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Analysis of Public Supply Water Use in Louisiana

A cooperative project between Louisiana Department of Transportation and Development and the U.S. Geological Survey

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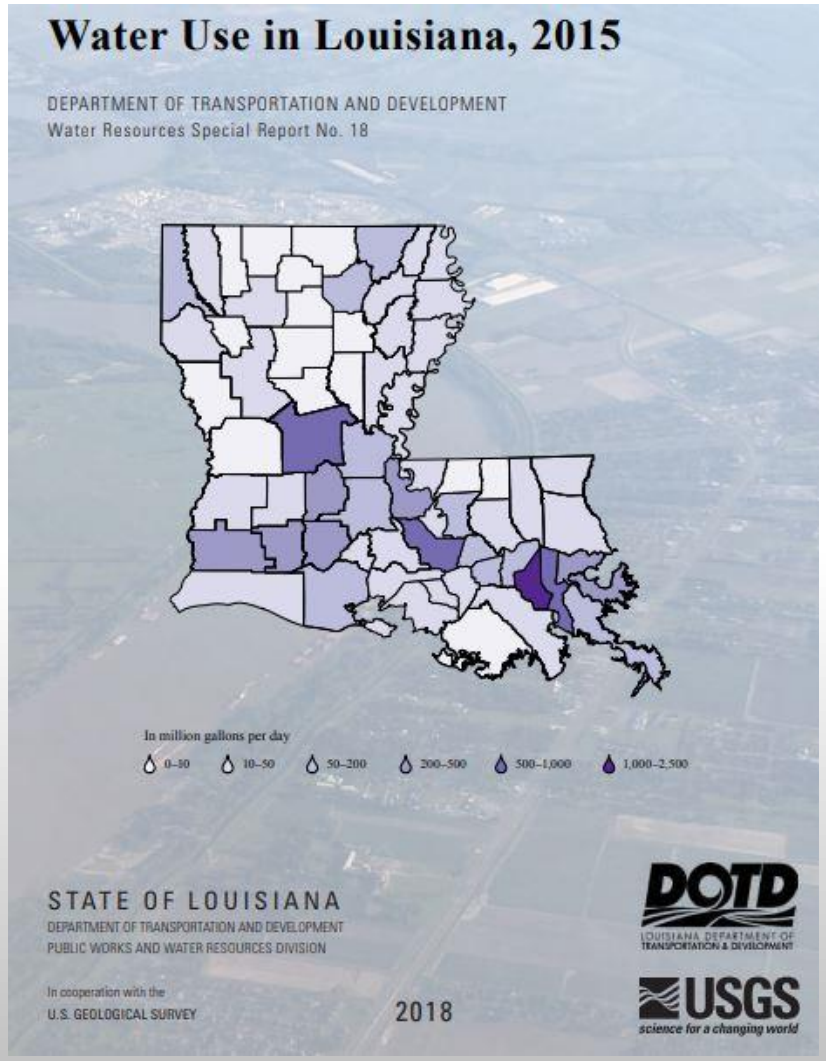
science for a changing world

2015 LOUISIANA WATER USE COMPILATION



https://la.water.usgs.gov/publications/pdfs/WaterUse2015.pdf

PROBLEM DEFINITION

Accuracy of water use data collected could be improved:

- **Except for very large suppliers, water-use data are collected every 5 years**
- **Withdrawals are estimated when data are not provided**
- **Even public suppliers with meters could provide erroneous data**

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GOALS

- (1) Develop an improved method to estimate pumpage from public water suppliers, and
- (2) Provide a means to evaluate the validity of withdrawal data provided by all public water suppliers.

STUDY BENEFIT

Expected improved public supply water use data will aid in the appraisal of Louisiana's water resources based on:

>present land use and

> the planning of future use.

ASSUMPTIONS

- Withdrawal data from water supply facility with meters approximates ‘true’ residential water use
- Meters have been calibrated and read and reported correctly
- Data are sufficient and available to develop a new algorithm to estimate water use

DATA COLLECTED FROM THE 2015 COMPILATION

- Percentage of water – public supply, commercial, industrial, unknown
- Number or residential connections and population served
- Method: metered or estimated
- Meter source: at well, at water plant, at customer
- Withdrawals in million gallons per day on an annual basis

OTHER AVAILABLE DATA (1)

Louisiana Department of Health and the U.S. Environmental Protection Agency

- Service connection type and count – AG, agricultural; **CB**, combined; CM, commercial; IN, industrial; and **RS**, residential
- Meter type and meter size measure – **Me**, metered; **MU**, metered and unmetered; **UM**, unmetered; and **UN**, unknown
- Population served type and count – NT, non-transient; **R**, residential; T, transient; and W, wholesale

OTHER AVAILABLE DATA (2)

United States Department of Homeland Security Infrastructure Program Dataset

- Information obtained in January 2015 from the United States Environmental Protection Agency (EPA) Office of Water
- Has population served count and service connection count linked to water supply facility
- Helpful for quality assurance and quality control purposes

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ASSUMED APPROACH

- Public supply water use commonly related to population counts
- Typically expressed in terms of gallons per capita per day (gpcd)
- Gpcd coefficients can be determined using available records of metered sales to public-supplier populations
- Use data from metered water suppliers to develop model for water suppliers without meters

PROCESSING OF PUMPAGE DATA

Reduce total public supply pumpage by the percentage of:

1) **commercial,**
2) **industrial, and**
3) **unknown or unaccounted for water.**

