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CAPE COD
COMMISSION

June 1, 2017

Angela Gallagher
Site Remediation Section
Southeast Regional Office
Department of Environmental Protection
20 Riverside Drive
Lakeville, MA 02347

Re: WSA-4-26179
Immediate Response Action
PFOS/PFOA in Groundwater

Dear Ms. Gallagher:

This is the sixth IRA monthly remedial monitoring and status report for the IRA approved by the Department in a letter dated November 10, 2016. This report includes a status report on the pump and treat, the post Soil Removal Rembind Treatment metals monitoring and the private well assessment.

Pump and Treat System

The pump and treat system operated continuously throughout the month. PFOS concentrations in influent and effluent were 2700 and Below Reporting Limits respectively. The monthly pump volume was 50.5 Million Gallons with an estimated removal of 1.3 Pounds of PFOS. The pump rate has decreased to below 40 gpm so the well and force mains will be scheduled for cleaning to improve flow. The results from the May 18th system sampled has yet to be received. A comprehensive sampling of groundwater in monitoring wells was conducted in April to evaluate the configuration of PFAS in groundwater and the effectiveness of the pump and treat system. Laboratory results will be received in May for review in June.

Post Soil Removal Monitoring

The DEP IRA approval included requirements for assessing the potential for metals leaching from the Rembind soil amendment to groundwater. The conditions required sampling groundwater upgradient and downgradient of the excavated soil and Rembind amended soil area and Flintrock Pond, which supplies groundwater to the HS wells. The pre-excavation sampling was conducted on December 8, 2016 from two monitoring wells HS-6 and PFW-2 and Flintrock Pond (Figure 1). Results of the pre-excavation background groundwater and pond water data, and the description of soil excavation and amendment, conducted over January 25-27, 2017, was included in the February 2017 Remedial Monitoring and Status report dated February 28, 2017.

The post groundwater monitoring task included the installation of two monitoring wells HS-1a and HS-2a to replace the HS-6 well that was removed as part of the soil excavation. The two new monitoring wells and the downgradient well PFW-2 were sampled on April 10, 2017. The three sampled monitoring wells bracket downgradient, mid hole and upgradient hole areas. The results of the metals, PFAS and field parameters are shown in Table 1 below.

Figure 1. Excavation Area and Monitoring Wells

(New) (Existing)

From Figure 4 of the RDA

There were no significant changes in chemistry from the pre to post soil excavation sampling results. For instance, arsenic was slightly higher in the HS-1a results, but BRL for the other two locations. The metal assessment of the Rembind product (indicated that only barium, copper and nickel were detected above the reporting limit. The analytic results for those elements were detected at a low ten ppb concentration , if at all, in post excavation groundwater samples. All concentrations for metals were below the associated Maximum Contaminant levels and the GW-1 concentrations except for aluminum in HS-1a and HS-2a of 3.8 mg/l. The Pre-excavation groundwater in PFW-2 had a concentration of 2.3 mg/l. Aluminum is an extremely abundant element in the earth's crust and is associated with common feldspars. It is known to exist in groundwater in concentrations ranging from 0.1 to 8.0 mg/l (Water Quality Association, Aluminum Fact sheet, www.wqa.org, 2013). Aluminum can become more mobile in acidic conditions. Th pH of groundwater in the pre and post excavation groundwater samples is acidic ranging from 5.5 to 5.79. The Dissolved oxygen in groundwater was low except for the post removal sample from the downgradient well PFW-2 which increased to 3.65 from 0.6 mg/l. Specific conductance in groundwater did not change appreciably from its fairly low measurement of 130 umho/cm.

