

## **Appendix J**

# **Statistical Comparison of Water Quality Indicator Data for Agricultural Drainage Sites Located West of the San Joaquin River**

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## Objective

The purpose of this work is to statistically compare the water quality indicator results from various agricultural drainage sites located west of the San Joaquin River (SJR) and determine if significant similarities/differences exist between these sites.

## Methods

Data was analyzed using JMP statistical software. Standard unpaired parametric (t-test) analyses comparing data from twenty-eight agricultural drain sites located west of the SJR (Table 1) were done. The hypothesis tested in these comparisons is:

H<sub>0</sub>: There is no significant difference in the water quality data means of these sites.

H<sub>1</sub>: There is a significant difference in the water quality data means of these sites.

The results of all analyses are reported in terms of the probability (P) that H<sub>0</sub> is true. For results where  $P \geq 0.05$  (where there is a greater than or equal to 5% probability that H<sub>0</sub> is true), data is shown grouped together with a letter designation (A, B, C, etc.), with different letters assigned to means that are statistically different. While the letters A, B, C, etc. are used to designate statistically different water quality data means for each analysis, data for each water quality indicator are compared separately, so the same letter designations between different water quality indicator comparisons do not suggest statistically similar means. Two-tailed P values are used, even when one-tailed P values are available, as the two-tailed P is more conservative. The JMP output – including boxplots for each water quality parameter compared – are in the Analyses section of this document.

## Results

Data was analyzed for several water quality indicators including total phosphorous (total P), soluble phosphate, total nitrogen (total N), nitrate-nitrogen (NO<sub>3</sub>-N), ammonia-nitrogen (NH<sub>4</sub>-N), chlorophyll *a*, algal pigment, total organic carbon (TOC), dissolved organic carbon (DOC), biochemical oxygen demand (BOD), mineral suspended solids (MSS), and specific conductivity. Similarities in the t-test results between the sites were seen for:

1. total P and soluble phosphate
2. total N and NO<sub>3</sub>-N
3. chlorophyll *a*, algal pigment, and BOD
4. TOC and DOC

No similarities between the t-test results for MSS, specific conductivity, or NH<sub>4</sub>-N and any other indicator data were seen. Results from the statistical comparison of water quality indicator data for soluble phosphate, NO<sub>3</sub>-N, and chlorophyll *a* indicate that significant differences exist between some of the sites, and are shown in Figures 1 – 5; and Tables 2 – 6. T-test grouping of the sample means for these indicators are discussed by referring to eight major sampling sites (DO site numbers 18, 19, 20, 21, 34, 36, 44, and 57), and including four additional sites that proved to be unique for one or more t-test indicator groupings (DO site numbers 31, 32, 33, and 62). The other sixteen sites, while not included in the results discussion, were included in all of the analyses and grouped with one or more of the discussed t-test sample mean groups.

Figure 1 shows a boxplot and Table 2 the results of the t-test analysis of the soluble phosphate data means. The analysis indicates that site DO-20 (Los Banos Creek Flow Station) has significantly more soluble phosphate than the other seven major sampling sites, and similar amounts as sites DO-33 and 62. Site DO-20 also has significantly more total P than the other seven major sampling sites, and similar amounts as sites DO-32 and 33 (Analysis 10).

Figure 2 shows a boxplot and Table 3 the results of the t-test analysis of the NO<sub>3</sub>-N data means. The analysis indicates that site DO-44 (San Luis Drain End) has significantly more soluble phosphate than the other seven major sampling sites, and similar amounts as site DO-31. A similar result is seen for total N (Analysis 7).

Figure 3 shows a boxplot and Table 4 the results of the t-test analysis of the chlorophyll *a* data means. The analysis indicates that site DO-44 (San Luis Drain End) has significantly more chlorophyll *a* than all other sites, and site DO-57 (Ramona Lake Drain) has significantly more chlorophyll *a* than all sites except DO-44. A similar result is seen for algal pigment, with sites DO-57 and 44 having significantly more algal pigment than the other major sampling sites, and similar amounts as site DO-32 (Analysis 12). A similar result is also seen for BOD, with site DO-57 having significantly more BOD than the other major sampling sites, and site DO-44 having significantly more BOD than the other major sampling site except site DO-57 (Analysis 11). Interestingly, site DO-31 has much lower chlorophyll *a*, algal pigment, and BOD sample averages than all other sites, although statistically it groups with other low-average sites.

Figure 4 shows a boxplot and Table 5 the results of the t-test analysis of the TOC data means. The analysis indicates that site DO-20 (Los Banos Creek Flow Station) has significantly more TOC than the other major sampling sites, and similar amounts as site DO-32. A similar result is seen for DOC, with site DO-20 having significantly more DOC than the other major sampling sites (Analysis 6).

Figure 5 shows a boxplot and Table 6 the results of the t-test analysis of the NH<sub>4</sub>-N data means. The analysis indicates that site DO-32 (El Solyo WD – Grayson Drain) has significantly more soluble phosphate than all other sampling sites. Sites DO-34 (Ingram Creek) and 36 (Del Puerto Creek Flow Station) have significantly more NH<sub>4</sub>-N than the other major sampling sites except site DO-57, which groups with both higher- and lower-average NH<sub>4</sub>-N sites.

## Conclusions

A statistical comparison of water quality indicator data, including total P, soluble phosphate, total N, NO<sub>3</sub>-N, NH<sub>4</sub>-N, chlorophyll *a*, algal pigment, TOC, DOC, BOD, MSS, and specific conductivity, for agricultural drain sites located west of the SJR show that significant differences exist between many of the eight major sites (DO site numbers 18, 19, 20, 21, 34, 36, 44, and 57). However, there are also little to no significant differences between some sites. Some conclusions that can be made based on the analyses in this report include:

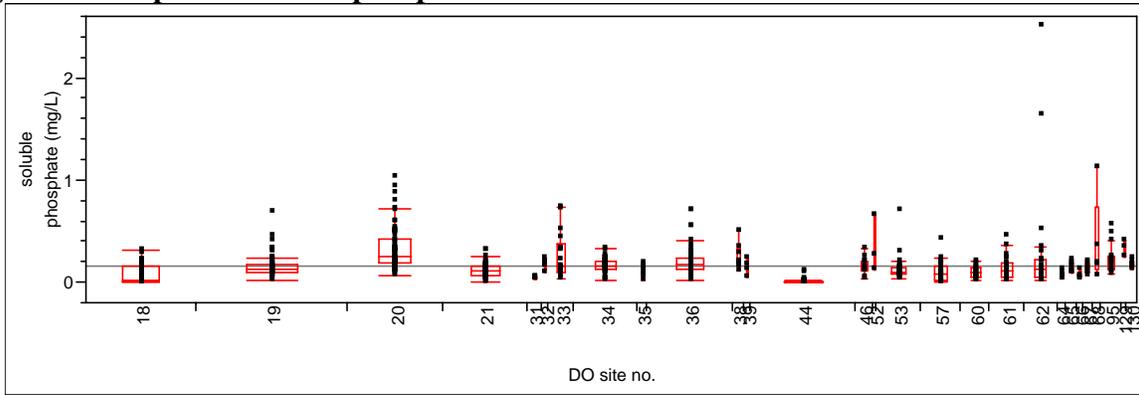
1. A statistical comparison of the sample means for soluble phosphate (Figure 1; Table 2) and total P yields three groupings of major west drain sites. Site DO-20 (Los Banos Creek Flow Station) comprises the first group, containing significantly more soluble phosphate and total P than the second group (DO site numbers 36, 34, 19, 21, 57, and 18), which all have significantly more soluble phosphate and total P than the third group, site DO-44.