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POPULATION DATA CHECK

Population Served vs Parish Population

Population served data available at:
https://www3.epa.gov/enviro/facts/sdwis/search.html

Population Served - Allen Parish:	**28,549**
Allen Parish 2015 Population:	**25,683**
Population Served - Claiborne Parish:	**17,341**
Claiborne Parish 2015 Population:	**16,295**
Population Served - Union Parish:	**31,544**
Union Parish 2015 Population:	**22,477**

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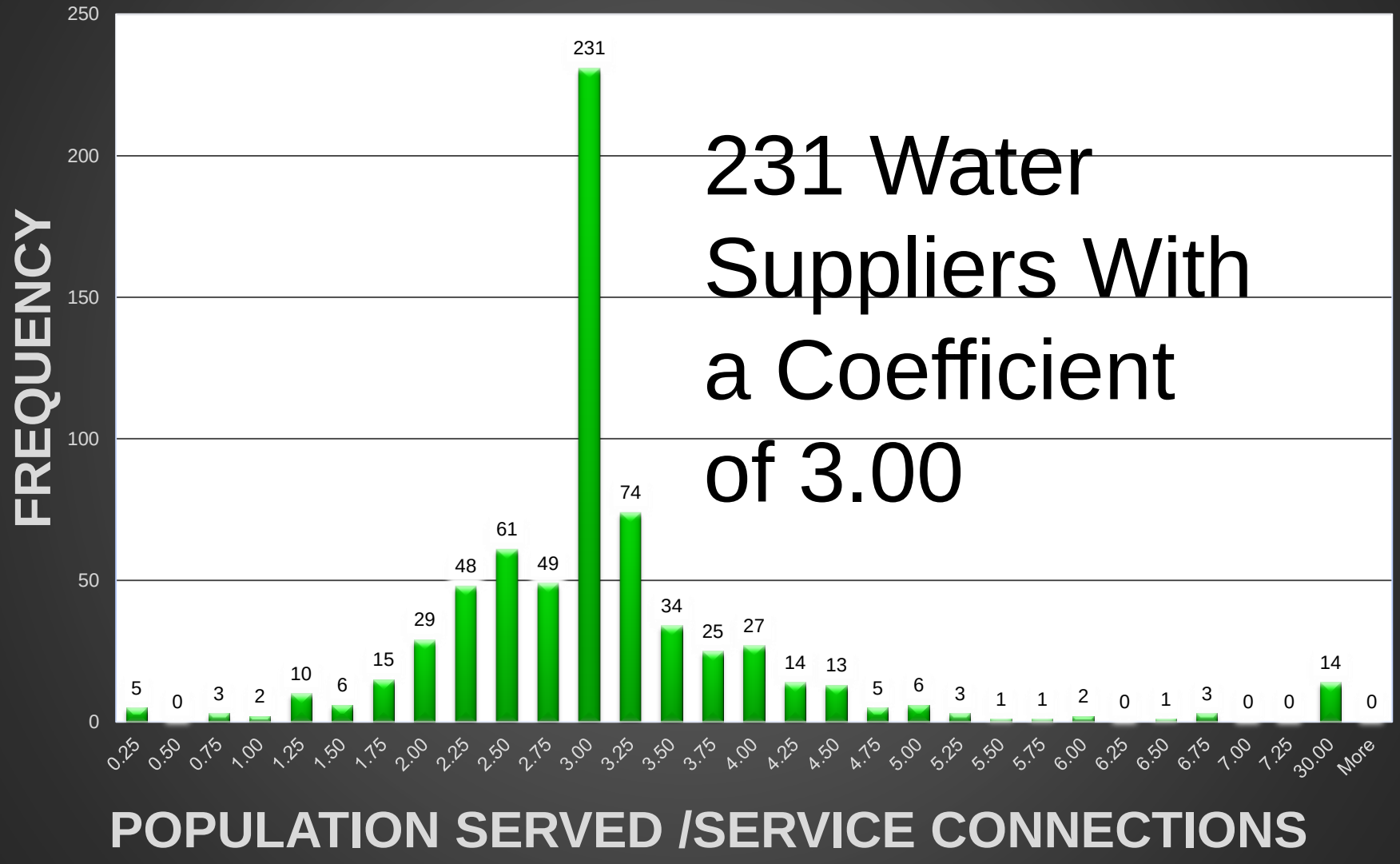
FREQUENCY
250
200
150
100
50
0
231 Water Suppliers With a Coefficient of 3.00
5
0
3
2
10
6
15
29
48
61
49
231
74
34
25
27
14
13
5
6
3
1
1
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3
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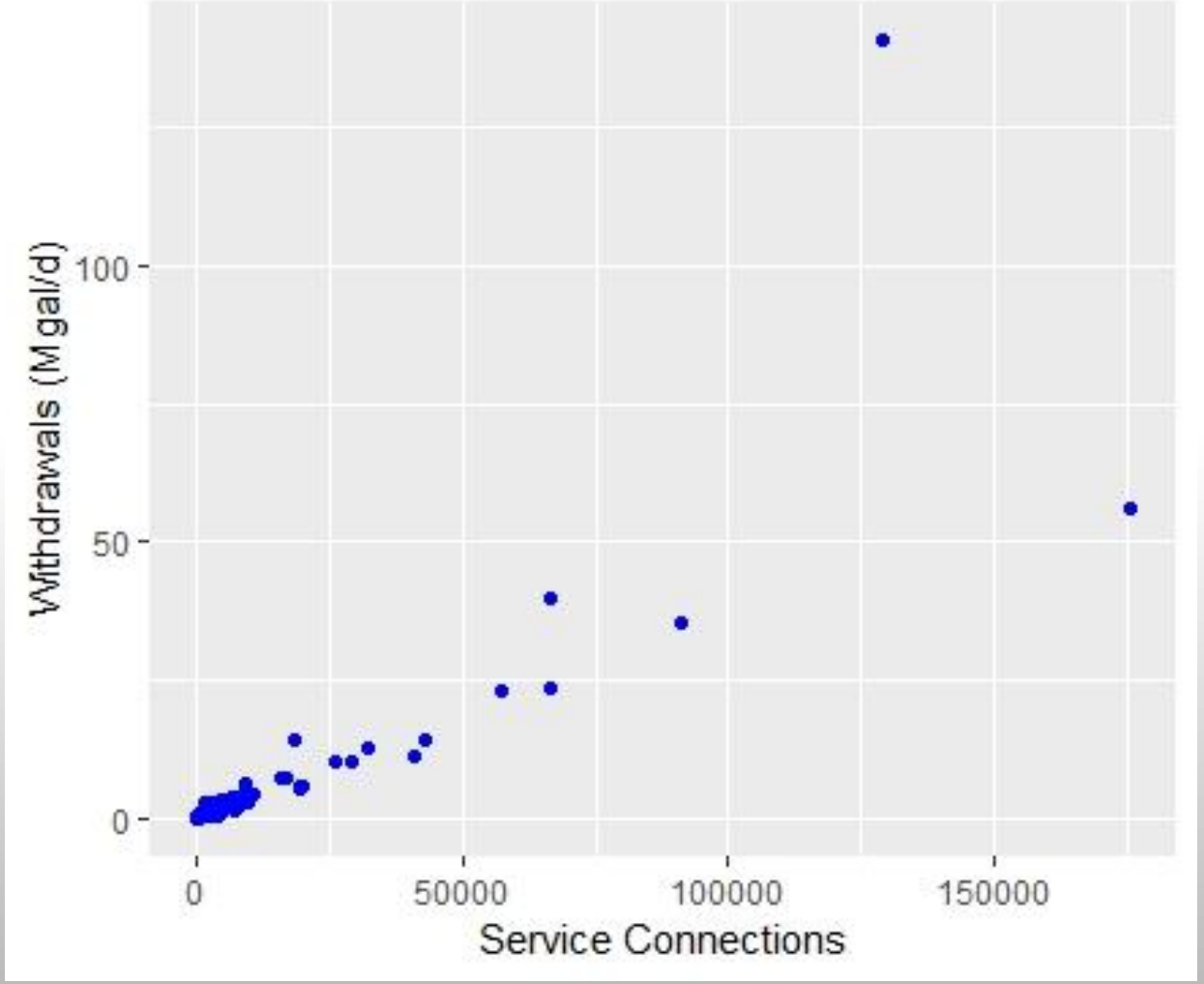
30.00
More
POPULATION SERVED /SERVICE CONNECTIONS