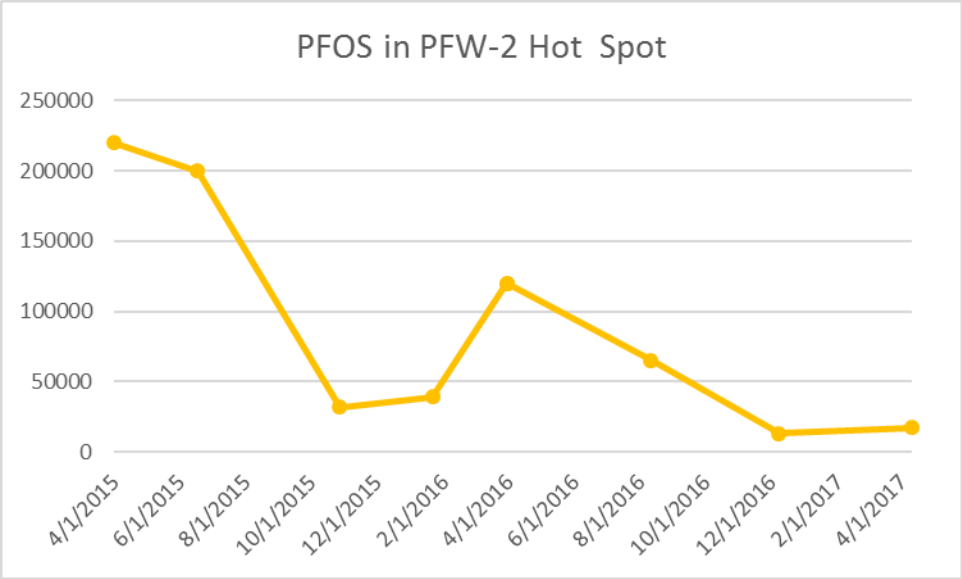
Table 1. Metals, PFAS and Field Parameters in Groundwater and Pond

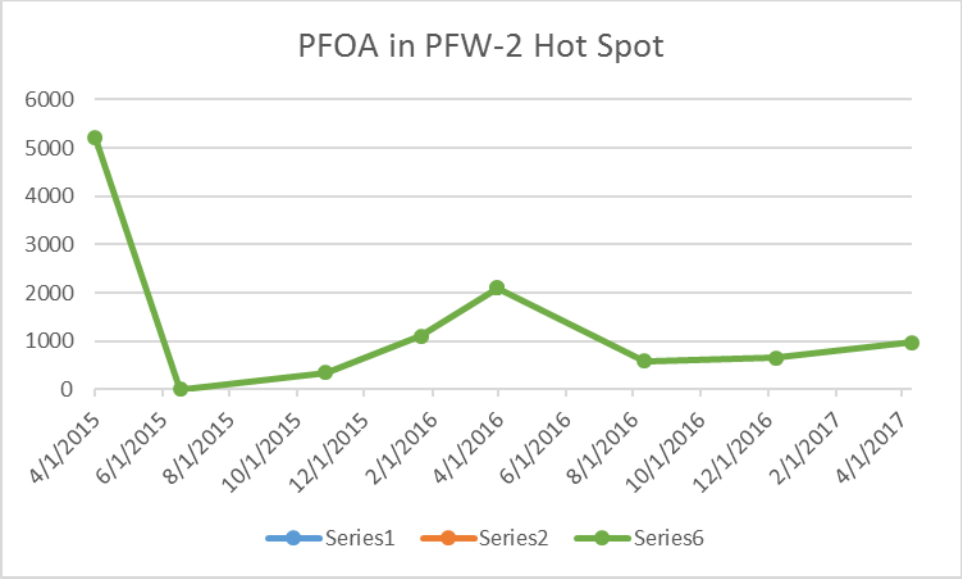
			8-Dec-16			10-Apr-17		
Metals		**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
		RCGW-1	**PFW-2**	**HS-1**	**Flintrock**	**PFW-2**	**HS-1a**	**HS-2a**
antimony		0.006	ND	ND	ND	ND	ND	ND
arsenic		0.01	0.0026	0.0016	0.001	ND	0.0039	ND
barium		2	0.0065	0.014	0.0057	ND	0.012	0.0089
beryllium		0.004	ND	ND	ND	ND	ND	ND
cadmium		0.004	ND	ND	ND	ND	ND	ND
Chromium		0.1	0.0024	ND	ND	ND	ND	ND
copper		10	0.0059	ND	0.0012	ND	0.038	ND
lead		0.01	0.0036	0.0017	0.0026	ND	ND	ND
nickel		0.1	0.0084	0.0049	ND	0.0061	0.0045	0.0078
selenium		0.05	ND	ND	ND	ND	ND	ND
silver		0.007	ND	ND	ND	ND	ND	ND
thallium		0.002	ND	ND	ND	ND	ND	ND
zinc		0.9	0.01	0.0097	0.017	ND	ND	ND
vanadium		0.03	0.0042	0.0037	0.0013	ND	0.0095	0.0068
Aluminum		1	2.3	0.66	0.014	0.57	3.8	3.8
mercury		0.002	ND	ND	ND	Nd	ND	ND
DO	mg/l		0.6	1.42	11.1	3.65	1.06	3.05
pH	pH		5.66	5.79	6.3	5.46	5.72	5.5
Spec Cond	umho/cm		115	130	85	120	132	138
Temp	C		14.4	12.5	6.3	10	10.9	10
PFOS	ng/l	70	13000	36000	1300	17000	38000	28000
PFOA	ng/l	70	660	1800	130	970	1000	660

