

# **State of Vermont - Residuals Management Update**

**Eamon Twohig**

**Northeast Biosolids & Residuals Conference**

**October 26, 2017**



# **State of Vermont**

## **Residuals Management Update**

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**Vermont Stats**  
**Lake Champlain TMDL**  
**VT Phosphorus Index**  
**Polyfluorinated Compounds (PFCs)**  
**Rule-Making Efforts**

# Residuals Management Stats

## 2015 Quantities of Biosolids Managed In and Out of State

Amounts are in wet tons at 15% solids

Management Option	In-State (wet tons)	Out-of-State (wet tons)	Total (wet tons)	Percent of Total	Percent Managed
<b>Beneficial Uses:</b>					50.3%
Land Application	6,292	0	6,292	9.6%	
EQ Biosolids	9,646	17,098	26,744	40.7%	
Subtotal	15,938	17,098	33,036		
<b>Non-Beneficial Uses:</b>					49.7%
Landfill	29,681	2,216	31,897	48.6%	
Incineration <sup>3</sup>	0	721	721	1.1%	
Subtotal	29,681	2,937	32,618		
<b>Total:</b>	45,619	20,035	65,654	100%	100%
<b>Percent of Total In &amp; Out of State</b>	69.5%	30.5%			



# Residuals Management Stats

2015 Quantities of Septage Managed In and Out of State<sup>1</sup>