SCATTER PLOT OF SERVICE CONNECTIONS VS WITHDRAWALS



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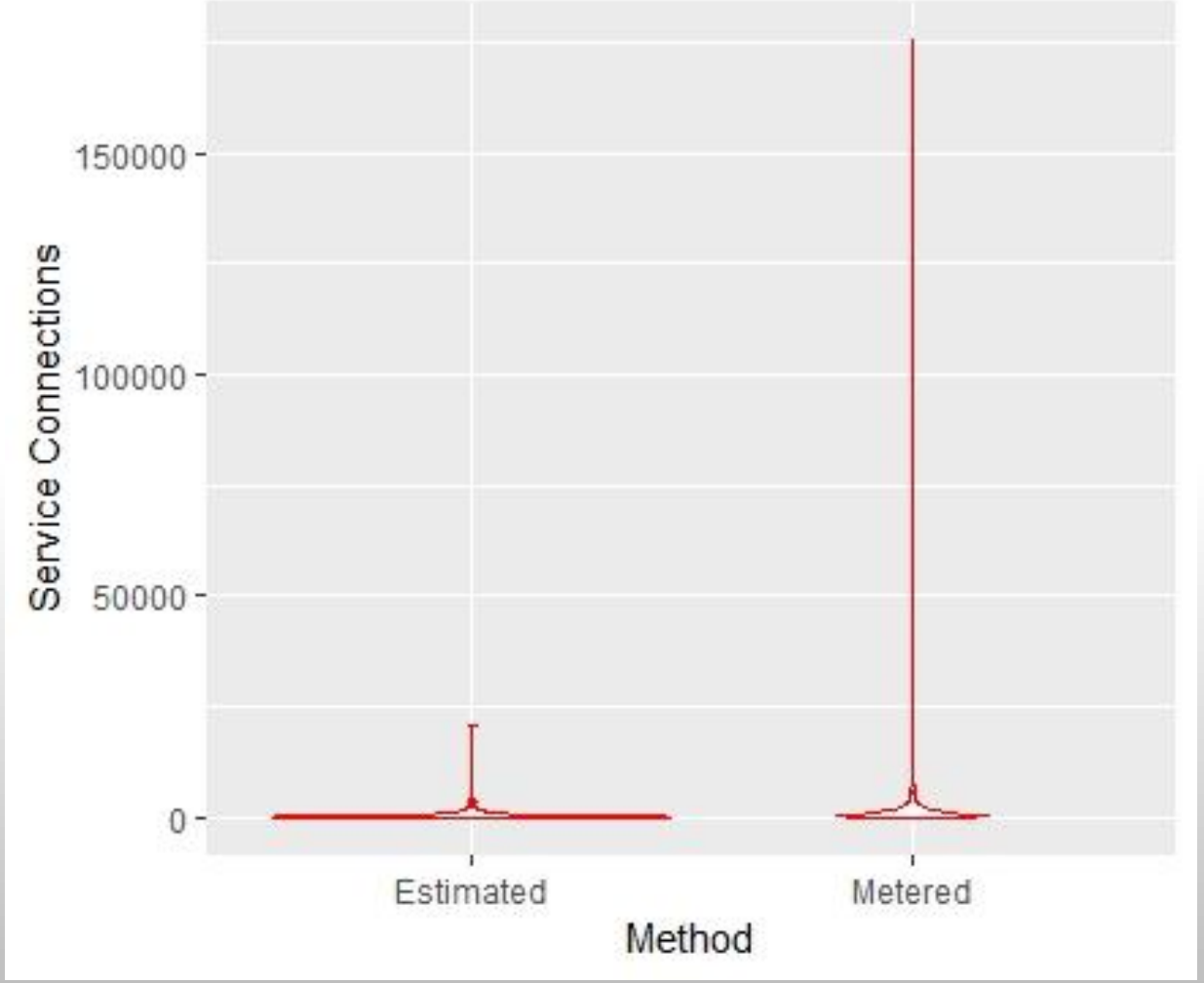
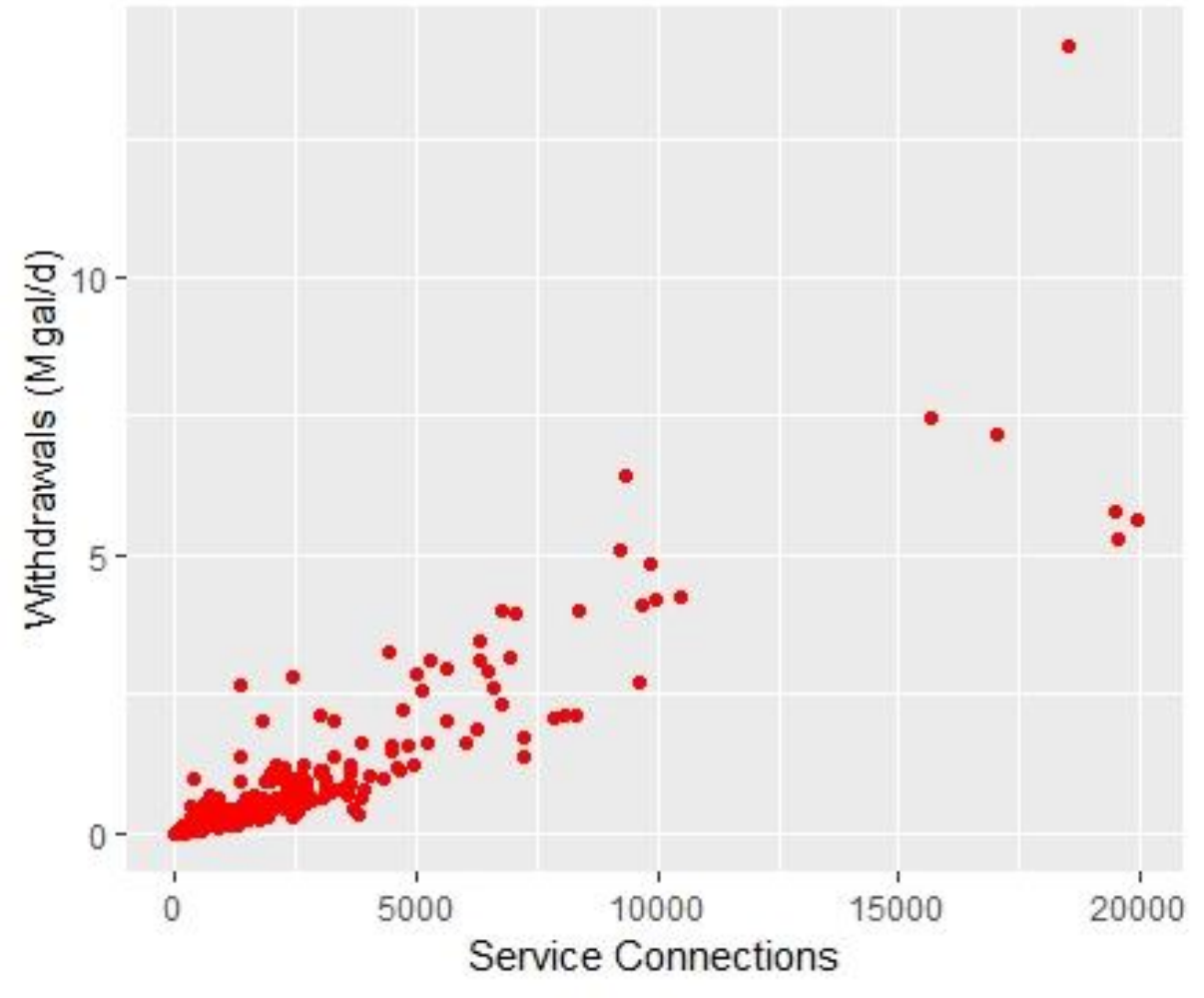
SERVICE CONNECTIONS - METERED AND ESTIMATED WATER SUPPLIERS



