Recomputation of Ambient Water Quality in the Santa Ana River Watershed

BMPTF: August 12, 2019

WSC
Water Systems Consulting, Inc.

Ambient Water Quality Phases

1: Data Gathering

- ✓ Data Compilation
- ✓ QA/QC, Process, and Upload recent data

2: Point Statistics

- ✓ Calculate Water Quality Point Statistics
- ✓ Shapiro-Wilk Test for Normality

3: Computations

- ✓ Groundwater Elevation Contours
- ✓ Nitrate, TDS Concentrations
- ✓ Compute ambient water quality for GMZ's

4: Interpretive Tools

- ✓ Innovative Interpretive Tool

1: Data Gathering

Data Compilation

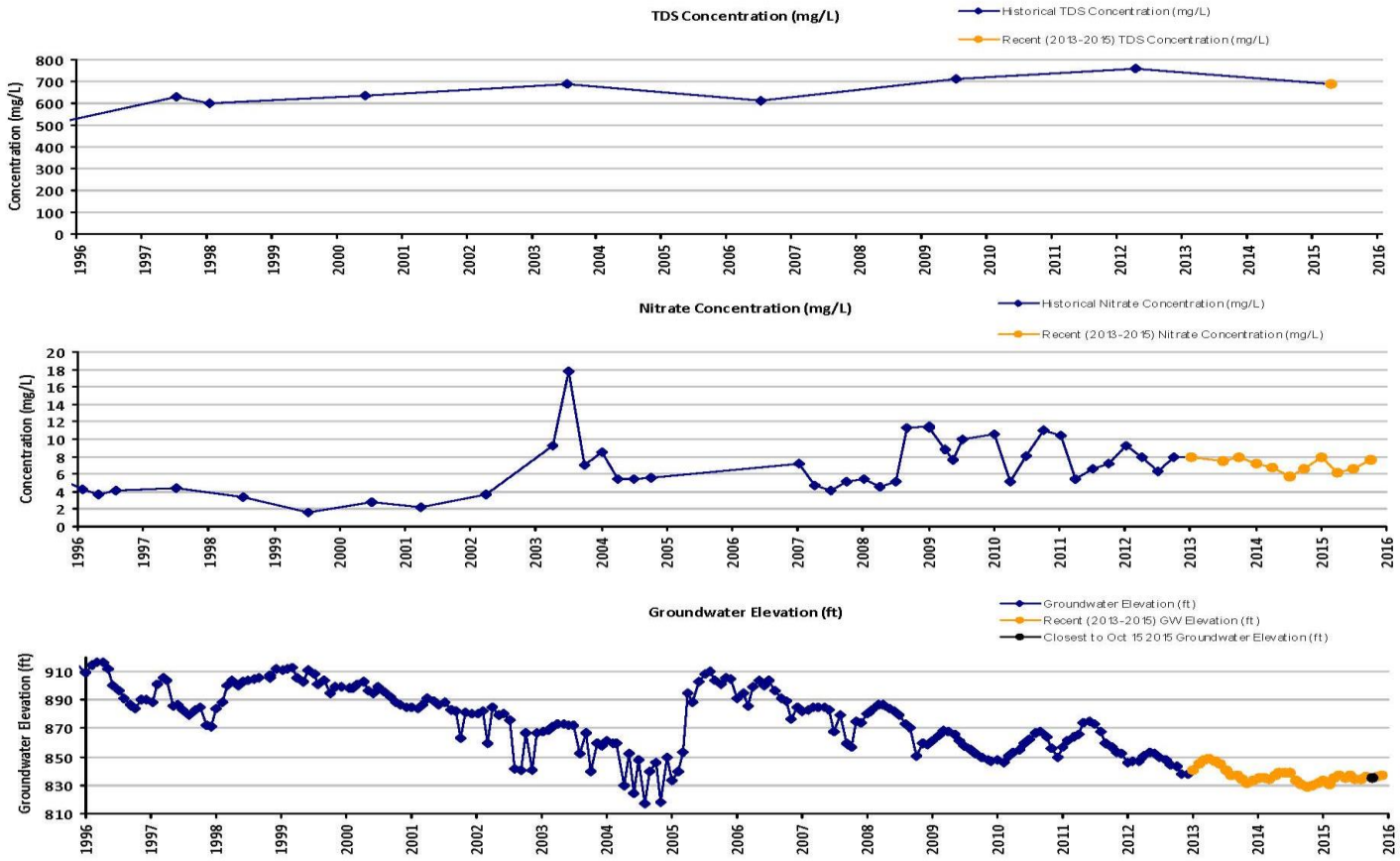
1	Banning, City of	20	Riverside County Landfills
2	Beaumont, City of	21	Riverside, City of (Public Utilities)
3	Beaumont Cherry Valley Water District	22	Riverside-Highland Water Company
4	Chino Basin Watermaster	23	Rubidoux Community Services District
5	Colton, City of	24	San Bernardino County Landfills
6	Colton/San Bernardino Regional Tertiary Treatment and Water Reclamation Authority	25	San Bernardino Municipal Water Department
7	Corona, City of	26	San Bernardino Valley Municipal Water District
8	East Valley Water District		
9	Eastern Municipal Water District	27	San Gorgonio Pass Water Agency
10	Elsinore Valley Municipal Water District	28	South Mesa Water Company
11	Home Gardens County Water District	29	Temescal Valley Water District
12	Inland Empire Utilities Agency	30	West Valley Water District
13	Irvine Ranch Water District	31	Western Heights Water Company
14	Jurupa Community Services District	32	Western Municipal Water District
15	Loma Linda, City of	33	Western Riverside County Regional Wastewater Authority
16	Muscoy Mutual Water Company		
17	Orange County Water District	34	Yucaipa Valley Water District
18	Redlands, City of		
19	Rialto, City of		

Color	Indicator
	Data complied

1: Data Gathering
QA/QC, Process, and Upload Recent Data

Ambient Water Quality Trend Charts for TDS, Nitrate, and Groundwater Elevation for the Recomputation Period 1996 to 2015

