

# JLA Geosciences, Inc.

HYDROGEOLOGIC CONSULTANTS

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April 18, 2018

**via Electronic Mail**

Shannon R. LaRocque, P.E.  
Utility Director, Village of Wellington  
12300 Forest Hill Blvd.  
Wellington, FL 33414

RE: ***Groundwater Modeling for the Village of Wellington - Model Development and Preliminary Consumptive Use Evaluation (Phase I)***

Dear Shannon:

JLA Geosciences, Inc. (JLA) is pleased to provide groundwater modeling services to the Village of Wellington (Village) for the above referenced project. Our scope of work involved developing a MODFLOW groundwater model to simulate the surficial aquifer system (SAS) in Wellington and the surrounding area, using currently permitted water use allocations. The model was used to evaluate potential increases to Wellington's permitted public water supply allocation.

Results from model simulations help identify areas from which additional water could be withdrawn, while complying with the South Florida Water Management (SFWMD) Regional Water Availability (RWA) rule. According to the RWA rule, consumptive use withdrawals "cannot cause a change in timing or a net increase in the monthly volume of surface water and groundwater withdrawn from the Lower East Coast Everglades Waterbodies or the North Palm Beach County/Loxahatchee River Watershed Waterbodies (Waterbodies), over that resulting from the base condition water use". The base condition corresponds to "the maximum quantity of water withdrawn by the applicant from the permitted source during any consecutive twelve month period during the five years preceding April 1, 2006".

The Village's existing Consumptive Use Permit (CUP) No. 50-00464-W, issued November 21, 2011, authorized annual SAS withdrawals of 2,926 million gallons (MG), equivalent to 8 million gallons per day (MGD) on average. Maximum monthly withdrawals of 290 MG (equivalent to approximately 9.5 MGD) are also authorized by the existing CUP. Additionally, specific limitations apply for each of the Village's three SAS wellfields, identified as the North, South, and East, as depicted in Figure 1. Limitations for each wellfield reflect groundwater modeling performed previously (not JLA) to avoid potential impacts to Waterbodies, as described in the CUP Staff Report. Specific limitations for each wellfield include the following annual allocations:

- ) North Wellfield - 1,364 MG (3.74 MGD average)
- ) South Wellfield - 1,002 MG (2.75 MGD average)
- ) East Wellfield - 573 MG (1.57 MGD average)

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**Groundwater Model Development**

JLA developed a MODFLOW model of the SAS in the vicinity of the Village by updating and refining a combination of MODFLOW models developed and applied previously by JLA and SFWMD. Model development incorporated results from recent specific capacity testing of Village production wells, to refine the hydraulic conductivity distribution of the production zone in the vicinity of each wellfield.

Historic and potential future model scenarios evaluated are consistent with requirements of SFWMD's Applicant Handbook for Water Use Permit Applications (AH). This involves a simulation period of 2 years, with monthly stress periods, and a year each of average and drought rainfall conditions. Simulated withdrawals for cumulative scenarios included those from permitted existed legal users (ELUs) located near Village wellfields.

**Model Simulations and Results**

JLA focused on three primary model scenarios, including: 1) base condition, 6.95 MGD average annual; 2) current CUP allocation, 8.0 MGD average annual; and 3) increase in allocation, 10.93 MGD average annual, arbitrary value assumed for modeling purposes. Table 1 identifies specific Village withdrawals simulated for each monthly stress period for the three scenarios.

The allocation authorized by the Village's current CUP resulted from previous model simulations (not JLA) comparing the base condition (Scenario 1) with that ultimately permitted (Scenario 2). Figure 2 presents the drawdown increase resulting from the permitted condition compared to the base condition, as depicted in Exhibit 8B of the CUP Staff Report. A critical metric SFWMD emphasized in developing the permitted increase above the base condition was drawdown increase at the C-51 Canal. As shown in Figure 2, the 0.1-foot (ft) drawdown increases do not extend to the C-51 Canal, although that resulting from North wellfield withdrawals is close to it. SFWMD considers drawdown or drawdown increases of less than 0.1 ft to be not measureable and therefore insignificant.

Simulations with the JLA model comparing the base condition (Scenario 1) with the current CUP (Scenario 2) enabled comparisons with the modeling provided previously and described in the CUP Staff Report. Figure 3 presents a comparison of JLA model results with those presented in the CUP Staff Report for model-predicted drawdown increases. As shown in Figure 3, JLA model results are similar for the East wellfield, but show less drawdown increase for the North and South wellfields. Note that for the South wellfield, the drawdown increase is less than 0.1 ft; consequently, a 0.1-ft contour increase is not shown.

Figure 4 presents increased drawdown comparisons of future increased allocations, equivalent to 10.93 MGD average annual (Scenario 3), versus the base condition (Scenario 1). For the increased-allocation scenario, withdrawals from the North wellfield are kept at the currently permitted allocation. Annual average wellfield withdrawal increases include: from 1.57 to 2.01

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MGD for East; 2.75 to 3.75 for South; and from 0 to 1.43 MGD for the three existing but not permitted wells located slightly north of the South wellfield. Model results presented in Figure 4 illustrate the extent to which drawdown increases from the East, South, and existing-but-unpermitted production wells differ compared to the currently permitted condition. The fact the resultant increases do not extend to the C-51 Canal, suggests that an increased allocation ultimately may be permissible. It is unclear, however, whether SFWMD will apply the same metric (i.e., limited drawdown increase at the C-51 Canal) for a requested increase in allocation for modification of the Village CUP.

In addition to potential drawdown increases at the C-51 Canal, SFWMD is likely to require an evaluation of how increased Village withdrawals may induce additional seepage from canals other than the C-51. Appendix A presents results of such an evaluation of potential seepage increases, for model simulations of Scenario 3 compared to the permitted condition (Scenario 2). These results are included with this letter report to illustrate the kinds of information that may need to be provided to SFWMD, and evaluated by them, as part of the application process for modification. It is unclear at this point, whether such increases in canal seepage would be considered permissible according to SFWMD criteria.

**Conclusions**

Groundwater modeling developed and performed by JLA will assist the Village in pursuing an increased allocation for SAS withdrawals above that currently permitted by their CUP. Meeting with SFWMD staff, to discuss results from the initial model simulations, as well as potential criteria SFWMD may apply in evaluating whether such increased allocations may be permissible, is warranted. Outcome from such meeting(s) will provide guidance for future model simulations anticipated to be performed to support a Village request for modification of their CUP.

We look forward to continue working with the Village on this important project. Please call Jim Andersen or me if you have any questions.

Respectfully submitted,  
JLA Geosciences, Inc.



