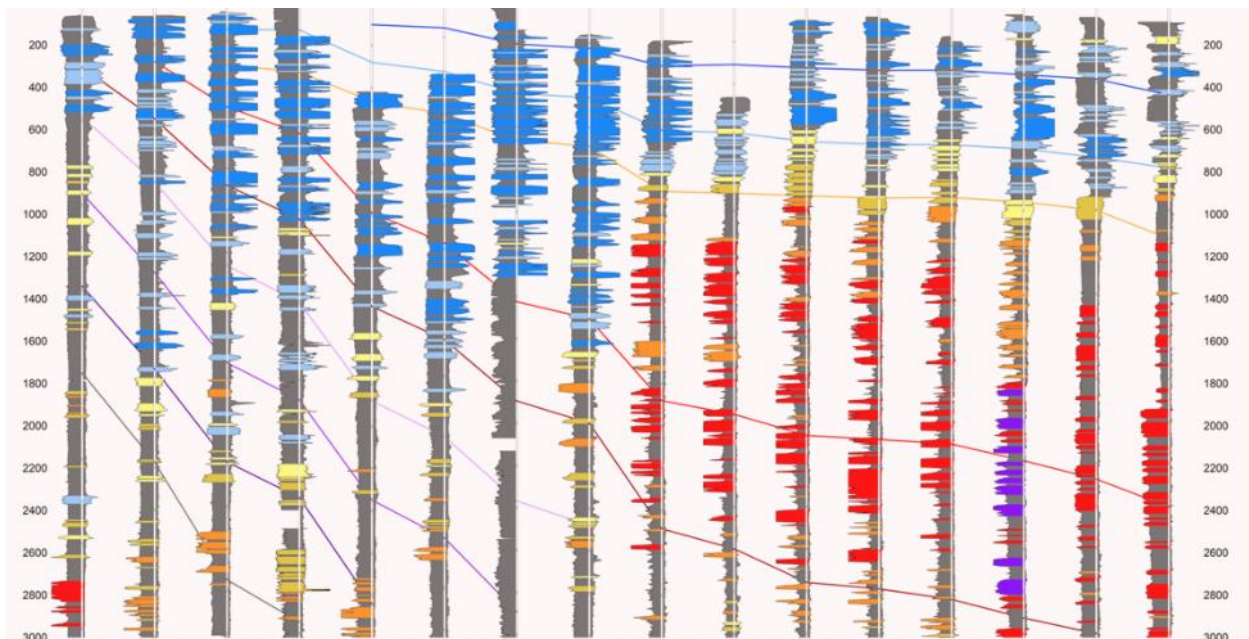


ADDENDUM

Characterization of Brackish Groundwater Resources for Calhoun, Jackson, Refugio, and Victoria Counties

Addendum #1. Simulation of Drawdowns Caused by Large-Scale Production



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MAY 2026

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Characterization of Brackish Groundwater Resources for Calhoun, Jackson, Refugio, and Victoria Counties

Addendum #1. Simulation of Drawdowns Caused by Large-Scale Production

Prepared for: Calhoun County Groundwater Conservation District
Texana Groundwater Conservation District
Refugio Groundwater Conservation District
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MAY 2026

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Acronyms and Abbreviations

CGCBGWF	Central Gulf Coast Brackish Groundwater Flow
GHB	General Head Boundary Condition
RCH	Recharge Boundary
WEL	Well Boundary
TDS	Total Dissolved Solids

1.0 Evaluations of Recharge and Discharge Representations in the CGCBGWF Model

The Central Gulf Coast Brackish Groundwater Flow Model (CGCBGWF Model) accounts for the recharge and discharge processes occurring at land surface and across surface waters using the general head boundaries (GHBs). The GHBs were used exclusively in order to facilitate model calibration. To ensure the model did not produce unrealistic fluxes, the GHB parameters that govern the boundary's capacity to act as a source or sink were constrained during the calibration process. Sensitivity analyses were performed on these calibrated parameters to identify potential limitations of using GHBs to represent recharge and discharge fluxes at aquifer outcrops. These analyses indicated that the current GHB implementation produces acceptable simulated fluxes when pumping is located in deeper model layers (where brackish groundwater exists) rather than in the uppermost layers. However, relying solely on GHBs presents conceptual risks. If groundwater heads near land surface drop significantly below the assigned GHB elevation, the GHB may result in an unrealistic supply of water (recharge) that does not align with actual precipitation or infiltration limits.

To address these concerns and move toward more standard MODFLOW practices, three distinct modeling approaches were evaluated:

1. General Head Boundary (GHB) Approach: Recharge and discharge at land surface are treated as entirely head-dependent. Rates are calculated based on the difference between simulated groundwater heads and assigned GHB hydraulic heads, governed by specified conductance. This approach is adopted in the current report.
2. Combined Recharge Boundary (RCH) and GHB Approach: This method applies fixed recharge rates via the RCH, while treating discharge as a head-dependent process via the GHB.
3. Combined Recharge Boundary (RCH) and Well Boundary (WEL) Approach: Both recharge and discharge are applied as fixed-flux boundaries through RCH and WEL, respectively. This approach assumes that these rates remain constant regardless of fluctuations in simulated groundwater heads.

Among the three methods evaluated, the Combined RCH and GHB approach (Method 2) is considered the most conceptually robust. Unlike the exclusive GHB approach, it decouples the recharge and discharge mechanisms. By using the RCH, the model enforces a physical limit on the amount of water entering the aquifer system based on available precipitation, preventing the potential unrealistic amount of recharge inherent in GHB-only approach. Meanwhile, it retains the GHB's ability to simulate head-dependent discharge, which reliably reflects the natural process that groundwater discharges into surface water bodies only when the water table is sufficiently high.

These three methods are applied to simulate the drawdown impacts at the six test well fields (refer to Table 4-11 in the report). The simulated drawdown using each method at each well field is provided in Appendix A through Appendix F. Comparisons of results suggest that the choice of boundary conditions results in negligible differences in simulated drawdown, indicating that the GHB-based approach (Method 1) remains a valid representation of the aquifer system's hydrological behavior for this specific application. However, the Combined RCH and GHB approach offers two advantages. One advantage is that the RCH-GHB combination is based on a sound conceptual framework. Another advantage is that the RCH-GHB combination prevents declines in the water levels in the shallowest model layer from increases recharge.

For these two reasons, the combined RCH-GHB combination will be used to use evaluate the drawdown impacts caused from large-scale brackish production simulated in the next section

2.0 Evaluations of Drawdown Impacts of Brackish Groundwater Development

The CGCBGWF Model is applied to simulate the drawdown as results of developing slightly saline groundwater (TDS of 1,000 – 3,000 mg/L) and moderately saline groundwater (TDS of 3,000 – 10,000 mg/L) across Victoria, Calhoun, Refugio, and Jackson County. Production well field locations within each TDS zone were selected based on aquifer transmissivity values derived from the model, with specific sites representing maximum and median transmissivity illustrated in **Figure 2-1** and **Figure 2-2**, respectively. As shown in **Table 2-1**, well fields in the slightly saline zone are assigned a production rate of 20,000 acre-feet per year (AFY), while those in the moderately saline zone are assigned 15,000 AFY. Each well field is comprised of nine production wells with 0.5-mile spacing and evenly distributed production rates. These wells are designed to withdraw groundwater from multiple model layers, with recharge and discharge processes represented using a combined RCH and GHB approach.

Table 2-2 presents the simulated drawdown in both brackish and freshwater zones resulting from independent pumping at each well field. For withdrawals in the slightly saline zone, simulations indicate brackish groundwater drawdown ranging from 84 to 132 ft at maximum transmissivity sites and 162 to 342 ft at median transmissivity sites, with associated freshwater drawdown varying between 5 and 54 ft. When pumping in the moderately saline zone, brackish groundwater drawdown ranges from 101 to 121 ft at maximum transmissivity sites and 257 to 667 ft at median transmissivity sites. Freshwater drawdown from moderately saline zone pumping is lower, ranging from 1 to 17 ft, due to the greater vertical separation from the freshwater zones. The spatial distribution of drawdown impacts for each well field is shown in **Figure 2-3 through 2-18**.

The cumulative impacts of simultaneous pumping from four well fields within the same TDS zone are summarized in **Table 2-3**. When pumping concurrently, the brackish groundwater drawdown at maximum transmissivity well fields increases by 44% compared to independent pumping scenarios. The drawdown at median transmissivity well fields increases by only up to 7%, as these well fields are situated in different model layers. Simultaneous pumping in the slightly saline zone results in freshwater drawdown ranging from 11 to 73 ft, while pumping in the moderately saline zone results in 2 to 30 ft of freshwater drawdown.

Figures 2-19 through 2-22 illustrate the spatial distribution of drawdown impacts resulting from simultaneous pumping from four well fields. Because the pumping layers and freshwater layers vary by well field, each figure depicts the composite maximum simulated drawdown across all the pumping layers (ada brackish layers) and all the freshwater layers of a group of four well fields. The composite maximum is generated by creating a raster that uses the maximum drawdown that occurs in any of the layers for a specific grid cell location.

Table 2-1. Locations of well fields for brackish groundwater productions.

Well Field ID	County	Transmissivity Category	Transmissivity Values (ft ² /d)	Latitude	Longitude	TDS Zone	Pumping Rate (AFY)	Pumping Layer	Fresh Water Layer
1	Calhoun	Maximum	13,831	28.602982	-96.867385	Slightly Saline	20,000	5, 6, 7	4
2	Jackson	Maximum	12,183	28.778066	-96.692491	Slightly Saline	20,000	5, 6, 7	4
3	Refugio	Maximum	8,334	28.486643	-96.935126	Slightly Saline	20,000	6, 7	5
4	Victoria	Maximum	15,810	28.742645	-96.711198	Slightly Saline	20,000	5, 6, 7, 8	4
5	Calhoun	Maximum	8,135	28.644489	-96.685370	Moderately Saline	15,000	6, 7	2
6	Jackson	Maximum	9,612	28.730235	-96.629946	Moderately Saline	15,000	7, 8, 9	2
7	Refugio	Maximum	5,914	28.409019	-96.908492	Moderately Saline	15,000	6, 7	3
8	Victoria	Maximum	7,199	28.700720	-96.677623	Moderately Saline	15,000	7, 8, 9	3
9	Calhoun	Median	4,734	28.600325	-96.762608	Slightly Saline	20,000	4, 5	2
10	Jackson	Median	3,910	29.055364	-96.513285	Slightly Saline	20,000	10, 11	8
11	Refugio	Median	2,718	28.354453	-96.985759	Slightly Saline	20,000	5	3
12	Victoria	Median	3,433	29.003648	-96.889548	Slightly Saline	20,000	11, 12	9
13	Calhoun	Median	1,788	28.480441	-96.690943	Moderately Saline	15,000	5	1
14	Jackson	Median	1,662	29.077143	-96.559339	Moderately Saline	15,000	13	9
15	Refugio	Median	1,218	28.173684	-97.391508	Moderately Saline	15,000	8, 9	4
16	Victoria	Median	1,589	28.841911	-96.988164	Moderately Saline	15,000	13	6

Table 2-2. Simulated drawdown by pumping at each well field independently.

Well Field ID	County	Transmissivity Category	TDS Zone	Pumping Rate (AFY)	Drawdown (ft) after 30 Years	
					Brackish Zone	Freshwater Zone
1	Calhoun	Maximum	Slightly Saline	20,000	84	34
2	Jackson	Maximum	Slightly Saline	20,000	93	36
3	Refugio	Maximum	Slightly Saline	20,000	132	54
4	Victoria	Maximum	Slightly Saline	20,000	84	35
5	Calhoun	Maximum	Moderately Saline	15,000	101	8
6	Jackson	Maximum	Moderately Saline	15,000	102	4
7	Refugio	Maximum	Moderately Saline	15,000	121	12
8	Victoria	Maximum	Moderately Saline	15,000	105	10
9	Calhoun	Median	Slightly Saline	20,000	162	24
10	Jackson	Median	Slightly Saline	20,000	339	8
11	Refugio	Median	Slightly Saline	20,000	269	43
12	Victoria	Median	Slightly Saline	20,000	342	42
13	Calhoun	Median	Moderately Saline	15,000	257	13
14	Jackson	Median	Moderately Saline	15,000	667	11
15	Refugio	Median	Moderately Saline	15,000	402	17
16	Victoria	Median	Moderately Saline	15,000	600	1

Table 2-3. Simulated drawdown by pumping at four well fields simultaneously.

TDS Zone	Maximum Transmissivity				Median Transmissivity			
	Well Field ID	Pumping Rate (AFY)	Drawdown (ft) after 30 Years		Well Field ID	Pumping Rate (AFY)	Drawdown (ft) after 30 Years	
			Brackish Zone	Freshwater Zone			Brackish Zone	Freshwater Zone
Slightly Saline	1	20,000	114	57	9	20,000	166	27
	2	20,000	144	71	10	20,000	363	11
	3	20,000	152	72	11	20,000	272	45
	4	20,000	138	73	12	20,000	366	55
Moderately Saline	5	15,000	152	19	13	15,000	258	13
	6	15,000	161	13	14	15,000	695	16
	7	15,000	129	16	15	15,000	403	17
	8	15,000	175	30	16	15,000	629	2

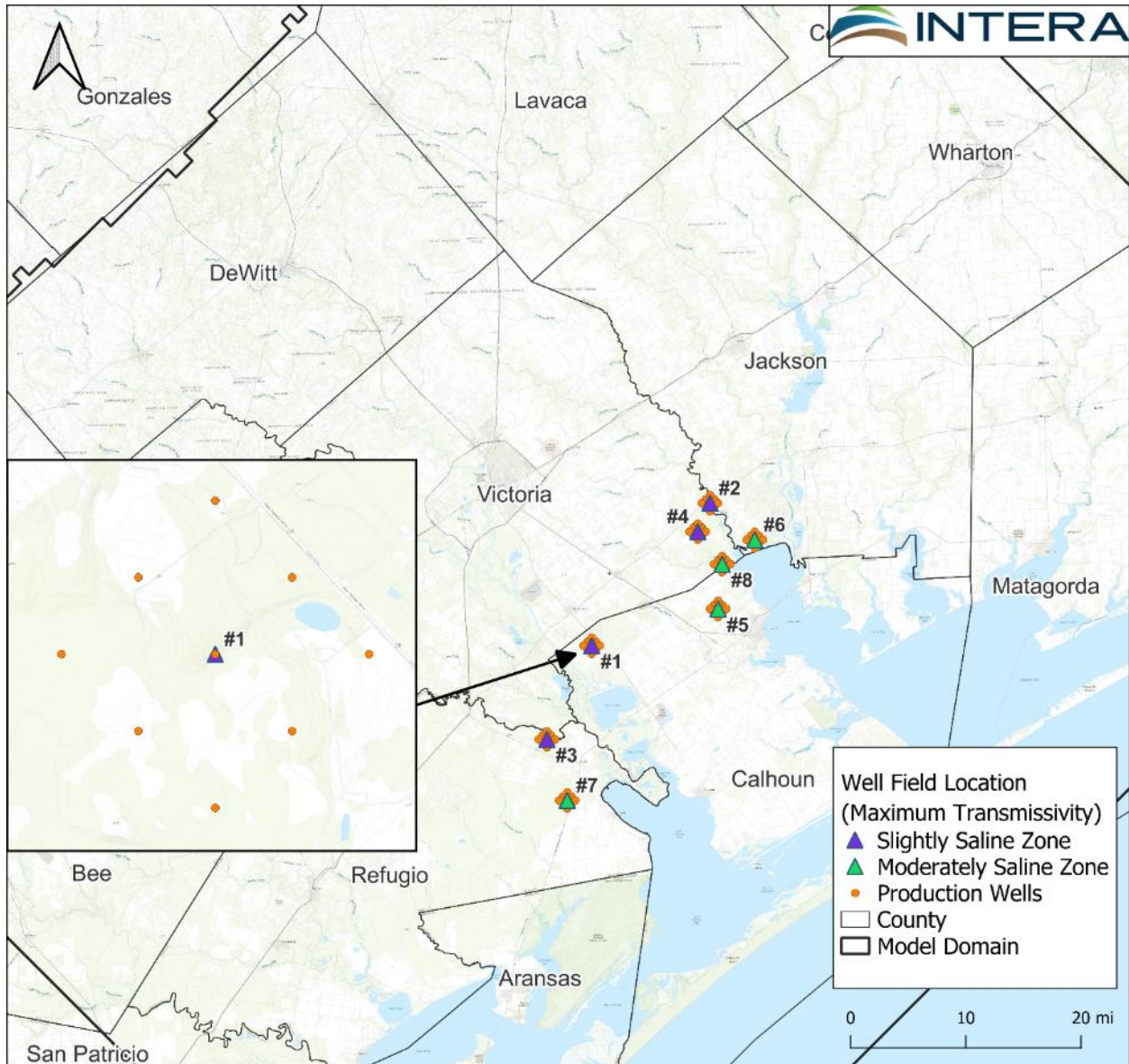


Figure 2-1. Well fields at the sites of maximum aquifer transmissivity values derived from the CGCBGWF Model.