2. A statistical comparison of the sample means for NO<sub>3</sub>-N (Figure 2; Table 3) yields three groupings of major west drain sites. The first group is comprised of site DO-44 (San Luis Drain End), and has significantly more NO<sub>3</sub>-N than all other major sites; the second group is comprised of sites DO-34, 18, 36, and 21, and has significantly more NO<sub>3</sub>-N than the remaining sites; the third group is comprised of sites DO-57, 19, and 20, and are not significantly different from one another. The t-test results were similar for total N, with five groupings including: (1) site DO-44, which has significantly more total N than all other major sites; (2) site DO-34; (3) sites DO-18 and 36; (4) sites DO-21 and 57; and (5) sites DO-20 and 19.
3. A statistical comparison of the sample means for chlorophyll *a* (Figure 3; Table 4) yields four groupings of major west drain sites. The first group is comprised of site DO-44 (San Luis Drain End), and has significantly more chlorophyll *a* than all other sites; the second group is comprised of site DO-57, and has significantly more chlorophyll *a* than all sites except DO-44; the third group is comprised of sites DO-18, 20, and 34, and has significantly more chlorophyll *a* than all other sites except DO-44 and 57; and the fourth group is comprised of the remaining sites (DO-36, 21, 19), and are not significantly different from one another. The t-test results were similar for algal pigment, with four groupings including: (1) sites DO-57 and 44, which have significantly more algal pigment than all other major sites; (2) sites DO-18, 20, and 34; (3) sites DO-36 and 19; and (4) site DO-21.
4. A statistical comparison of the sample means for TOC (Figure 4; Table 5) yields three groupings of major west drain sites. The first group is comprised of site DO-20 (Los Banos Creek Flow Station), and has significantly more TOC than all other major sites; the second group is comprised of sites DO-57, 18, and 44, and has significantly more TOC than all sites except DO-20; and the fourth group is comprised of the remaining sites (DO-34, 19, 36, 21), and are not significantly different from one another. The t-test results were similar for DOC, with three groupings including: (1) site DO-20, which has significantly more DOC than all other major sites; (2) sites DO-57, 18, 44, and 19; and (3) sites DO-34, 36, and 21.
5. A statistical comparison of the sample means for NH<sub>4</sub>-N (Figure 5; Table 6) yields one grouping of major east drain sites, as there were few significant differences between any of the sites.

**Table 1: Sites used for this study.**

Site Name	DO Site No.	Location
Mud Slough near Gustine	18	Lat. 37.26250 Long. -120.90555
Salt Slough at Lander Avenue	19	Lat. 37.24795 Long. -120.85194
Los Banos Creek at Hwy. 140	20	Lat. 37.27546 Long. -120.95532
estimba Creek at River Rd. near Crows Landi	21	Lat. 37.41396 Long. -121.01488
BCID – New Jerusalem Drain	31	
El Solyo WD – Grayson Drain	32	
Hospital Creek	33	
Ingram Creek	34	Lat. 37.60026 Long. -121.22506
Westley Wasteway Flow Station	35	
Del Puerto Creek Flow Station	36	Lat. 37.53947 Long. -121.12206
Marshall Road Drain	38	
Salado Creek Flow Station	39	
San Luis Drain End	44	Lat. 37.26090 Long. -120.90520
Mud Slough at Gun Club Road	46	
Salt Slough at Sand Dam	52	
Salt Slough at Wolfsen Road	53	
Ramona Lake Drain at Levee	57	Lat. 37.47881 Long. -121.06850
Moffit 1 South	60	
Deadman’s Slough	61	
Mallard Slough	62	
Moran Drain	64	
Spanish Grant Drain	65	
ESWD Maze Blvd. Drain	66	
Newman Wasteway at Brazo Road	67	
S. Lake Basin	68	
Ramona Lake Entrance	95	
Hollow Tree Drain	129	
Marshall Road Reservoir Entrance	130	

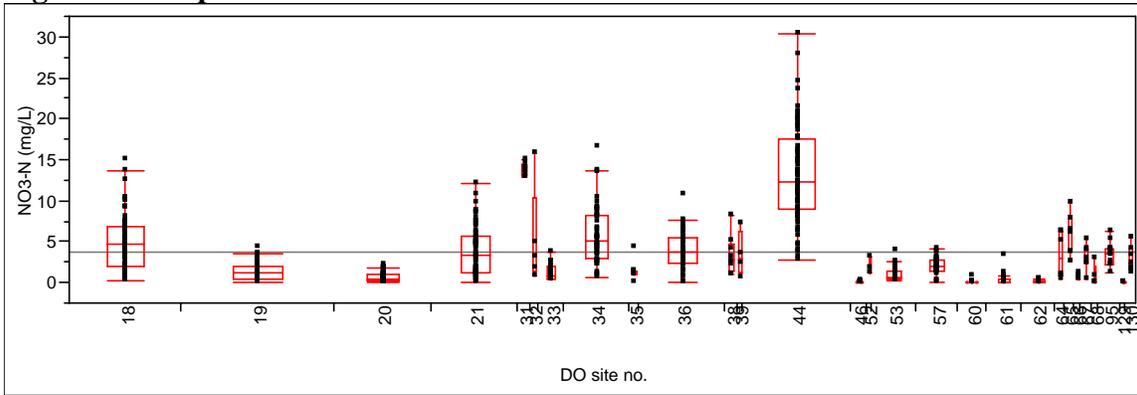
**Figure 1: Boxplot of soluble phosphate results.**



**Table 2: Statistical analysis of soluble phosphate data, student's t-test comparison of all pairs of agricultural drain sites west of the SJR. Statistically similar averages are grouped by letter designation. Major/unique sites are indicated by colored boxes. Sites not indicated by colored boxes are not significantly different from the indicated sites for nearly all water quality indicators.**

Site		Mean (mg/L)
68	A B	0.3802
52	A B C D	0.3477
129	A B C D E F	0.3283
20	A	0.3251
62	A B D	0.3076
33	A B C D E	0.2643
38	A B C D E F G I	0.2435
95	B C D E F G	0.2327
36	C E F G H	0.2045
130	C E F G H I J K M	0.1743
32	C D E F G H I J K M	0.1732
34	F G H I J	0.1614
46	C E F G H I J K M	0.1566
39	C D E F G H I J K L M	0.1503
65	C E F G H I J K M	0.1466
19	I J M	0.1452
61	G H I J K M	0.1334
67	E F G H I J K M	0.1314
53	I J K M	0.1262
35	G H I J K L M	0.1134
21	J K M	0.1094
57	J K M	0.0997
60	J K M	0.0943
64	H J K L M	0.0750
18	K	0.0727
66	G H I J K L M	0.0675
31	K L M	0.0429
44	L	0.0059