The post excavation samples were taken three months after the soil removal operation. There were several major precipitation events and water from fire fighter training was also observed to flow and infiltrate the area during this time. Given the natural and artificial infiltration through the area over the last 3 months, it would be expected that changes in inorganic chemistry from the excavation and soil amendment would be fairly-well established. There are only slight comparable differences between the pre and post excavation groundwater results indicating no demonstrable leaching of elements from the Rembind soil amendment. The soil amendment was placed above

the watertable at the bottom of the hole to curtail the migration of any residual PFAS in surface water runoff to the hot spot area.

The initially high PFAS concentrations of 2015 in PFW-2 have a trending decrease. PFOS/PFOA concentrations in groundwater from PFW-2 has decreased since it initial sample in 2015. But a significant PFOS/PFOA concentration increase occurs after 2016 spring rains and training activities. Now that the soil is removed and training water is actively managed to not infiltrate the area, it is expected that the Hot Spot monitoring wells will show a continuing decrease of PFOS/PFOA. Continued monitoring of the Hot Spot monitoring wells will further evaluate that potential changes from the April 2017 high PFOS/PFOA concentrations of 17,000 and 970 ng/l. Metal samples for Flintrock Pond were not collected, but the PFAS sampling indicates a PFOS pond concentration at 1,300 ng/l that is consistent with previous samples from 2015 to the pre-excavation sampling event. Changes in inorganic chemistry in the Pond are not expected basis on the negligible changes observed in groundwater beneath and downgradient of the excavation area and the fact that the Flintrock Pond is upgradient from the study area. The area will be sampled for PFAS again to confirm these conclusions, but only Aluminum for metals will be analyzed.