Paul M Stout, Ph.D., P.G.  
Principal Hydrogeologist

PMS/pms  
Attachments

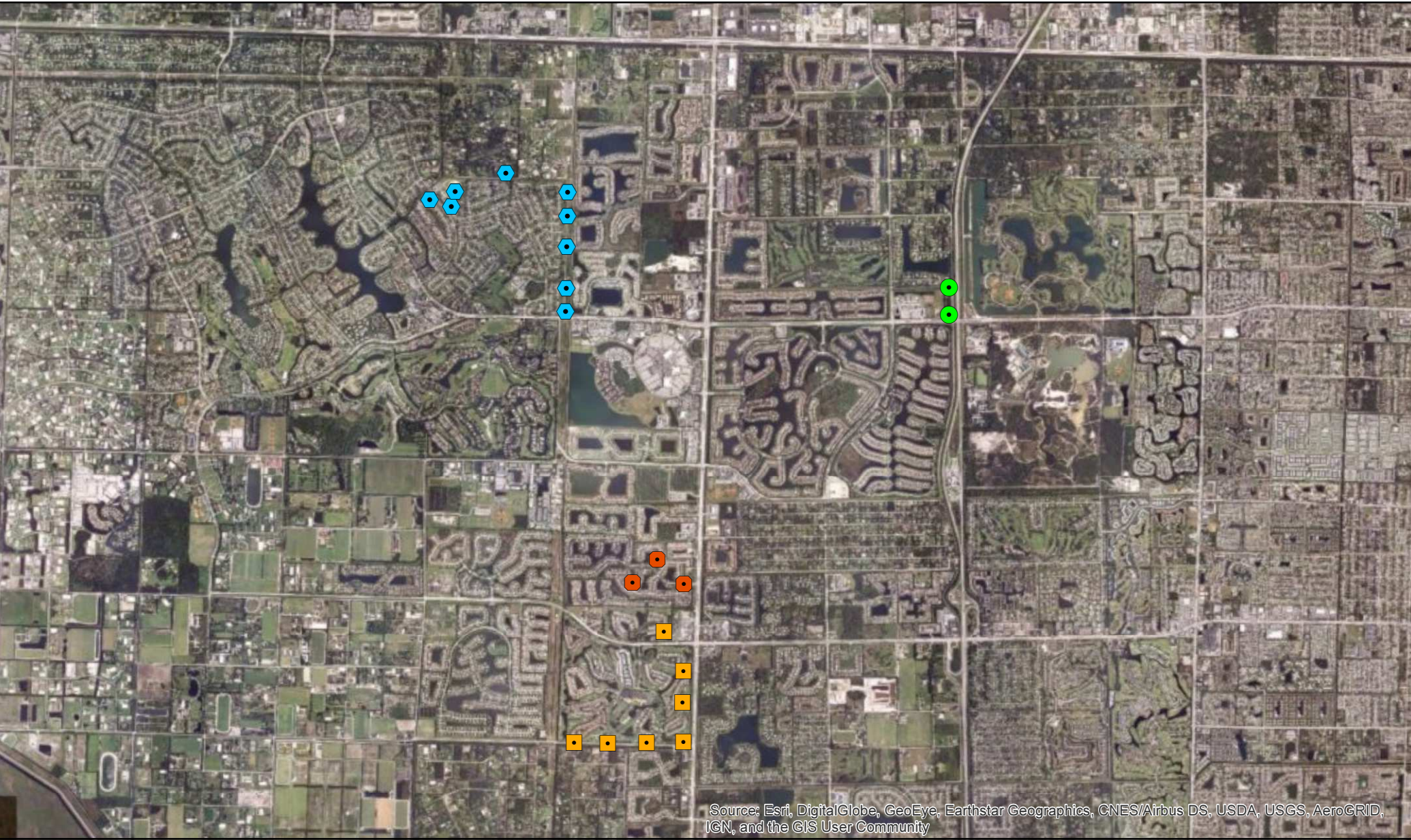
## TABLE

|       |         | <b>Base Condition<br/>(Scenario 1)</b> |      |  | <b>Current CUP<br/>(Scenario 2)</b> |      |  | <b>Increased Withdrawals<br/>(Scenario 3)</b> |       |
|-------|---------|----------------------------------------|------|--|-------------------------------------|------|--|-----------------------------------------------|-------|
| Month |         | MGM                                    | MGD  |  | MGM                                 | MGD  |  | MGM                                           | MGD   |
| Jan   | 31      | 212.03                                 | 6.84 |  | 279.54                              | 9.02 |  | 333.47                                        | 10.76 |
| Feb   | 28      | 217.80                                 | 7.78 |  | 238.73                              | 8.53 |  | 342.55                                        | 12.23 |
| Mar   | 31      | 228.00                                 | 7.35 |  | 274.46                              | 8.85 |  | 358.59                                        | 11.57 |
| Apr   | 30      | 229.12                                 | 7.64 |  | 241.88                              | 8.06 |  | 360.35                                        | 12.01 |
| May   | 31      | 215.61                                 | 6.96 |  | 243.07                              | 7.84 |  | 339.10                                        | 10.94 |
| Jun   | 30      | 202.92                                 | 6.76 |  | 234.10                              | 7.80 |  | 319.14                                        | 10.64 |
| Jul   | 31      | 208.67                                 | 6.73 |  | 228.91                              | 7.38 |  | 328.18                                        | 10.59 |
| Aug   | 31      | 197.46                                 | 6.37 |  | 221.63                              | 7.15 |  | 310.56                                        | 10.02 |
| Sep   | 30      | 185.02                                 | 6.17 |  | 221.16                              | 7.37 |  | 290.98                                        | 9.70  |
| Oct   | 31      | 197.14                                 | 6.36 |  | 267.05                              | 8.61 |  | 310.05                                        | 10.00 |
| Nov   | 30      | 222.94                                 | 7.43 |  | 244.90                              | 8.16 |  | 350.62                                        | 11.69 |
| Dec   | 31      | 218.30                                 | 7.04 |  | 245.80                              | 7.93 |  | 343.33                                        | 11.08 |
|       |         |                                        |      |  |                                     |      |  |                                               |       |
|       | Average | 211.25                                 | 6.95 |  | 245.10                              | 8.06 |  | 332.24                                        | 10.93 |
|       | Max     | 229.12                                 | 7.78 |  | 279.54                              | 9.02 |  | 360.35                                        | 12.23 |
|       | Max Avg | 1.08                                   | 1.12 |  | 1.14                                | 1.12 |  | 1.08                                          | 1.12  |

Table 1  
Village of Wellington (VOW)  
Model Scenario Pumping Rates

## FIGURES





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**WELLFIELD**

-  East
-  North
-  South
-  Not Permitted

**VOW Wellfields  
Well Locations**



|                       |             |  |
|-----------------------|-------------|--|
| JLA Geosciences, Inc. |             |  |
| DATE: 04/17/18        | FIGURE NO.: |  |
| DRAWN BY: PS          | 1           |  |
| PROJECT NO.: 17-047   |             |  |



C-51 Canal

0.1

0.05

0.1

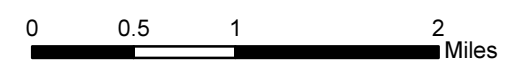
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

WELLFIELD

- East
- North
- South
- Not Permitted

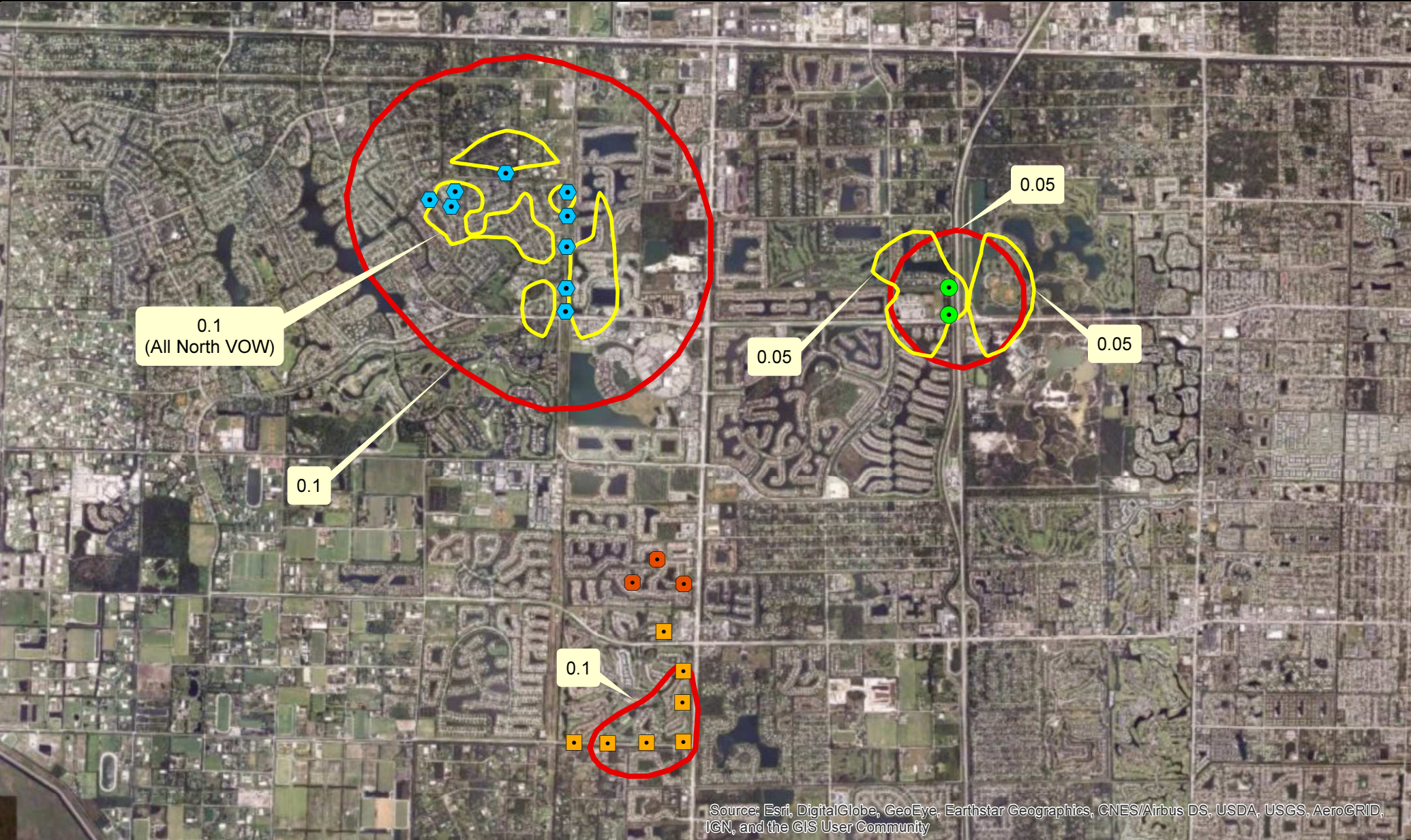
Drawdown Increase (ft)