Well ID 1001958
Management Zone Riverside A

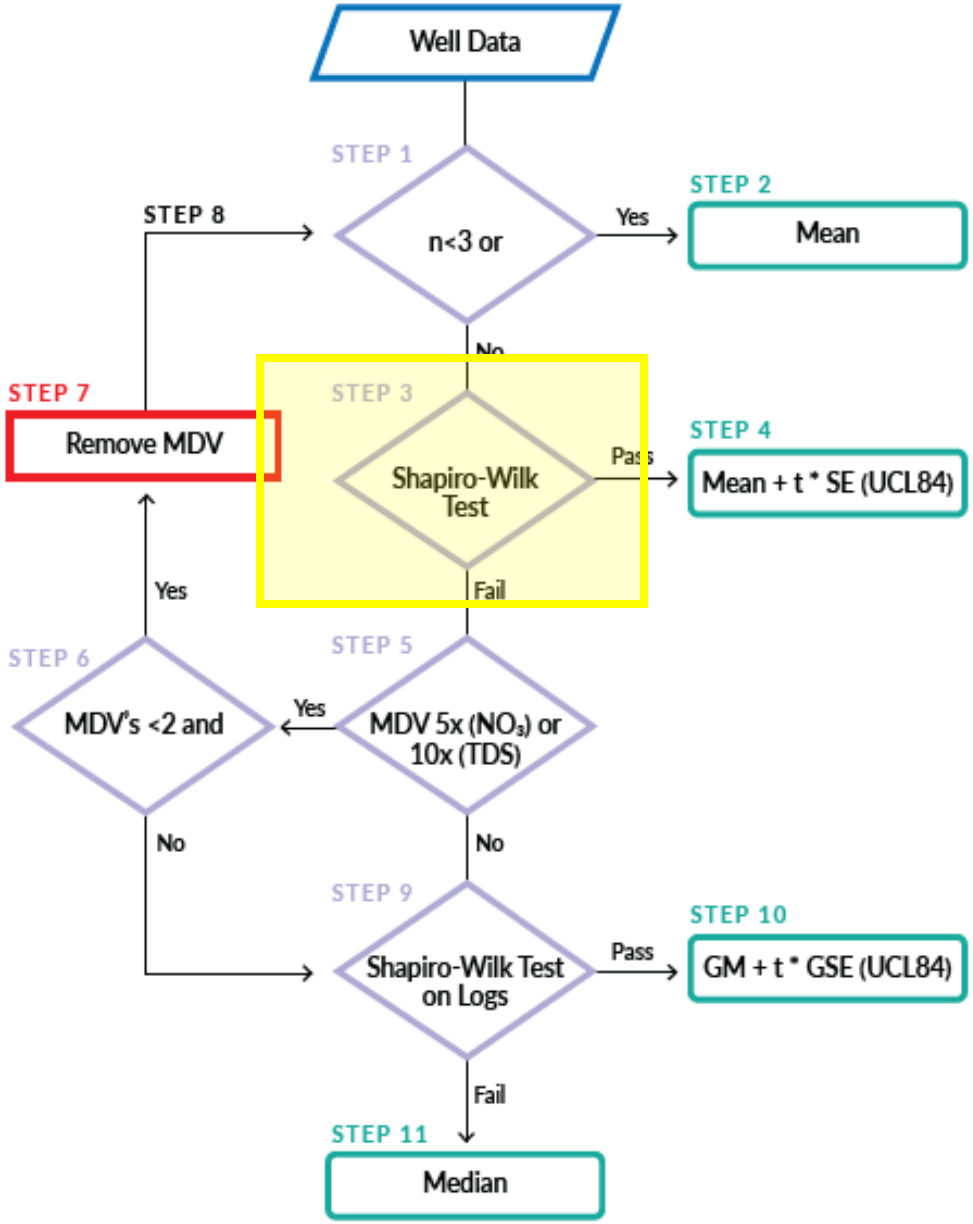


Page 1 of 319

WSC
Water Systems Consulting, Inc.

2: Point Statistics

- Annualized Averages
- At least 3 years of water quality (TDS or NO3-N) in 20 year period
- Shapiro Wilk test for normality
- Point Statistics – mean plus t*standard error of the mean

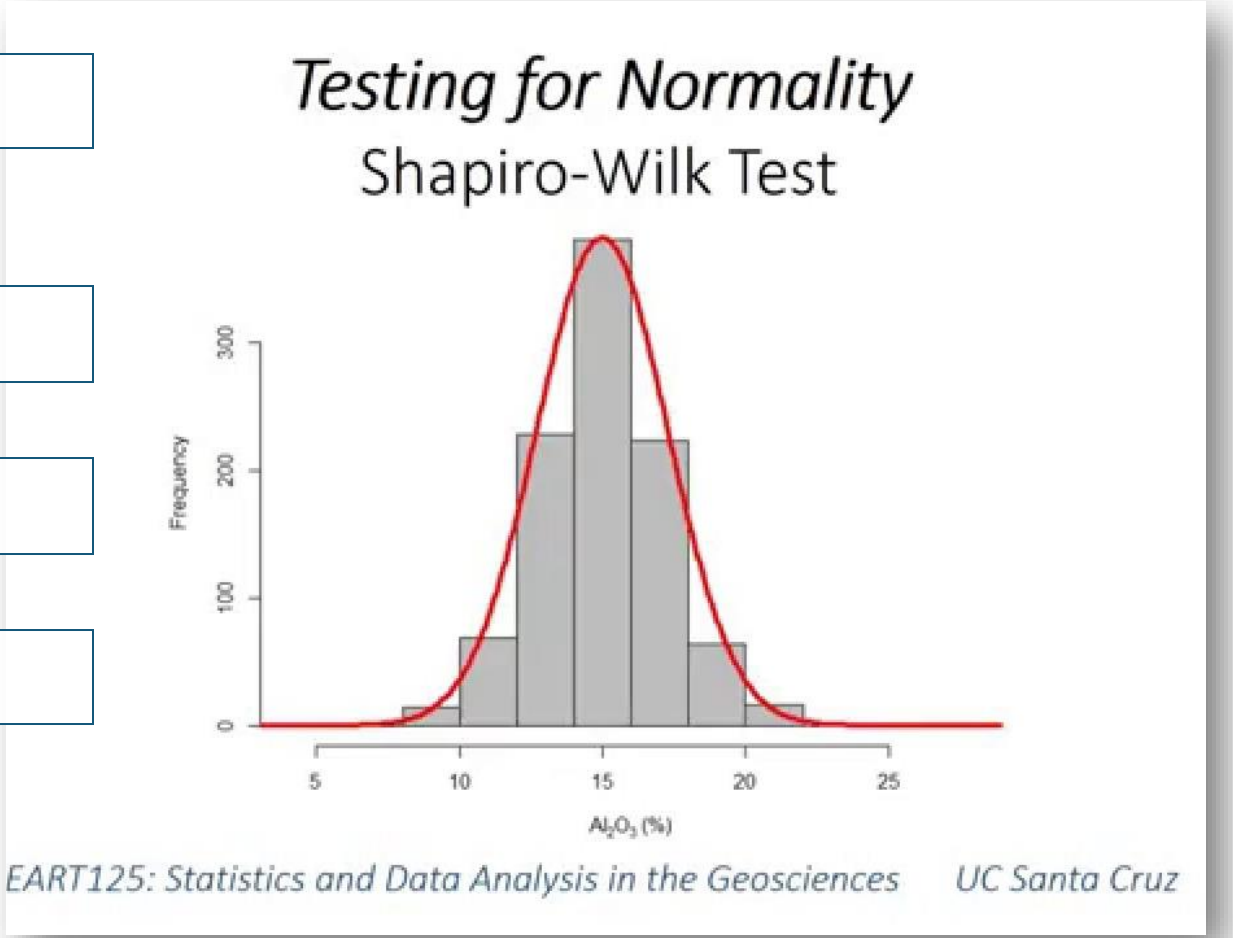


MDV: Most discordant value from median
SE: Standard error at student's t
GM: Geometric Mean
GSE: Geometric standard error
UCL84: 84% upper confidence limit of me

WSC
Water Systems Consulting, Inc.

