Calculation of Weighted 95% UCLs for a Combined Decision Unit (DU) from Several Smaller DUs with Statistical Sampling of SUs

See the "Instructions" tab (worksheet) for detailed instructions

Project ID: Arkwood Dioxin Site
Property/Sample ID: Combine DUs #1,2,3,4 and 6 into single large DU
Date: 10-Jan-16
Operator: DMCrumbling

Select from drop-down

Select whether the DU is based on **area, volume or depth**:	Area	acres

Phil should use this as within-DU CV

Or use this one? (see the 3rd item of the email

DU#	DU Name	DU Area (any constant units)	SU concentrations (ppt Dioxin TEQ) SU 1	SU 2	SU 3	SU 4	SU 5	SU 6	SU 7	SU 8	SU 9	SU 10	Number of Sampled SUs	Total No. of SUs in DU	Wt of DU	DU Mean	SD between SUs	Within-DU CV (SUs)	Ave # inc in sampled SUs*	Within-SU Btw-	Within-DU CV (inc)	SE of DU	95% UCL Student's-t	Chebychev
1	Uncapped Area East	1.2	379	1040	1105								3	5	0.09	841	402	0.48	30	314.0	2.0	232	1519	1852
2	Capped Area	11	195	60	248	610	463	109	168	128			8	44	0.81	248	191	0.77	30	149.0	3.3	68	376	542
3	Stormwater Ditch N	0.14	465	1427									2	2	0.01	946	680	0.72	40	315.0	2.1	481	3983	3043
4	Stormwater Ditch S	0.17	1502	602									2	2	0.01	1052	636	0.60	48	308.0	2.0	450	3893	3014
6	Uncapped Area West	1.0	1556	3121	1771								3	4	0.07	2149	848	0.39	32	451.0	1.2	490	3579	4284
Total Area (as acres) of Combined DU =		**13.51**	--	--	--	--	--	--	--	--	--	--	**18**	**57**	**1.00**	**458**	**172**	**Low**	--	--	**High**	**69.4**	**584**	**761**

* Ignore any SU replicate increments

For calculation purposes only

W^2	SD^2	1/n	W^2*SD^2/n
0.008	161370	0.33	90049
0.663	36506	0.13	1307373
0.00011	462722	0.50	617
0.00016	405000	0.50	1028
0.005	719658	0.33	863692

Degrees of freedom by Welch-Satterthwaite approximation =	10.27

Recommended UCL		
Chebychev 95% UCL is recommended because the dispersion of the data is high.	Chebyshev 95% UCL = 761	ppt TEQ for the 13.51-acre Area DU
The User should consult the instructions for additional guidance on which 95% UCL is recommended for specific data sets.		

Notes

DU Decision unit
SD Standard deviation
SE Standard errror
SU Sampling Unit
UCL Upper confidence limit

	Sample ID	TEQ Result (ppt)	
DU1	DU1SU2	379	
	DU1SU4	1040	
	DU1SU5	1105	
	DU1 mean =	841	
	DU1 SD =	402	
	DU1 %RSD =	47.8	
	DU1 1-sided 95% t-UCL =	1519	
	ed 95% Cheb-UCL =	1853	n = 3

	Sample ID	TEQ Result (ppt)
DU4	DU4SU1repeat	1502
	DU4SU2	602
	DU4 mean =	1052
	DU4 SD =	637
	DU4 %RSD =	60.5
	DU4 1-sided 95% t-UCL =	3895
	ed 95% Cheb-UCL =	3015	n = 2

	Sample ID	TEQ Result (ppt)	
DU2	DU2SU9	195	
	DU2SU10	60	
	DU2SU17	248	
	DU2SU19	610	
	DU2SU28	463	
	DU2SU36	109	
DU2 SU30	DU2SU30-1	168	use on
	DU2SU44	128	
	DU2 mean =	248	
	DU2 SD =	191	
	DU2 %RSD =	77.1	
	U2 1-sided 95% t-UCL =	376	
	ed 95% Cheb-UCL =	542	n = 8