VOW CUP Model Drawdown Increase  
Permitted (8.0 MGD Avg.) vs.  
Base Condition (6.95 MGD Avg.)



|                       |             |  |
|-----------------------|-------------|--|
| JLA Geosciences, Inc. |             |  |
| DATE: 04/17/18        | FIGURE NO.: |  |
| DRAWN BY: PS          | 2           |  |
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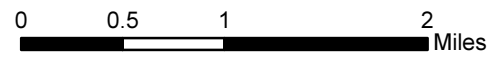


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**WELLFIELD**

- East
- North
- South
- Not Permitted

- VOW Model Drawdown Increase (ft)
- CUP Model Drawdown Increase (ft)



**CUP vs. VOW Models  
Drawdown Increase vs. Base Condition**

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DATE: 04/17/18

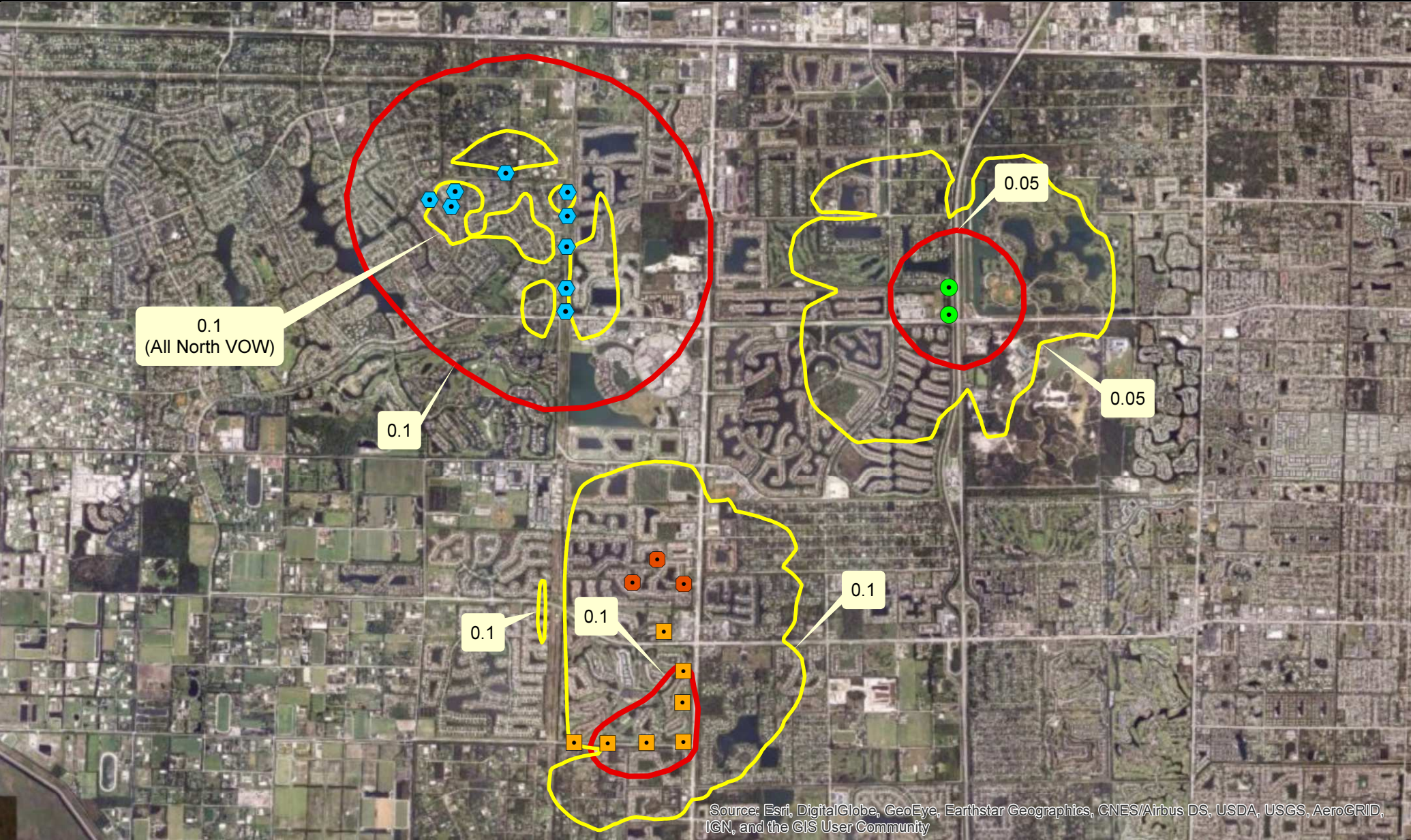
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DRAWN BY: PS

3

PROJECT NO.: 17-047





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**WELLFIELD**

- East
- North
- South
- Not Permitted

— VOW Model Drawdown Increase (ft)  
— CUP Model Drawdown Increase (ft)



0 0.5 1 2 Miles

**VOW Model Drawdown Increase  
Increased Withdrawals (10.93 MGD Avg) vs.  
Base Condition (6.95 MGD Avg)**

JLA Geosciences, Inc.

DATE: 04/17/18

FIGURE NO.:

DRAWN BY: PS

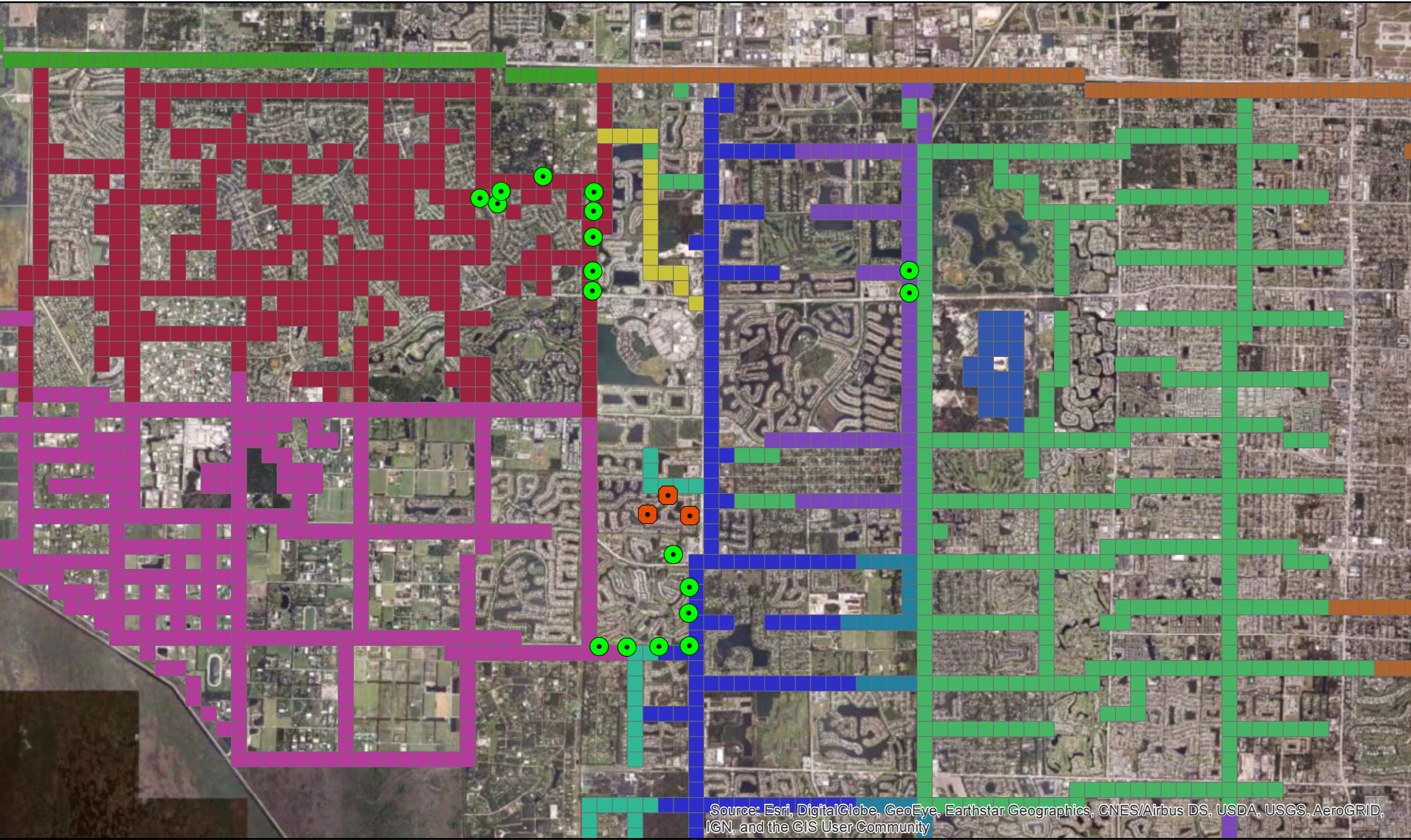
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PROJECT NO.: 17-047

## **APPENDIX A**

### **Canal Seepage Evaluation**





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Not Permitted

Permitted

REACH

8

9

10

39

74

560

561

666

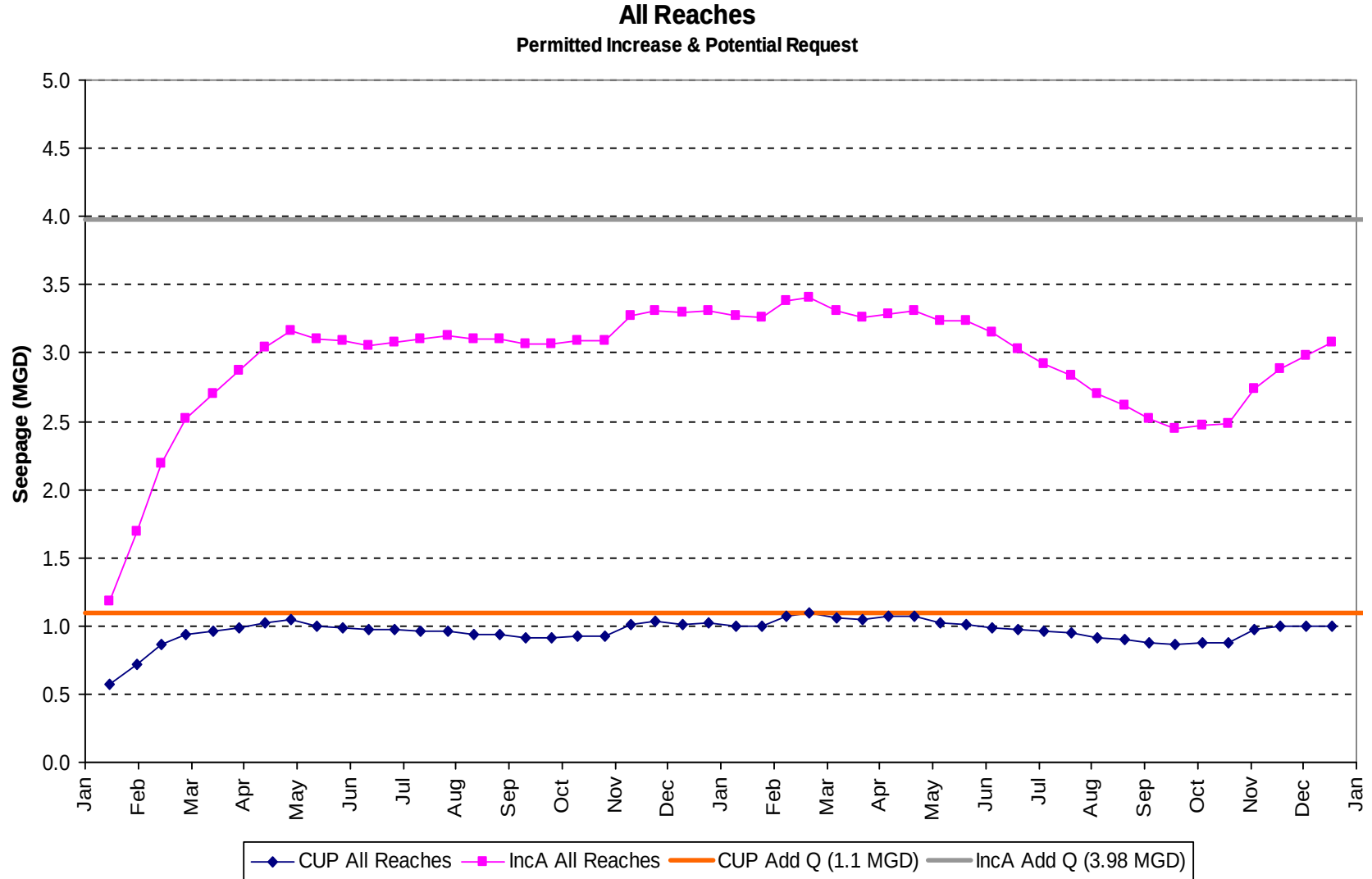
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880