SCATTER PLOT OF METERED SERVICE CONNECTIONS UNDER 20,000



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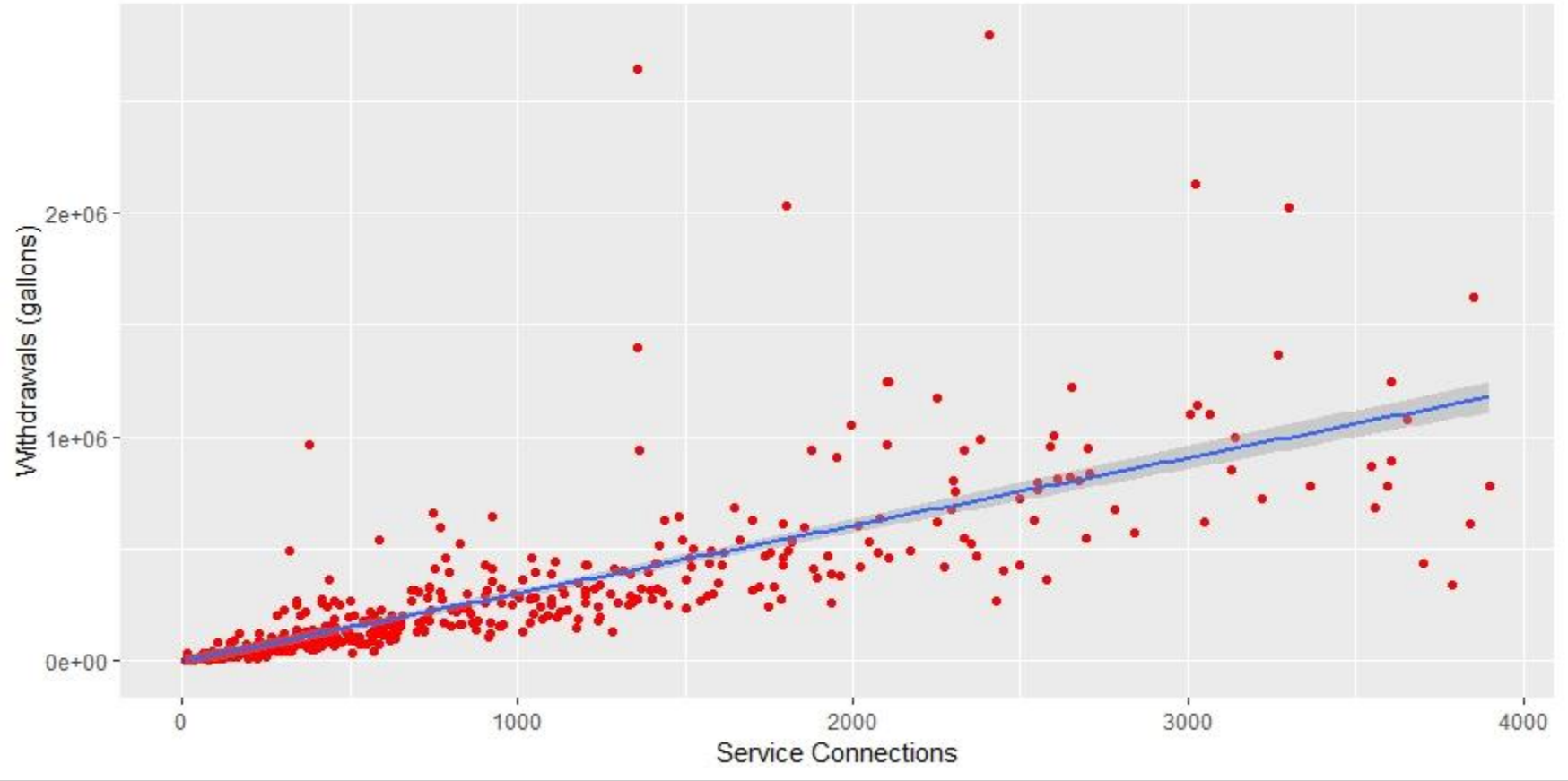
LINEAR MODEL OF METERED SERVICE CONNECTIONS UNDER 4,000