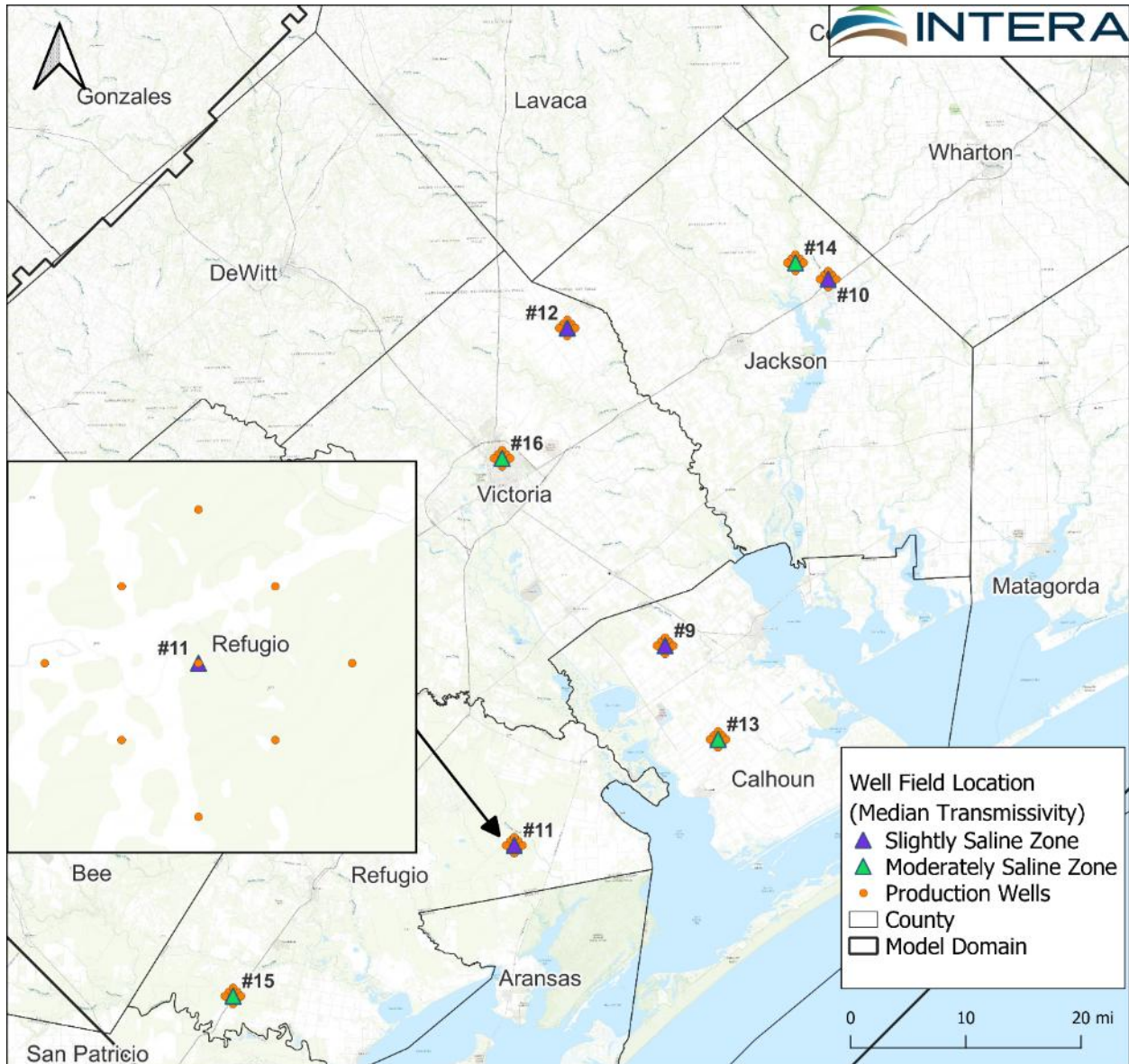
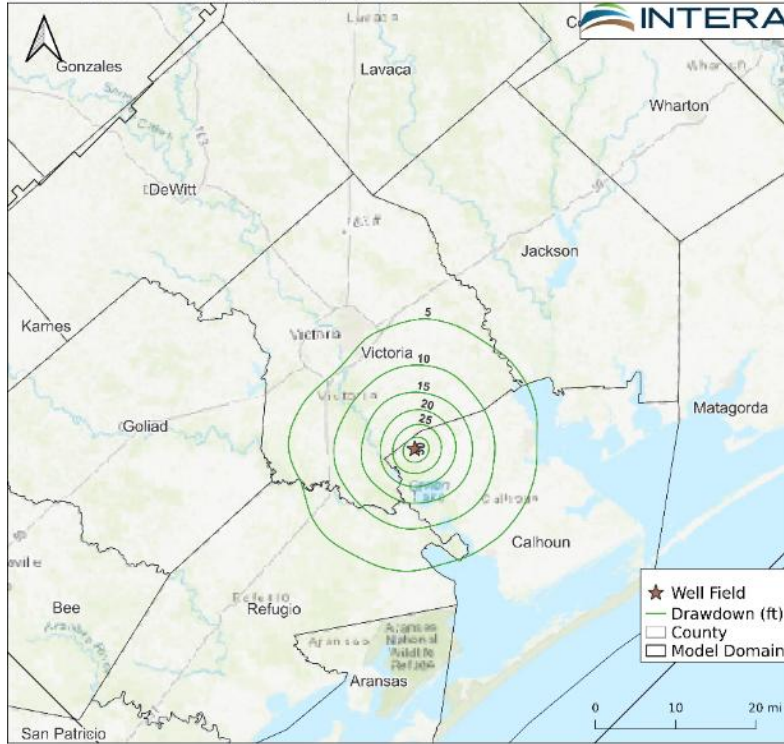


Figure 2-2. Well fields at the sites of median aquifer transmissivity values derived from the CGCBGWF Model.

Calhoun, Maximum Transmissivity, Layer 4 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Calhoun, Maximum Transmissivity, Layer 6 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

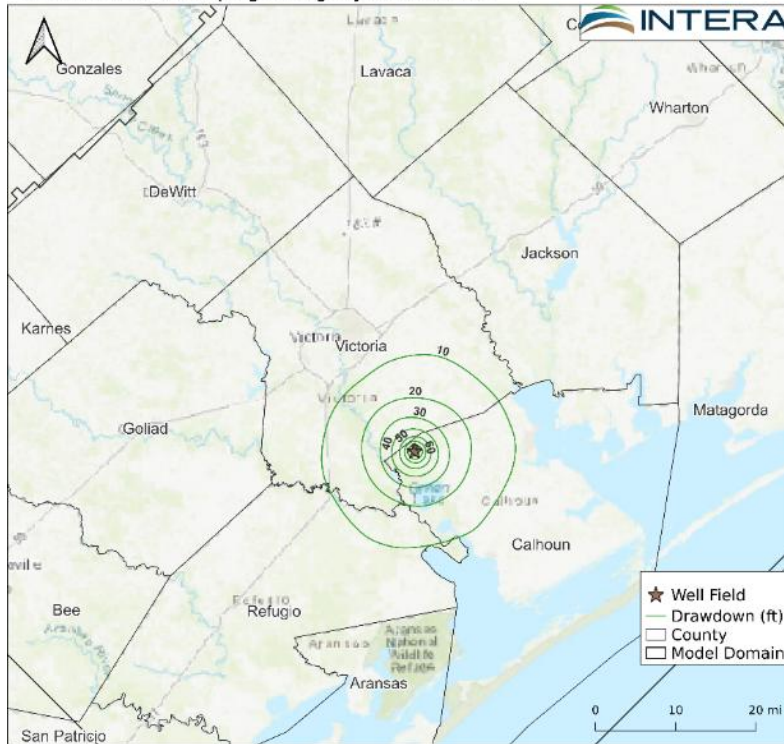
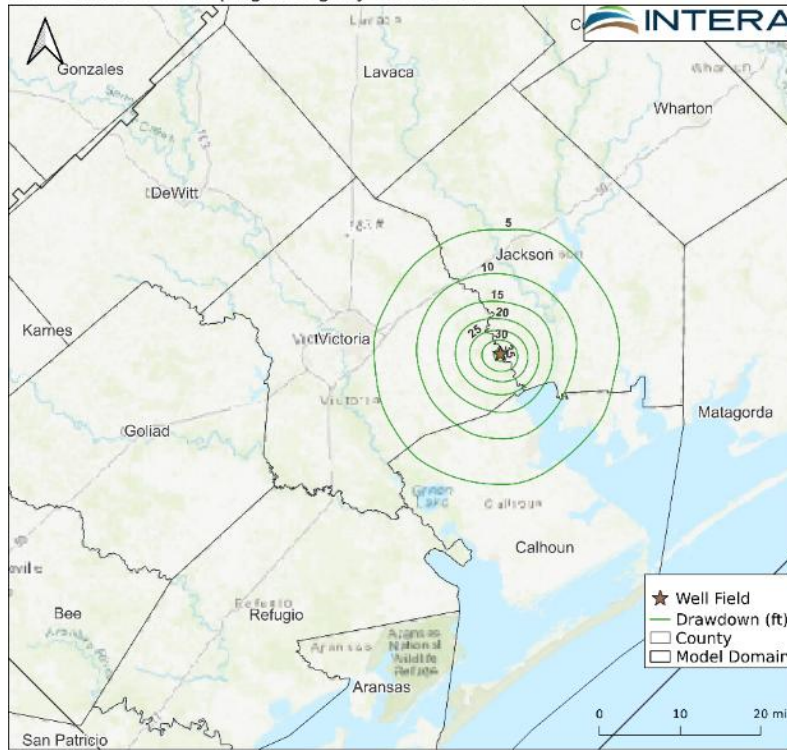


Figure 2-3. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #1.

Jackson, Maximum Transmissivity, Layer 4 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Jackson, Maximum Transmissivity, Layer 6 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

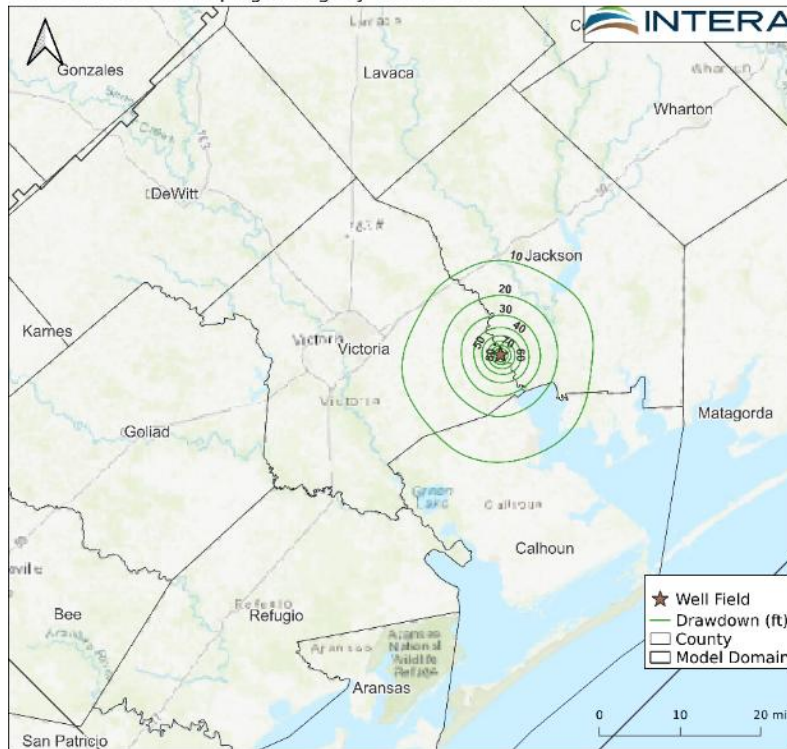
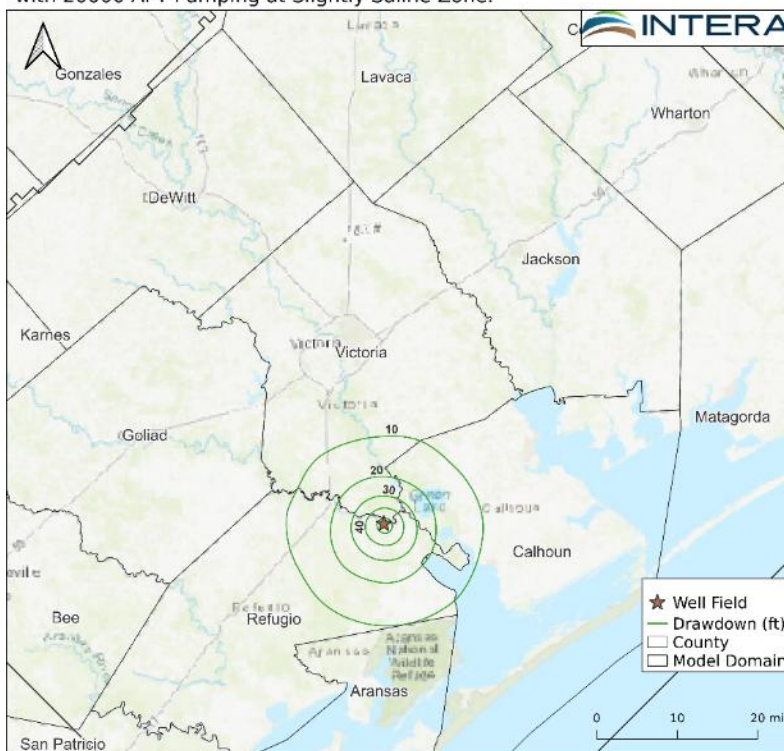


Figure 2-4. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #2.