888

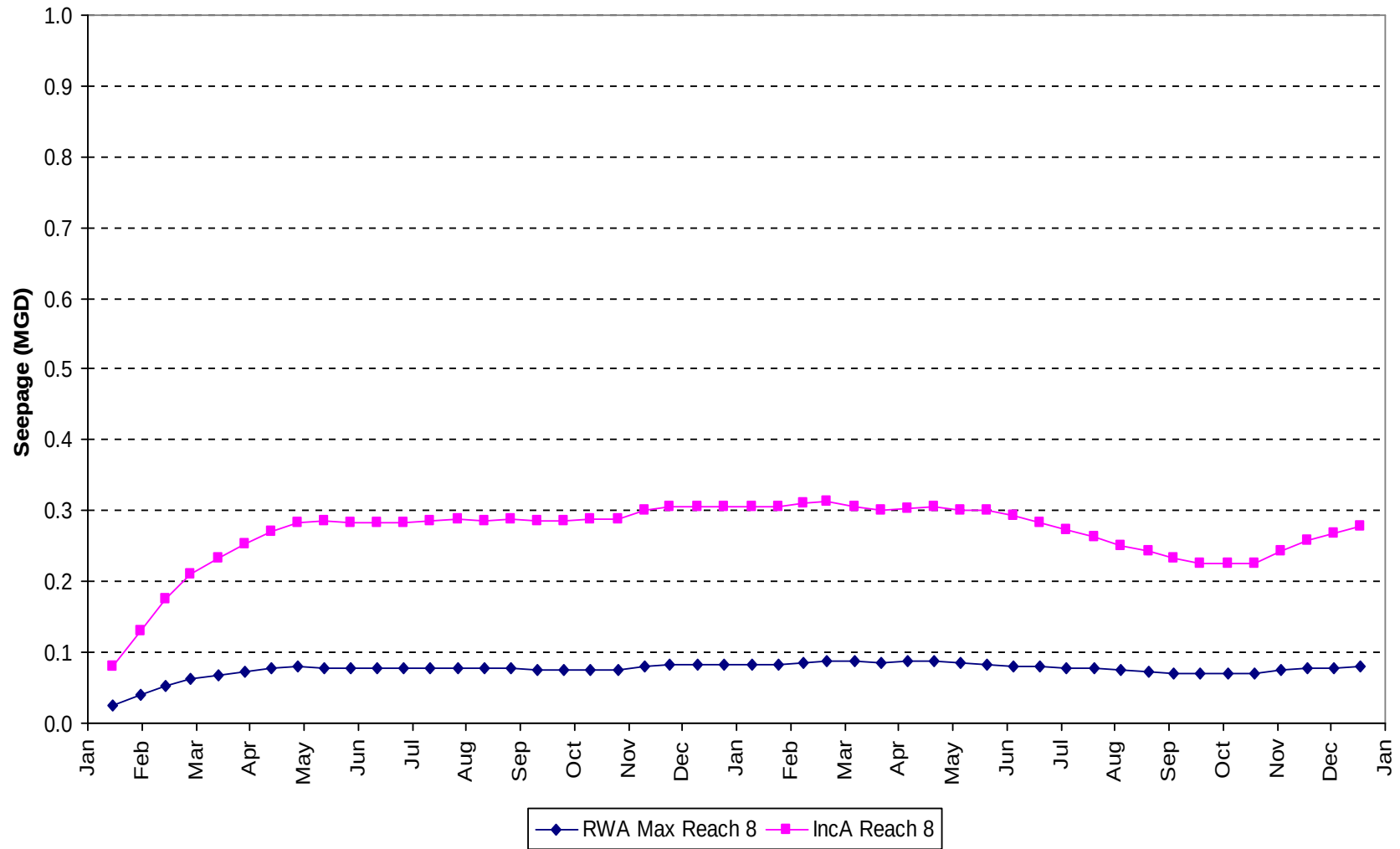
**VOW Wellfield  
Model River Reaches**

|                       |          |                               |
|-----------------------|----------|-------------------------------|
| JLA Geosciences, Inc. |          |                               |
| DATE:                 | 04/17/18 | FIGURE NO.:<br><br><b>A-1</b> |
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| PROJECT NO.:          | 17-047   |                               |

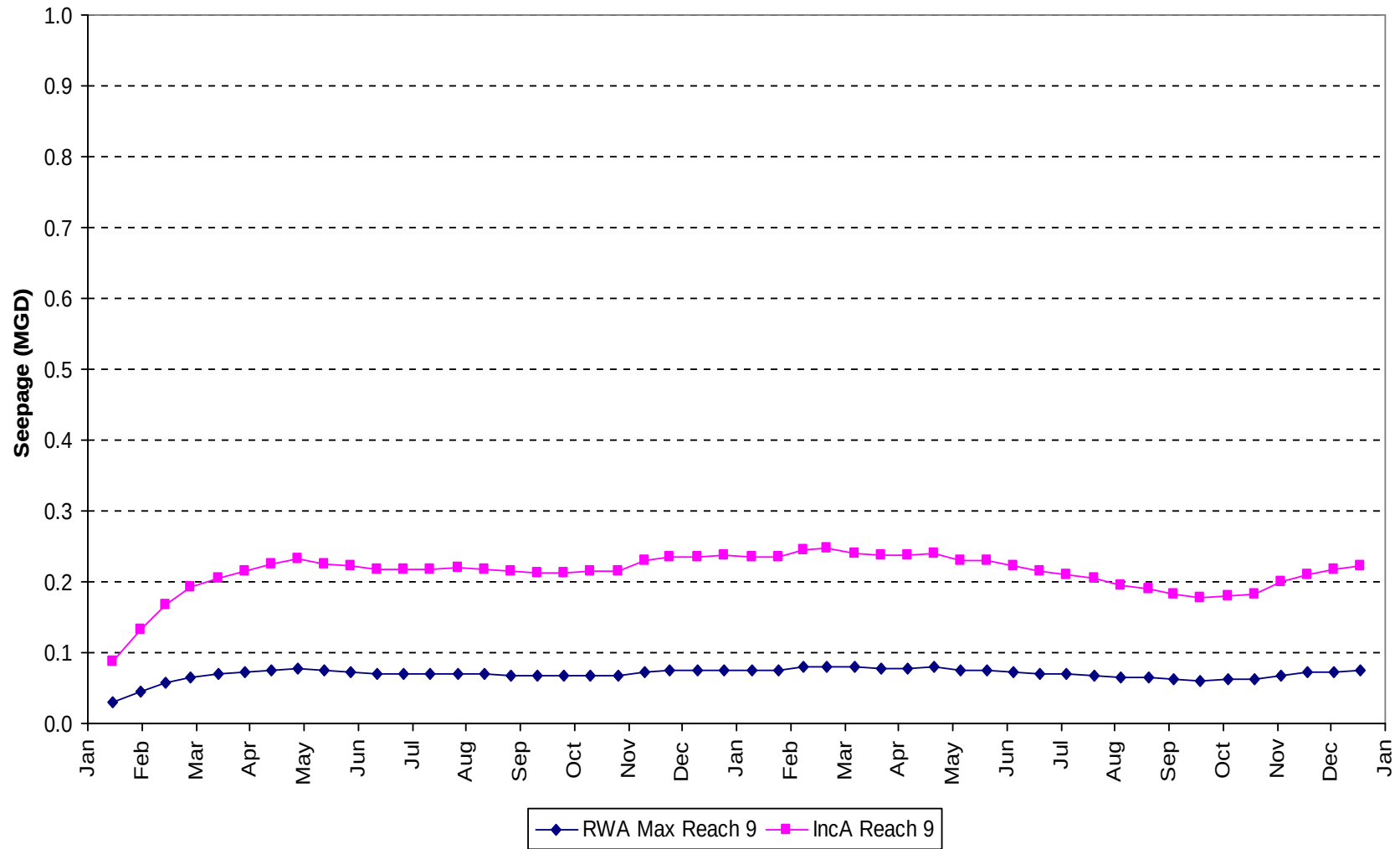




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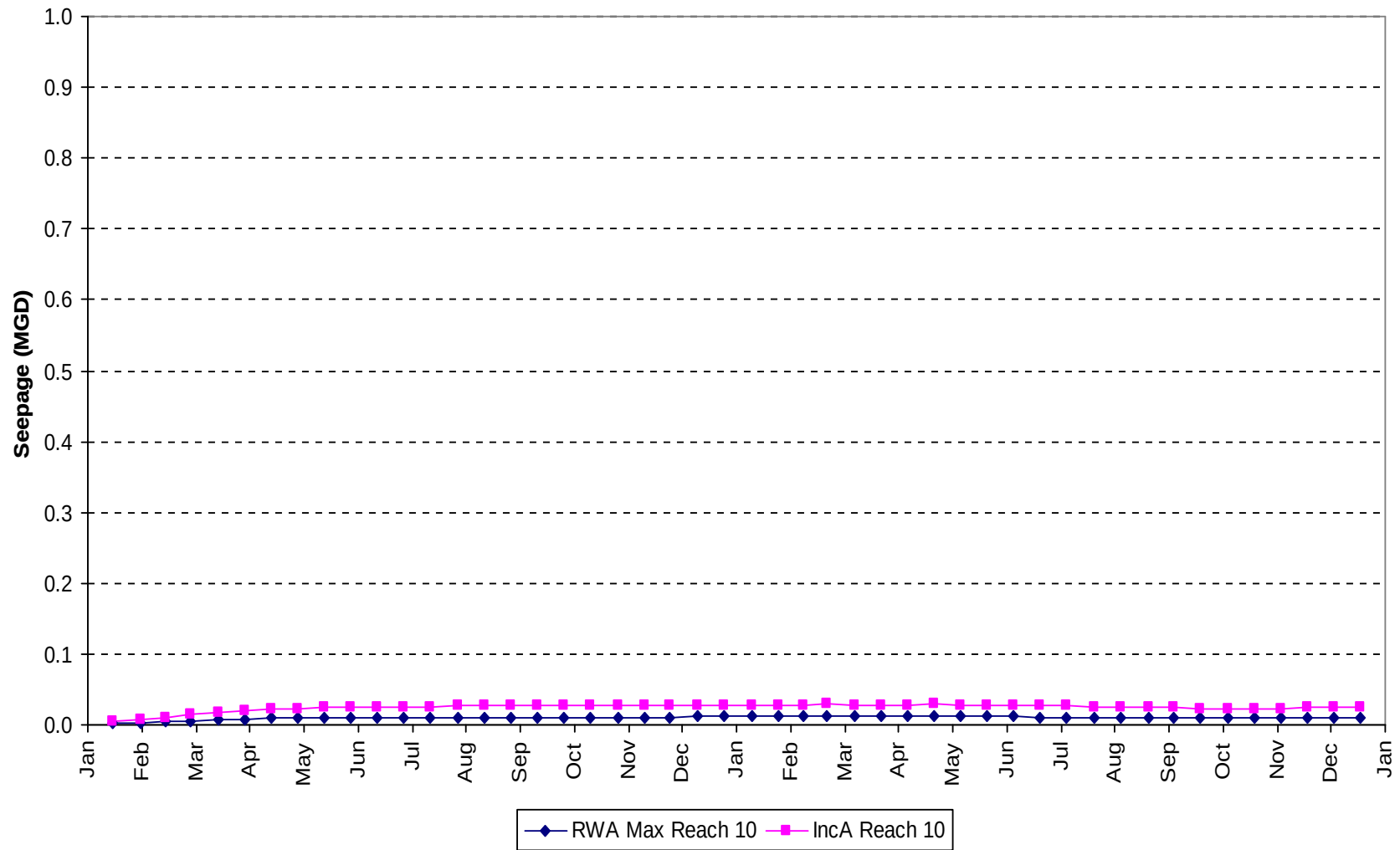