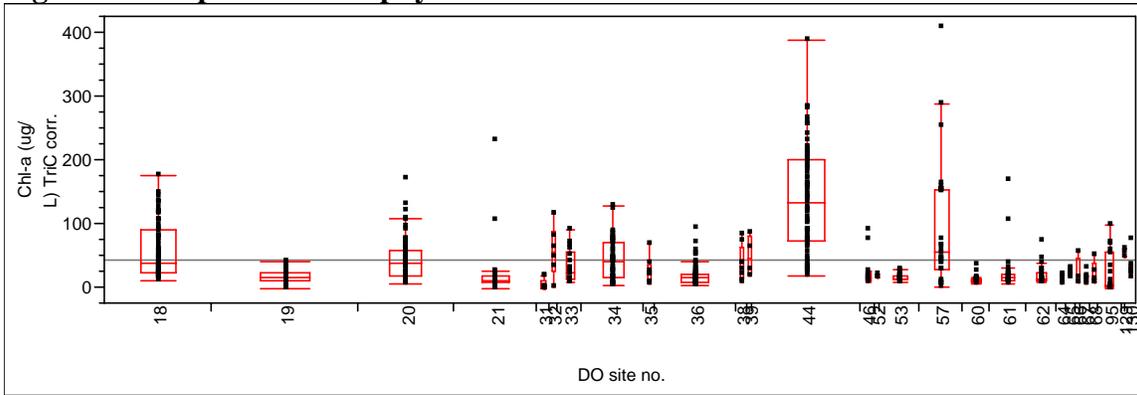
**Figure 2: Boxplot of NO3-N results.**



**Table 3: Statistical analysis of NO3-N data, student's t-test comparison of all pairs of agricultural drain sites west of the SJR. Statistically similar averages are grouped by letter designation. Major/unique sites are indicated by colored boxes. Sites not indicated by colored boxes are not significantly different from the indicated sites for nearly all water quality indicators.**

Site		Mean (mg/L)
31	A	13.78
44	A	13.05
34	B	5.74
65	B C D	5.74
32	B C D E F	5.29
18	B C E	4.82
36	C D E F	4.04
21	D F	3.84
39	B C D E F G H I	3.44
95	C D E F G	3.43
38	C D E F G H	3.41
64	C D E F G H I	3.29
67	C D E F G H I	3.01
130	E F G H I	2.86
52	C D E F G H I J	2.09
57	G H I	2.05
35	G H I J	1.50
33	H I J	1.28
19	I J	1.28
53	I J	1.04
68	G H I J	0.80
66	G H I J	0.75
20	J	0.62
61	J	0.31
62	J	0.09
46	J	0.06
60	J	0.05
129	H I J	0.02

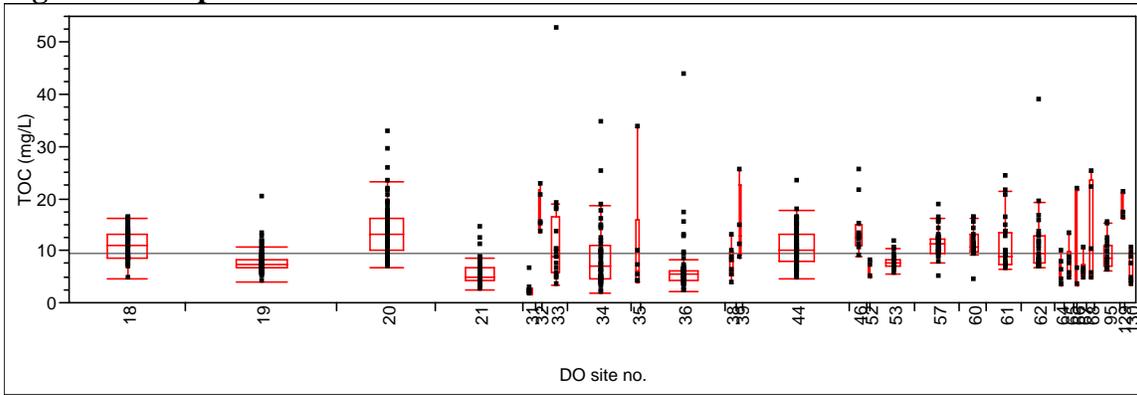
**Figure 3: Boxplot of chlorophyll *a* results.**



**Table 4: Statistical analysis of chlorophyll *a* data, student's t-test comparison of all pairs of agricultural drain sites west of the SJR. Statistically similar averages are grouped by letter designation. Major/unique sites are indicated by colored boxes. Sites not indicated by colored boxes are not significantly different from the indicated sites for nearly all water quality indicators.**

Site		Mean (µg/L)
44	A	136.05
57	B	94.19
18	C	56.95
32	C D E	56.05
129	B C D E F	53.81
39	C D E F	47.81
20	D	43.26
34	C D E	41.85
38	C D E F	36.54
33	D E F	33.55
130	C D E F	31.94
46	D E F	27.00
35	D E F	25.10
61	E F	24.60
95	D E F	24.03
65	D E F	21.61
66	C D E F	21.19
68	C D E F	21.01
62	F	18.98
36	F	18.34
52	C D E F	16.51
21	F	16.33
19	F	16.32
53	F	15.00
67	D E F	14.52
64	D E F	13.55
60	F	11.90
31	F	3.28

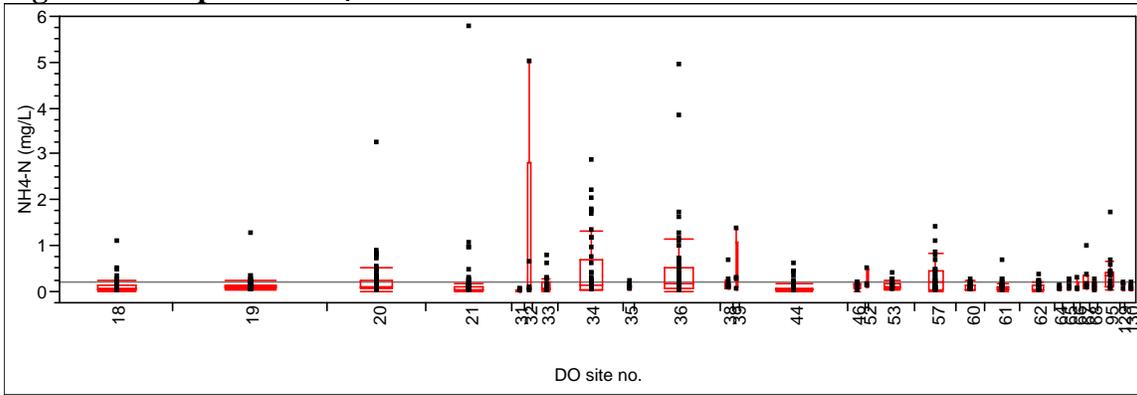
**Figure 4: Boxplot of TOC results.**



**Table 5: Statistical analysis of TOC data, student's t-test comparison of all pairs of agricultural drain sites west of the SJR. Statistically similar averages are grouped by letter designation. Major/unique sites are indicated by colored boxes. Sites not indicated by colored boxes are not significantly different from the indicated sites for nearly all water quality indicators.**

Site		Mean (mg/L)
129	A	18.10
32	A	17.34
39	A B C D	14.94
46	A B C	14.07
20	A B	13.97
68	A B C D E	13.40
33	B C D	12.47
62	C D E F	11.65
57	C D E F G	11.38
60	C D E F G	11.30
61	C D E F G	11.15
18	D E F G	11.05
44	D E F G	10.64
35	B C D E F G H	10.56
66	B C D E F G H I J	10.46
95	E F G H	9.38
34	H	8.75
65	F G H I J	7.92
53	H I	7.77
38	G H I J	7.75
19	H I	7.69
130	H I J K	6.75
52	F G H I J K	6.65
36	I J	6.56
67	H I J K	6.43
64	H I J K	5.74
21	J K	5.62
31	K	2.57