Refugio, Maximum Transmissivity, Layer 5 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Refugio, Maximum Transmissivity, Layer 6 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

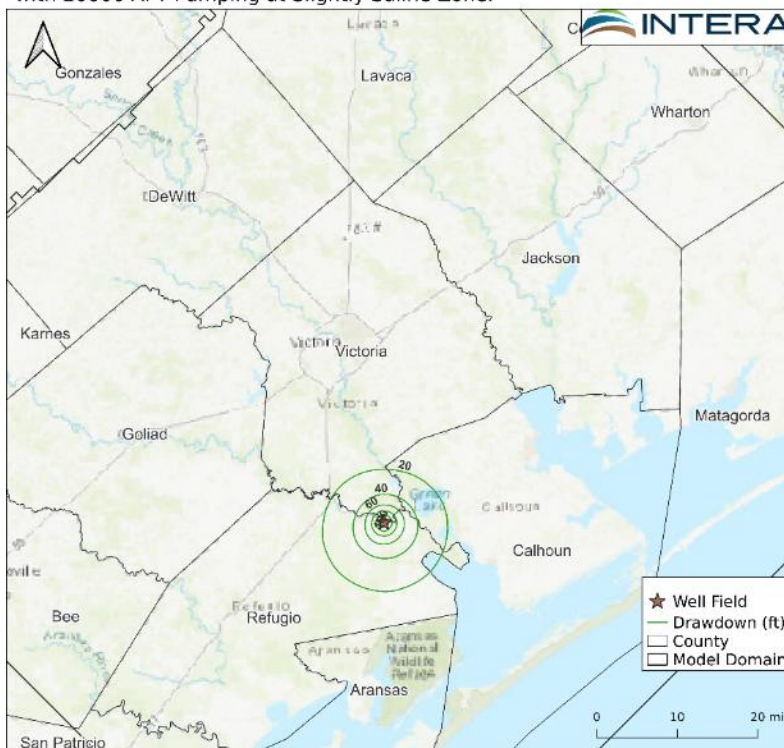
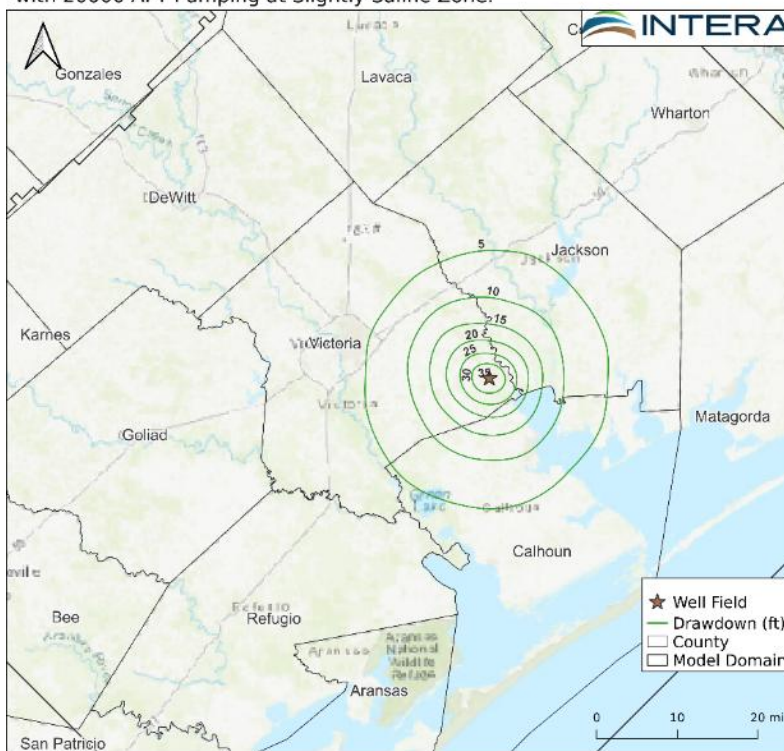


Figure 2-5. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #3.

Victoria, Maximum Transmissivity, Layer 4 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Victoria, Maximum Transmissivity, Layer 6 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

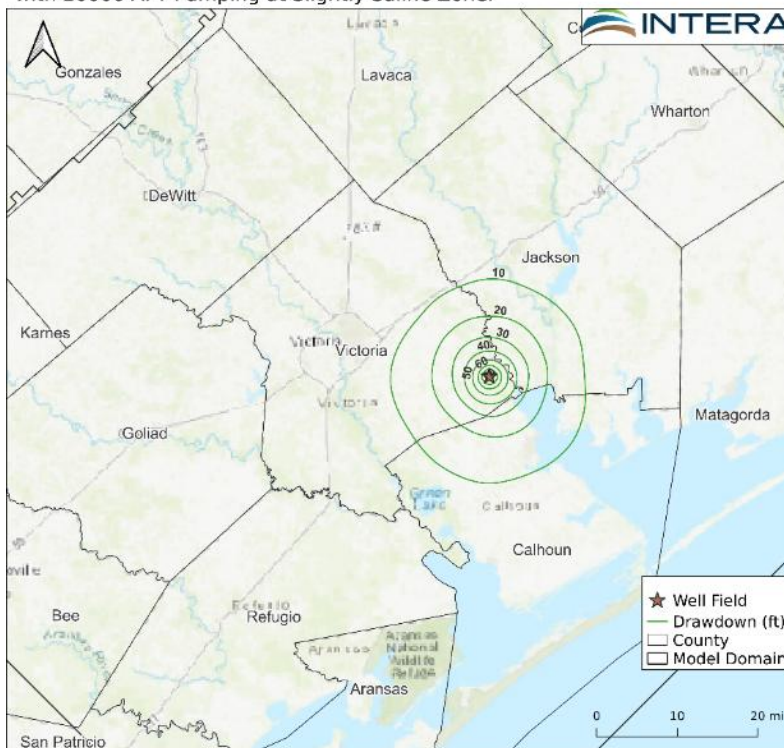
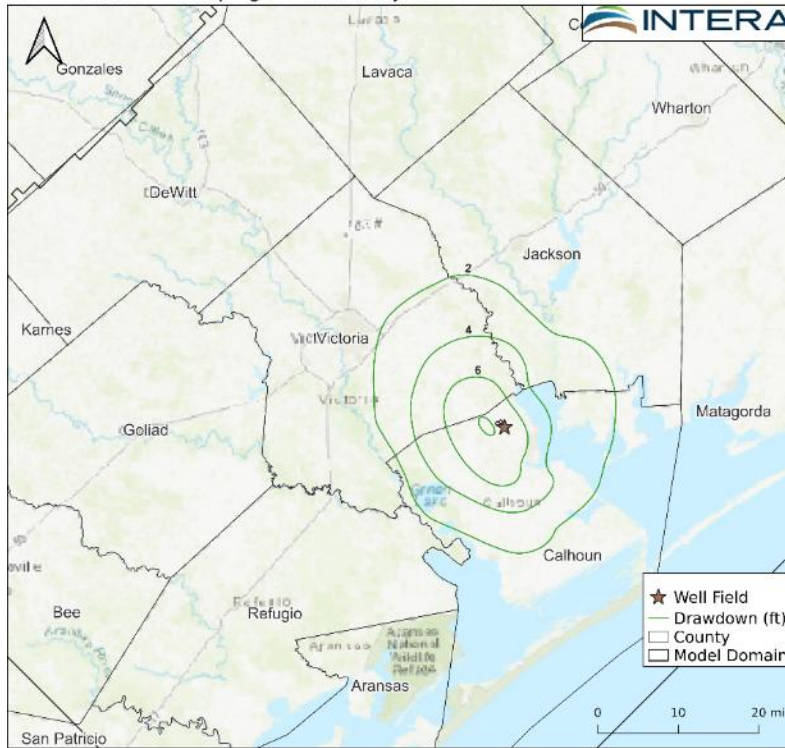


Figure 2-6. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #4.

Calhoun, Maximum Transmissivity, Layer 2 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Calhoun, Maximum Transmissivity, Layer 6 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

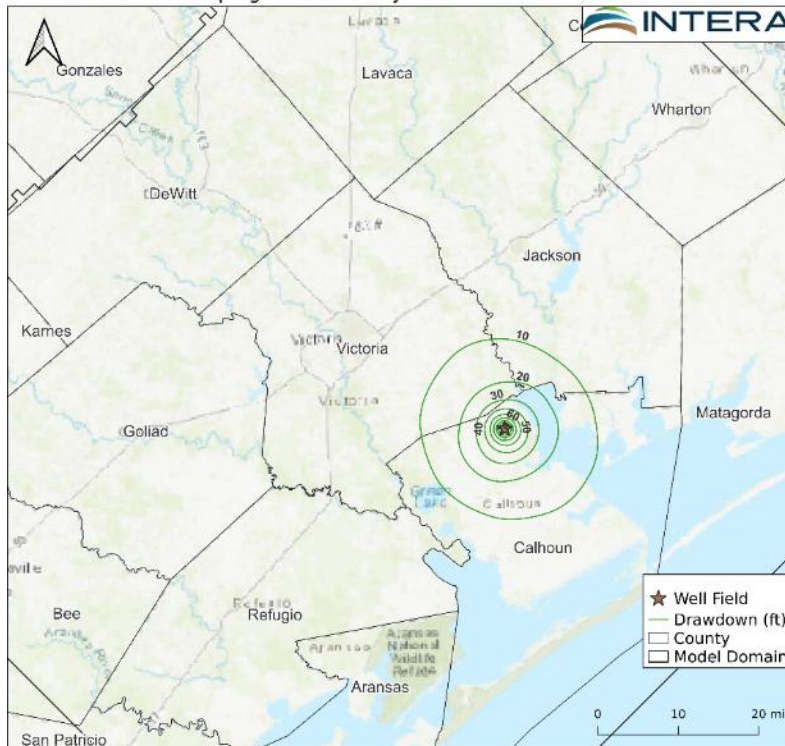
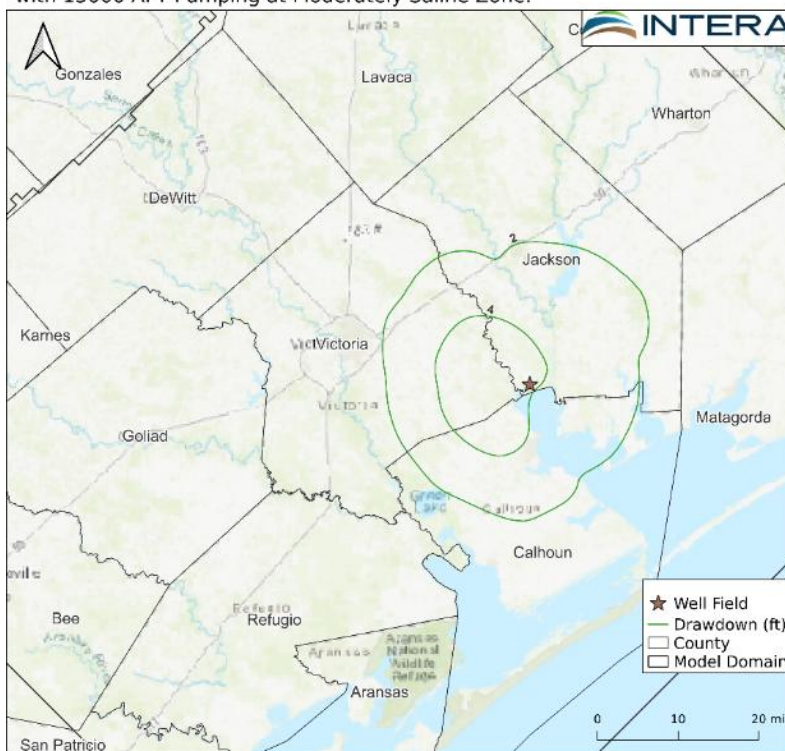


Figure 2-7. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #5.

Jackson, Maximum Transmissivity, Layer 2 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Jackson, Maximum Transmissivity, Layer 8 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

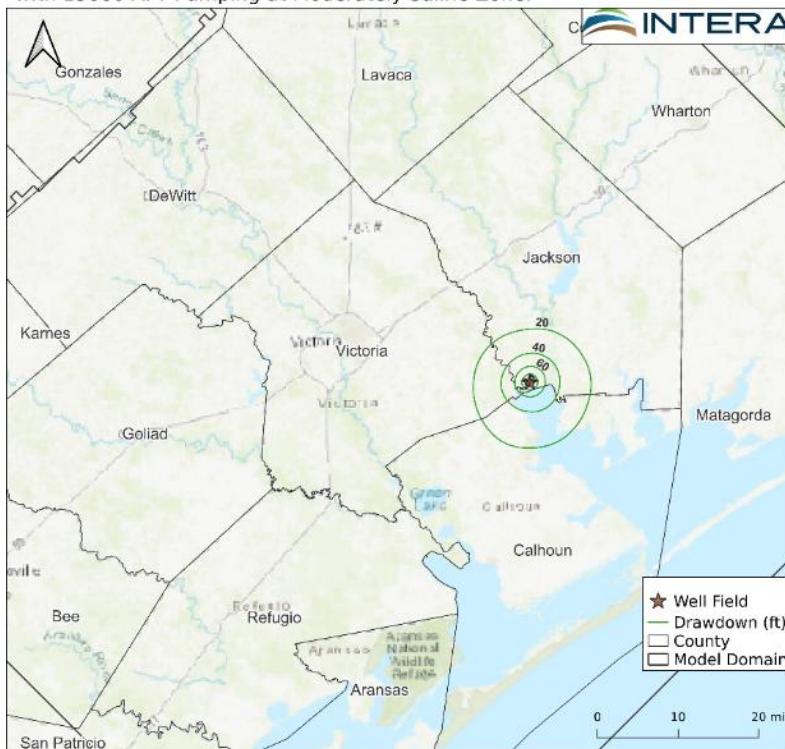
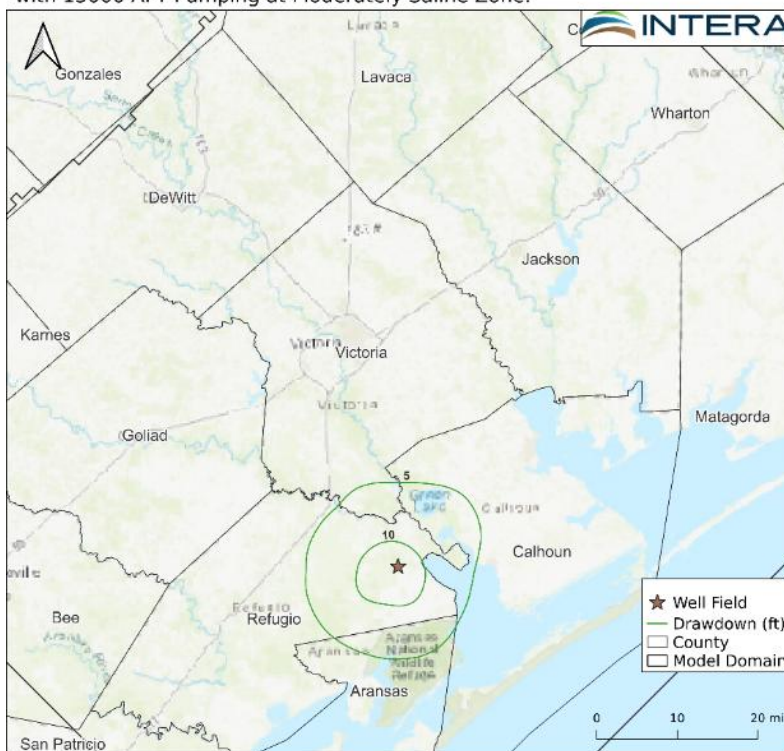


Figure 2-8. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #6.