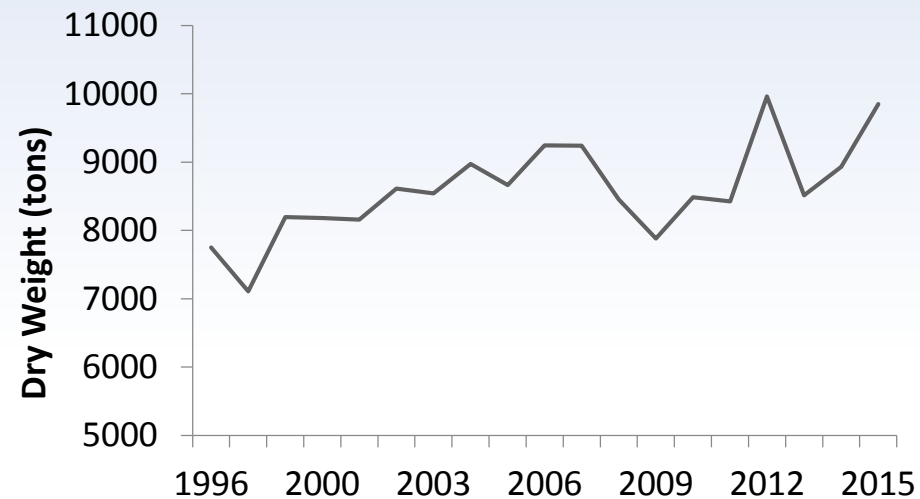
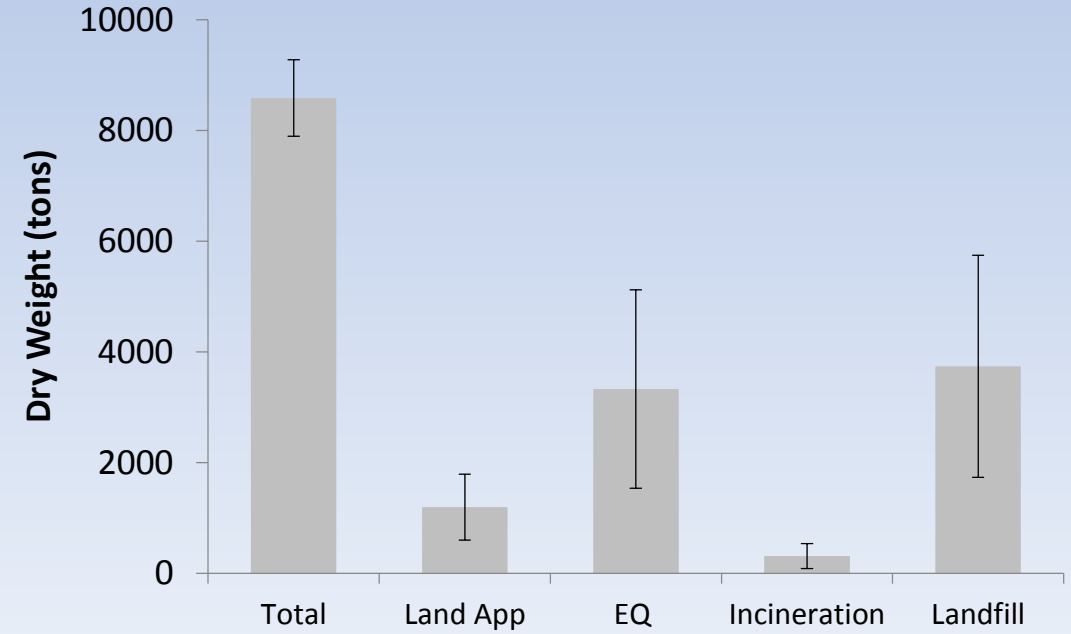
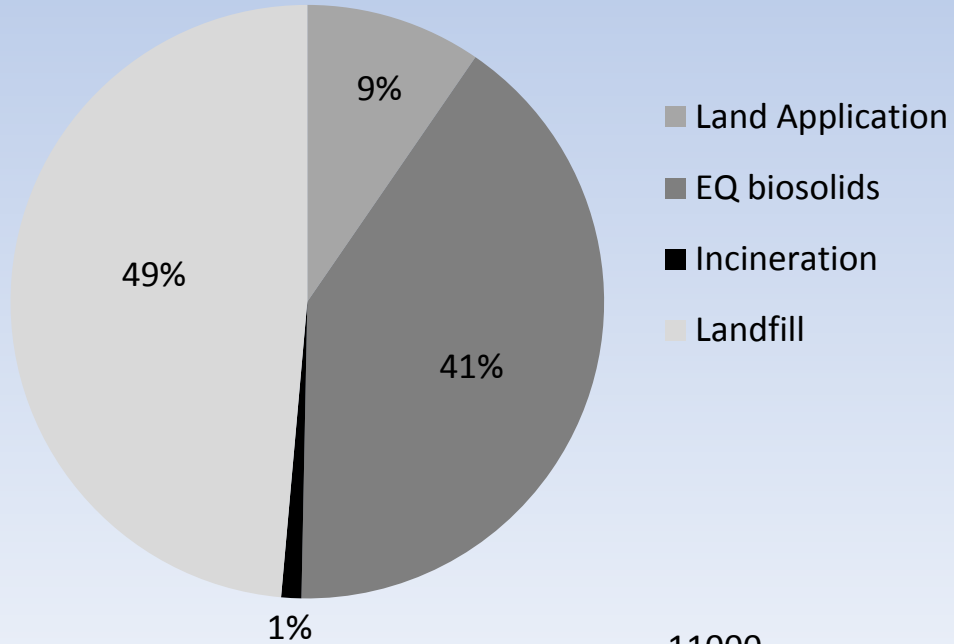
Management Option	In-State (gallons)	Out-of-State (gallons)	Total (gallons)	Percent of Total	Percent Managed
<b>Beneficial Uses:</b>					
Land Application	7,773,522	280,927	8,054,449	15.5%	
EQ Biosolids	2,577,850	8,564,056	11,141,906	21.5%	
Subtotal	10,351,372	8,844,983	19,196,355		37.0%
<b>Non-Beneficial Uses:</b>					
Landfill	28,522,561	898,532	29,421,093	56.8%	
Incineration	0	3,204,221	3,204,221	6.2%	
Subtotal	28,522,561	4,102,753	32,625,314		63.0%
<b>Total:</b>	38,873,933	12,947,736	51,821,669	100%	100%
<b>Percent of Total In &amp; Out of State</b>	75.0%	25.0%			

<sup>1</sup> Septage generated in Vermont regardless of where disposed, and all septage disposed in VT regardless of where generated (estimated that <1% of the total volume is generated out-of-state and disposed in VT)

Since start of FY15, septage haulers operating in VT (pumping and/or disposing) must pay a **fee of \$10.00 per 1,000 gallons** pumped, rounded to the nearest 1,000 gallon.