INITIAL LINEAR MODEL FUNCTION

Format: y = mx +b with b = intercept and m = slope

Withdrawals =

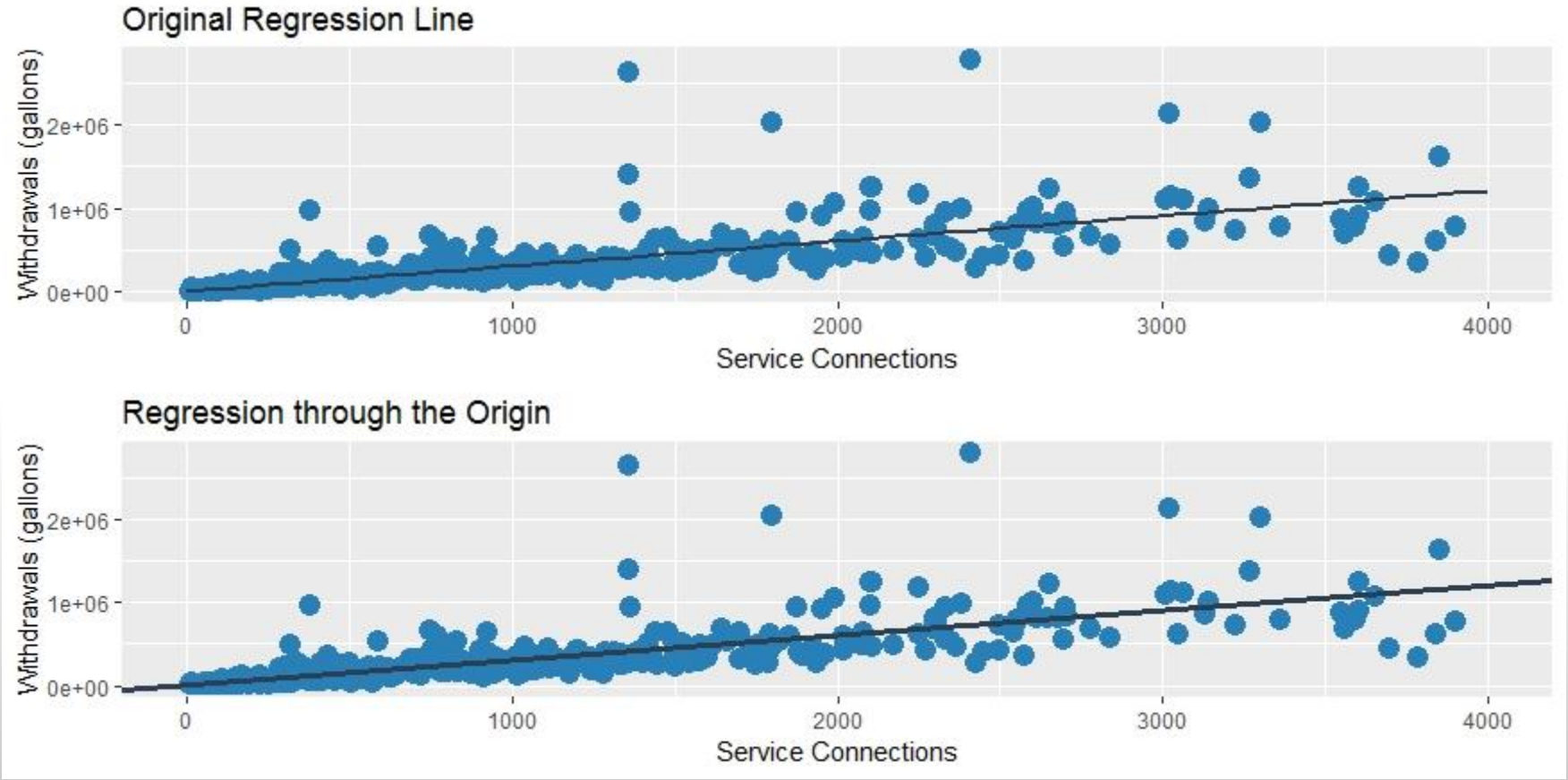
302 .3 x number of service connections +

-8,753.05 <<< !!!

The test that the intercept is not equal to zero failed, that is, the intercept is not significantly different from zero.