**Figure 5: Boxplot of NH<sub>4</sub>-N results.**



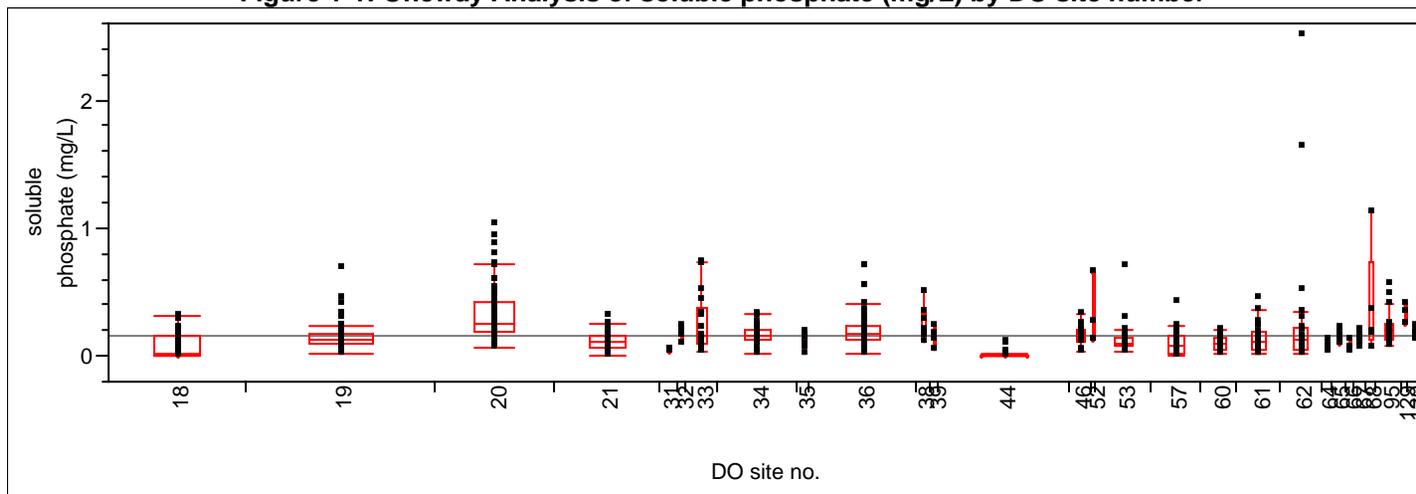
**Table 6: Statistical analysis of NH<sub>4</sub>-N data, student's t-test comparison of all pairs of agricultural drain sites west of the SJR. Statistically similar averages are grouped by letter designation. Major/unique sites are indicated by colored boxes. Sites not indicated by colored boxes are not significantly different from the indicated sites for nearly all water quality indicators.**

Site		Mean
32	A	1.1416
34	B	0.4896
39	B C D E F	0.4720
36	B	0.4596
95	B C	0.3782
57	B C D	0.3059
67	B C D E F	0.2623
52	B C D E F	0.2350
20	C D E	0.2311
21	C D E F	0.2105
38	B C D E F	0.1760
33	C D E F	0.1440
65	B C D E F	0.1336
53	C D E F	0.1254
46	C D E F	0.1115
18	E F	0.1065
61	C D E F	0.1054
129	B C D E F	0.1053
19	E F	0.1043
68	B C D E F	0.0970
66	B C D E F	0.0900
35	C D E F	0.0900
62	D E F	0.0839
60	C D E F	0.0780
44	F	0.0713
130	C D E F	0.0629
64	C D E F	0.0570
31	C D E F	0.0062

**Analyses 1 - 12: Data from the Statistical  
Comparison of Water Quality Indicators for  
Agricultural Drains Located West of the SJR**

### Analysis 1: West Drain Sites Soluble Phosphate

Figure 1-1: Oneway Analysis of soluble phosphate (mg/L) by DO site number



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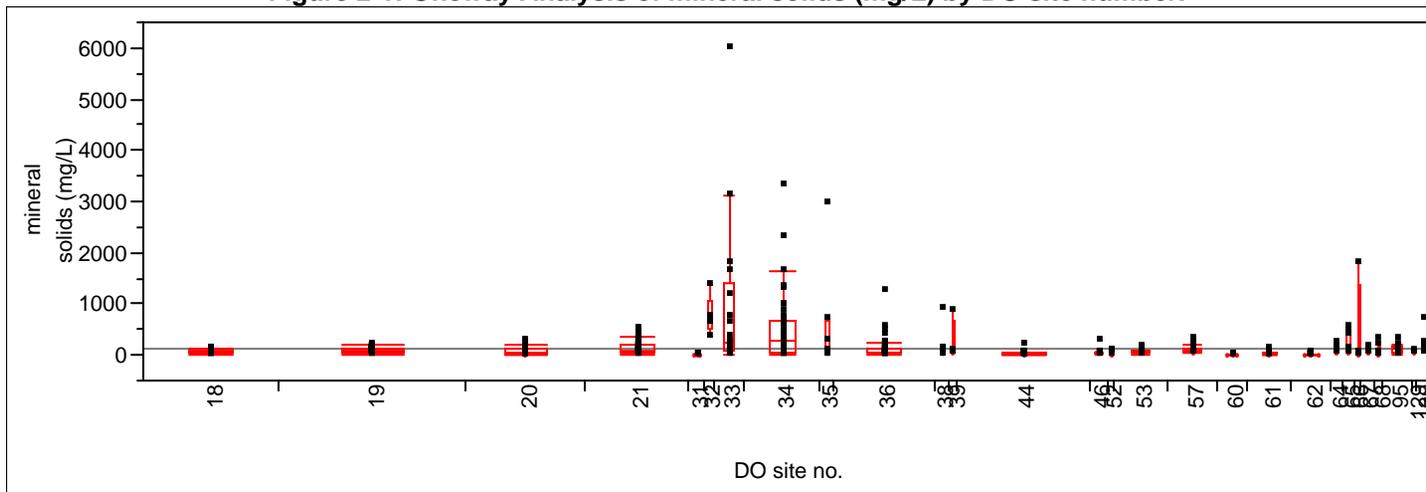
**Table 1-1: Soluble phosphate mean comparisons for each pair using Student's t-test.**

	t		Alpha		
	1.96340		0.05		
Level					Mean (mg/L)
68	A	B			0.38020000
52	A	B	C	D	0.34766667
129	A	B	C	D	0.32833333
20	A				0.32506061
62	A	B		D	0.30760870
33	A	B	C	D	0.26429412
38	A	B	C	D	0.24350000
95	B	C	D	E	0.23273333
36				E	0.20453448
130				F	0.17428571
32				G	0.17320000
34				H	0.16138636
46				I	0.15663636
39				J	0.15025000
65				K	0.14657143
19				L	0.14522330
61				M	0.13341667
67				N	0.13142857
53				O	0.12616667
35				P	0.11342857
21				Q	0.10936207
57				R	0.09967857
60				S	0.09426316
64				T	0.07500000
18				U	0.07269737
66				V	0.06750000
31				W	0.04288889
44				X	0.00589041

Levels not connected by same letter are significantly different.

## Analysis 2: West Drain Sites Mineral Suspended Solids

Figure 2-1: Oneway Analysis of mineral solids (mg/L) by DO site number.