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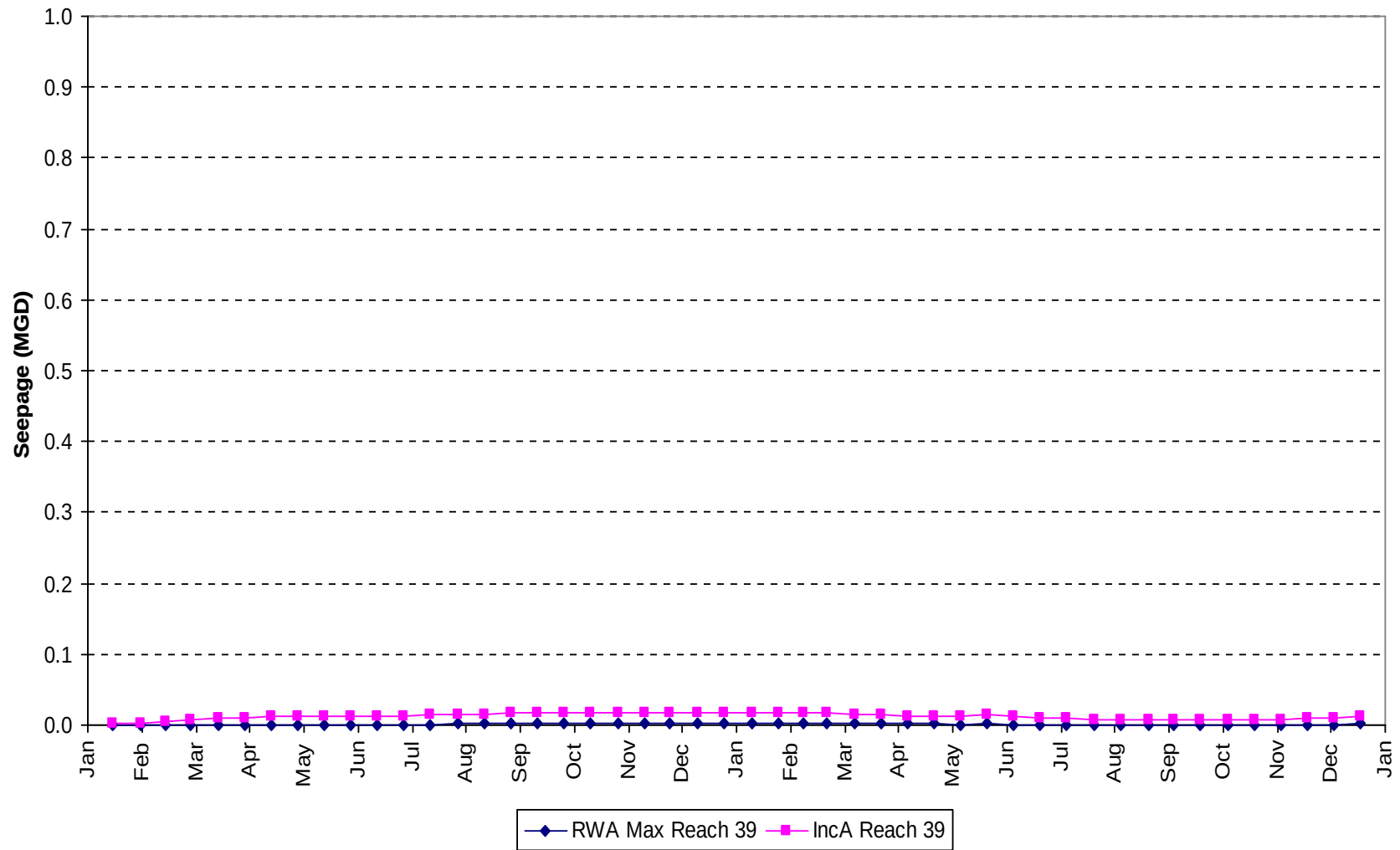




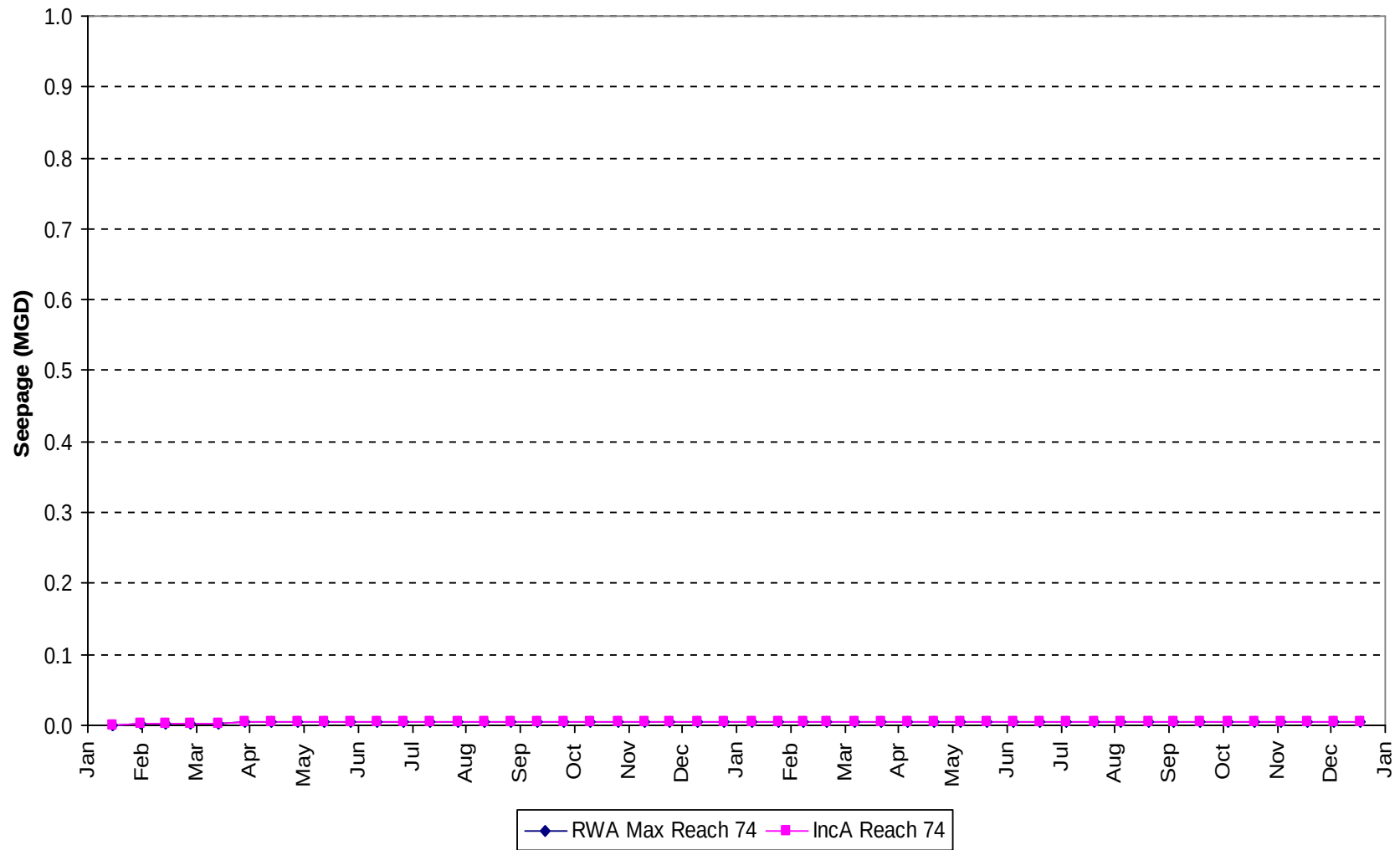
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### Reach 39