# Residuals Management Stats - 2015



# Lake Champlain TMDL

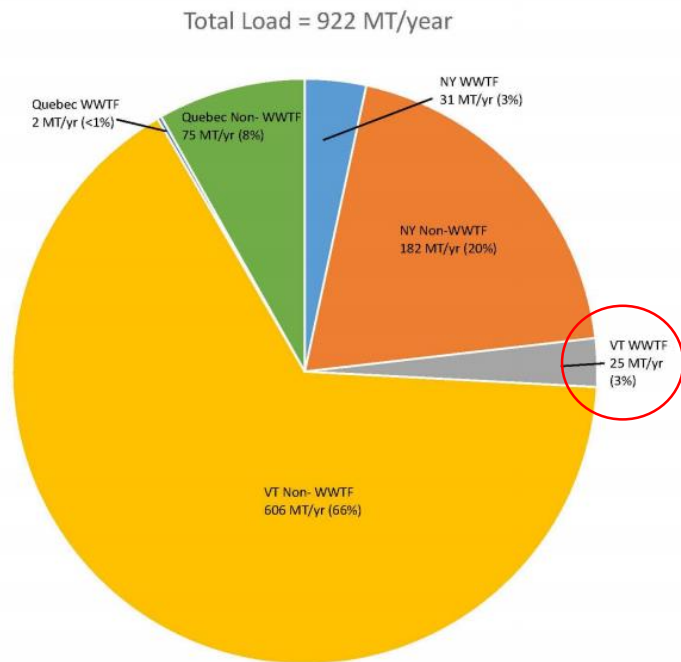


Figure 6: Lake Champlain phosphorus loads by State/Province, in metric tons per year, annual average of 2001-2010. Sources: Data are from TetraTech, 2015a

Table 8. Percent reductions needed to meet TMDL allocations.

Lake Segment	Total Overall	Wastewater <sup>1</sup>	CSO	Developed Land <sup>2</sup>	Agricultural Production Areas	Forest	Streams	Agricultural Nonpoint
01. South Lake B	41.4%	0.0%		21.1%	80.0%	40.0%	46.7%	62.9%
02. South Lake A	55.5%	0.0%		18.1%	80.0%	5.0%		62.9%
03. Port Henry	55.4%			7.6%	80.0%	5.0%		62.9%
04. Otter Creek	23.6%	0.0%		15.0%	80.0%	5.0%	40.1%	46.9%
05. Main Lake	20.5%	61.1%		20.2%	80.0%	5.0%	28.9%	46.9%
06. Shelburne Bay	11.6%	64.1%		20.2%	80.0%	5.0%	55.0%	20.0%
07. Burlington Bay	31.2%	66.7%	11.8%	24.2%	0.0%	0.0%		0.0%
09. Malletts Bay	17.6%	0.2%		20.5%	80.0%	5.0%	44.9%	28.6%
10. Northeast Arm	12.5%			7.2%	80.0%	5.0%		20.0%
11. St. Albans Bay	24.5%	59.4%		21.7%	80.0%	5.0%	55.0%	34.5%
12. Missisquoi Bay	64.3%	51.9%		34.2%	80.0%	50.0%	68.5%	82.8%
13. Isle La Motte	11.7%	0.0%		8.9%	80.0%	5.0%		20.0%
<b>TOTAL</b>	<b>33.7%</b>	<b>42.1%</b>	<b>11.8%</b>	<b>20.9%</b>	<b>80.0%</b>	<b>18.7%</b>	<b>45.4%</b>	<b>53.6%</b>