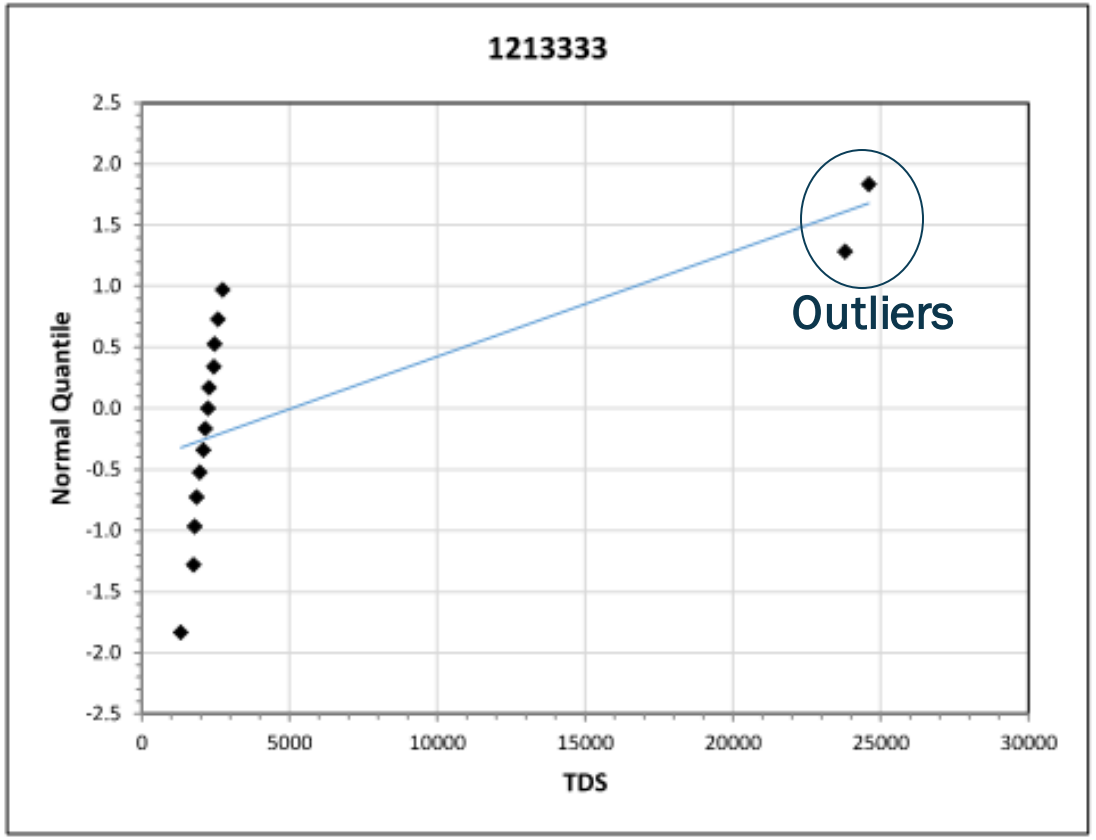
Shapiro-Wilk Test for Normality

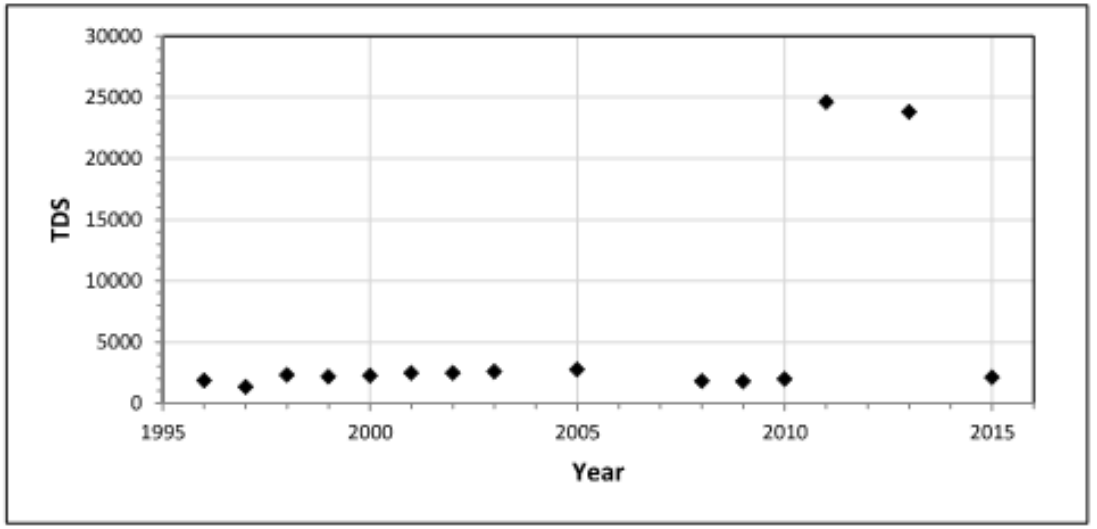
- Assumes “normal” data
- Bias towards low values
- No apparent limit on the number of iterations
- Rejects data that may correspond to event changes



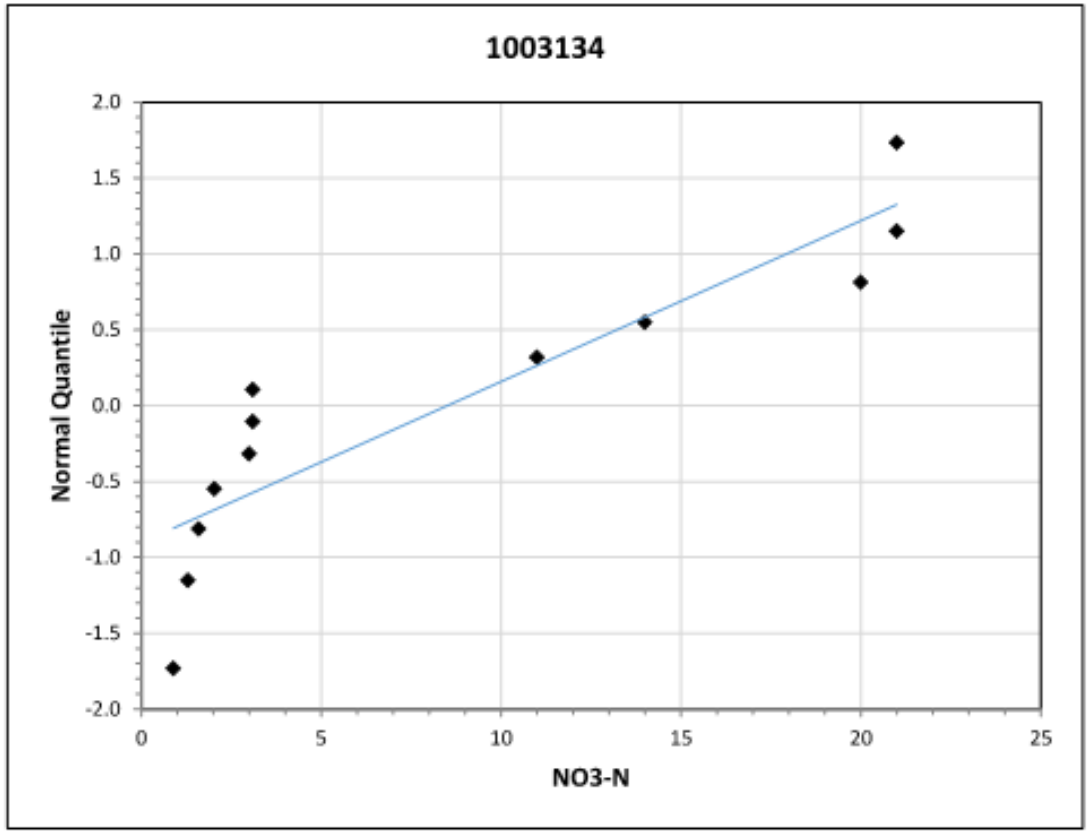
WSC
Water Systems Consulting, Inc.