	Sample ID	TEQ Result (ppt)
DU6	DU6SU1-1	1556
	DU6SU2 repeat	3121
	DU6SU3	1771
	DU6 mean =	2149
	DU6 SD =	848
	DU6 %RSD =	39.5
	DU6 1-sided 95% t-UCL =	3579
	ed 95% Cheb-UCL =	4284	n = 3

	Sample ID	TEQ Result (ppt)	
DU3	DU3SU1	465	
	DU3SU2 repeat	1427	
	DU3 mean =	946	
	DU3 SD =	680	
	DU3 %RSD =	71.9	
	U3 1-sided 95% t-UCL =	3383	
	ed 95% Cheb-UCL =	3043	n = 2

DU1 variability partitioning

mean for sampled SUs =	841	ppt TEQ
Total between sampled SUs =	47.8	%RSD
within-SU extrapolated @ 841 =	37.3	%RSD
within-aveSU SD =	313.7	ppt TEQ
Subs & Anal =	6.1	%RSD
Field: between "ave SU" =	30.5	%RSD
Field: within "ave SU" @ 841 =	36.8	%RSD
Field: within-aveSU SD =	309.5	ppt TEQ

each SU sample = 30 inc each
total DU area = 1.2 acre
each SU ~0.25 acre area
3 of 5 SUs sampled

DU2 variability partitioning

mean for sampled SUs =	248	ppt TEQ
Total between sampled SUs =	77.1	%RSD
within-SU extrapolated @ 248 =	59.9	%RSD
within-aveSU SD =	148.6	ppt TEQ
Subs & Anal =	6.1	%RSD
Field: between "ave SU" =	48.9	%RSD
Field: within "ave SU" @ 248 =	59.6	%RSD
Field: within-aveSU SD =	147.8	ppt TEQ

DU2SU30 had 1 field sample triplicate
each SU sample = 30 inc each
total DU area = 11 acre
each SU ~0.25 acre area
8 of 44 SUs sampled

DU3 variability partitioning

mean for sampled SUs =	946	ppt TEQ
Total between sampled SUs =	71.9	%RSD
within-SU extrapolated @ 946 =	33.3	%RSD
within-aveSU SD =	315	ppt TEQ
Subs & Anal =	6.1	%RSD
Field: between "ave SU" =	64.0	%RSD
Field: within "ave SU" @ 946 =	32.7	%RSD
Field: within-aveSU SD =	309.7	ppt TEQ

SU1 sample = 40 inc; SU2 sample = 41 i
SU1 had triplicate subsamples
total DU area = 0.14 acre; ditch 233 m x
2 of 2 SUs sampled

DU4 variability partitioning

mean for sampled SUs =	1052	ppt TEQ
Total between sampled SUs =	60.5	%RSD
within-SU extrapolated @ 1052 =	29.3	%RSD
within-aveSU SD =	308.2	ppt TEQ
Subs & Anal =	6.1	%RSD
Field: between "ave SU" =	53.3	%RSD
Field: within "ave SU" @ 1052 =	28.7	%RSD
Field: within-aveSU SD =	301.5	ppt TEQ

SU1 sample = 42 inc; SU2 sample = 54 inc
total DU area = 0.17 acre; ditch 280 m x 2 long
2 of 2 SUs sampled

DU6 variability partitioning

mean for sampled SUs =	2149	ppt TEQ
Total between sampled SUs =	39.5	%RSD
actual within-SU =	21.0	%RSD
actual within-SU SD =	451.3	ppt TEQ
Subs & Anal =	6.1	%RSD
Field: between "ave SU" =	34.0	%RSD
Field: within "ave SU" =	20.1	%RSD
Field: within-aveSU SD =	431.8	ppt TEQ

SU2 & 3 had 35 inc. each
total DU area = 1 acre
3 of 4 0.25-acre SUs sampled
SU1 had triplicate ISs, 32 inc. each

IF NO WEIGHTING FOR AREA

	379	
	1040	
	1105	
	195	
	60	
	248	
	610	
	463	
	109	
	168	
	128	
	465	
	1427	
	1502	
	602	
	1556	
	3121	
	1771	n = 18
mean =	830	
SD =	802	
RSD =	0.97	
t-UCL =	1160	
Cheb-UCL =	1655	

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