<sup>1</sup>Percent change from current permitted loads

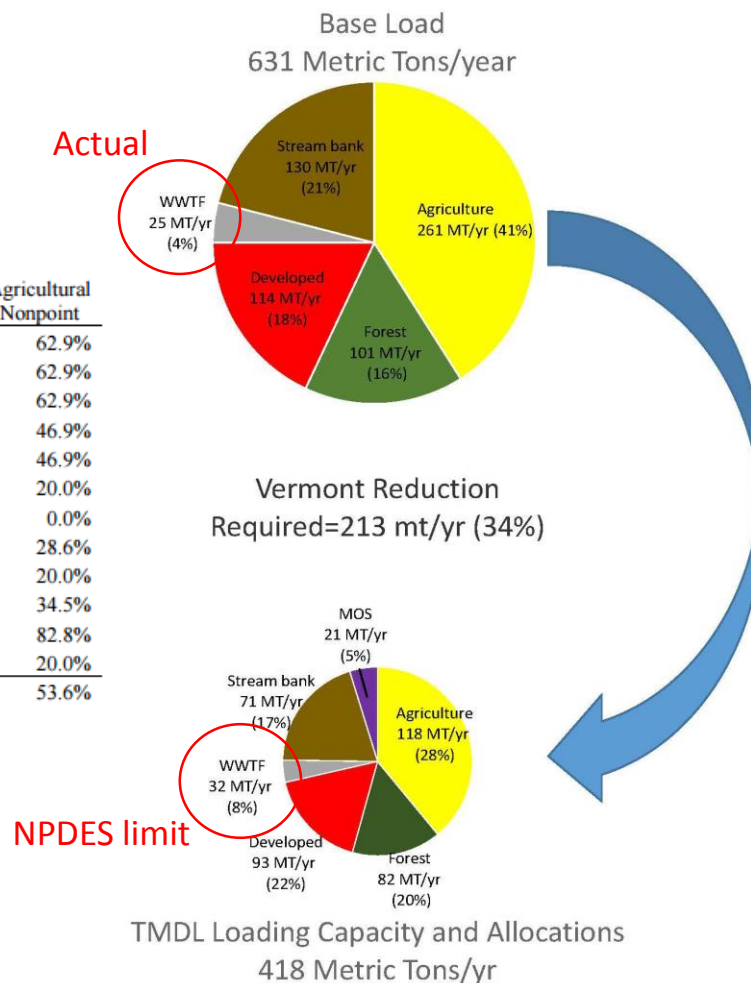


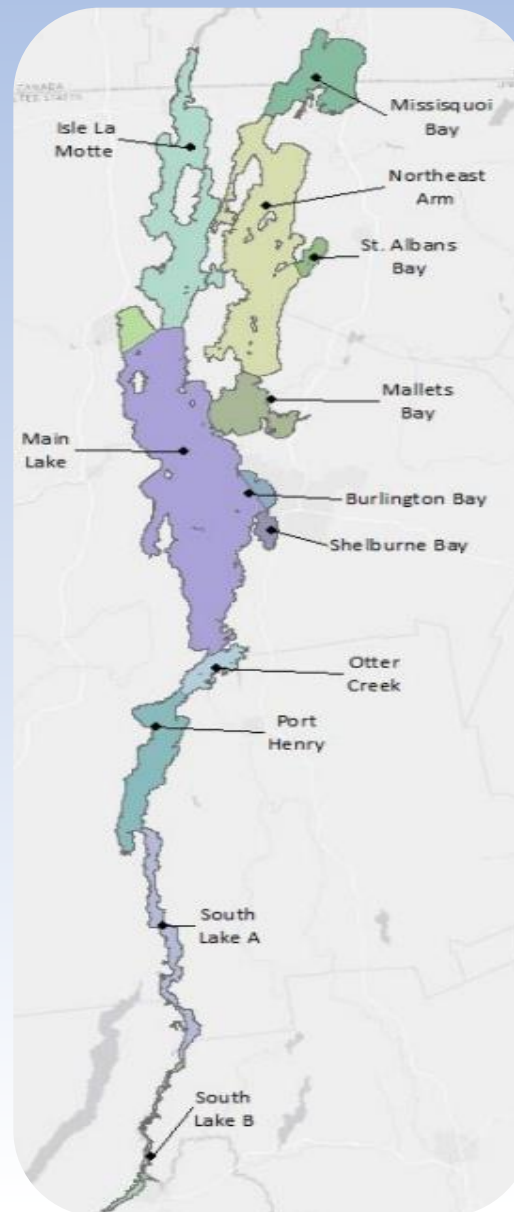
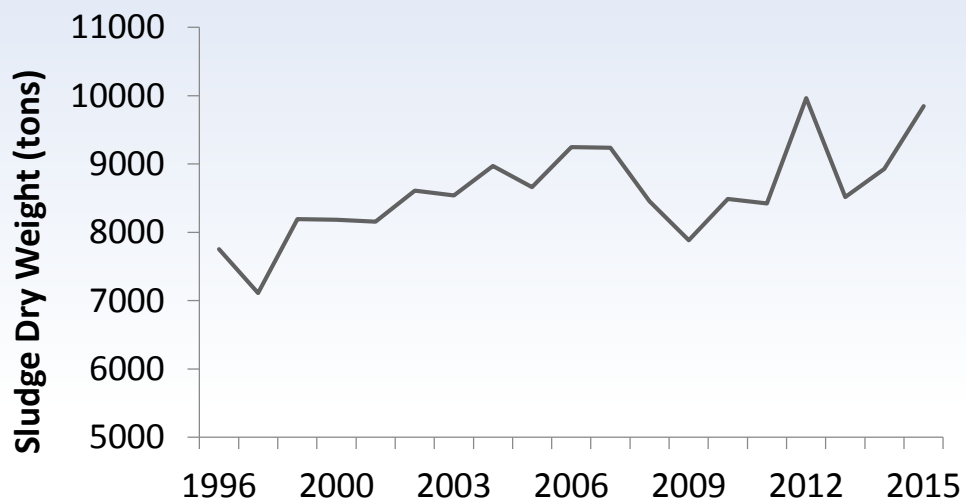
Figure 7: Vermont Lake Champlain base phosphorus loads, 2001-2010, compared to Vermont Lake Champlain TMDL loading capacity and allocations, by sector, in MT/yr Sources: Data for base loads are from TetraTech, 2015a