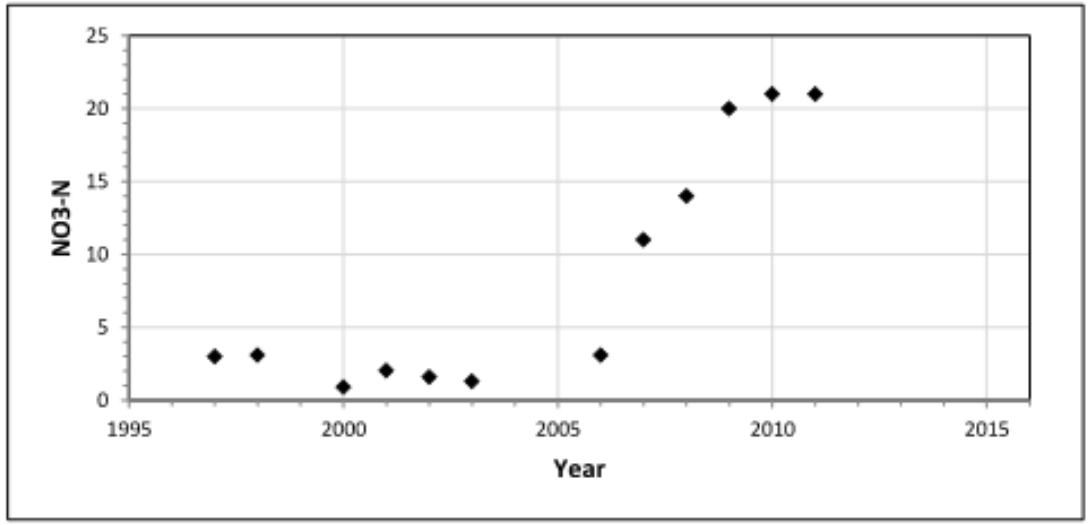
Statistics	
site	Santa Ana
location	1213333
analyte	TDS
count	15
count detects	15
Sample_Year min	1996
Sample_Year max	2015
Annual_Average min	1330
Annual_Average max	24600
Annual_Average mean	5076.333333
Annual_Average stdev	7774.04116
Shapiro-Wilk W	0.46114707
Shapiro-Wilk p-value	1.73653E-06
Critical Alpha	0.01
Most Discordant Value	24600
Pearson	NA
Slope	NA
Intercept	NA
MDV	Max Abs Diff : Median
MDV Diff Crit	10
SE of mean	NA
Student t	NA
Mean + SE (UCL84)	NA
SW p-value Logs	3.46091E-05
Geomean	NA
GM + GSE (UCL84)	NA
Median	2250



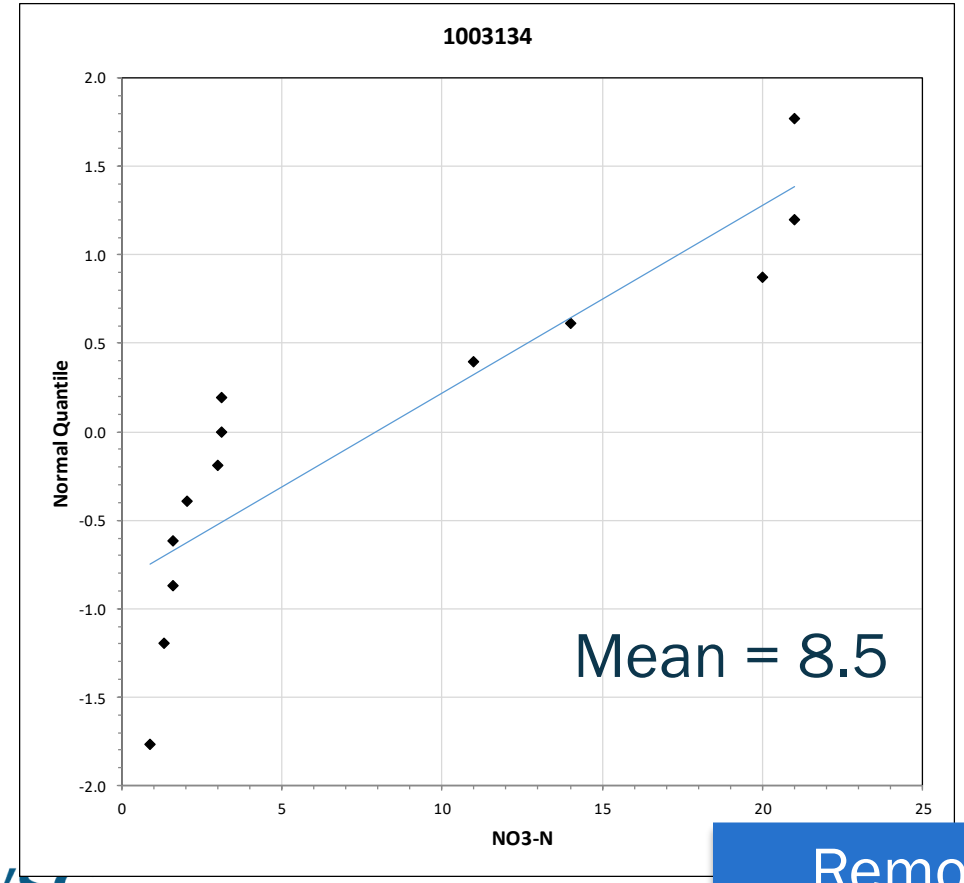


Statistics	
site	Santa Ana
location	1003134
analyte	NO3-N
count	12
count detects	12
Sample_Year min	1997
Sample_Year max	2011
Annual_Average min	0.8999
Annual_Average max	21
Annual_Average mean	8.502716667
Annual_Average stdev	8.360388858
Shapiro-Wilk W	0.781420281
Shapiro-Wilk p-value	0.005804796
Critical Alpha	0.01
Most Discordant Value	21
Pearson	NA
Slope	NA
Intercept	NA
MDV	Max Abs Diff : Median
MDV Diff Crit	5
SE of mean	NA
Student t	1.041486012
Mean + SE (UCL84)	NA
SW p-value Logs	0.089245126
Geomean	4.798409304
GM + GSE (UCL84)	6.839257057
Median	NA

