion of the construction site at any time. frog environmental do not take responsibility for the quality of water discharging from site at any time and do not accept design liability for the efficacy of any water treatment systems that are developed as part of this report. Please refer to our full terms and conditions prior to procurement, as these will form part of any contract for supply of silt control products and services.

Any product specifications, technical drawings, sketches and site plans provided by frog environmental Ltd in relation to this report are proposals and should be reviewed and approved by the Permanent Works Designer. All proposals are based on the best available data at the time of quotation.

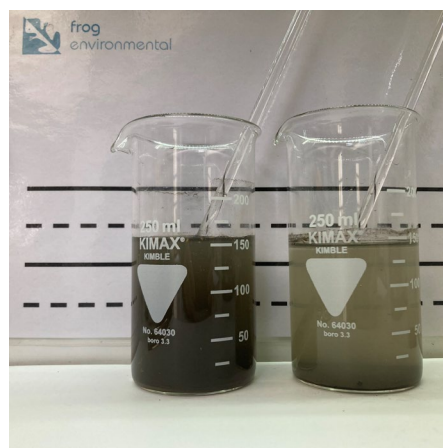
Testing results are indicative and are reliant on the representative nature of samples. Most silt control systems require an element of fine tuning once installed to operate at optimal levels.

Results

Water Temperature (°C)	17.4	pH	7.89
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A. Control vs 30 min Settlement



B. Control vs 12h Settlement

Turbidity
256 NTU to 172 NTU

Turbidity
172 NTU to 81 NTU



A. **Test 1** Control vs WL 494 / 398
(15 seconds agitation plus 30 seconds settlement)



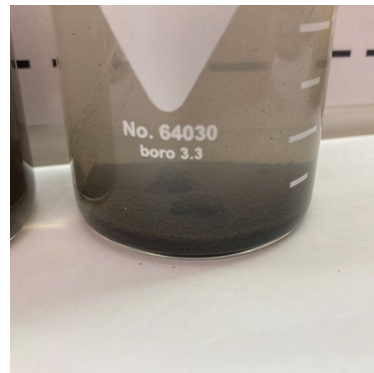
B. **Test 2** Control vs WL 494 / 398
(further 15 second agitation from Test 1 plus 60 seconds settlement)

Turbidity
256 NTU to 287 NTU

Turbidity
287 NTU to 153 NTU



C. **Test 3** Control vs WL 494 / 398
(further 15 second agitation from Test 2 plus 60 second settlement)



Turbidity
153 NTU to 64 NTU

Test 3 Close Up

Summary of Results

Natural settlement at Twyn y Rodyn reduced from 256 NTU to 239 NTU over a period of 10 mins. Settlement for 30 min decreased the NTU from 239 NTU to 172 NTU, with visible change. After 2 hours, turbidity decreased to 130 NTU. A further 12-hour settlement provided a further reduction in turbidity to 81 NTU.

Testing showed the most effective Gel Flocculant to be WL494 in combination with WL398. The first stage of testing did not show a quick reaction nor a visible solid-separation, with the turbidity reading showing an increase from 256 NTU to 287 NTU. The second stage of mixing resulted in a fast reaction with visible sediment deposition, reducing the turbidity to 153 NTU. The third and last stage reduced the turbidity to 64 NTU, resulting in a clear sample with noticeable deposition and a fine flocculated sediment.

Conclusions and next Steps

Physical settlement is extremely likely to achieve clear water at Twyn Y Rodyn if correct attenuation and silt management is implemented. The addition of flocculant will enhance and speed up the sediment deposition when the volumes on site hinder longer attenuation times. Settlement Testing is a key factor when it comes to assessing the risk of a construction site causing a silt pollution event. However, there are other important factors to consider:

Factor	Why is it important?
Settlement characteristics of particle (defined by Settlement Test)	Defines how the silt particles behaves when in suspension with and without the application of Gel Flocculant
Water Attenuation areas and attenuation design	Attenuation areas slow the flow of water and allow time for silt or floc particles to settle out of suspension. If this can be done without use of flocculant, it should be.
Permitted Total Suspended Solids (TSS) value expressed in mg/l	Notes the quality of water acceptable for discharge.
The flow rate of effluent that requires treatment	Treatment solutions have differing effective treatment rates. Knowing the flow rate helps to come up with the most cost-effective approach.
Proximity and connectivity to watercourse(s)	Where does surface water from your site drain to? It is illegal to cause silt pollution or erosion at the point of discharge.
Knowledge and Experience on site	Skills and knowledge on site can help prevent a silt pollution incident or react quickly to mitigate one
Management Systems	Named roles and responsibilities on site helps a company to respond effectively to an incident.

There are 5 key components to a treatment system using Gel Flocculant:

1. **Mixing:** the mixing of effluent with Gel Flocculant, through passive or forced measures.
2. **Capturing:** trapping flocculated particles, either in attenuation features, Silt Capture Channels or a combination of measures.
3. **Maintenance:** removing accreted silt from attenuation features or Silt Capture Channels
4. **Monitoring:** testing effluent quality to ensure compliance
5. **Optimise:** refine the system, scaling treatment up or down depending on the season or the risk associated with a specific construction phase

More information on the deployment of Gel Flocculant is available from frog environmental.

To discuss next steps, contact: Natalia Perez del Postigo (natalia@frogeenvironmental.co.uk)