Refugio, Maximum Transmissivity, Layer 3 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Refugio, Maximum Transmissivity, Layer 6 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

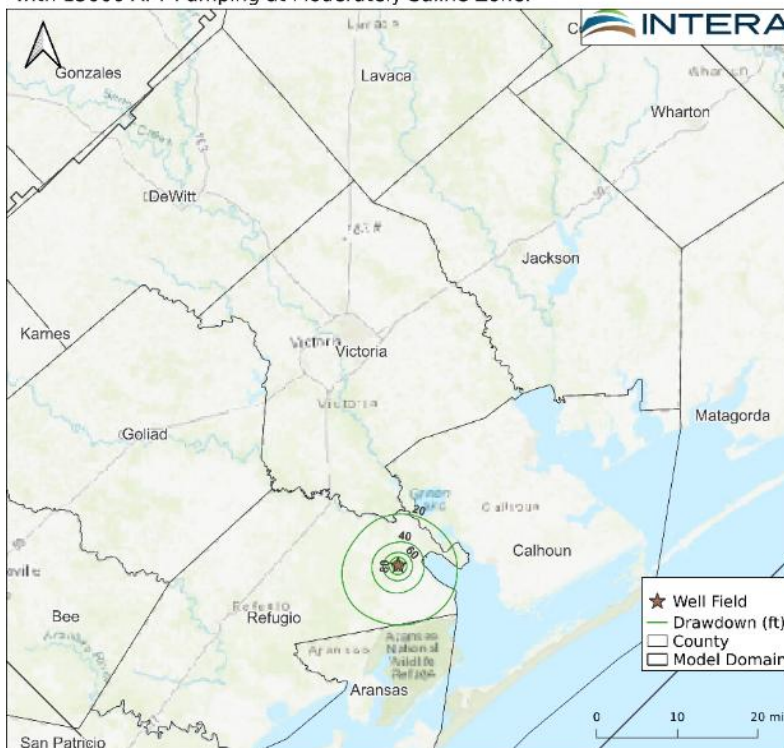
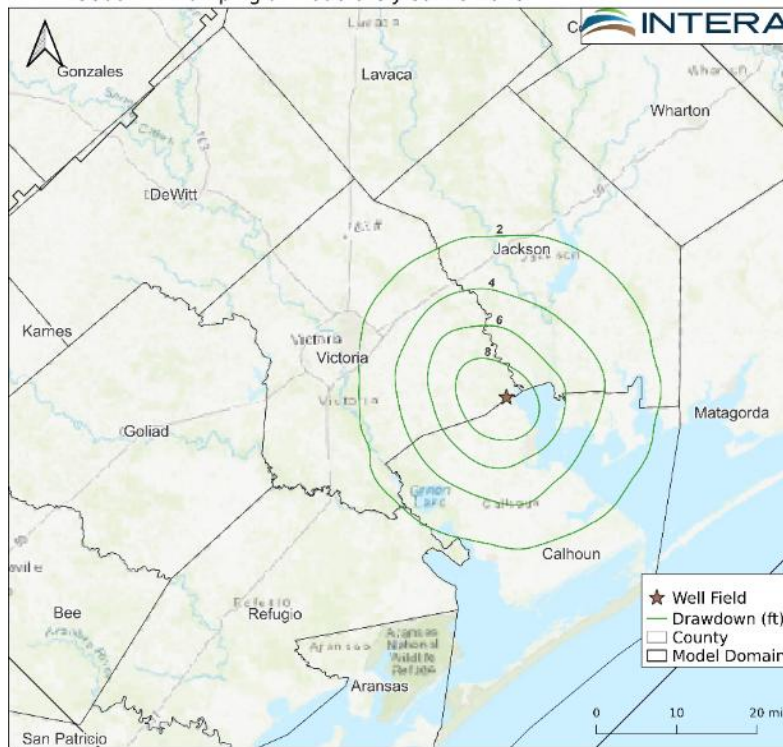


Figure 2-9. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #7.

Victoria, Maximum Transmissivity, Layer 3 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Victoria, Maximum Transmissivity, Layer 8 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

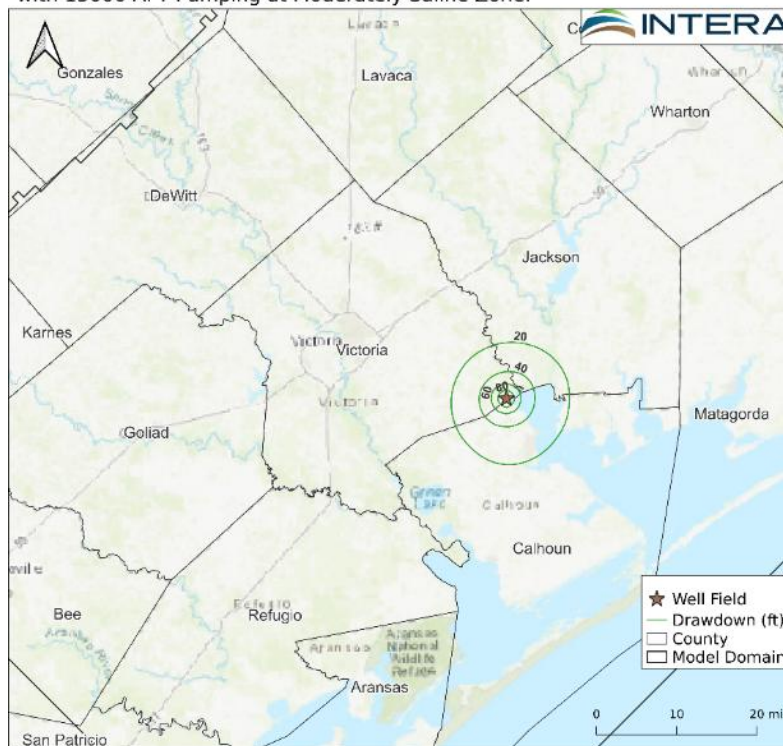
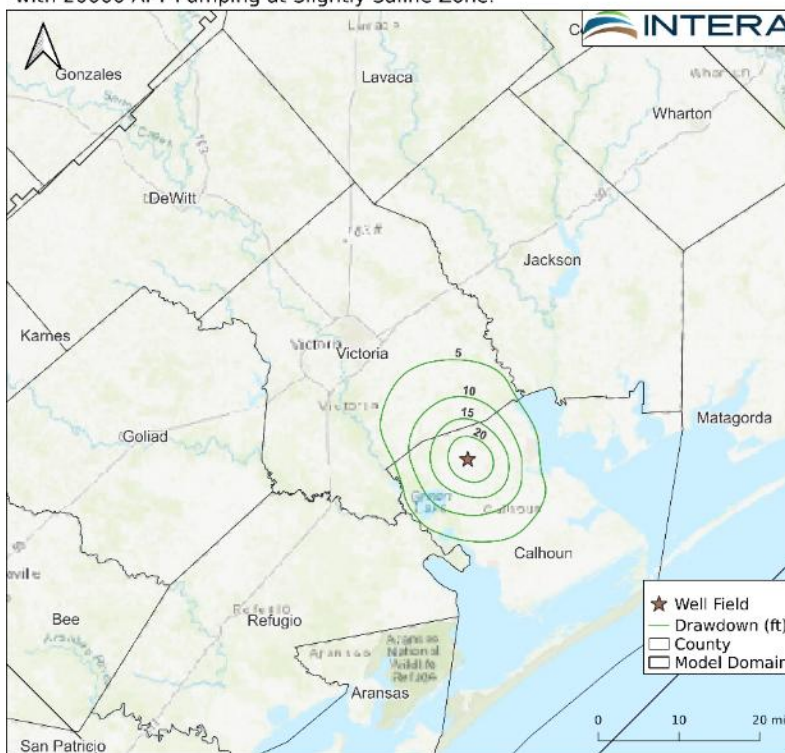


Figure 2-10. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #8.

Calhoun, Median Transmissivity, Layer 2 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Calhoun, Median Transmissivity, Layer 4 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

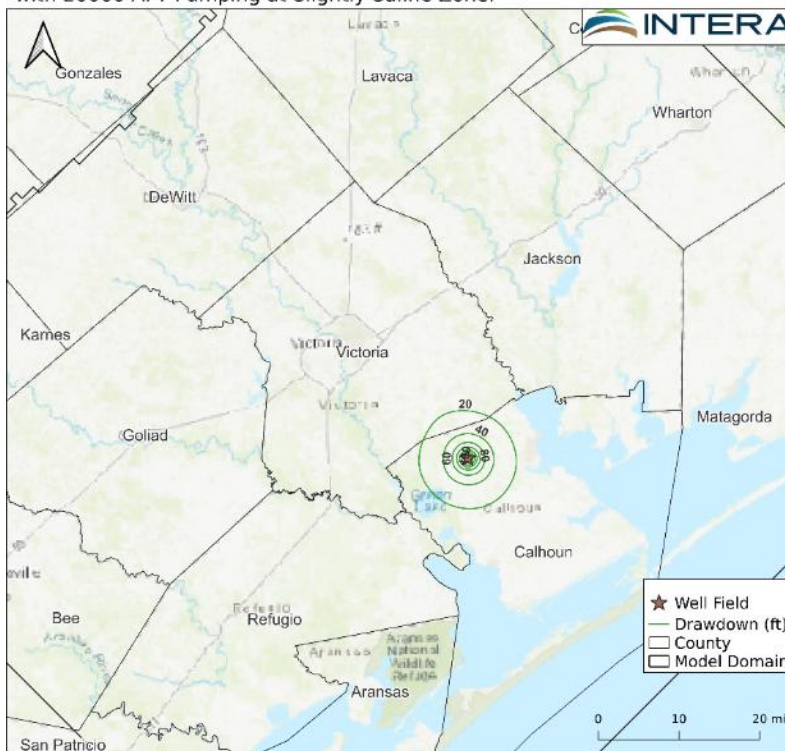
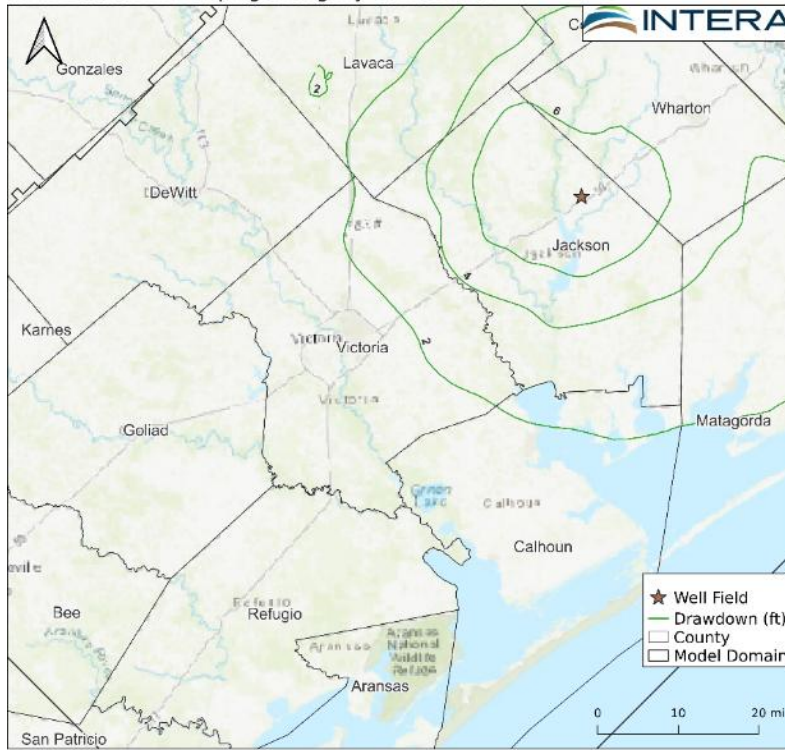


Figure 2-11. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #9.

Jackson, Median Transmissivity, Layer 8 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Jackson, Median Transmissivity, Layer 10 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

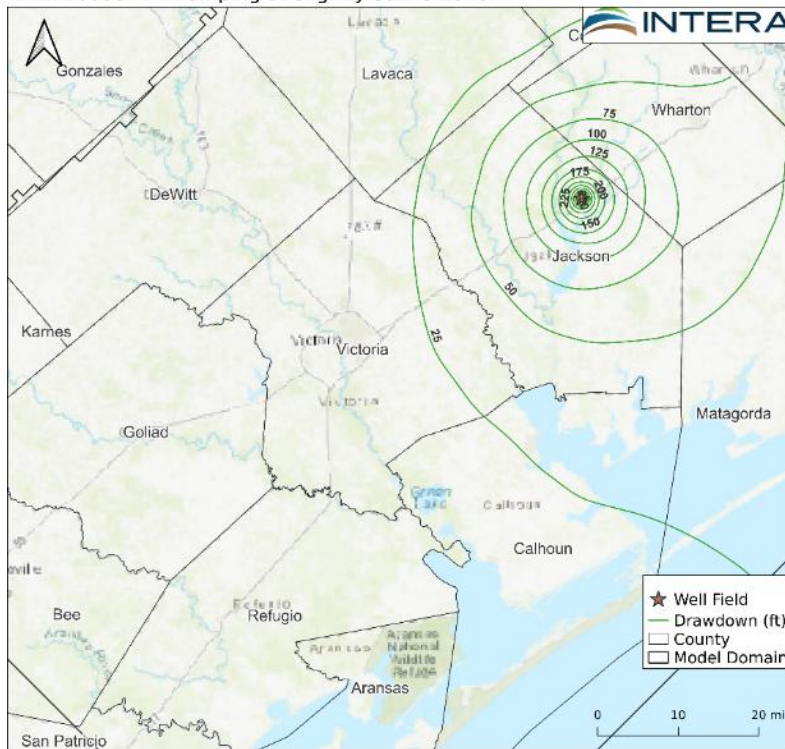
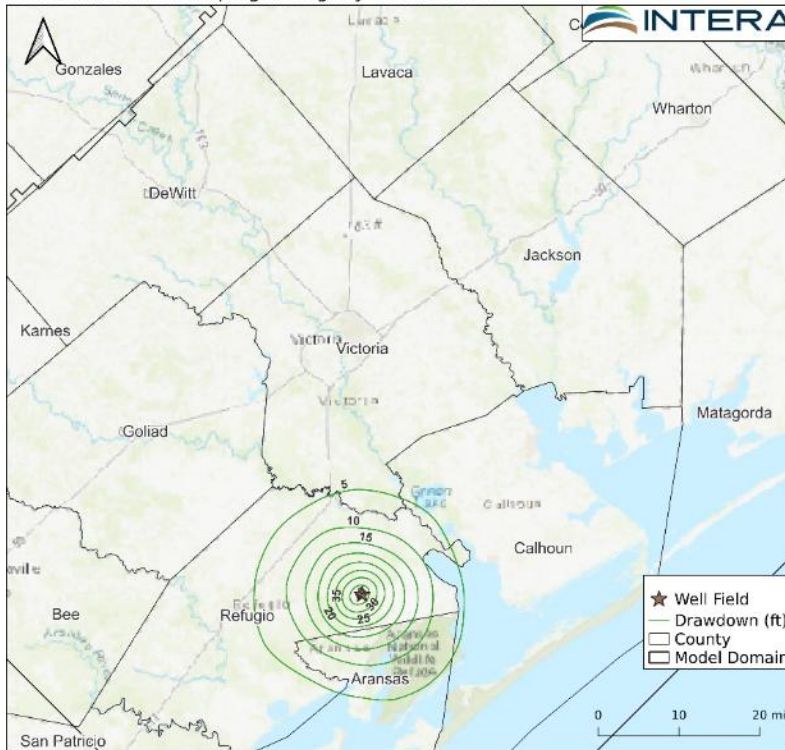


Figure 2-12. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #10.