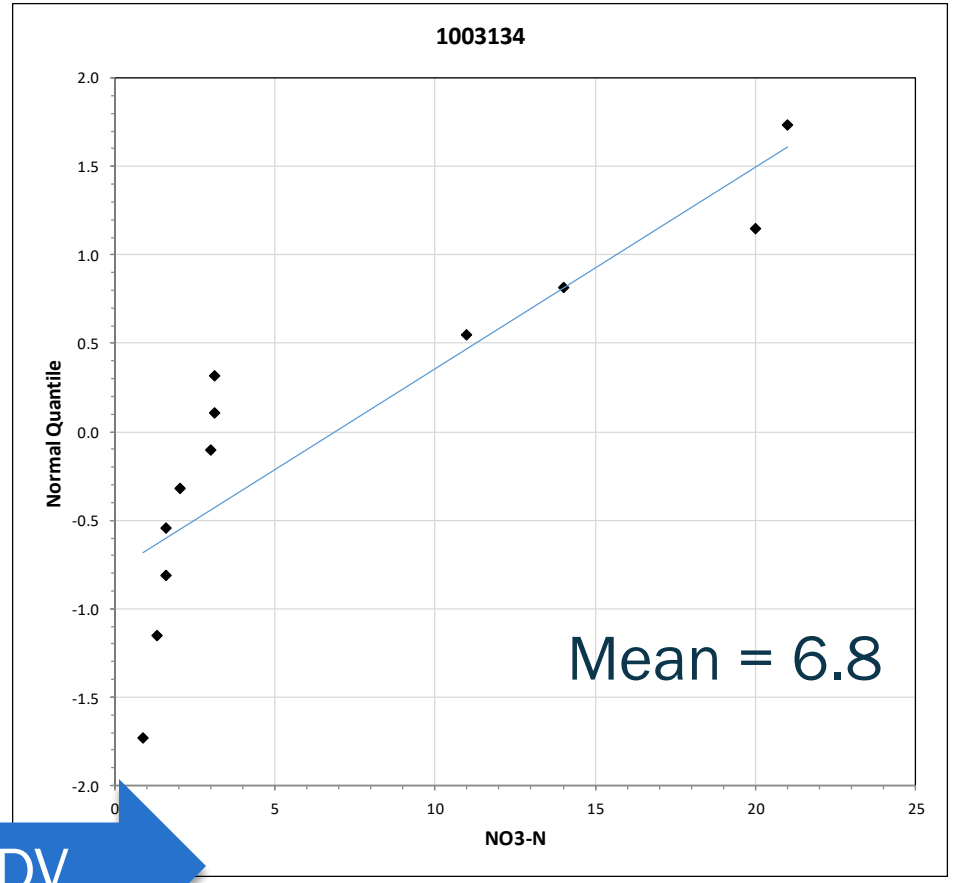




Potential Bias on Bimodal data

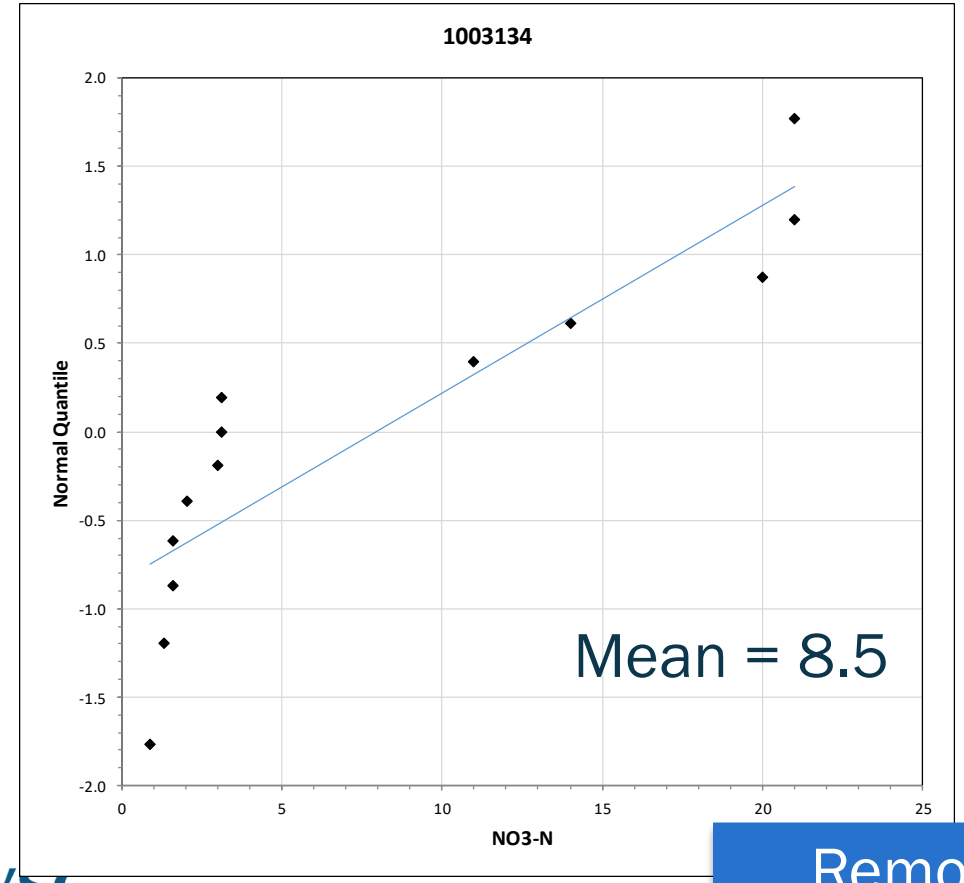


Remove 1 MDV

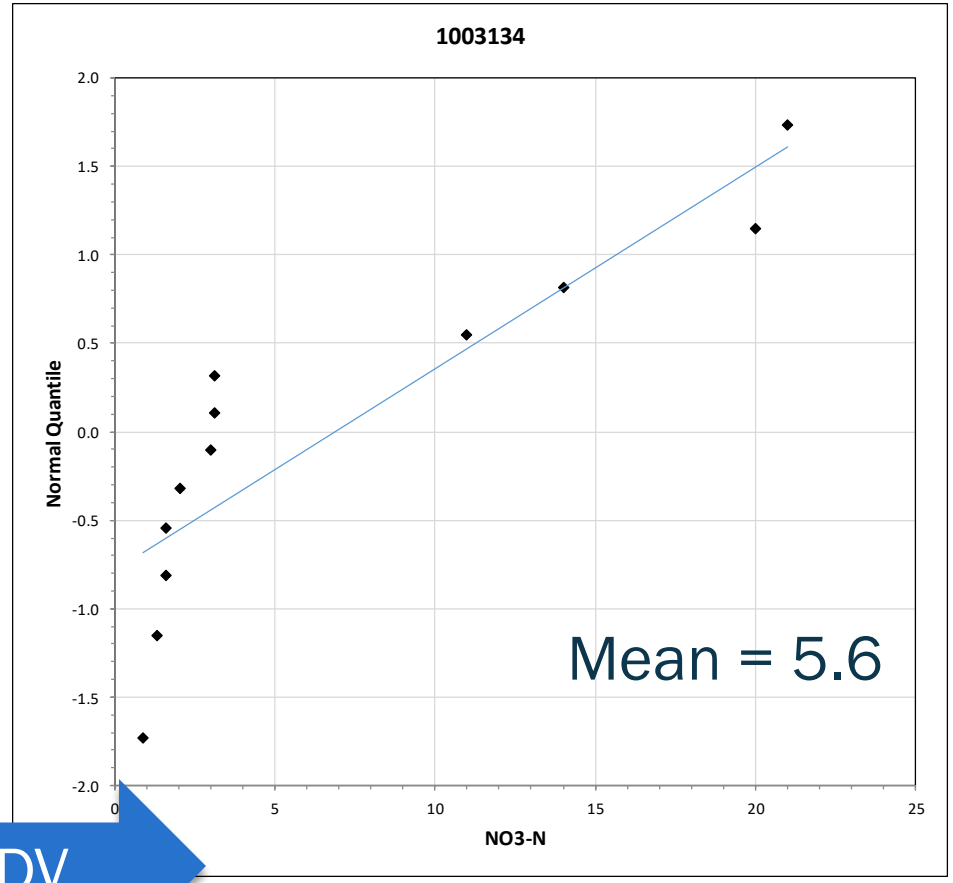


WSC
Water Systems Consulting, Inc.