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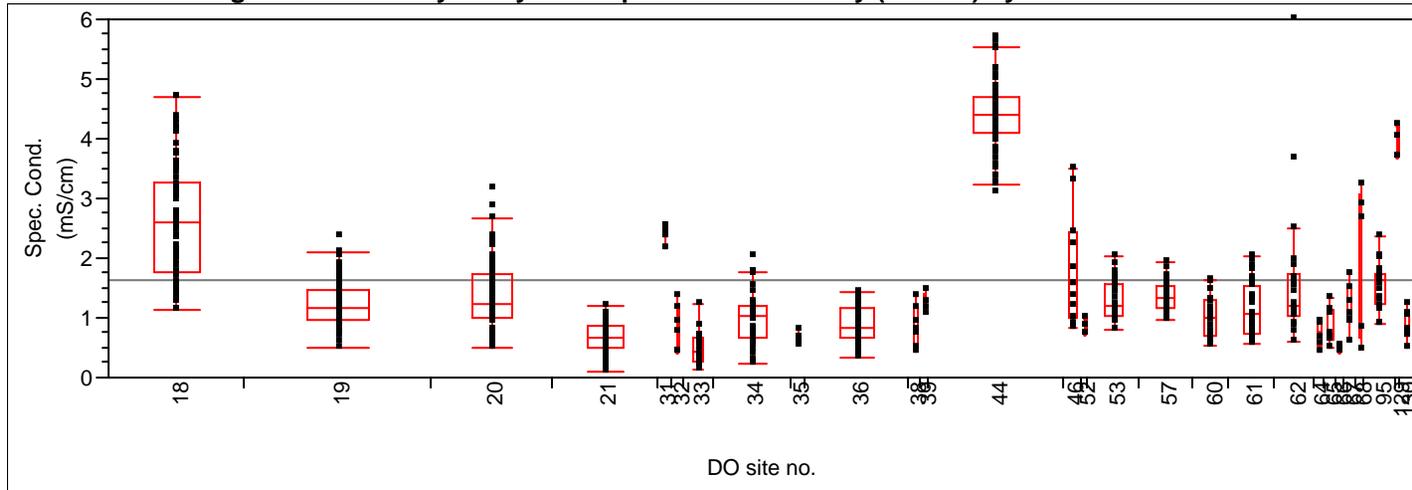
**Table 2-1: Mineral suspended solids mean comparisons for each pair using Student's t-test.**

	t	Alpha	
	1.96339	0.05	
Level			Mean (mg/L)
33	A		973.15059
32	A		750.04600
35	B		591.97000
34	B C		504.12349
66	B C D		466.16000
39	C D E F G		258.28250
65	D E F G		252.61429
130	E F G		216.14286
38	E F G		173.69125
21	F		139.59534
95	E F G		117.64250
36	F G		117.40105
64	E F G		113.11667
68	E F G		111.42400
57	F G		102.41143
67	E F G		89.26286
19	F G		84.51076
20	F G		69.98612
53	F G		68.62800
46	F G		57.43100
52	E F G		51.47000
18	F G		50.98566
129	E F G		46.37667
44	G		28.73173
61	F G		23.71542
62	F G		8.24304
31	F G		4.89222
60	F G		1.64000

Levels not connected by same letter are significantly different.

### Analysis 3: West Drain Sites Specific Conductivity

Figure 3-1: Oneway Analysis of specific conductivity (mS/cm) by DO site number.



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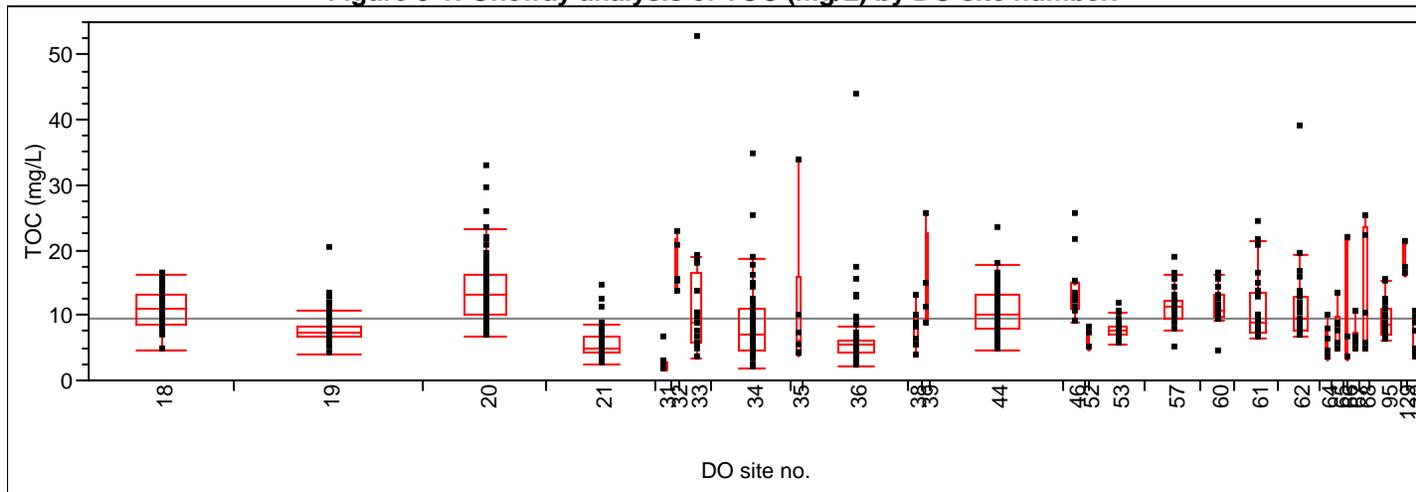
**Table 4-1: Chlorophyll *a* mean comparisons for each pair using Student's t-test.**

	t				Alpha	
	1.96331				0.05	
Level					Mean (µg/L)	
44	A					136.04519
57	B					94.18933
18	C					56.94961
32	C	D	E			56.04667
129	B	C	D	E	F	53.80667
39		C	D	E	F	47.81000
20			D			43.25868
34		C	D	E		41.84864
38		C	D	E	F	36.54125
33			D	E	F	33.55412
130		C	D	E	F	31.93714
46			D	E	F	26.99818
35			D	E	F	25.10000
61				E	F	24.59538
95			D	E	F	24.02765
65			D	E	F	21.60571
66		C	D	E	F	21.19000
68		C	D	E	F	21.01200
62					F	18.98091
36					F	18.33690
52		C	D	E	F	16.50667
21					F	16.33117
19					F	16.32305
53					F	15.00310
67			D	E	F	14.51857
64			D	E	F	13.55000
60					F	11.90450
31					F	3.28333

Levels not connected by same letter are significantly different.

### Analysis 5: West Drain Sites TOC

Figure 5-1: Oneway analysis of TOC (mg/L) by DO site number.



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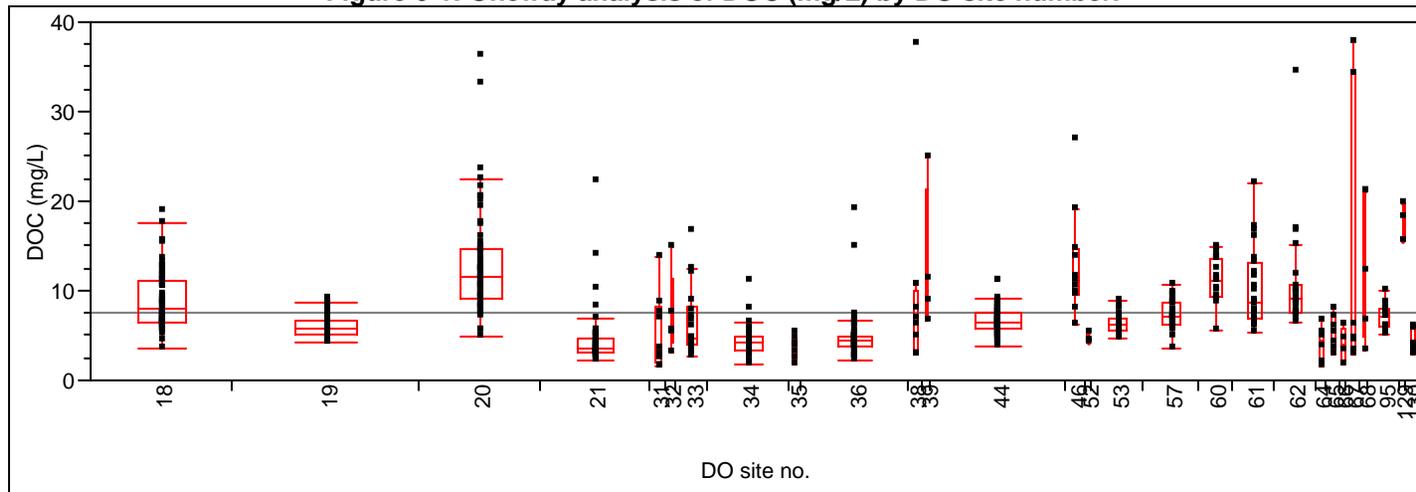
**Table 5-1: TOC mean comparisons for each pair using Student's t-test.**