Refugio, Median Transmissivity, Layer 3 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Refugio, Median Transmissivity, Layer 5 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

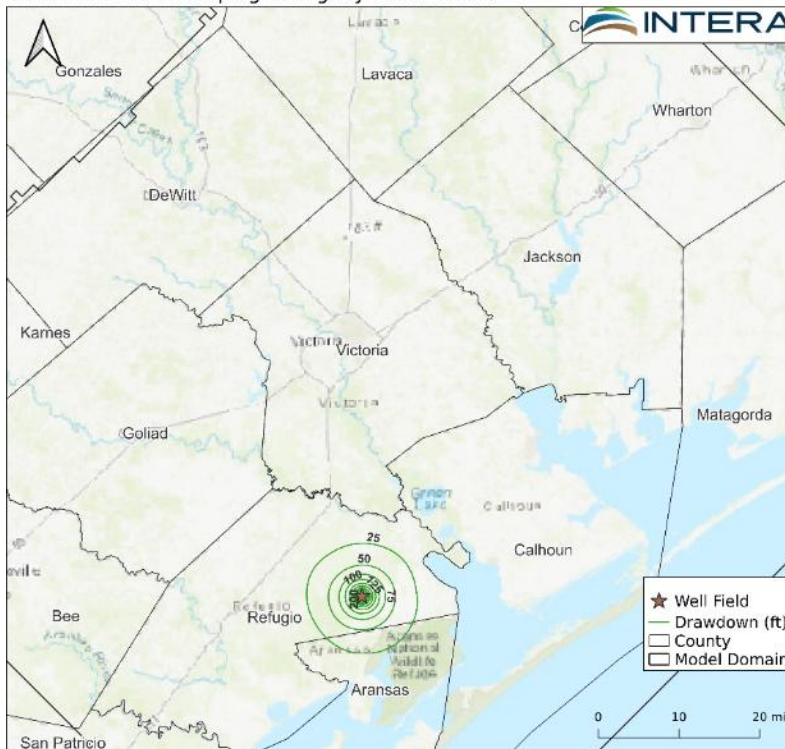
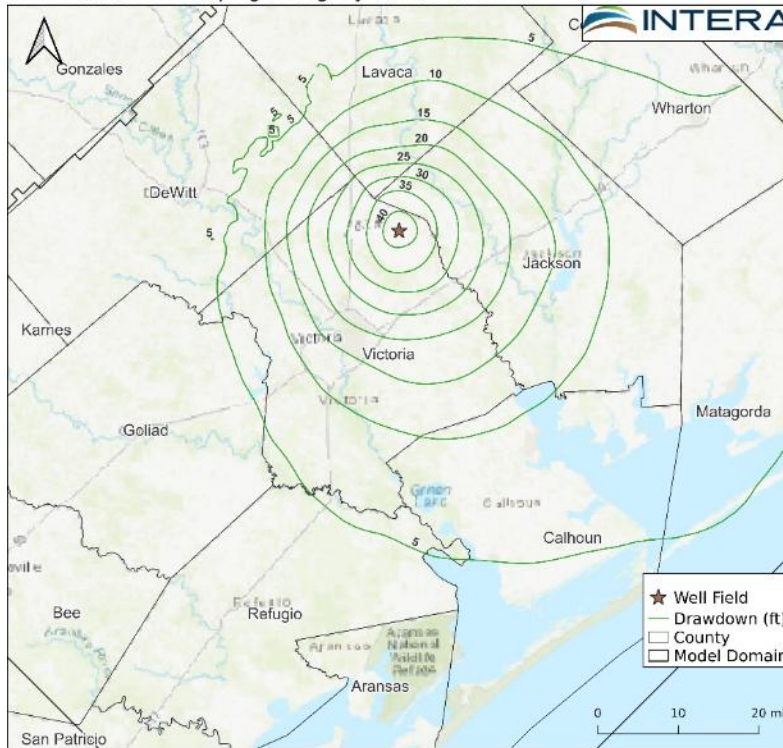


Figure 2-13. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #11.

Victoria, Median Transmissivity, Layer 9 (Fresh Water),
with 20000 AFY Pumping at Slightly Saline Zone.



Victoria, Median Transmissivity, Layer 11 (Brackish Water),
with 20000 AFY Pumping at Slightly Saline Zone.

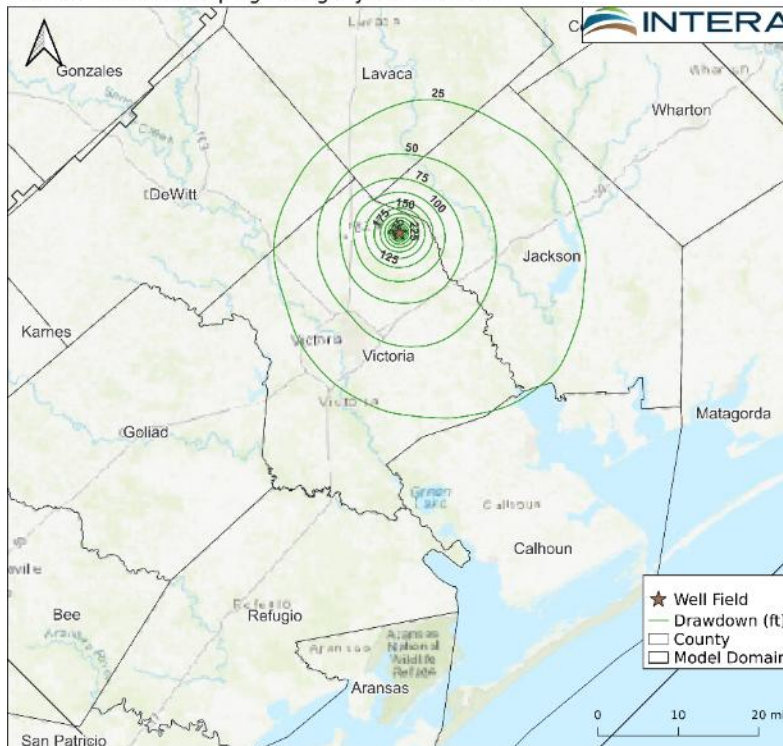


Figure 2-14. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #12.

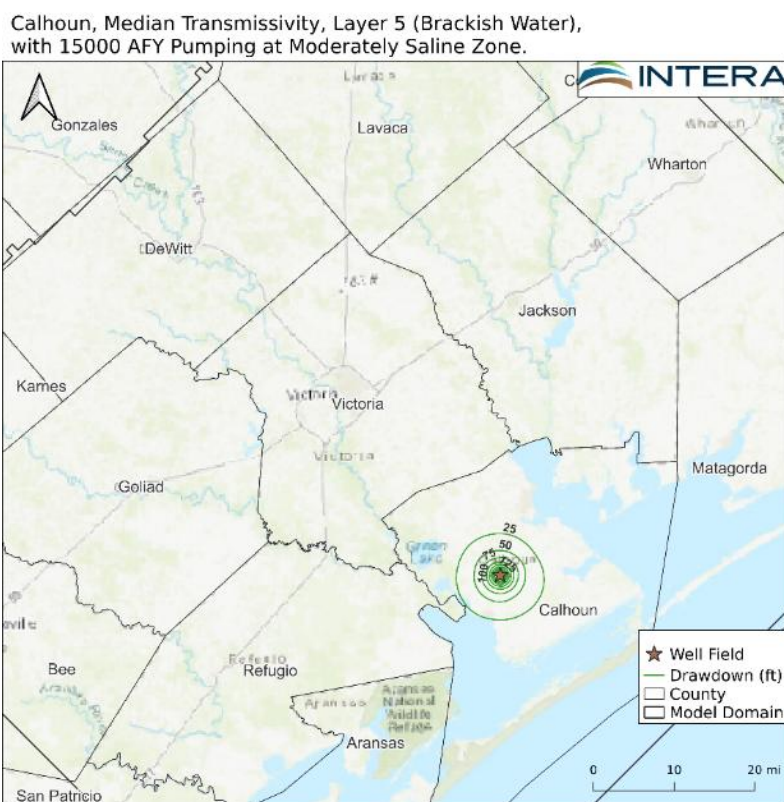
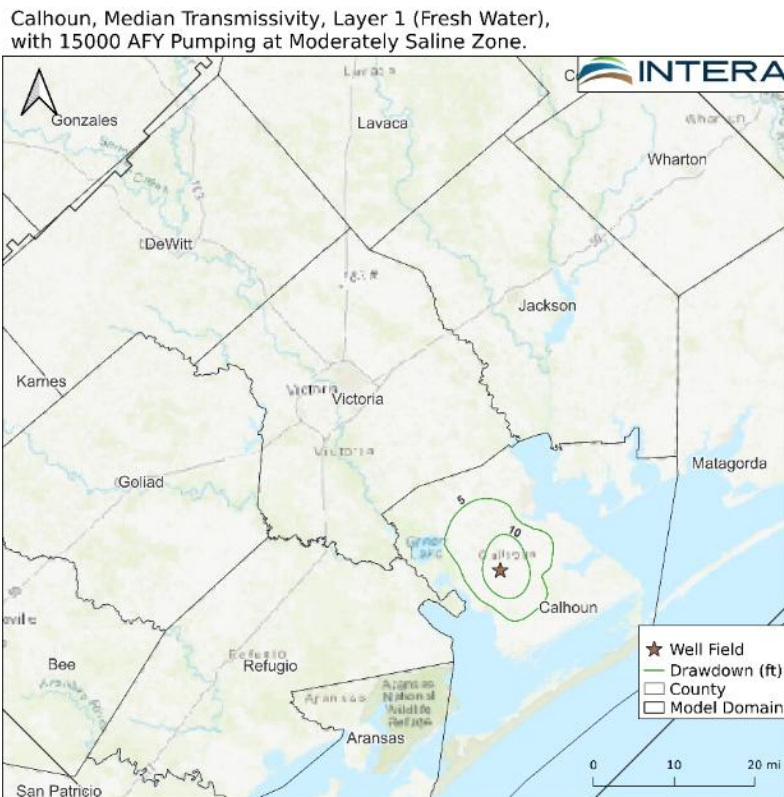
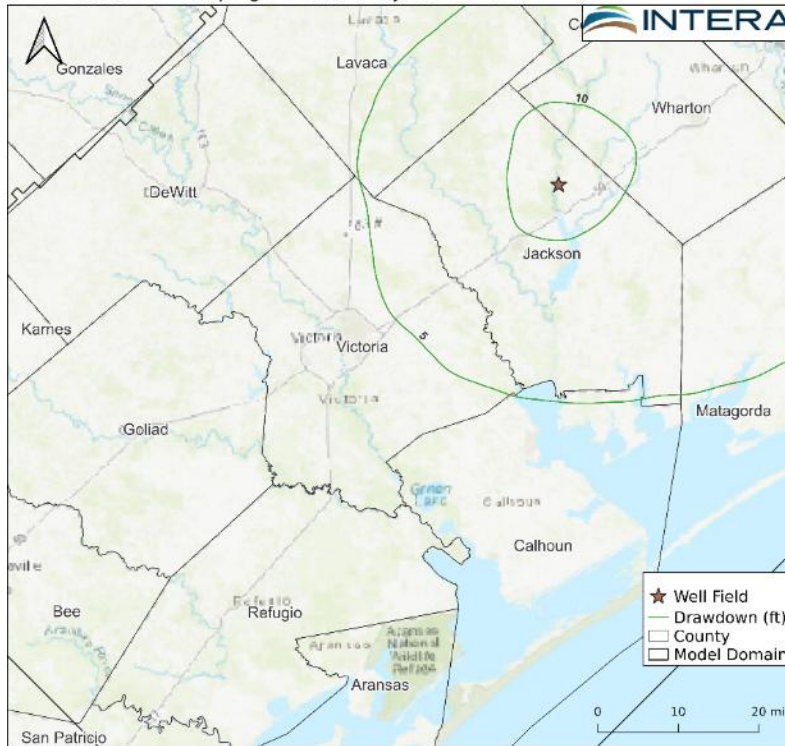


Figure 2-15. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #13.

Jackson, Median Transmissivity, Layer 9 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Jackson, Median Transmissivity, Layer 13 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

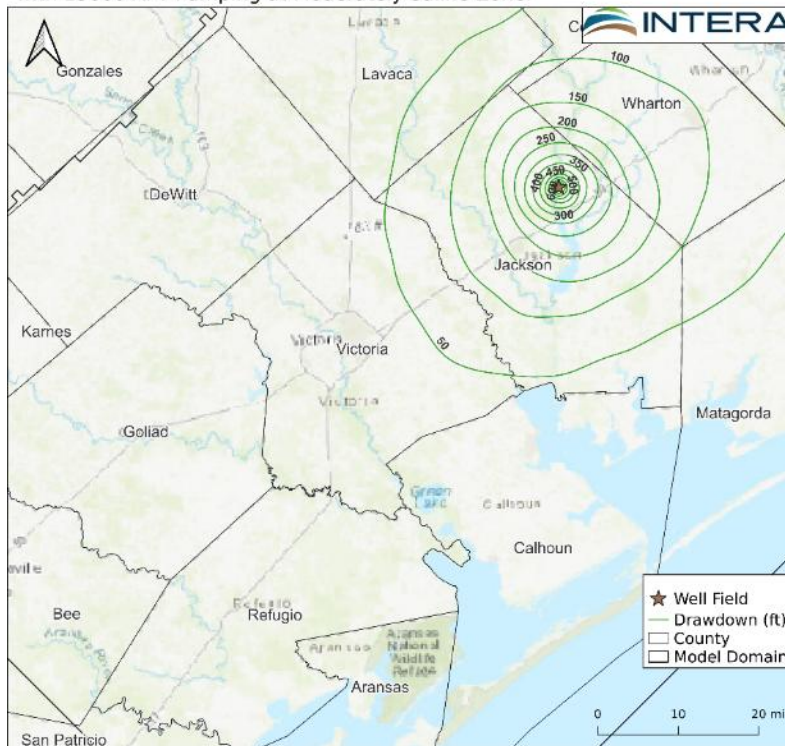
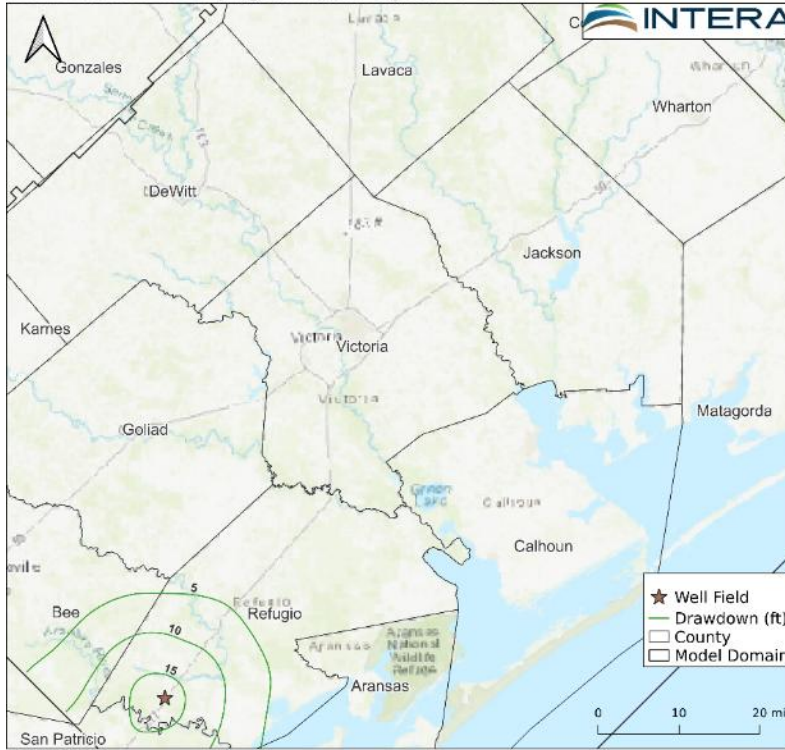


Figure 2-16. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #14.