“For each lake segment, EPA considered both the relative contribution of the WWTFs and the degree of reduction required for .... (other) sources”

# Lake Champlain TMDL

WWTF Design Flow (MGD)	Annual Permit Limit (tons)
< 0.10	no change in TP limit
0.10 – 0.20	based on 0.8 mg/l
> 0.20	based on 0.2 mg/l

- 25 WWTFs will receive reduced TP permit limits
- 42% reduction of TP to Lake Champlain from WWTPs
- Impact on sludge production and/or management ?



# VT P-Index

A	E	F	G	H	I	J
1	VT P Index -- Version 5.1 1-25-2005					
2	Error messages:					
3	Field ID:	Field 1	Field 2	Field 3		
4	P Index:	32	21	32		
5	Interpretation:	Medium	Low	Medium		
6	Pathway I: Sediment-bound P	27	15	18		
7	Pathway II: Dissolved P in surface runoff	5	6	14		
8	Location (Vermont county)	NE (Orange, Orleans, Essex, Caledonia)	NE (Orange, Orleans, Essex, Caledonia)	NE (Orange, Orleans, Essex, Caledonia)		
9	Elevation zone, feet	< 600	< 600	< 600		
10	Soil test P, ppm (Mod. Morgan's)	35.9	14.5	35.9		
11	Reactive soil aluminum, ppm	12	19	12		
12	Manure 1 rate, lb P2O5/ac	42	42	42		
13	Manure 1 application time of year	May - Sept	May - Sept	May - Sept		
14	Manure 1 application method	Inject / subsurf. band	Inject / subsurf. band	Inject / subsurf. band		
15	Manure 1 time to incorporation	< 2 days	< 2 days	< 2 days		
16	Manure 2 rate, lb P2O5/ac	0	0	0		
17	Manure 2 application time of year	None applied	None applied	None applied		
18	Manure 2 application method	None applied	None applied	None applied		
19	Manure 2 time to incorporation	None applied	None applied	None applied		
20	Manure type	Dairy	Dairy	Dairy		
21	Fertilizer rate, lb P2O5/ac	0	0	0		
22	Fertilizer method/timing	None applied	None applied	None applied		
23	Erosion rate (RUSLE, tons/ac)	1.4	1.1	1.0		
24	Soil type or series (& HydrGrp)	Colton (A)	Ondawa (B)	Ondawa (B)		
25	Surface cover %	> 20 %	> 20 %	> 20 %		
26	Crop / Vegetation type	Corn & other row crops	Corn & other row crops	Corn & other row crops		
27	TOTAL distance to stream, feet	25	25	50	25	300
28	Vegetated buffer width, feet	25	25	25	25	300
29	Manure spreading setback, feet	25	25	25	25	300
30	Sediment trap structure or other erosion control	None	None	None	None	None
40	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140
47				Fall 2017 Application	Fall 2017 Application	Fall 2017 Application
48						