Potential Bias on Bimodal data

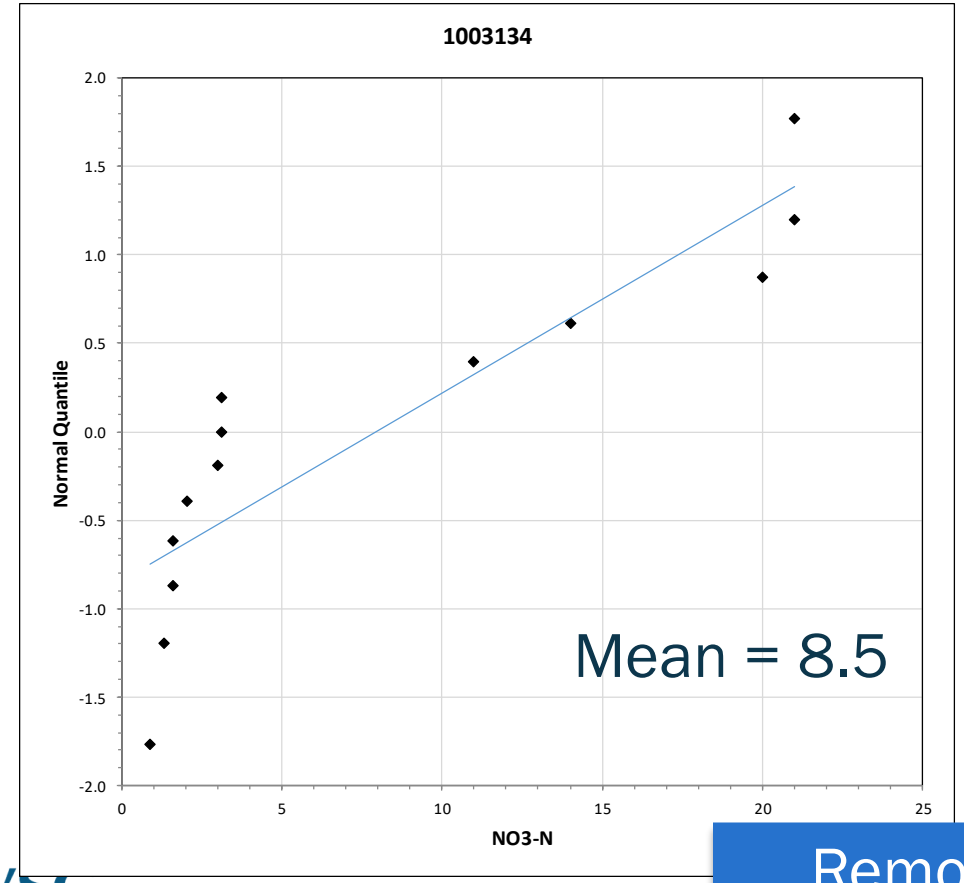


Remove 2 MDV

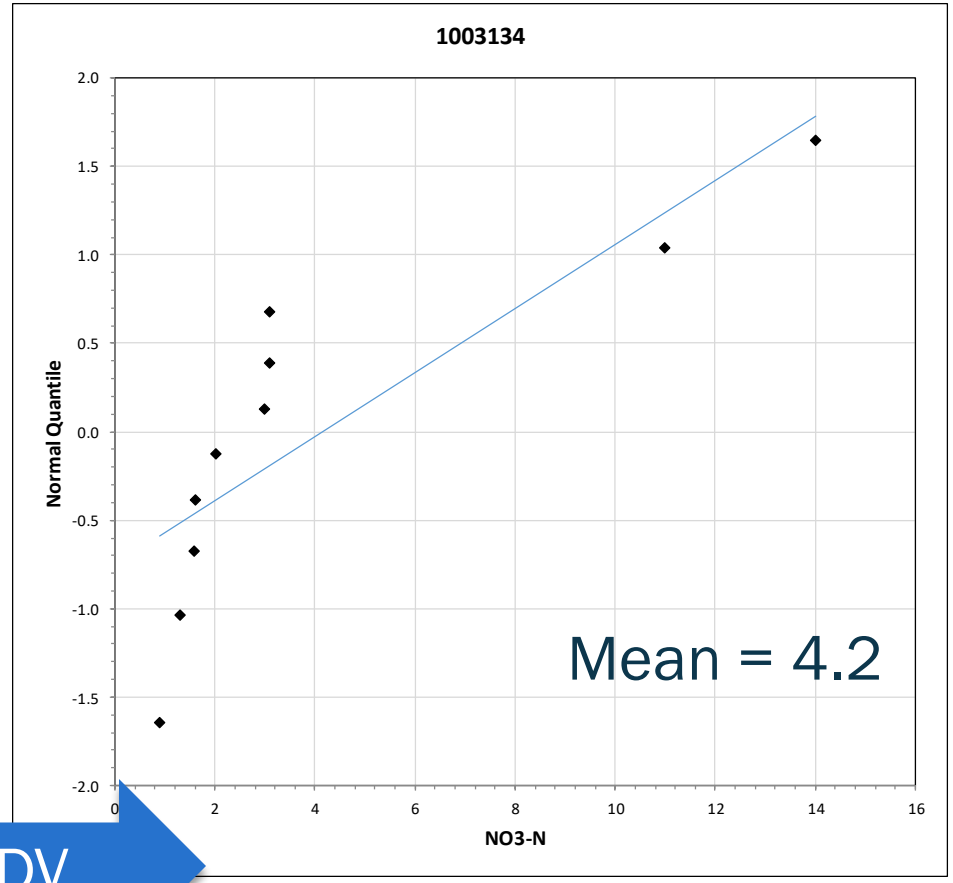


WSC
Water Systems Consulting, Inc.