Refugio, Median Transmissivity, Layer 4 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Refugio, Median Transmissivity, Layer 8 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

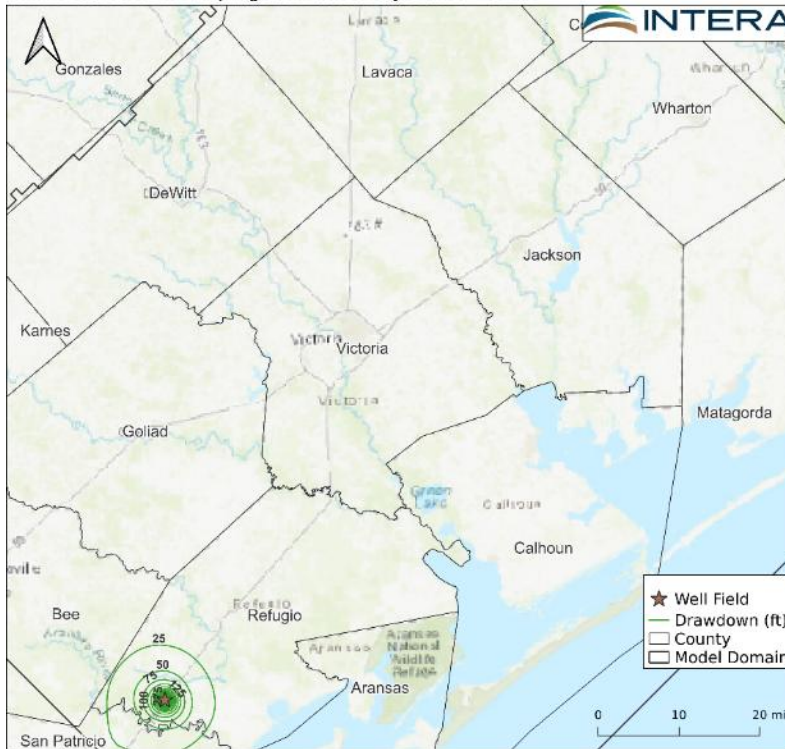
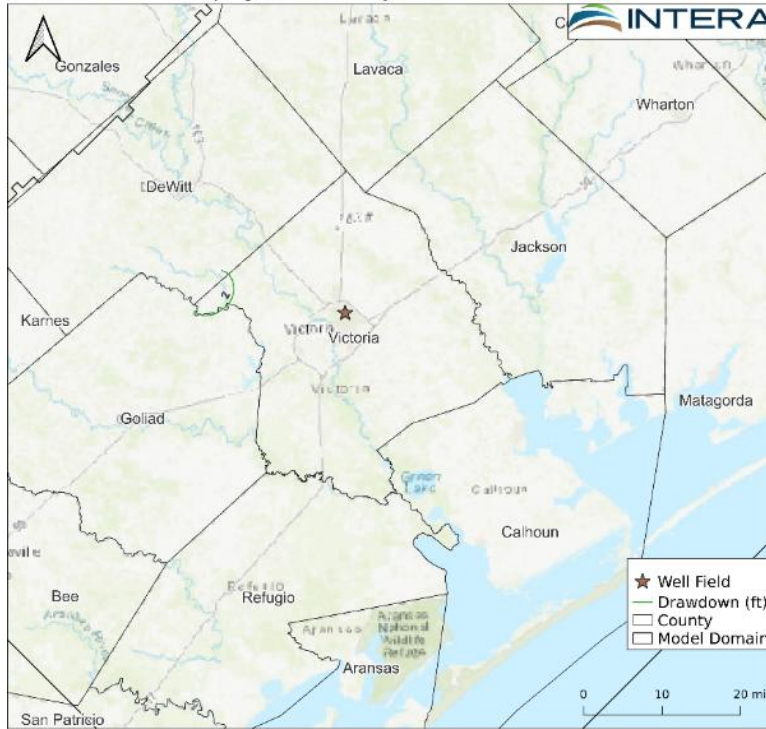


Figure 2-17. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #15.

Victoria, Median Transmissivity, Layer 6 (Fresh Water),
with 15000 AFY Pumping at Moderately Saline Zone.



Victoria, Median Transmissivity, Layer 13 (Brackish Water),
with 15000 AFY Pumping at Moderately Saline Zone.

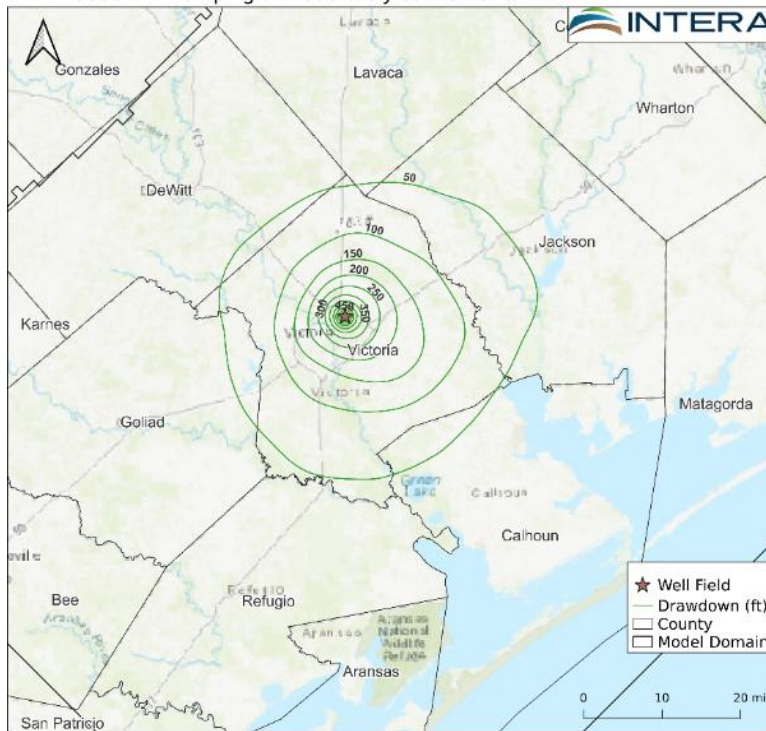


Figure 2-18. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to well field #16. The drawdown in freshwater zone is less than 2 ft.

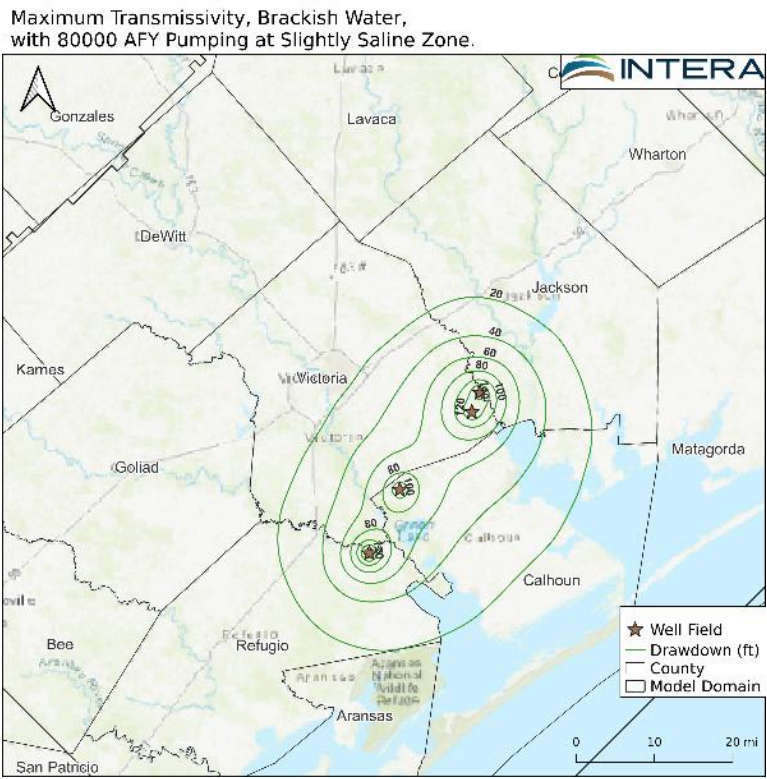
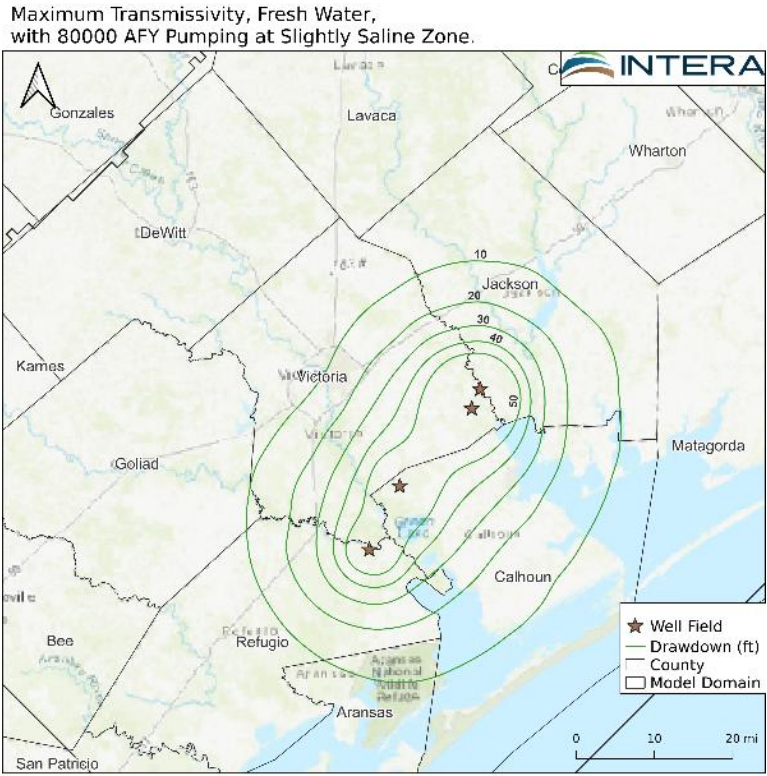


Figure 2-19. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to four well fields at sites of maximum transmissivity in the slightly saline zone.

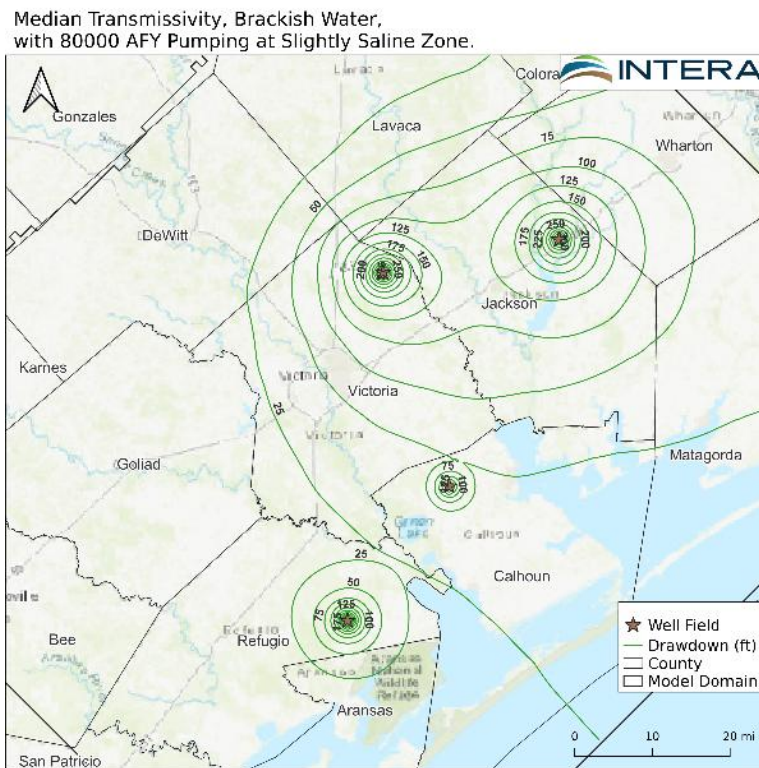
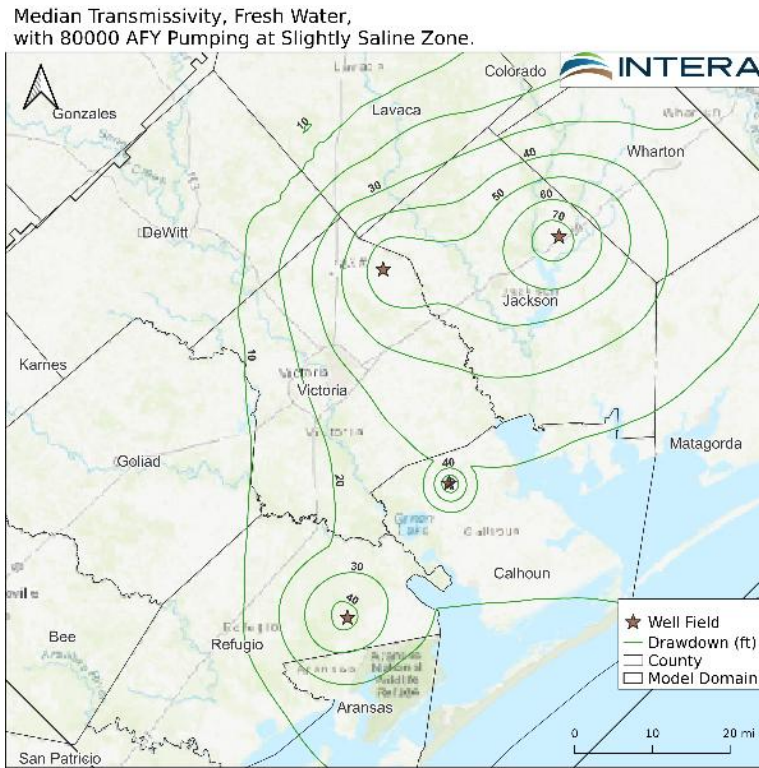


Figure 2-20. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to four well fields at sites of median transmissivity in the slightly saline zone.