	t		Alpha									
	1.96347		0.05									
Level					Mean (mg/L)							
129	A				18.100667							
32	A				17.341000							
39	A	B	C	D	14.935750							
46	A	B	C		14.068545							
20	A	B			13.965692							
68	A	B	C	D	E	13.399800						
33		B	C	D		12.469813						
62			C	D	E	F	11.645000					
57			C	D	E	F	G	11.383233				
60			C	D	E	F	G	11.295444				
61			C	D	E	F	G	11.148609				
18				D	E	F	G	11.051494				
44				D	E	F	G	10.643803				
35		B	C	D	E	F	G	H	10.560833			
66		B	C	D	E	F	G	H	I	J	10.463333	
95					E	F	G	H			9.380529	
34								H			8.748349	
65						F	G	H	I	J	7.919833	
53								H	I		7.774138	
38							G	H	I	J	7.753143	
19								H	I		7.694020	
130								H	I	J	K	6.754429
52						F	G	H	I	J	K	6.645000
36									I	J		6.555893
67								H	I	J	K	6.428000
64								H	I	J	K	5.735000
21										J	K	5.618310
31											K	2.568375

Levels not connected by same letter are significantly different.

### Analysis 6: West Drain Sites DOC

Figure 6-1: Oneway analysis of DOC (mg/L) by DO site number.



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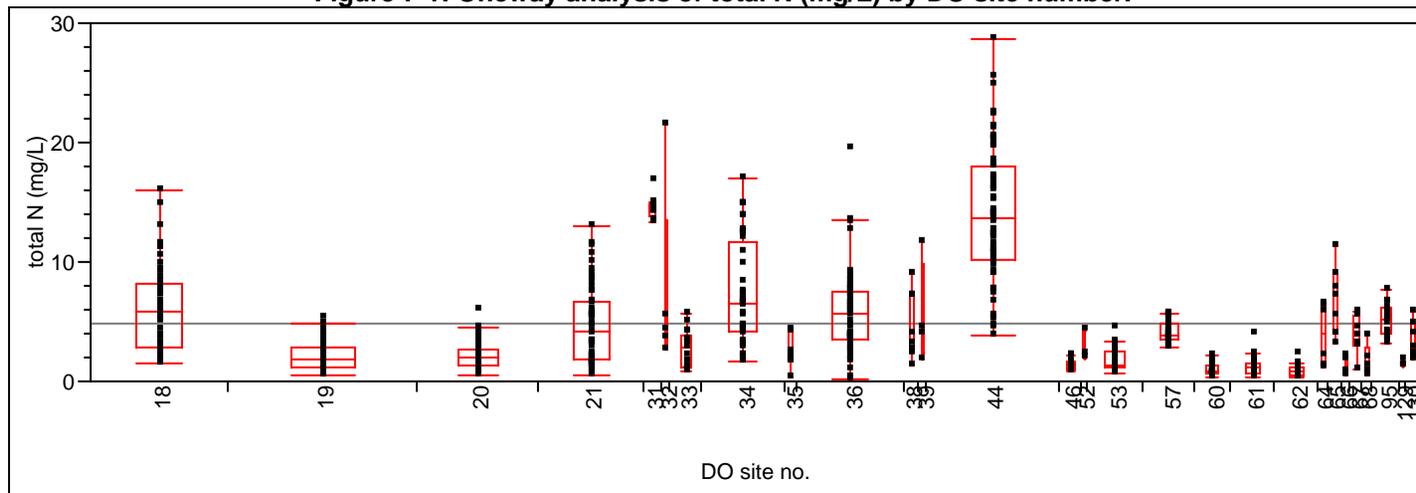
**Table 6-1: DOC mean comparisons for each pair using Student's t-test.**

	t		Alpha		
	1.96339		0.05		
Level					Mean (mg/L)
129	A				17.822000
67	A	B	C		13.374857
39	A	B	C		12.903500
68	A	B	C		12.894400
20		B			12.847000
46		B	C		12.820182
60		B	C		11.350000
62			C		10.902364
61			C	D	10.272739
38			C	D	10.016625
18			D	E	8.871688
57			D	E	7.409667
32			D	E	7.298000
95			E	F	7.114941
44			E	F	6.635603
33			F	G	6.603000
53			F	G	6.375310
19			G	H	6.042647
31			G	H	5.475222
65			G	H	5.320000
36			H	I	4.828569
52			H	I	4.664000
21			I	J	4.403305
34			I	J	4.328250
130			J	K	4.074000
64			J	K	4.002833
66			K		3.985000
35			K		3.567429

Levels not connected by same letter are significantly different.

### Analysis 7: West Drain Sites Total N

Figure 7-1: Oneway analysis of total N (mg/L) by DO site number.

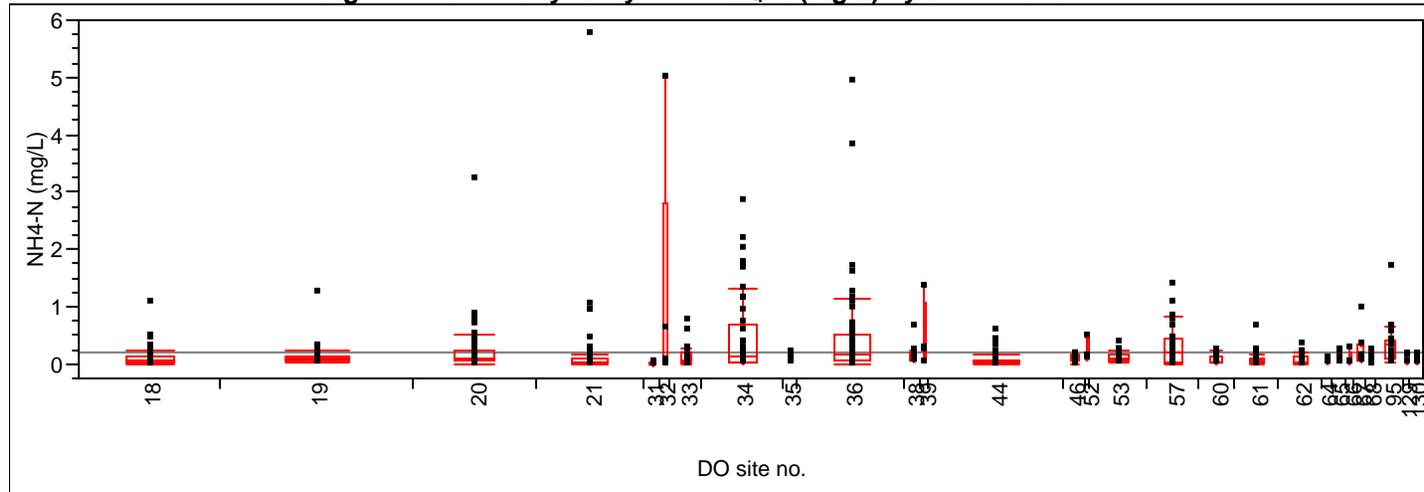


Missing Rows 63



### Analysis 8: West Drain Sites NH<sub>4</sub>-N

Figure 8-1: Oneway analysis of NH<sub>4</sub>-N (mg/L) by DO site number.