Potential Bias on Bimodal data

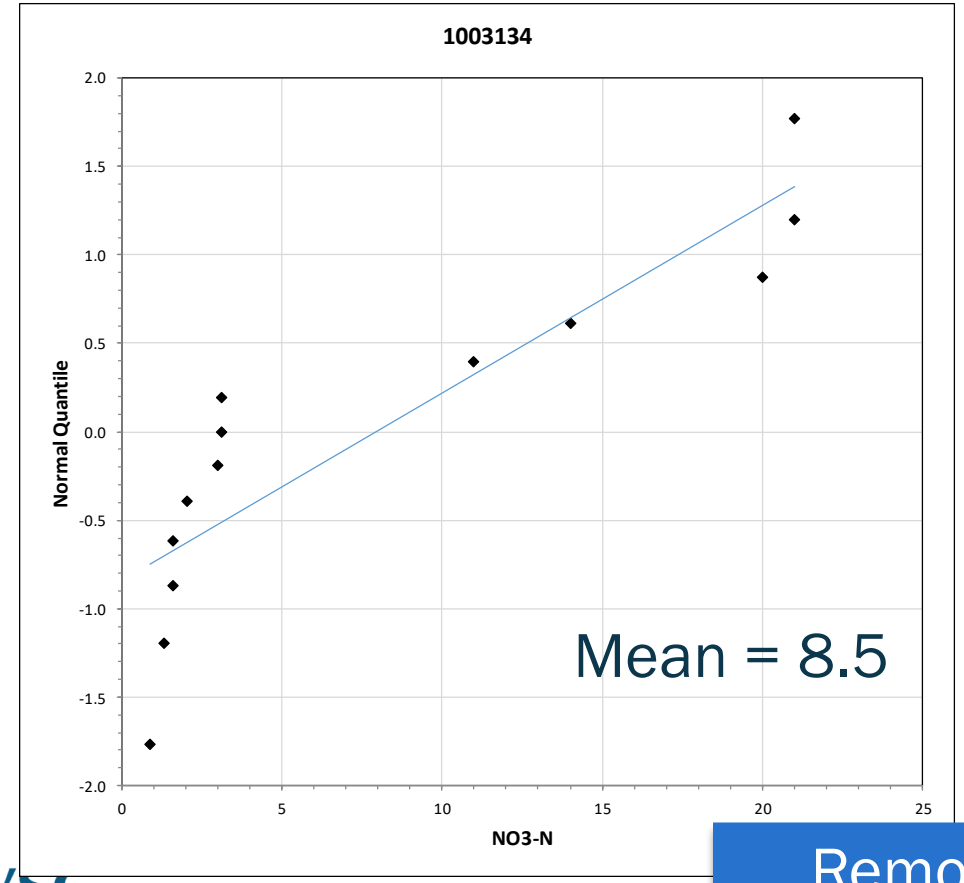


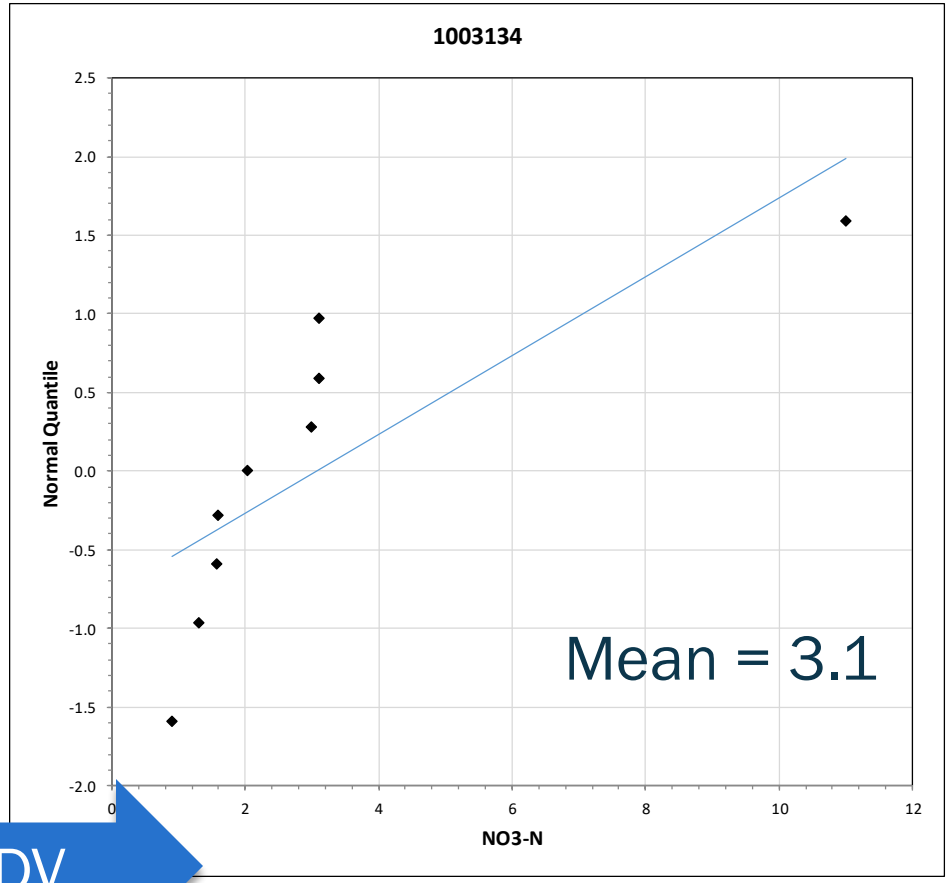
Remove 3 MDV



WSC
Water Systems Consulting, Inc.

Potential Bias on Bimodal data

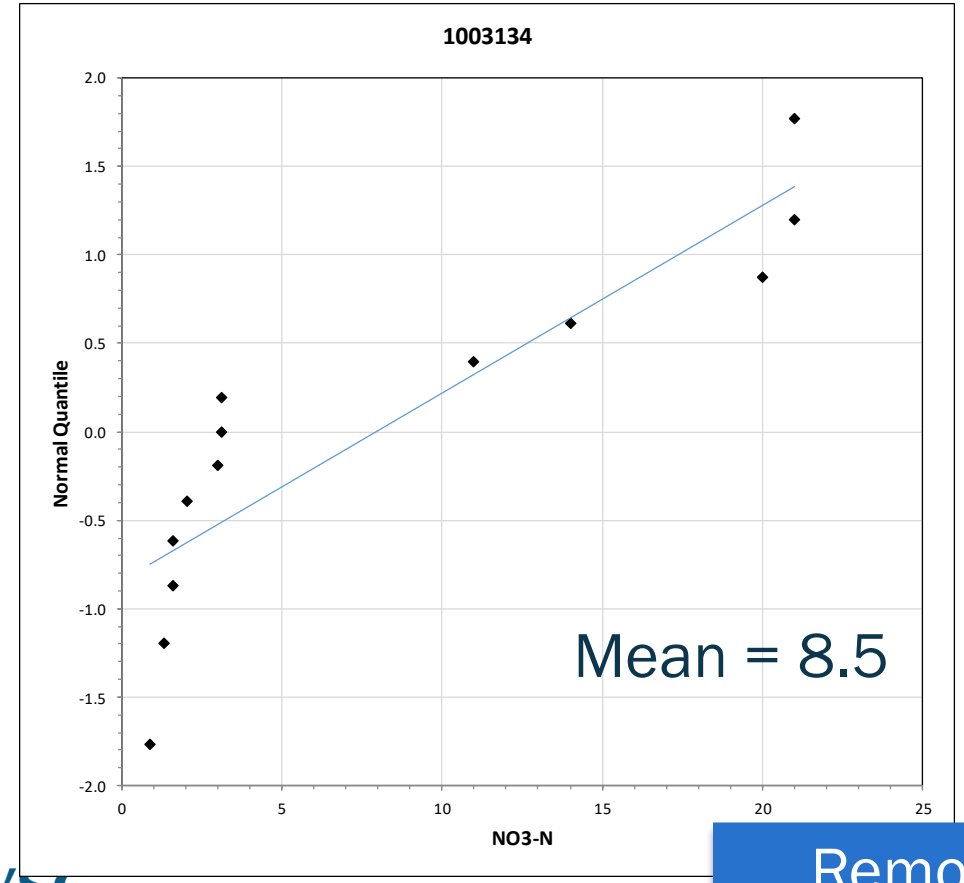




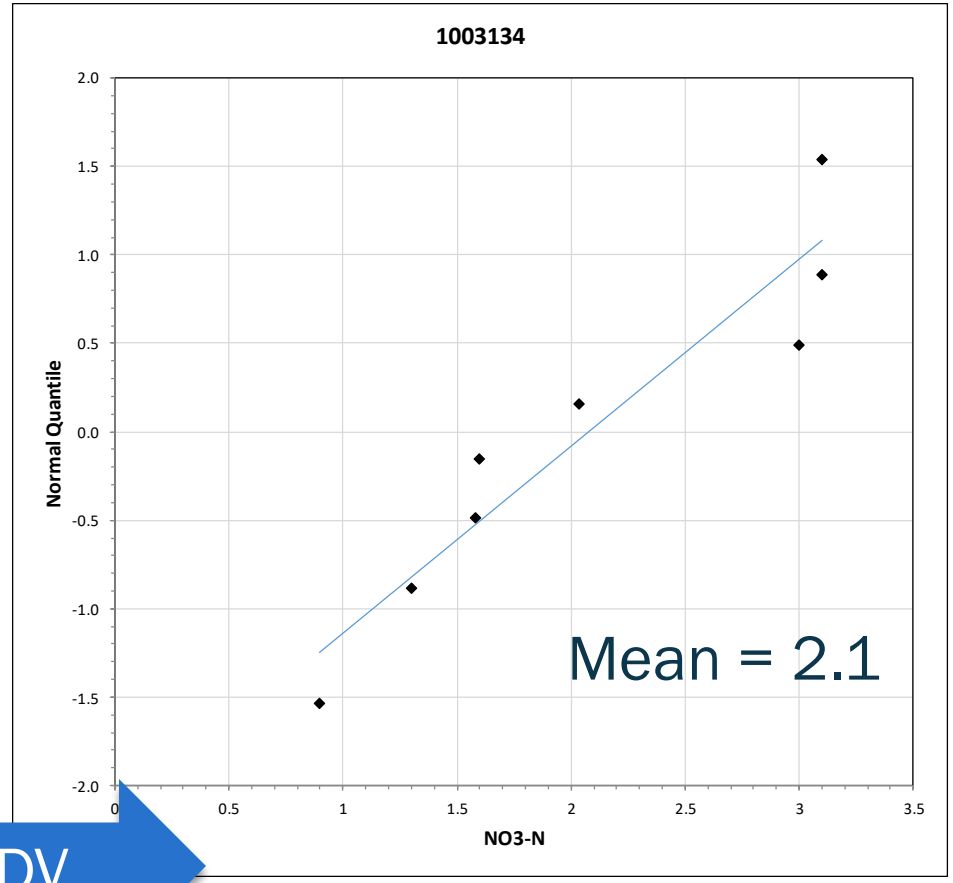
Remove 4 MDV

WSC
Water Systems Consulting, Inc.