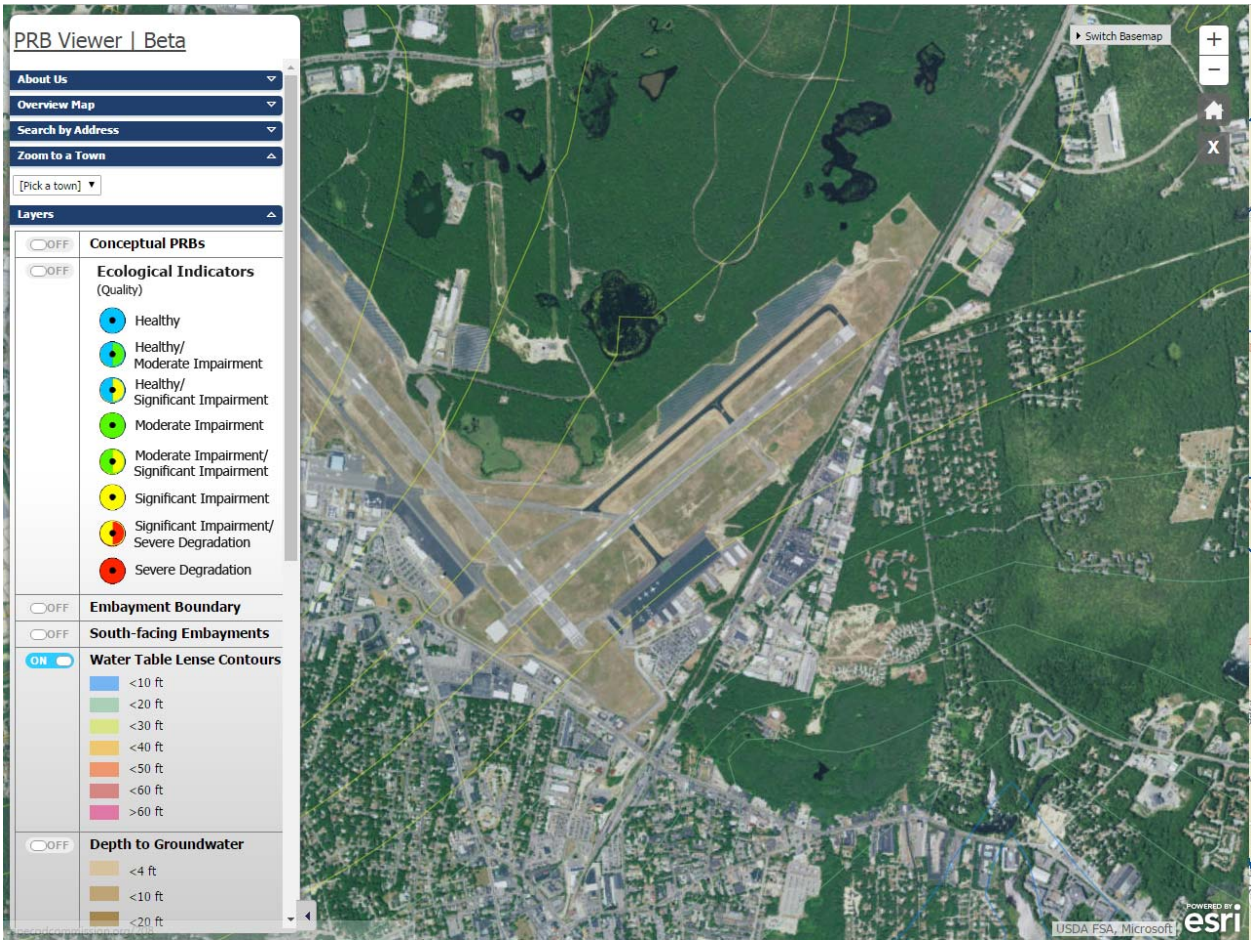




Private Well Assessment

The DEP Notice of Responsibility (Page 5/second paragraph) required an assessment of public and private wells in the downgradient area. The IRA Plan and the initial status report of January 2017 addressed the public water supply systems. The following is an analysis of the existence of private wells in the downgradient area of BCFRTA.

The Cape Cod Commission developed a Web-based viewer tool to display data layers pertinent to decisions for siting permeable reactive barriers for non-point source nitrogen remediation. Below is a screen shot of the PRB Viewer showing the "Water Table Lens Contours" data layer, indicating groundwater flow direction downgradient of the BCFRTA.