So new model created with the intercept = 0.00

VISUALIZATION OF TWO REGRESSION MODEL FITS



FINAL LINEAR MODEL FUNCTION

Format: y = mx +b with b = intercept and m = slope

Withdrawals =

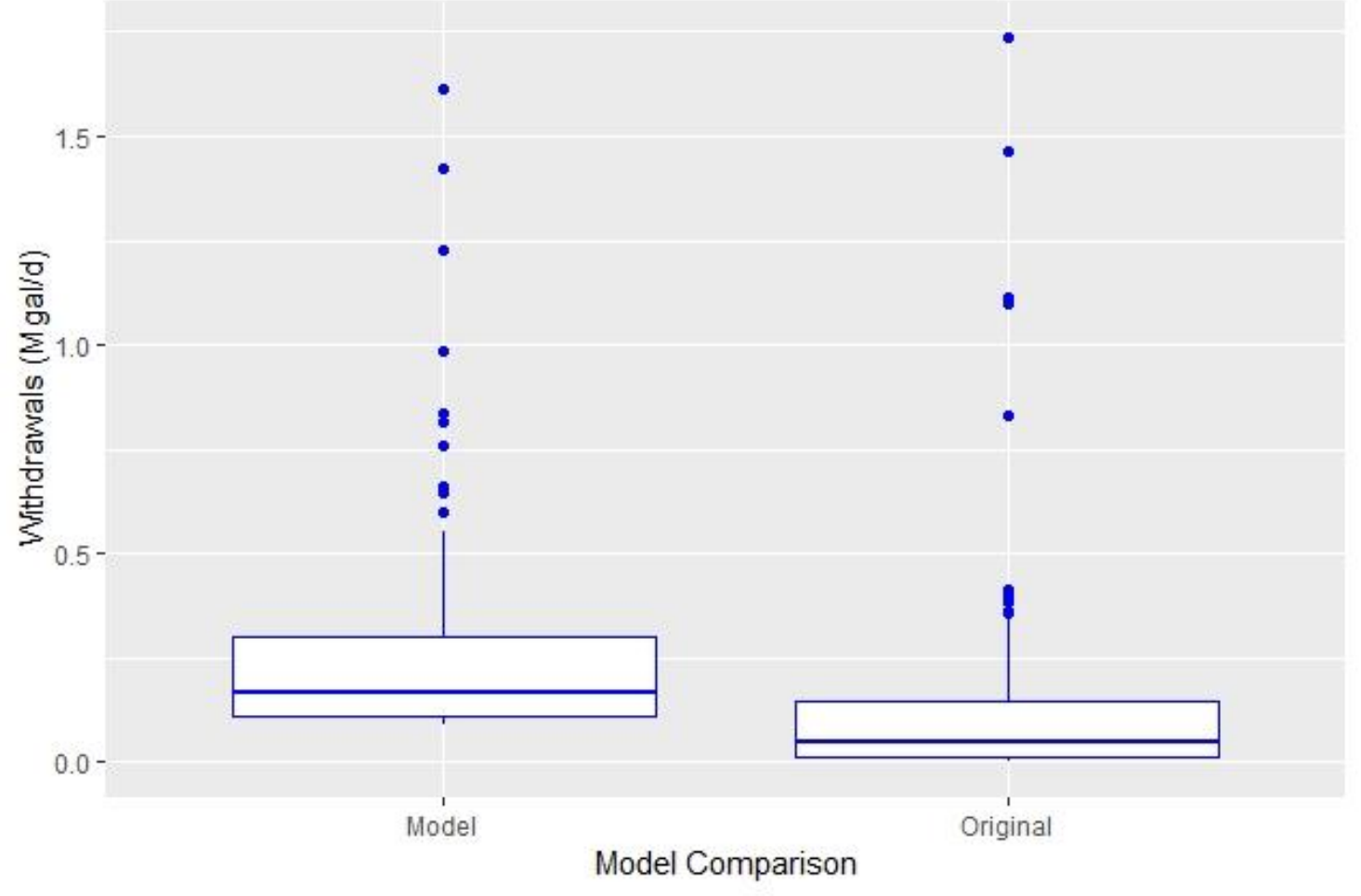
297.3 x number of service connections +

0.00 <<< IT MAKES SENSE!

The 297.3 slope estimate is significant at the 95% confidence level.

The model explains 77.97 percent of the data's variation.

COMPARISON OF MODEL TO ORIGINAL ESTIMATES OF WITHDRAWALS



ASSUMPTION REVISITED AND LESSONS LEARNED

"Meters have been calibrated and read and reported correctly"

-- Revise water use survey form to make sure water use value is from the *meter*

-- Revise form to request both well/water plant pumpage and customer pumpage to get data on water loss or unaccounted water

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PART II – FOCUS ON GOAL #2

- (1) Develop an improved method to estimate pumpage from public suppliers, and
- (2) Provide a means to evaluate the validity of withdrawal data provided by all public water suppliers.

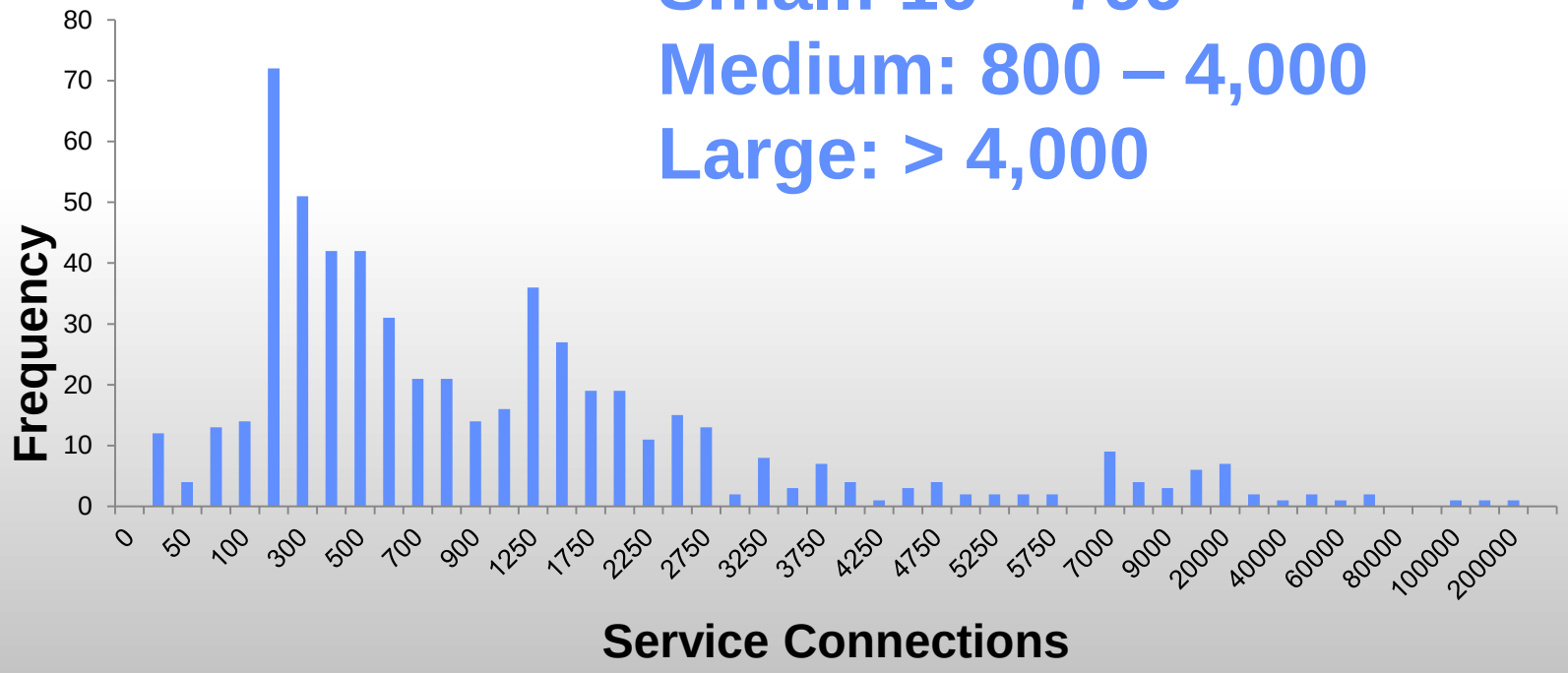
PART II: METERED FACILITY CLASSIFICATION