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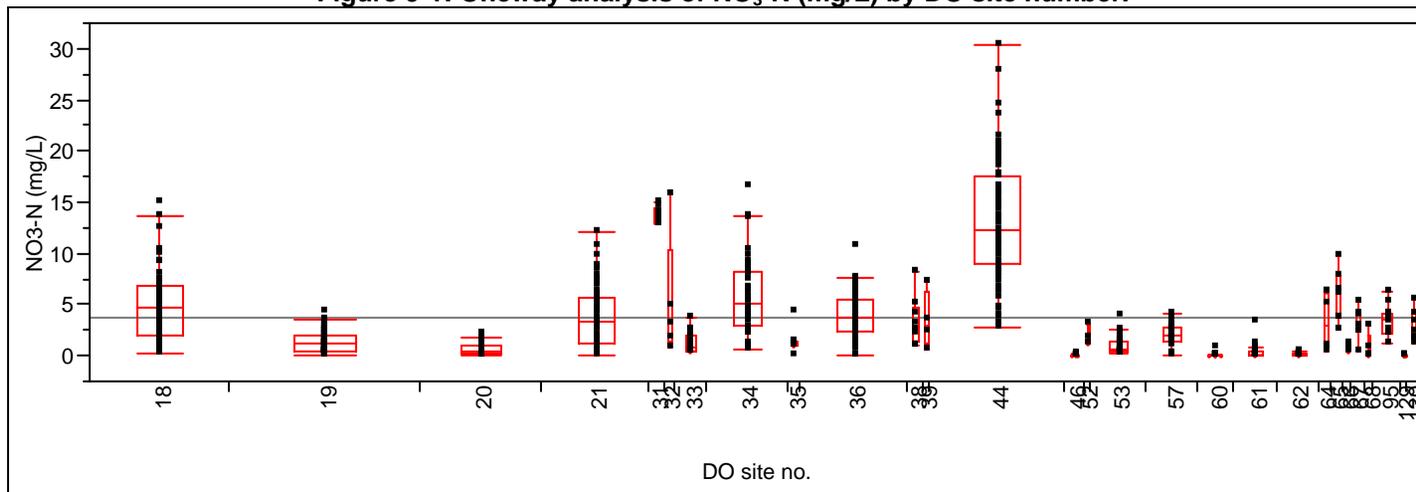
**Table 8-1: NH<sub>4</sub>-N mean comparisons for each pair using Student's t-test.**

	t	Alpha					
	1.96340	0.05					
Level							Mean (mg/L)
32	A						1.1416000
34	B						0.4895682
39	B	C	D	E	F		0.4720000
36	B						0.4596207
95	B	C					0.3782000
57	B	C	D				0.3058571
67	B	C	D	E	F		0.2622857
52	B	C	D	E	F		0.2350000
20		C	D	E			0.2310606
21		C	D	E	F		0.2104828
38	B	C	D	E	F		0.1760000
33		C	D	E	F		0.1440000
65	B	C	D	E	F		0.1335714
53		C	D	E	F		0.1254333
46		C	D	E	F		0.1114545
18				E	F		0.1065395
61		C	D	E	F		0.1053750
129	B	C	D	E	F		0.1053333
19				E	F		0.1042816
68	B	C	D	E	F		0.0970000
66	B	C	D	E	F		0.0900000
35		C	D	E	F		0.0900000
62			D	E	F		0.0839130
60		C	D	E	F		0.0780000
44					F		0.0713014
130		C	D	E	F		0.0628571
64		C	D	E	F		0.0570000
31		C	D	E	F		0.0062222

Levels not connected by same letter are significantly different.

### Analysis 9: West Drain Sites NO<sub>3</sub>-N Analysis

Figure 9-1: Oneway analysis of NO<sub>3</sub>-N (mg/L) by DO site number.



Missing Rows 55

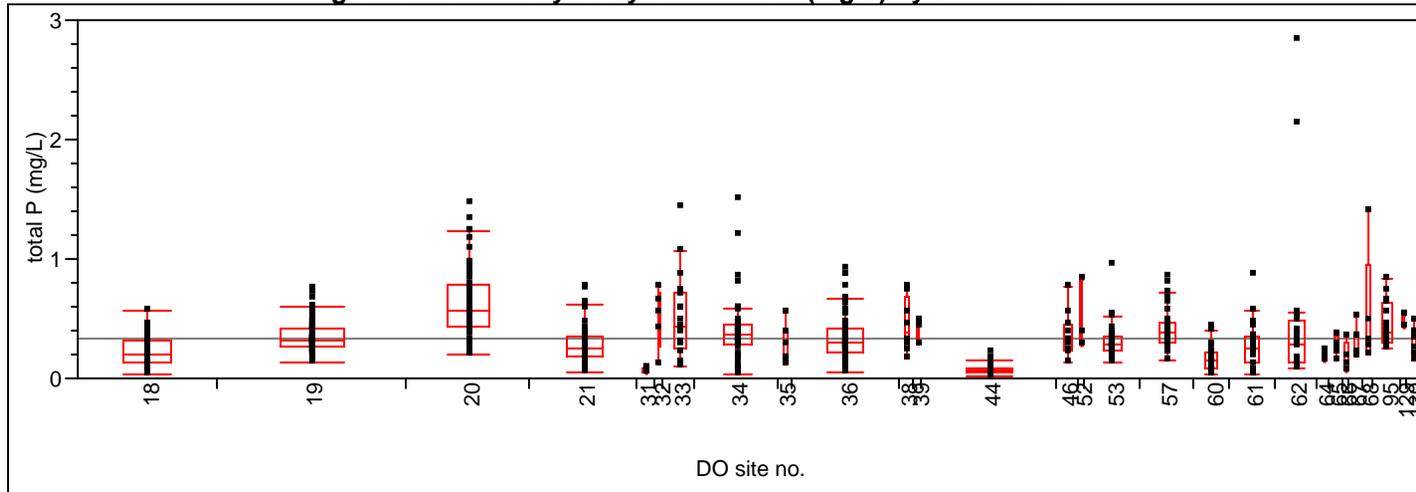
**Table 9-1: NO<sub>3</sub>-N mean comparisons for each pair using Student's t-test.**

	t		Alpha		
	1.96340		0.05		
Level					Mean (mg/L)
31	A				13.776444
44	A				13.048808
34		B			5.736909
65		B	C	D	5.735000
32		B	C	D	5.291400
18		B		E	4.824553
36			C	D	4.038397
21				E	3.836310
39				F	3.436750
95		B	C	D	3.429733
38			C	D	3.412000
64			C	D	3.294333
67			C	D	3.005143
130				E	2.860143
52			C	D	2.091333
57				E	2.051964
35				F	1.498143
33				G	1.280471
19				H	1.277456
53				I	1.039333
68				J	0.797000
66				G	0.745000
20				H	0.623379
61				I	0.312083
62				J	0.088783
46				J	0.055182
60				J	0.050421
129				H	0.023667

Levels not connected by same letter are significantly different.