## CERTIFIED SMALL FARM OPERATION (CSFO)



Have at least the following animal numbers:

50 mature dairy cows, 75 young stock or heifers, 75 cattle or cow/calf pairs, 40 equines, 750 sheep or goats, or a combination of animals with total live weight exceeding 90,000 pounds (see RAPs for complete animal threshold numbers); OR



Operate more than 50 acres of annual cropland (corn, sweet corn, soybean, or pumpkin); OR



Operate more than 50 acres of vegetable production.

## Other Requirements:

- Annual Certification
- Farm Inspections
- 590 Nutrient Management Plan
- Water Quality Training



# VT P-Index

The new version accounts for residuals  
w/ coefficients of available P:

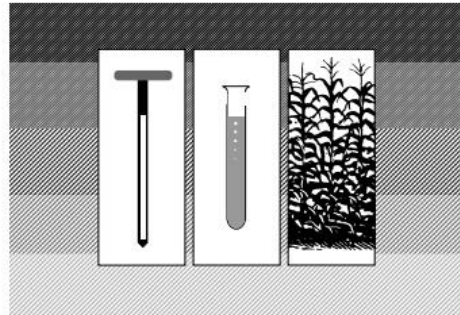
septage = 1.0

biosolids (WEP) = 1.0

biosolids (TP) = 0.4\*

\*chemically stabilized biosolids, if TP is used  
to calculate app rate (lbs P2O5/ac)

## Nutrient Recommendations for Field Crops in Vermont



A	E	F
1	VT P Index -- Version 5.1 1-25-2005	
2	Error messages:	
3	Field ID:	Field 1
4	P Index:	32
5	Interpretation:	Medium
6	Pathway I: Sediment-bound P	27
7	Pathway II: Dissolved P in surface runoff	5
8	Line #	
9	1 Location (Vermont county)	NE (Orange, Orleans, Essex, Caledonia)
10	2 Elevation zone, feet	< 600
11	3 Soil test P, ppm (Mod. Morgan's)	35.9
12	4 Reactive soil aluminum, ppm	12
13	5 Manure 1 rate, lb P2O5/ac	42
14	6 Manure 1 application time of year	May - Sept
15	7 Manure 1 application method	Inject / subsurf. band
16	8 Manure 1 time to incorporation	< 2 days
17	9 Manure 2 rate, lb P2O5/ac	0
18	10 Manure 2 application time of year	None applied
19	11 Manure 2 application method	None applied
20	12 Manure 2 time to incorporation	None applied
21	13 Manure type	Dairy
22	14 Fertilizer rate, lb P2O5/ac	0
23	15 Fertilizer method/timing	None applied
24	16 Erosion rate (RUSLE, tons/ac)	1.4
25	17 Soil type or series (& HydrGrp)	Colton (A)
26	18 Surface cover %	> 20 %
27	19 Crop / Vegetation type	Corn & other row crops
28	20 TOTAL distance to stream, feet	25
29	21 Vegetated buffer width, feet	25
30	22 Manure spreading setback, feet	25
31	23 Sediment trap structure or other erosion control	None
40	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140