Classes:

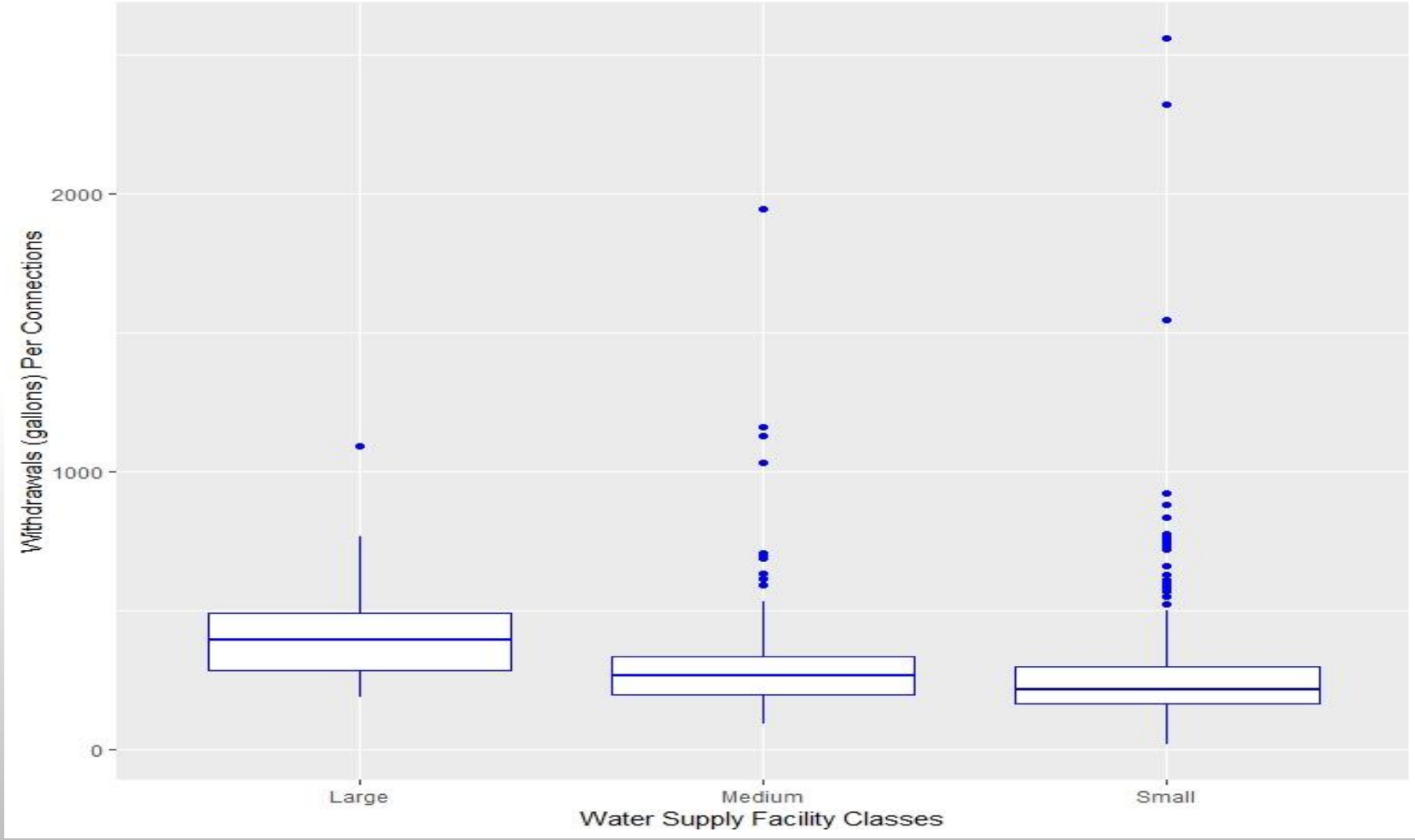
Small: 10 – 799

Medium: 800 – 4,000

Large: > 4,000



BOX PLOT OF GALLONS PER CONNECTION BY CLASS



DESCRIPTIVE STATISTICS BY CLASS (gallons per connection)

	25%	50%	75%
SMALL	167	215	305
MEDIUM	199	267	340
LARGE	283	397	490

STUDY SUMMARY

- **1. Created a model to estimate withdrawals for water supply facilities that do not have meters:**

  Withdrawals (gallons) = 297.3 gallons per connection * number of connections

- **2. Classified water suppliers into large, medium, and small groups with a range of withdrawals for each group to be used to check submitted data**

QUESTIONS?

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