### Analysis 10: West Drain Sites Total P

Figure 10-1: Oneway analysis of total P (mg/L) by DO site number.



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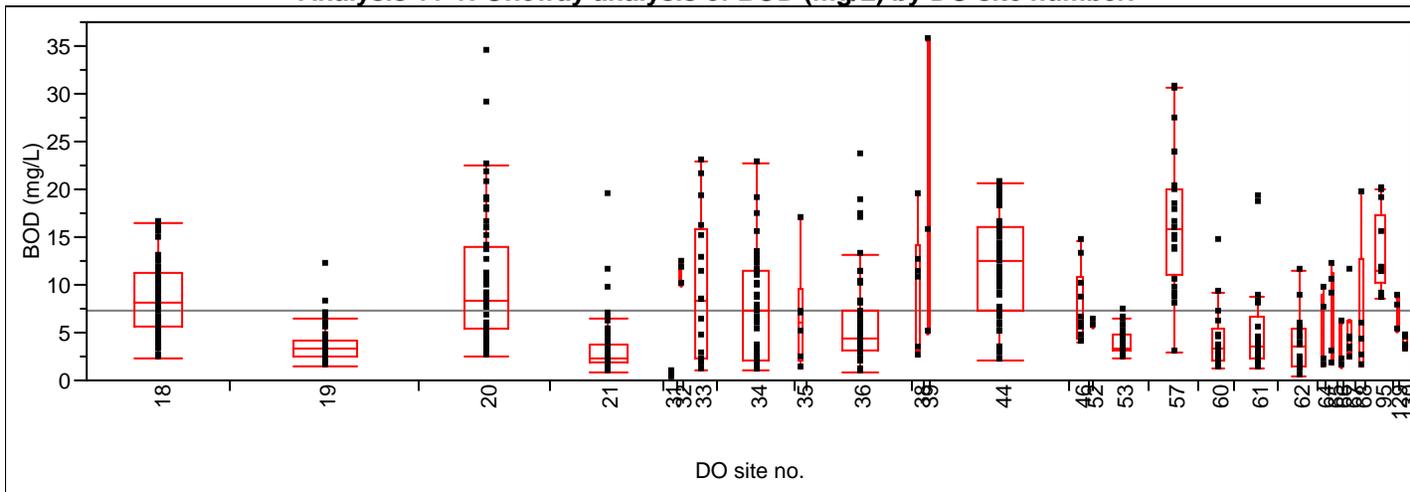
**Table 10-1: Total P mean comparisons for each pair using Student's t-test.**

	t		Alpha											
	1.96344		0.05											
Level					Mean (mg/L)									
20	A				0.62336923									
68	A	B	C	E	0.53380000									
33	A	B			0.51723529									
52	A	B	C	D	E	F	G				0.50433333			
129	A	B	C	D	E	F	G		I		0.50033333			
32	A	B	C	D	E	F					0.50020000			
62		B			E						0.46108696			
95		B	C		E	F					0.44913333			
38		B	C	D	E	F	G		I		0.43500000			
57		B	C	D	E	F					0.41789286			
39	A	B	C	D	E	F	G	H	I	J	0.41575000			
34		B	C	D	E	F			I		0.39900000			
46		B	C	D	E	F	G		I	J	0.36045455			
19			C	D		F	G		I	J	0.34801980			
36			C	D		F	G		I	J	0.34217544			
130			C	D	E	F	G	H	I	J	K	0.31285714		
53				D			G	H	I	J		0.31250000		
67			C	D	E	F	G	H	I	J	K	0.29014286		
21							G	H		J		0.28505263		
61							G	H		J	K	0.27104167		
65				D		F	G	H	I	J	K	L	0.26785714	
35				D		F	G	H	I	J	K	L	0.25628571	
18								H			K		0.22124324	
64								H		J	K	L	M	0.18316667
66								H	I	J	K	L	M	0.17750000
60											K	L	M	0.16657895
44													M	0.07544444
31												L	M	0.06600000

Levels not connected by same letter are significantly different.

### Analysis 11: West Drain Sites BOD

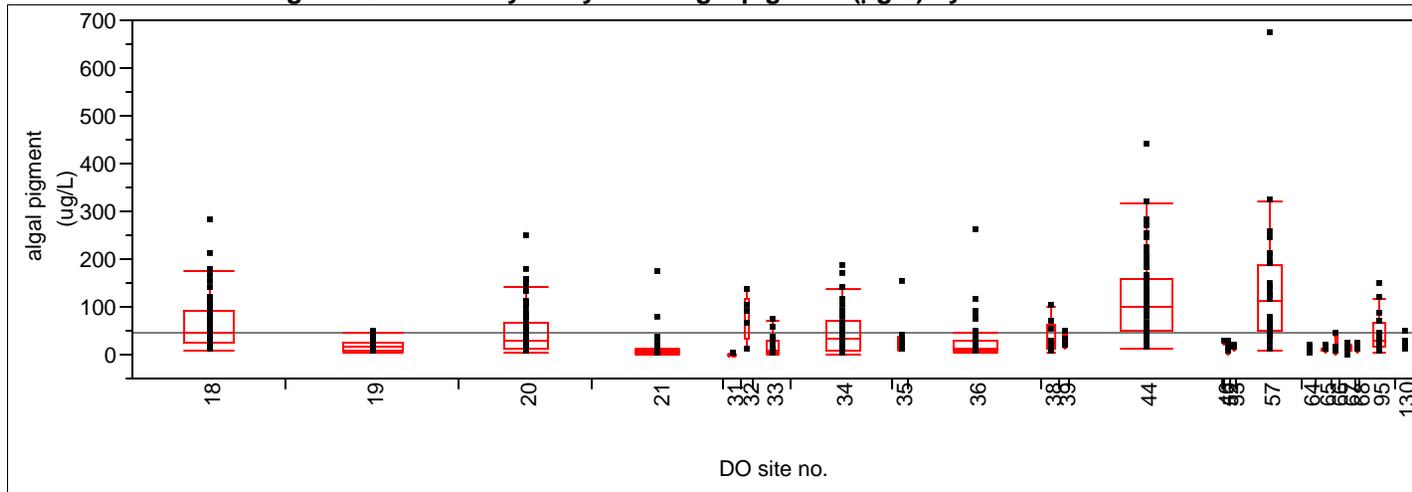
Analysis 11-1: Oneway analysis of BOD (mg/L) by DO site number.





### Analysis 12: West Drain Sites Algal Pigment

Figure 12-1: Oneway analysis of algal pigment ( $\mu\text{g/L}$ ) by DO site number.



Missing Rows 216

**Table 12-1: Algal pigment mean comparisons for each pair using Student's t-test.**

	t	Alpha	
	1.96441	0.05	
Level			Mean (µg/L)
57	A		132.90724
44	A B		113.90746
32	B C		77.83800
18	C		62.06881
20	C D		46.81776
95	C D E F		46.33875
34	C D E		44.35614
35	C D E F G		38.82429
38	C D E F G		37.24875
39	C D E F G		27.37000
36	E F G		25.29362
46	B C D E F G		23.97000
130	C D E F G		22.99857
66	C D E F G		19.39667
19	F G		18.91513
33	E F G		17.32941
68	C D E F G		13.95000
53	C D E F G		13.74000
52	C D E F G		13.23333
67	D E F G		11.63857
65	D E F G		11.51286
21	G		10.38491
64	D E F G		9.40167
31	G		0.31250

Levels not connected by same letter are significantly different.