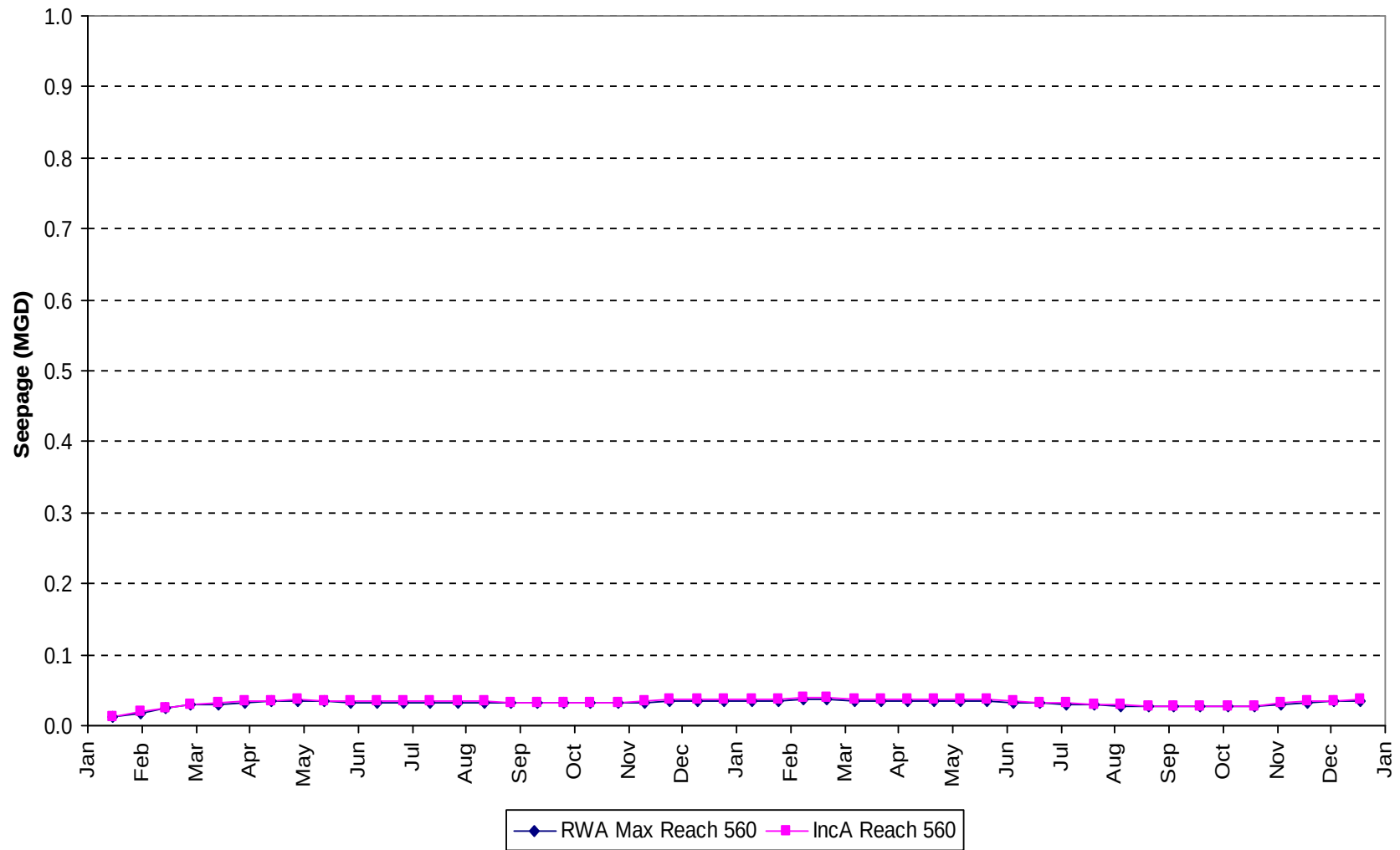


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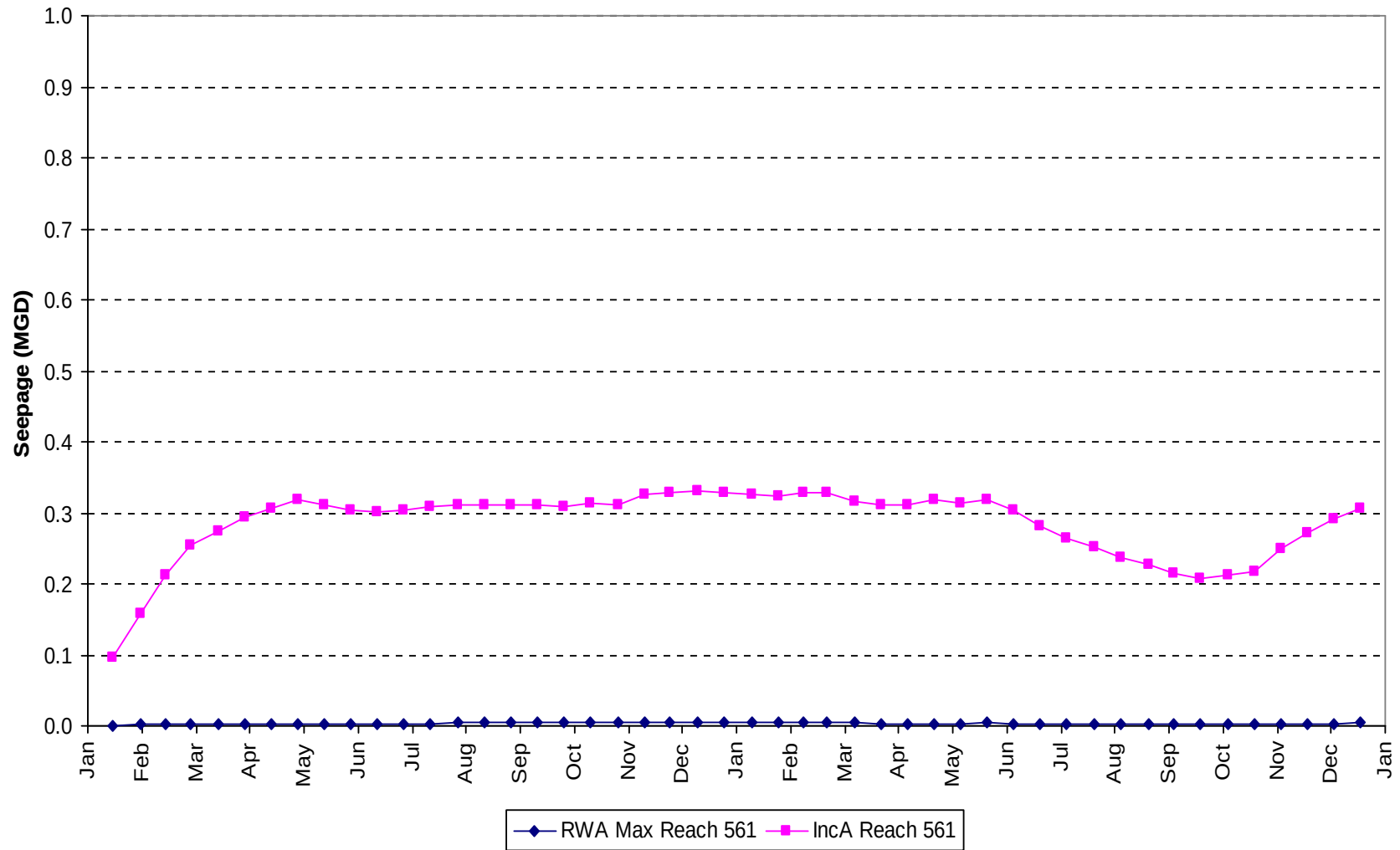