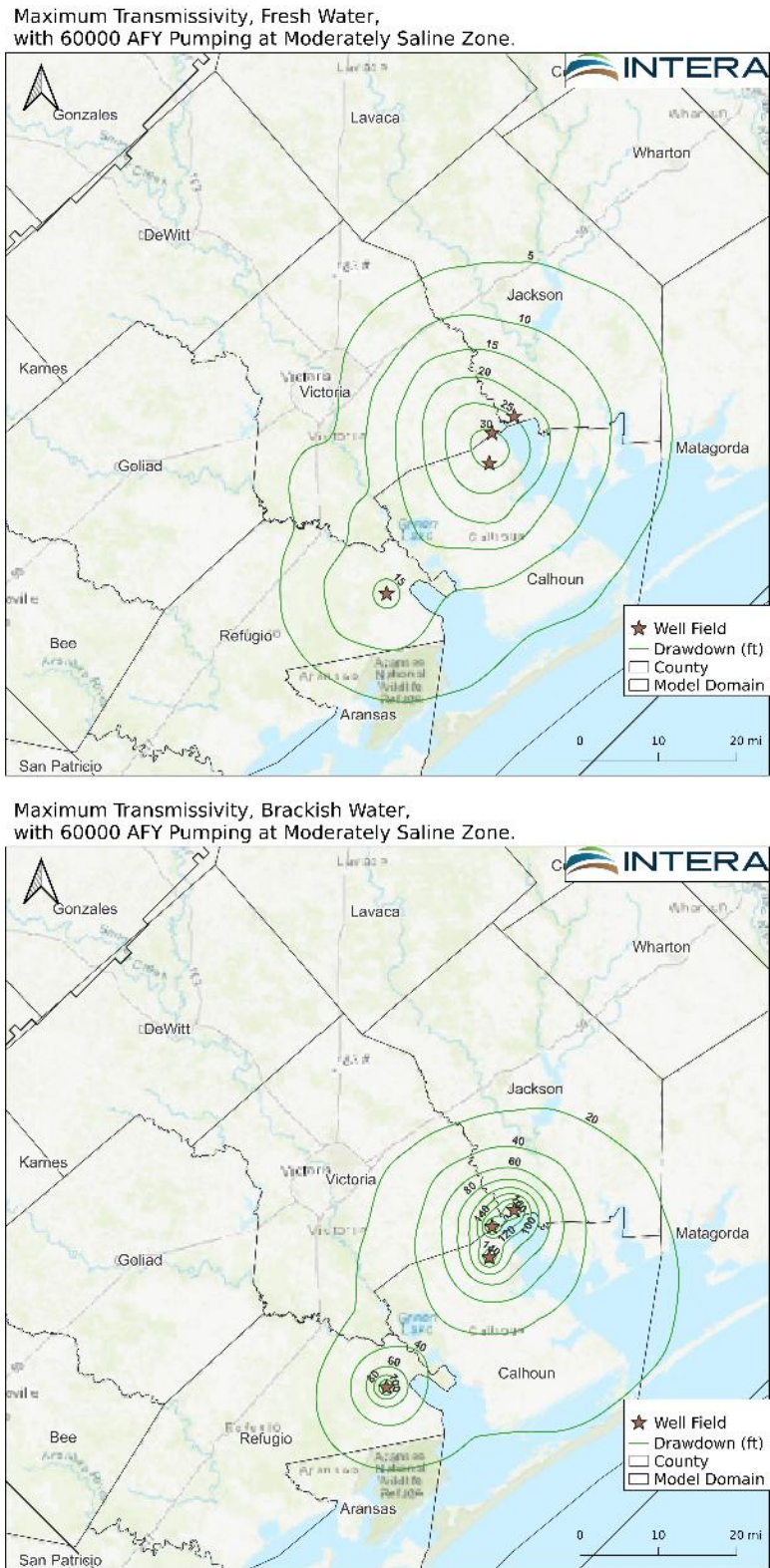


Figure 2-21. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to four well fields at sites of maximum transmissivity in the moderately saline zone.

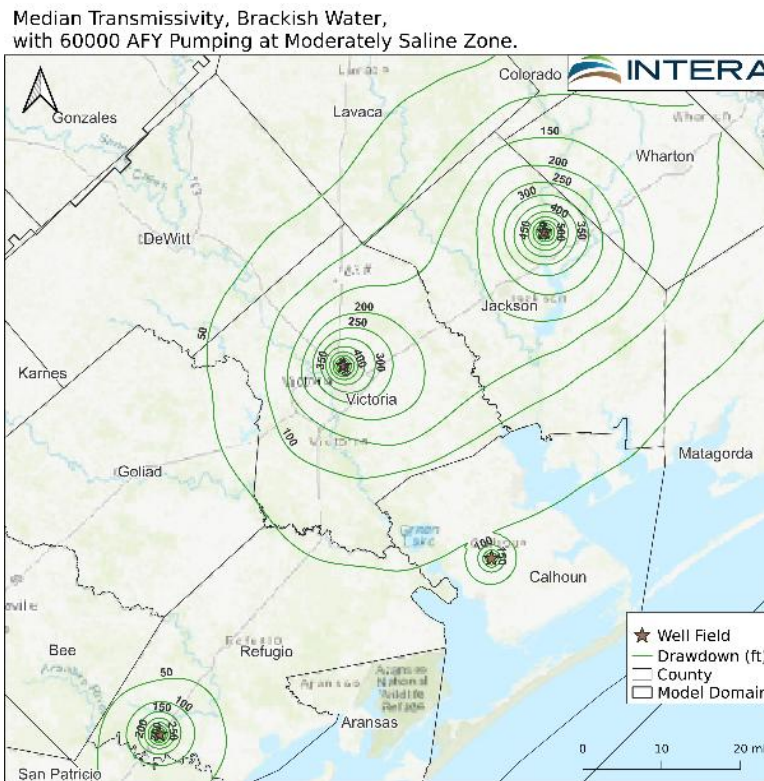
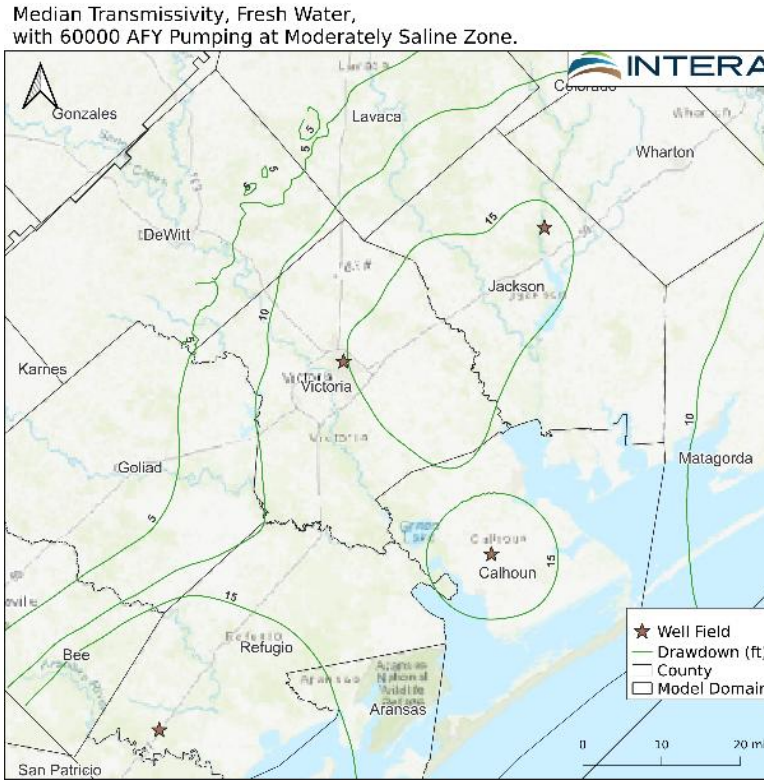


Figure 2-22. Simulated drawdown in freshwater zone (top) and brackish water zone (bottom) due to four well fields at sites of median transmissivity in the moderately saline zone.

Appendix A. Comparisons of Alternative Method to Represent Recharge and Discharge on Land Surface at Well Field #1.

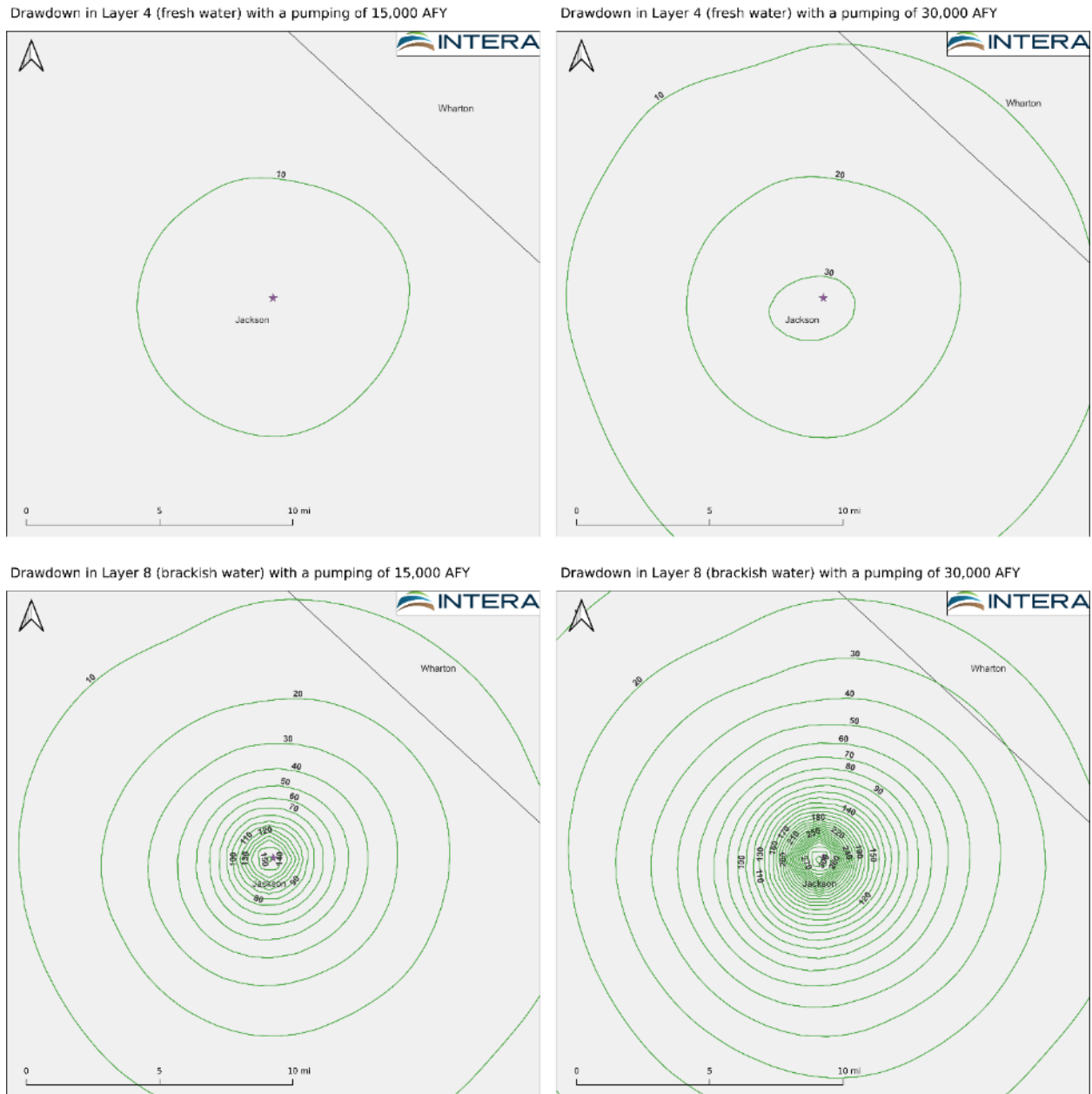


Figure A-1. Simulated drawdowns after 5-year pumping at well field #1 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

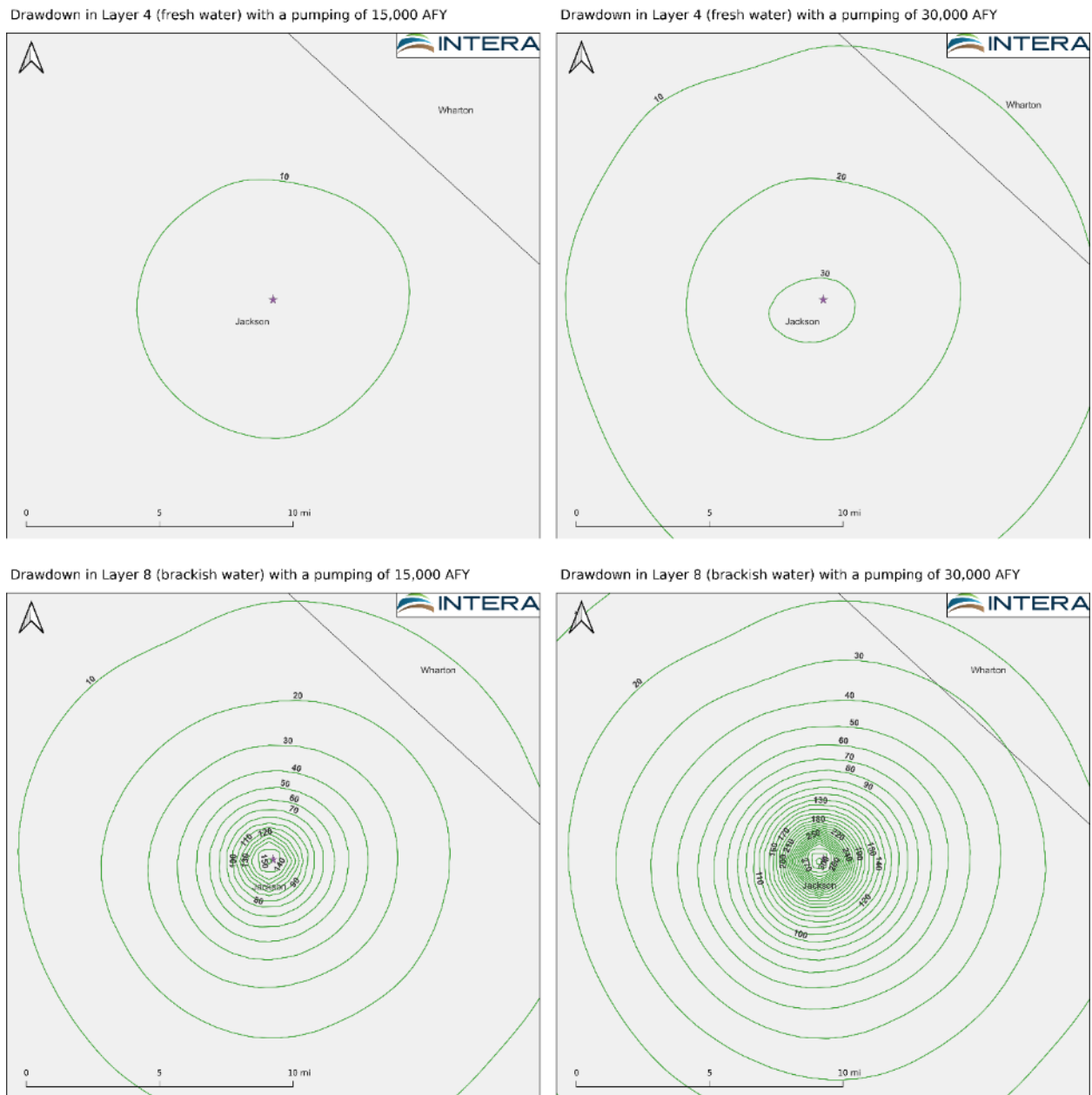


Figure A-2. Simulated drawdowns after 5-year pumping at well field #1 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