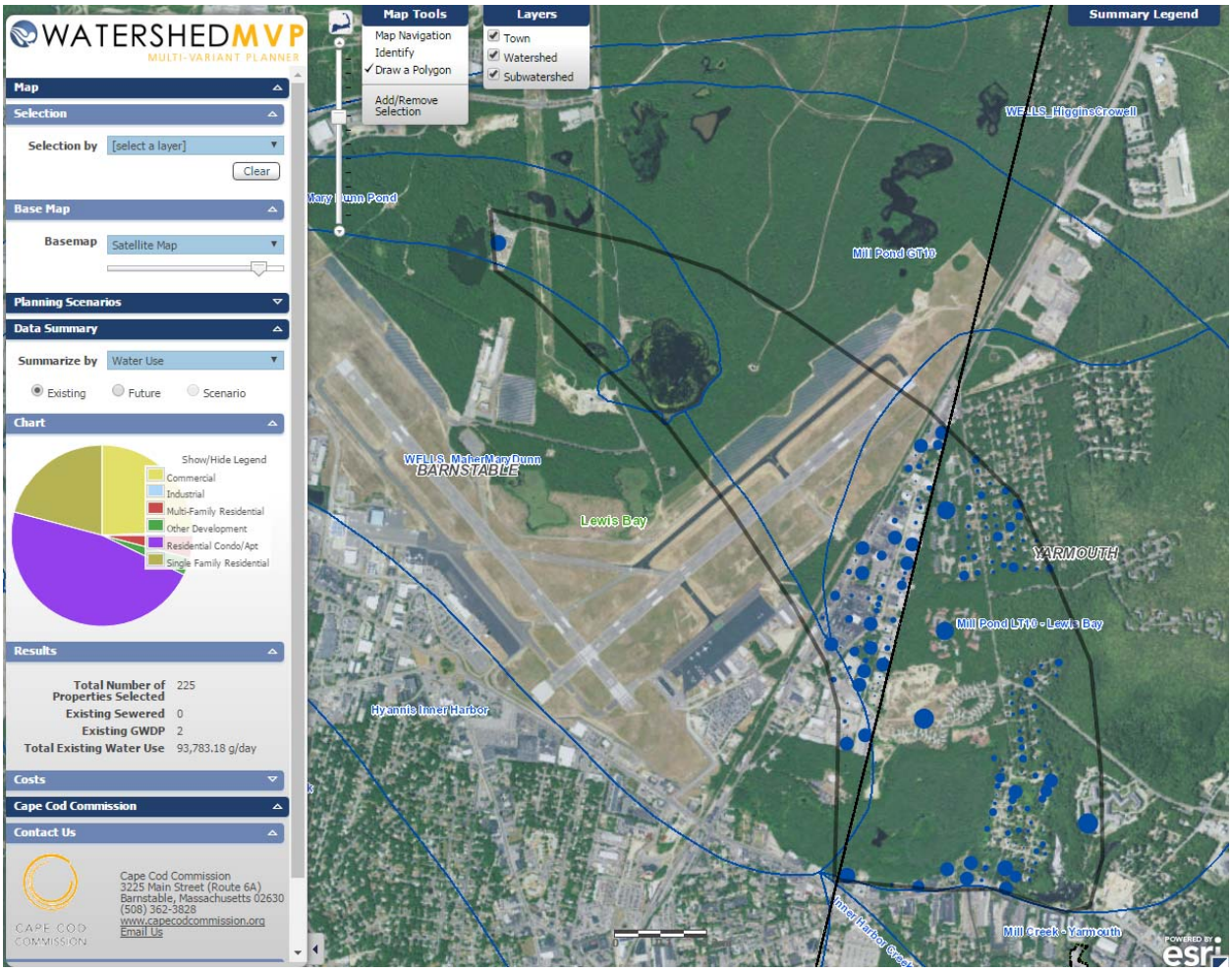
Source: http://gis-services.capecodcommission.org/apps/JS_Developing/prb/viewer.html

The BCFRTA premises and downgradient extent lies wholly within the Lewis Bay watershed. The area downgradient of the BCFRTA encompasses portions of the following subwatersheds within the Lewis Bay watershed:

Mary Dunn Pond (Barnstable)
Mill Pond GT10 (Barnstable)
Wells_MaherMaryDunn (Barnstable)
Mill Pond LT10-Lewis Bay (portions in Yarmouth + Barnstable)

Outlined in black, below, is a polygon delineating the downgradient area of the BCFRTA considered in this analysis using the Cape Cod Commission's Watershed MVP tool. The downgradient extent was assumed to end at the southern boundary of the Mill Pond LT10-Lewis Bay subwatershed boundary. This downgradient polygon area encompasses flow path distances of approximately 1.6 miles – 2 miles downgradient