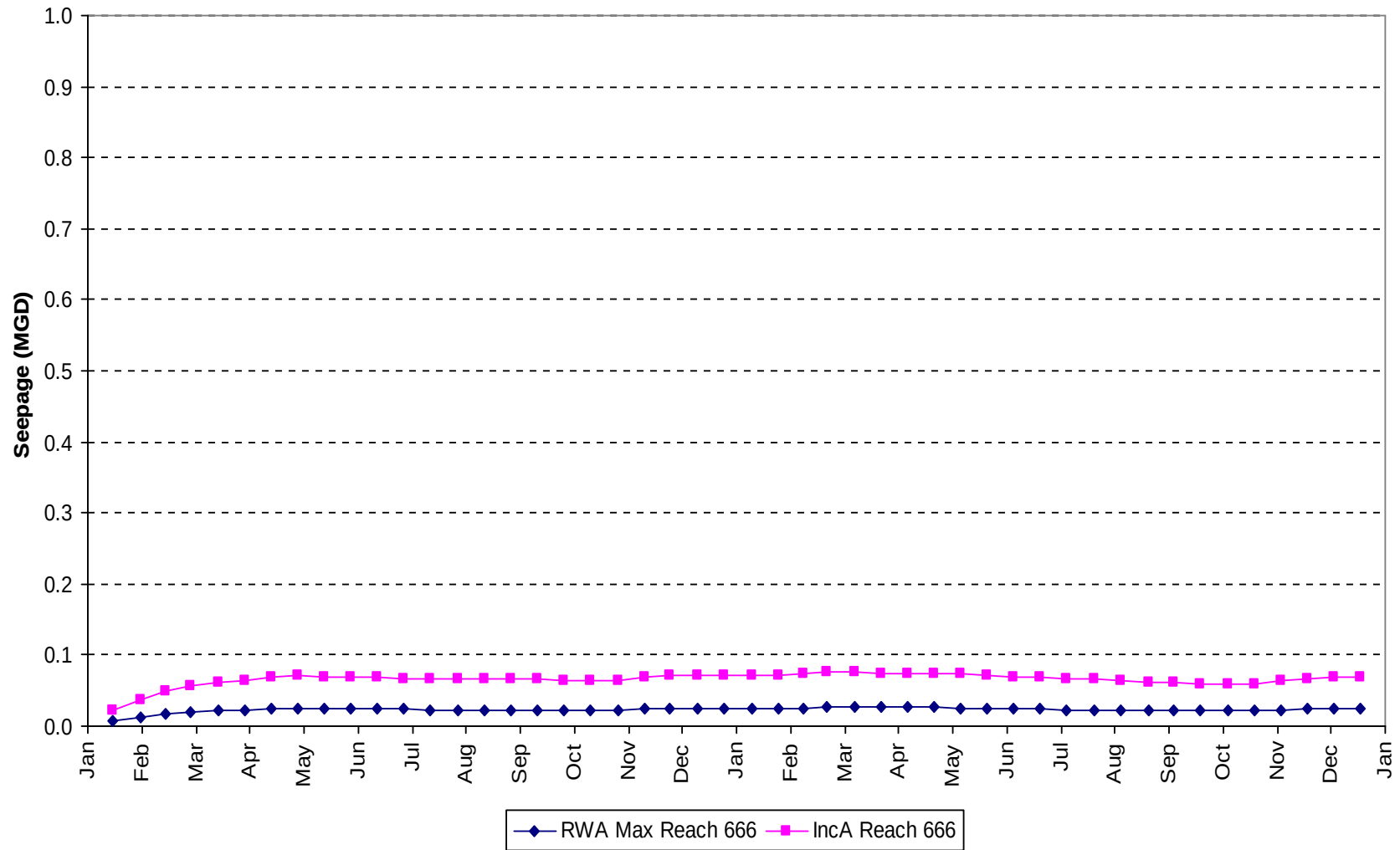
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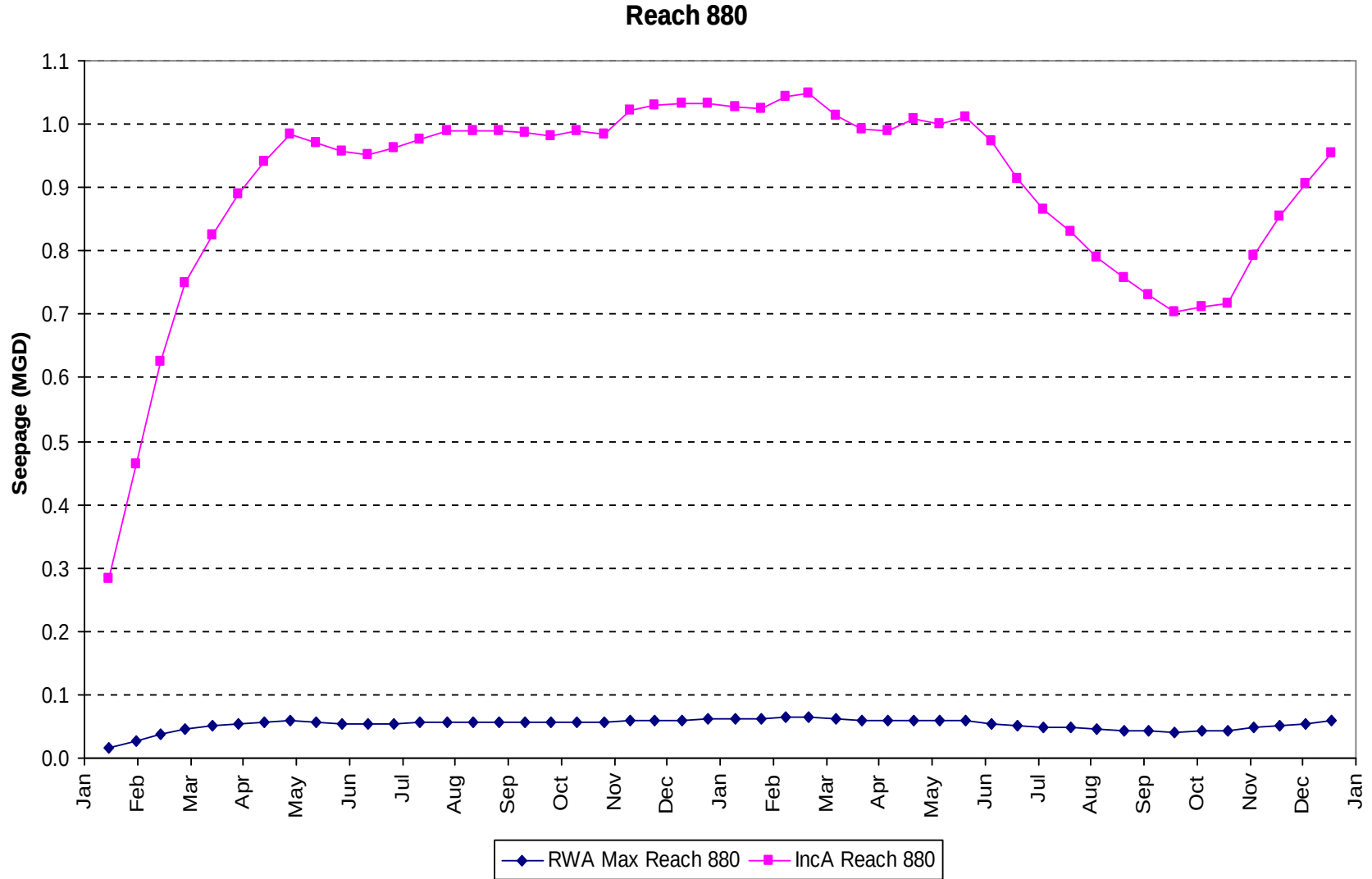
### Reach 561



### Reach 666







### Reach 888