Potential Bias on Bimodal data

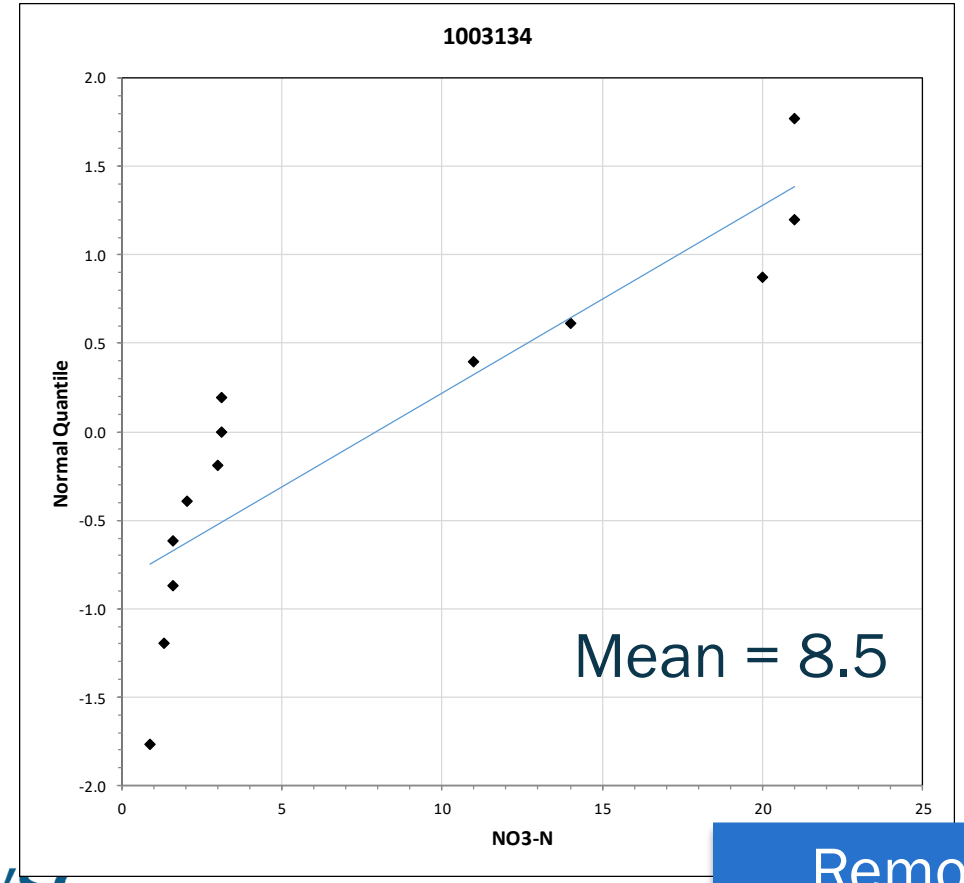


Remove 5 MDV

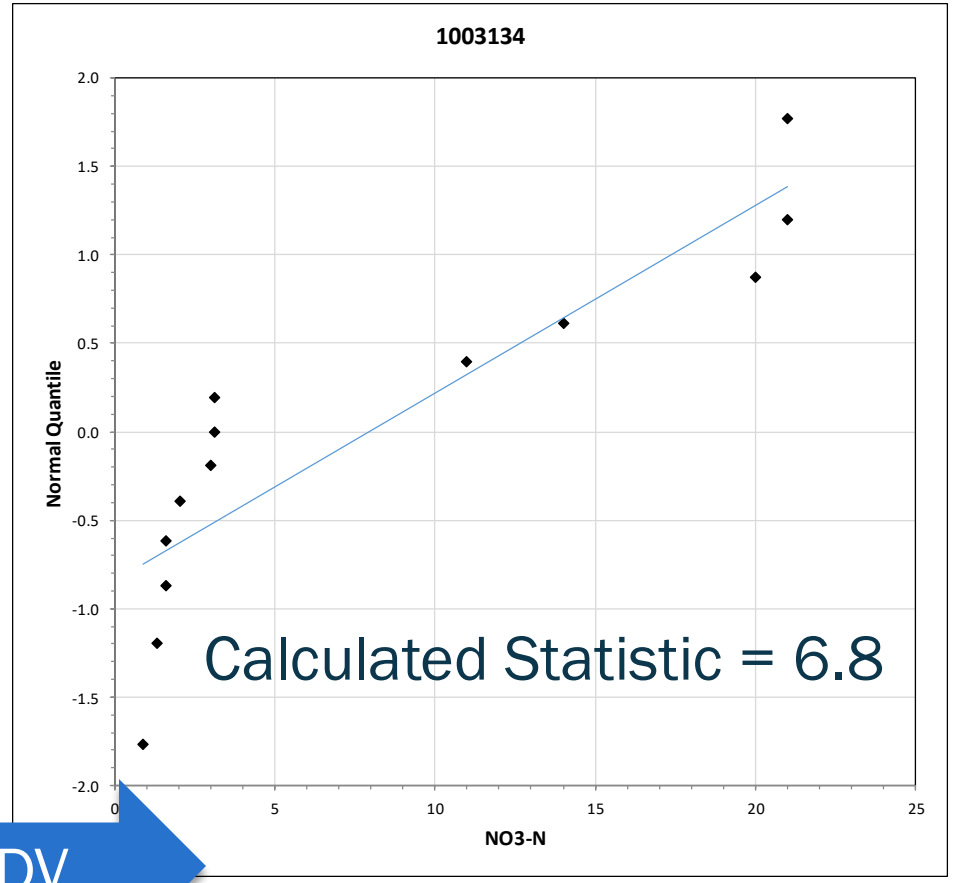


WSC
Water Systems Consulting, Inc.

Updated Shapiro Wilk

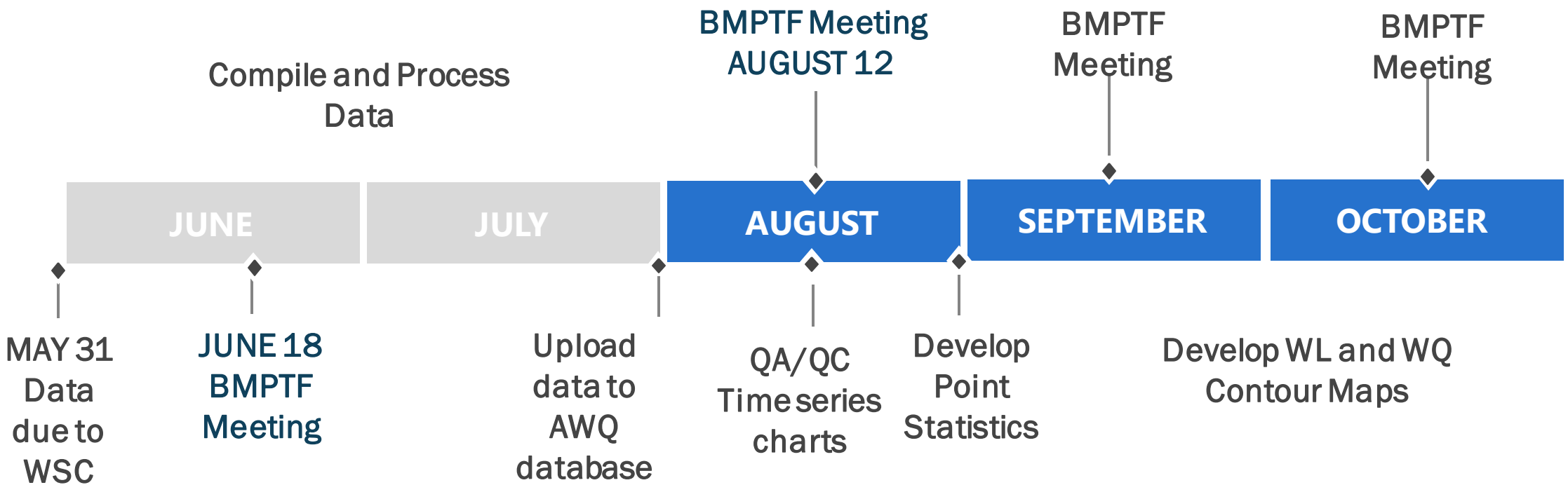


Remove 0 MDV



WSC
Water Systems Consulting, Inc.

Near-term Schedule



QUESTIONS?

WSC
Water Systems Consulting, Inc.