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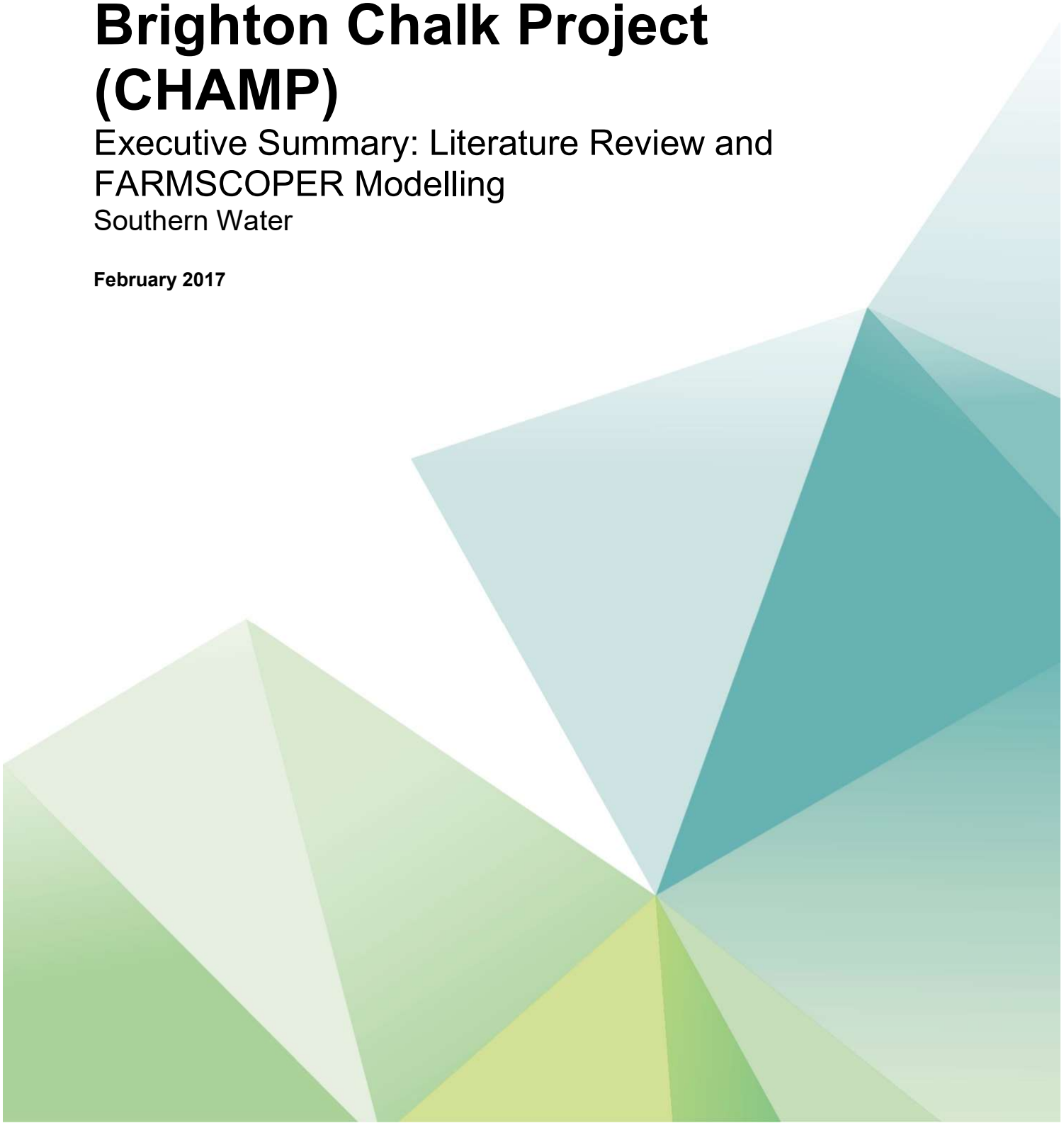
Nitrate Reduction in Brighton Chalk Project (CHAMP)

Executive Summary: Literature Review and FARMSCOPER Modelling

Southern Water

February 2017



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This document has 59 pages including the cover.

Document history

Job number: 5149388			**Document ref:**			
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	First draft	MB / MW / DGT / CN / RD	MW / MB	CN / DR	DR	30/10/2016
Rev 2.0	Final	MB / MW / DGT / CN / RD				

Client signoff

Client	Southern Water
Project	Nitrate Reduction in Brighton Chalk Project (CHAMP)
Document title	Final Report
Job no.	5149388
Copy no.	
Document reference	

Executive summary

Nitrate levels in groundwaters are a longstanding problem, with rising groundwater nitrate trends in some areas putting the future reliability of sources at risk. Aside from, or supplementary to, traditional treatment options, catchment management can play a role in helping control nitrates at source. One major source of nitrate pollution in groundwater is agriculture due to the heavy use of nitrates in fertilisers. Nitrates that are applied to soil can leach through the soil into groundwater; when over used, or applied inappropriately, these inputs can have a significant and longstanding impact.