A	E	F
1	VT P Index -- Version 6.0, draft May 17, 2017 (pending final approval)	
2	Program error messages:	
3	Notices	High STP, dredging strategy needed
4	USDA Tract #	
5	Field ID:	Field 1
6	Field Name	
7	P Index:	33
8	Interpretation:	Medium
9	Pathway I: Sediment-bound P	27
10	Pathway II: Dissolved P in surface runoff	6
11	Pathway III: Subsurface loss of diss. & sed.-bound P	0
12	Line #	
13	1 Location (Vermont county)	NE (Orange, Orleans, Essex, Caledonia)
14	2 Elevation zone, feet	< 600
15	3 Soil test P, ppm (Mod. Morgan's)	35.9
16	4 Reactive soil aluminum, ppm	12
17	5 Manure 1 rate, lb P2O5/ac	42
18	6 Manure 1 application time of year	May - Sept
19	7 Manure 1 application method	Inject / subsurf. band
20	8 Manure 1 time to incorporation	Immediate
21	9 Manure 2 rate, lb P2O5/ac	0
22	10 Manure 2 application time of year	None applied
23	11 Manure 2 application method	None applied
24	12 Manure 2 time to incorporation	None applied
25	13 Manure 3 rate, lb P2O5/ac	0
26	14 Manure 3 application time of year	None applied
27	15 Manure 3 application method	None applied
28	16 Manure 3 time to incorporation	None applied
29	17 Manure type	Biosolids w/Biological P removal
30	18 Fertilizer rate, lb P2O5/ac	0
31	19 Fertilizer method/timing	None applied
32	20 Erosion rate (RUSLE or WEP, tons/ac/yr)	1.4
33	21 Soil type or series (& HydrGrp)	Colton (A)
34	22 Surface cover %	> 20 %
35	23 Crop / Vegetation type	Corn & other row crops
36	24 TOTAL distance FROM field edge TO any water conveyance, ft	25
37	25 Vegetated buffer width BETWEEN field edge & conveyance, ft	25
38	26 Manure spreading setback dist WITHIN field, ft	25
39	27 Presence of Pattern Tile Drainage	No
40	To add additional columns, copy rows 1 to 187	To add additional columns, copy rows 1 to 187

# VT P-Index

A	E	F
1	VT P Index -- Version 5.1 1-25-2005	
2	Error messages:	
3	Field ID:	Field 1
4	P Index:	32
5	Interpretation:	Medium
6	Pathway I: Sediment-bound P	27
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2	Elevation zone, feet	< 600
3	Soil test P, ppm (Mod. Morgan's)	35.9
4	Reactive soil aluminum, ppm	12
5	Manure 1 rate, lb P2O5/ac	42
6	Manure 1 application time of year	May - Sept
7	Manure 1 application method	Inject / subsurf. band
8	Manure 1 time to incorporation	< 2 days
9	Manure 2 rate, lb P2O5/ac	0
10	Manure 2 application time of year	None applied
11	Manure 2 application method	None applied
12	Manure 2 time to incorporation	None applied
13	Manure type	Dairy
14	Fertilizer rate, lb P2O5/ac	0
15	Fertilizer method/timing	None applied
16	Erosion rate (RUSLE, tons/ac)	1.4
17	Soil type or series (& HydrGrp)	Colton (A)
18	Surface cover %	> 20 %
19	Crop / Vegetation type	Corn & other row crops
20	TOTAL distance to stream, feet	25
21	Vegetated buffer width, feet	25
22	Manure spreading setback, feet	25
23	Sediment trap structure or other erosion control	None
40	To add additional columns, copy rows 1 to 140	To add additional columns, copy rows 1 to 140

## SITE SOIL DATA:

1) enter the site's Phosphorus Index Value as calculated using the Vermont Phosphorus Index:

NOTE: Generally, a VT P-Index rating over 100 will mean that no phosphorus (i.e. - no biosolids) may be applied, a rating of 60 - 100 may mean that phosphorus will be the limiting nutrient, and a rating of less than 60 will mean that nitrogen is usually the limiting nutrient.

2) enter the concentration of extractable phosphorus in the site's soils from the most recent soil analysis:

Note: Extractable phosphorus is the concentration of phosphorus extracted using the Modified Morgan's extraction method.

3) enter the concentration of reactive aluminum in the site's soils from the most recent soil analysis:

Note: Reactive aluminum is the concentration of aluminum extracted using the Modified Morgan's extraction method.