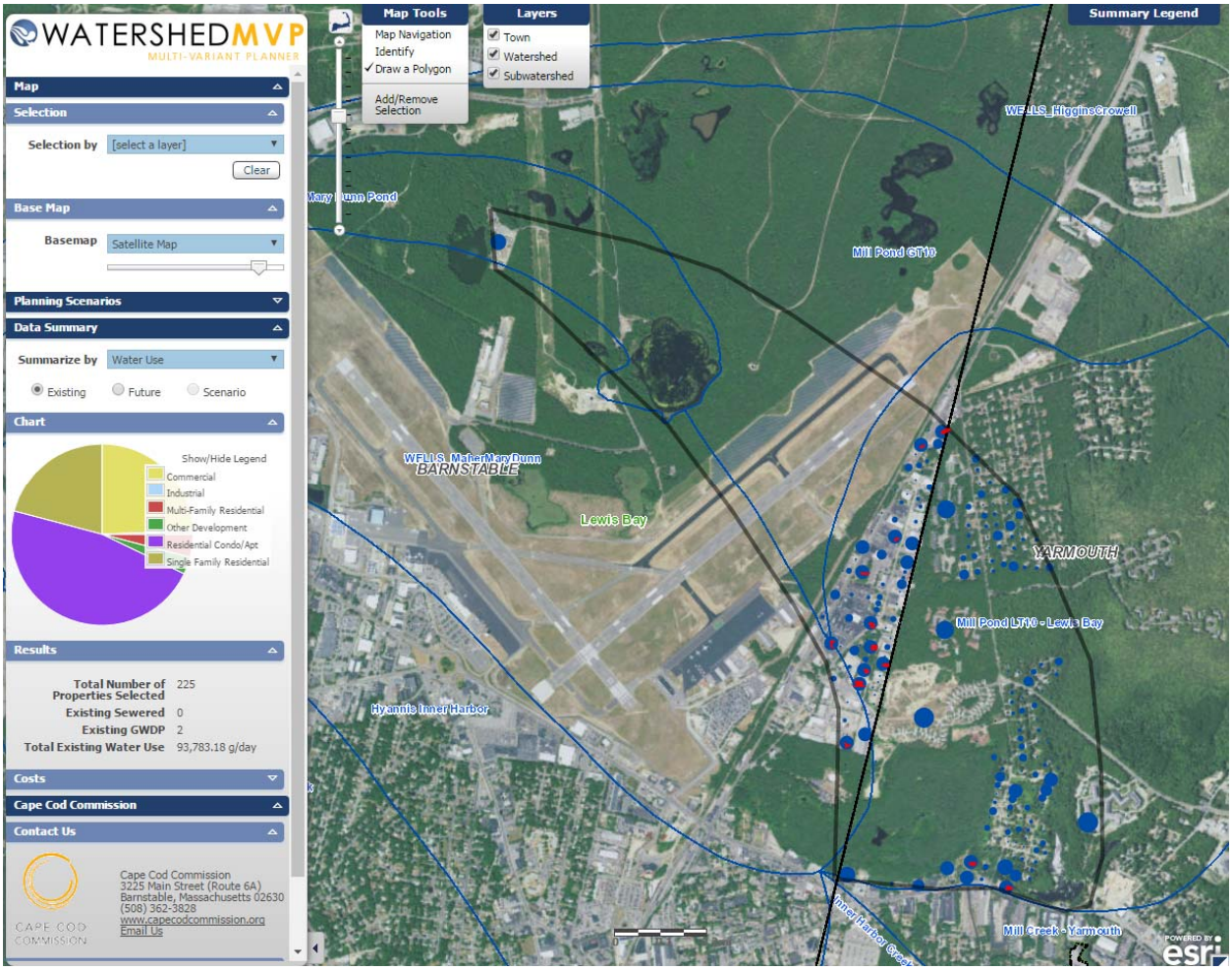
from the BCFRTA site.



Source: www.watershedmvp.org

The wMVP database (updated March 2017) can be queried to show actual water use from the water department for parcels within these subwatersheds. If there is no record of a water use the wMVP assigns an "assumed" water use of: 799 gpd for commercial use. The parcels with the "red" dots indicate no public water supply data for these parcels, possibly indicating the presence of a private well. The number of parcels without actual data in the downgradient area potentially identifying a parcel with a private well is 16.

Within the downgradient polygon boundary, 14 parcels within the Town of Barnstable and two parcels within the Town of Yarmouth did not have associated water use records according to the wMVP database. Town staff from the Town of Barnstable and Town of Yarmouth health departments were contacted regarding these parcels and were able to verify that the parcels in question did not have private wells utilized for potable water. In many instances, the absence of water use data for a given parcel was due to the parcel's land use as a parking lot or storage area.



Please contact me if you have any questions on this submittal.

Sincerely,

Tom Cambareri
Technical Services Director for Water Resources
LSP #3788

Cc: Gerard Martin, DEP-SERO
Jack Yunits, County Administrator