Aims and objectives

The aim of the overall project is to try to reduce nitrates in the Brighton Chalk Block, particularly the magnitude of any seasonal nitrate peaks related to weather / rainfall in the short term, but with a view to reducing upward trends over the long term through a catchment management approach. This study is part of the CHAMP (Brighton Chalk Management Partnership) Project, which is a multi-stakeholder project developed through the Adur & Ouse Catchment Partnership with an aim to *"protect and improve the quality of groundwater in the Brighton Chalk, to ensure it remains a sustainable resource for public water supply".*

The objectives of this particular study are to:

1. Undertake a broad-ranging literature review to identify possible on-farm mitigation measures to reduce nitrate losses from agriculture on and around the Brighton Chalk Block, quantifying as far as possible the impact of mitigation measures on nitrate losses from agriculture.
2. Review the role of cover crops and their potential for reducing all aspects of diffuse pollution with specific reference to the Brighton Chalk Block, providing data on the costs associated with cover cropping and the value of any nutrients saved.
3. Incorporate the findings of ongoing related projects due to report during the life of this project.
4. Quantify nitrate pollution using a model such as FARMSCOPER.

Approach

A three-phased approach has been taken for this study. In the first phase, the Brighton Chalk Block catchment was characterised through assessing the land cover, agricultural characteristics and current borehole nitrate trends within the catchment (i.e. the groundwater block).

In the second phase, an online literature review was undertaken to help identify possible on-farm mitigation measures to reduce nitrate losses from agriculture on and around the Brighton Chalk Block. In addition to this, a series of telephone interviews were conducted with specialists including representatives from water companies, Natural England, the Environment Agency, academia, seed companies and agronomists. This range of participants was carefully selected in order to provide a broad ranging viewpoint of organisations potentially involved in cover crop trials and nitrate reduction studies, and served to gather lessons learned that weren't yet published.

In the third phase, modelling was undertaken using the ADAS/Defra FARMSCOPER model in order to identify the most effective measures for reducing nitrate losses, as well as to quantify the effectiveness of such measures, the costs involved in their implementation, and the wider benefits that could be realised (e.g. for other agricultural pollutants).

Key findings

Current nitrate borehole trends

The following conclusions can be drawn from the analysis of borehole nitrate trend data:

- Generally the boreholes in the west of the Brighton Chalk Block have the highest nitrate concentrations.
- Boreholes in agricultural areas have higher rates of increase compared to boreholes in suburban areas.

- Nitrate trends are, or will soon be, an issue for water supply at a number of the boreholes in the study area. Both rising trends and seasonal peaks are a risk to security of production.
- A number of the boreholes in the area could potentially benefit from a catchment management approach to try to reduce the nitrate peaks in boreholes.

Lessons learned on measures to reduce nitrate losses from agriculture

The review of measures to reduce nitrate losses from agriculture indicated that the most effective measures are cover crops, arable reversion to grassland and arable/grassland reversion to woodland.

The FARMSCOPER modelling undertaken identified cover crops as the most effective measure of those included in the model for all farms with arable cropping, with potential reductions in nitrate losses of up to 21%. Cover crops have become increasingly recognised over the last few years for their ability to capture nitrogen in the soil, reduce nitrate leaching and deliver a range of other benefits. They are currently being promoted by collaborative grassroots efforts involving water companies, Natural England, seed companies, agronomists and NGOs.

Whilst cover crops are rapidly increasing in popularity and a number of trials have been undertaken by various organisations, arable reversion to grassland and woodland was not identified as a popular measure that was currently being trialled by any of the consultees during the project, despite potential nitrate loss reductions of up to 90% (according to the FARMSCOPER model). This is likely to be due to the relative high cost of this measure and long term investment and change in land use required.

Based on the FARMSCOPER results and the number of each farm type assumed to be in the catchment, the maximum potential reduction in nitrate loss across the catchment is estimated to be 12-17% depending on the assumed current level of uptake of measures.

Lessons learned on delivery routes

From the lessons learned consultations that were undertaken, it is clear that a range of organisations are involved in farmer engagement at the catchment scale. Whilst some water companies have opted to work through Catchment Sensitive Farming Officers (CSFOs), others employ in-house catchment advisors and managers.

Although it was reported that farmers respond well to input from a range of different local stakeholders, it was also evident that this is a crowded marketplace, different organisations can have conflicting priorities and there is potential for duplication and confusion. There is a need to ensure that farmers receive clear and consistent advice and close collaboration between different organisations is therefore important for maximising engagement and effectiveness.

Financial incentives for implementation of measures are currently available both through agri-environment schemes and through some water company schemes. Consultees reported that financial incentives in the form of subsidies and grants, as well as compliance with Ecological Focus Area requirements, are important for farmers and may give them the “final push” in implementing measures. However, one consultee estimated that over half of cover crop usage is not related to subsidies and that soil improvement and the associated cost benefits are key drivers. Tailoring messages and approaches to individual farmer concerns was also found to be important.

Furthermore, it was also reported that the lack of flexibility, level of funding and future uncertainties associated with government agri-environment schemes can be make these schemes unappealing to farmers. There is an opportunity for water companies to set up their own agreements with farmers (provided that they are not double funding any measures in existing stewardship agreements).

Lessons learned on measuring outcomes

Outcomes of catchment management approaches and cover crops in particular were found to be measured in a variety of ways. These included the use of water quality monitoring across the catchment and source, porous pots, green tissue and soil sampling and monitoring of farmer engagement.

Although there are numerous trials showing the effectiveness of catchment management measures at the plot scale, a lack of studies measuring effectiveness in improving water quality at the catchment scale was identified. Given the length of time that it may take for improvements in water quality to become apparent (particularly in the case of nitrates in groundwater), trials and monitoring over several years may be needed to measure outcomes across the catchment.

Claire Neale
Atkins Ltd
Woodcote Grove
Ashley Road
Epsom
KT18 5BW

claire.neale@atkinsglobal.com