4) select the predominant soil type on the site:

NOTE: the site's predominant soil type can be found in the site description in your certification fact sheet, in the NRCS Soil Survey manual for the county in which the site is located, or at the NRCS web site:

<http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateid=VT>

## BIOSEDILDS DATA:

### FOR THE BIOSOLIDS TO BE APPLIED:

1) enter the analytical data for the biosolids:

If the concentration was reported < enter the detection limit value (5.0)

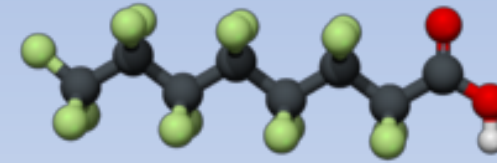
The % solids entered in this table may be Be aware that this number may be chemical analysis; in particular, if You may need to determine the pei calculate an accurate application r

Be sure to enter the concentration of water extractable phosphorus - not total, available, c

PARAMETER	CONCENTRATION	UNITS
TKN		% by weight
NO <sub>3</sub> nitrogen		% by weight
NH <sub>4</sub> nitrogen		% by weight
water extractable P		% by weight
% solids		% by weight
arsenic (As)		mg/kg, dry wt.
cadmium (Cd)		mg/kg, dry wt.
chromium (Cr)		mg/kg, dry wt.
copper (Cu)		mg/kg, dry wt.
lead (Pb)		mg/kg, dry wt.
mercury (Hg)		mg/kg, dry wt.
molybdenum (Mo)		mg/kg, dry wt.
nickel (Ni)		mg/kg, dry wt.
selenium (Se)		mg/kg, dry wt.
zinc (Zn)		mg/kg, dry wt.

WEP

## Residuals & PFCs



**April 2016**

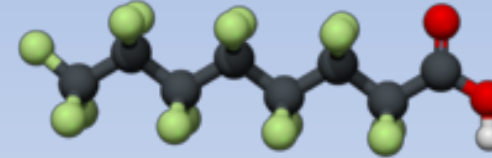
Samples collected from Bennington WWTF, Williamstown Mass Compost Facility and residential septic tanks.

<b>Media</b>	<b>PFOA (ppb) (EPA 537*)</b>	<b>PFOA (ppt) (SPLP)</b>	<b>PFOS (ppb) (EPA 537*)</b>	<b>PFOS (ppt) (SPLP)</b>
WWTF Sludge	6.9 - 8.2	ND - 68	8.0	ND
Septic Sludge	ND - 301	ND - 430	ND	ND
Composted Biosolids	ND	61	ND	11
VT Soil Screening Level	300ppb	---	---	---
VT Drinking Water Std	20ppt	---	20ppt	---

\*Solids analyzed for PFCs with EPA Method 537 (modified) and Synthetic Precipitation Leaching Procedure (SPLP)

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# Residuals & PFCs



## Ongoing Efforts:

VTDEC has concluded that there is a strong probability that PFAs will be present in the landfill leachate and will be collecting samples of sludge/biosolids and effluent from municipal WWTFs that accept landfill leachate.

Residuals Management Program providing guidance on analysis methods:

- Analyze sludge/biosolids samples for PFCs using ASTM Method 7968
- Analyze one duplicate sludge/biosolid for PFCs using EPA Method 537 (modified)
- Perform SPLP on sludge and analyze for PFCs using EPA Method 537 (modified)

## Short Paper Fiber:

VT-DEC is requiring that SPF that is used in VT in any manner involving its application to the land be sampled and analyzed for PFOA/PFOS. VT-DEC is not currently working on a standard for SPF.

NY-DEC sampled paper mills in NY and did not find PFCs from mills that do not take recycled paper. Potential standard being developed... ?



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## Rule-Making Efforts

- ☐ Ongoing Advisory/Stakeholder Meetings – Examining Current Residuals Management Strategies in Vermont and Provide Recommendations
- ☐ Draft Rules (VTDEC Residuals Management Program, Ernie Kelley & Eamon Twohig)
  - Approval and tracking system for importation of out of state EQ material
  - Remove TCLP analysis from requirements
  - No numerical standard changes expected
- ☐ Public Notice Process
- ☐ Interagency Committee on Administrative Rules (ICAR)
- ☐ Legislative Committee on Administrative Rules (LCAR)

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# Thank you!

**Eamon Twohig**     [Eamon.Twohig@Vermont.gov](mailto:Eamon.Twohig@Vermont.gov)     802-490-6189

**Ernie Kelley**     [Ernie.Kelley@Vermont.gov](mailto:Ernie.Kelley@Vermont.gov)     802-490-6187

**Vermont Department of Environmental Conservation**  
Waste Management & Prevention Division  
Residual Waste & Emerging Contaminants Program