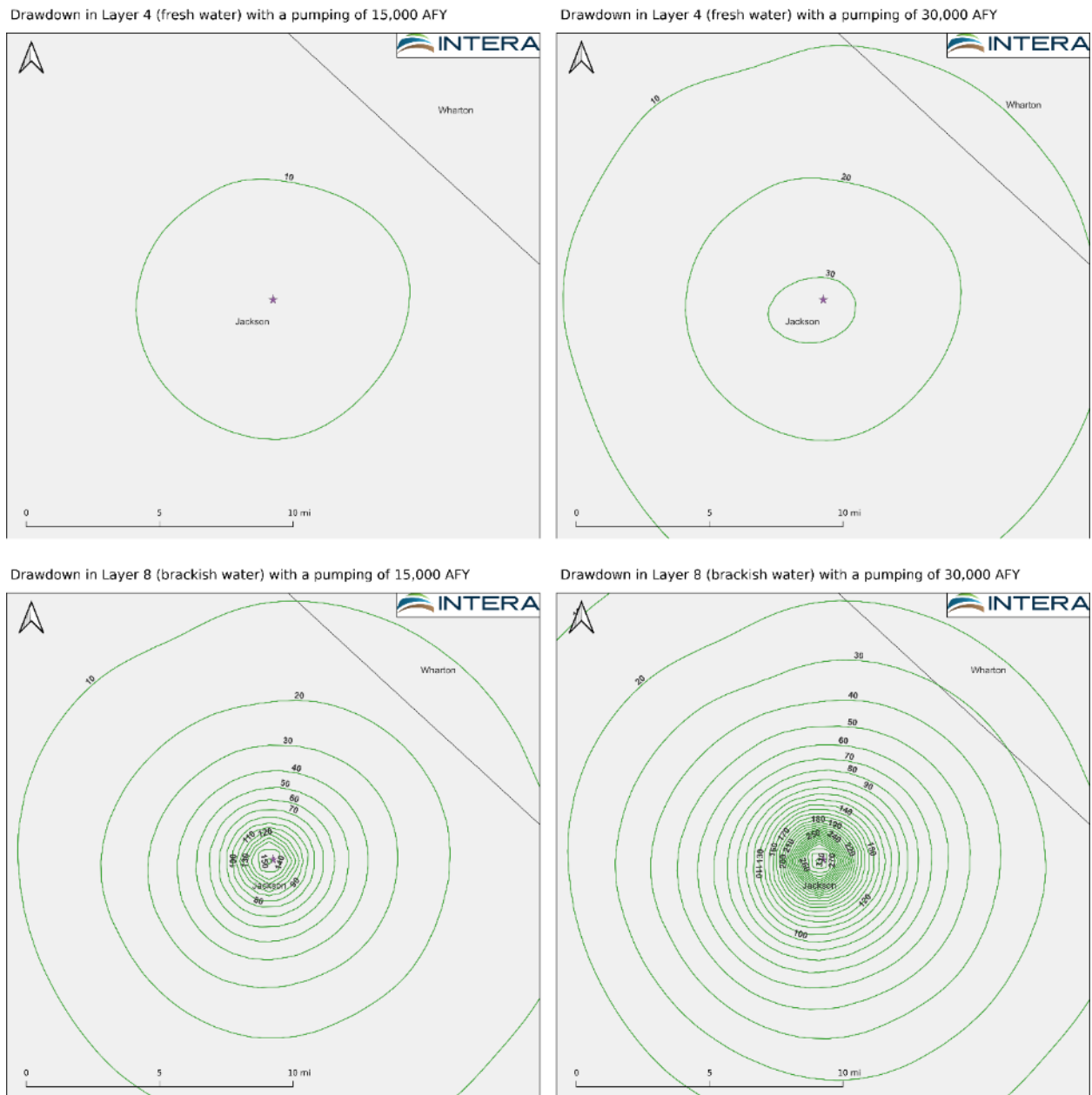


Figure A-3. Simulated drawdowns after 5-year pumping at well field #1 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

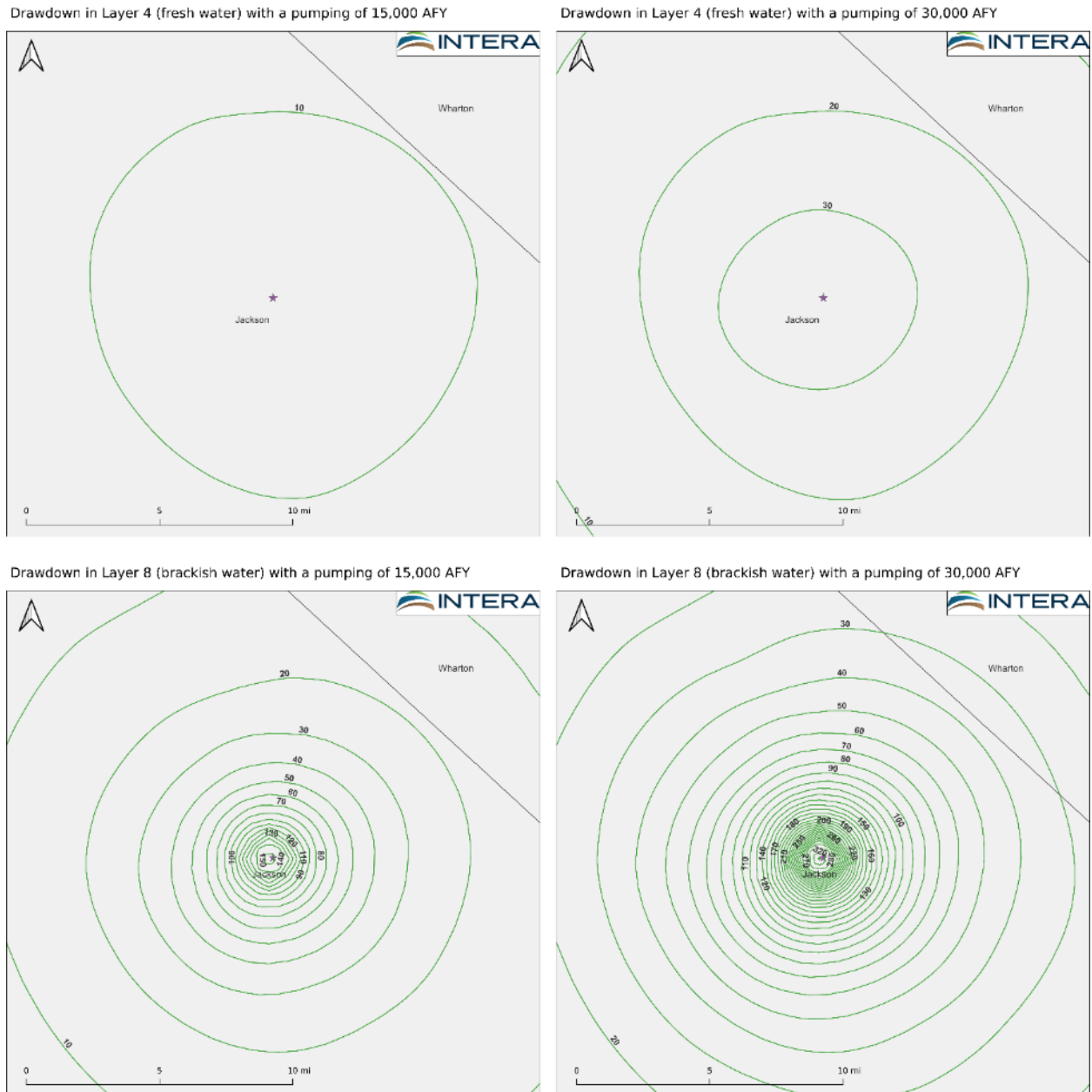


Figure A-4. Simulated drawdowns after 30-year pumping at well field #1 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

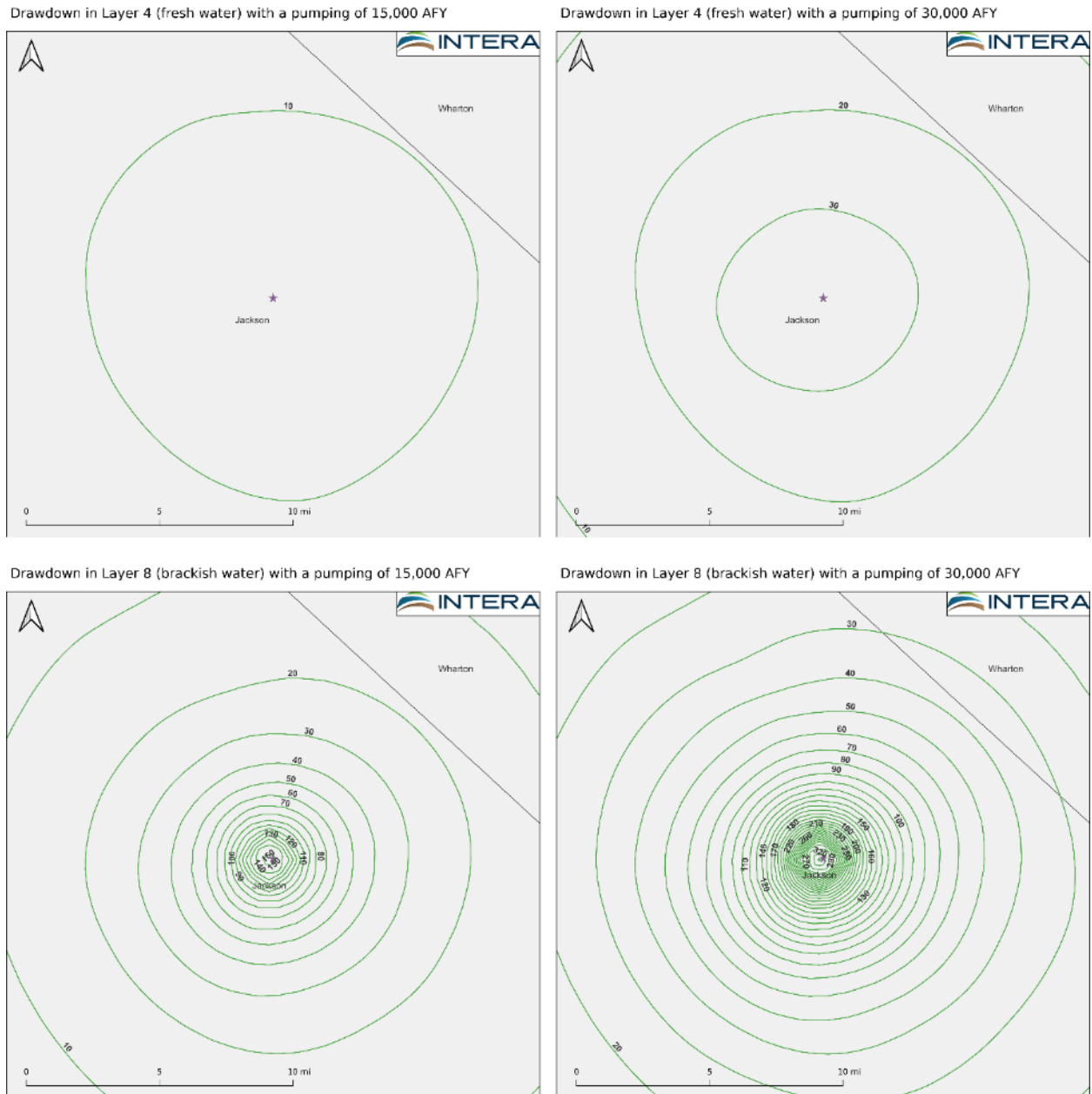


Figure A-5. Simulated drawdowns after 30-year pumping at well field #1 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

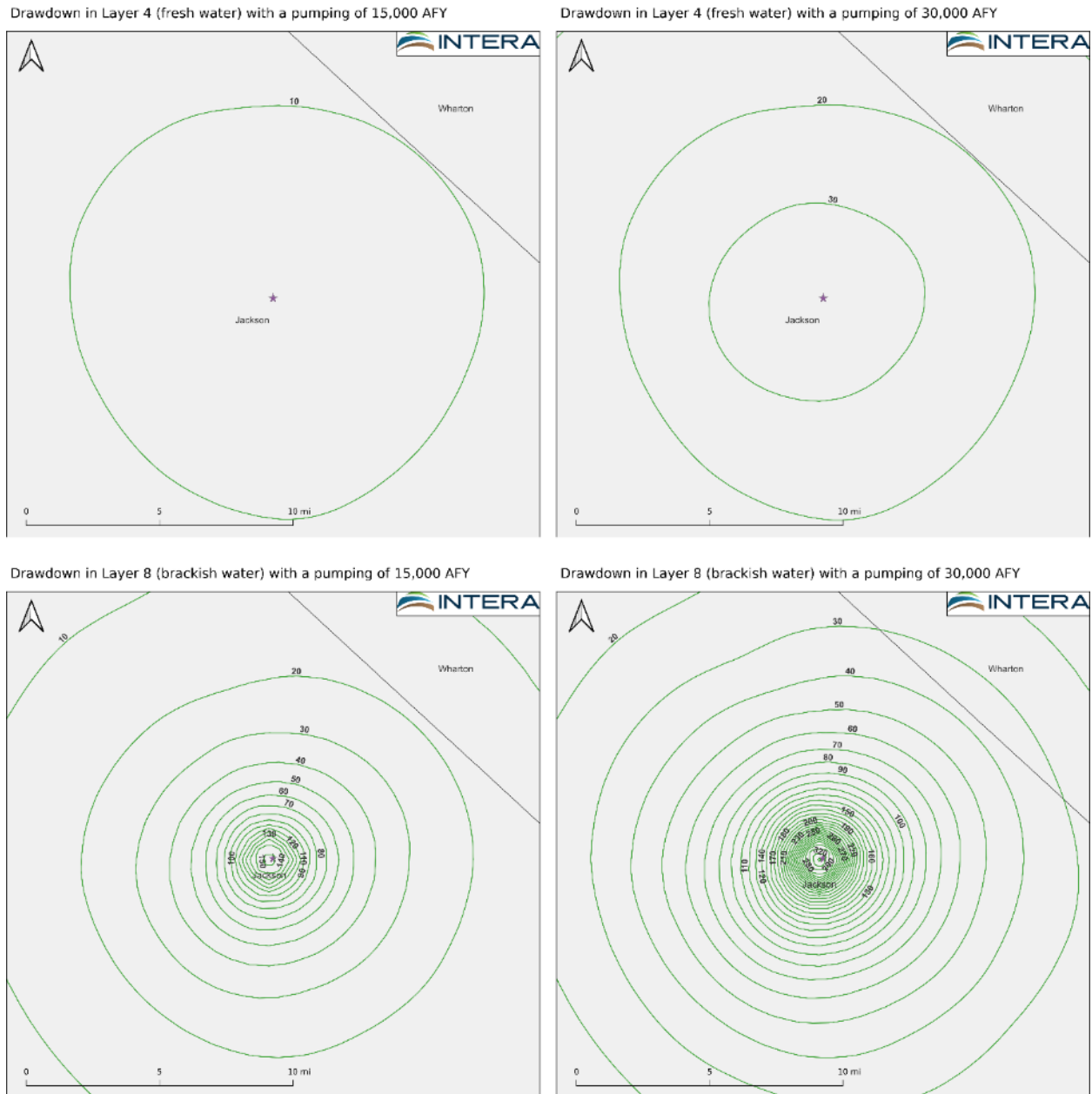


Figure A-6. Simulated drawdowns after 30-year pumping at well field #1 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

Appendix B. Comparisons of Alternative Method to Represent Recharge and Discharge on Land Surface at Well Field #2.

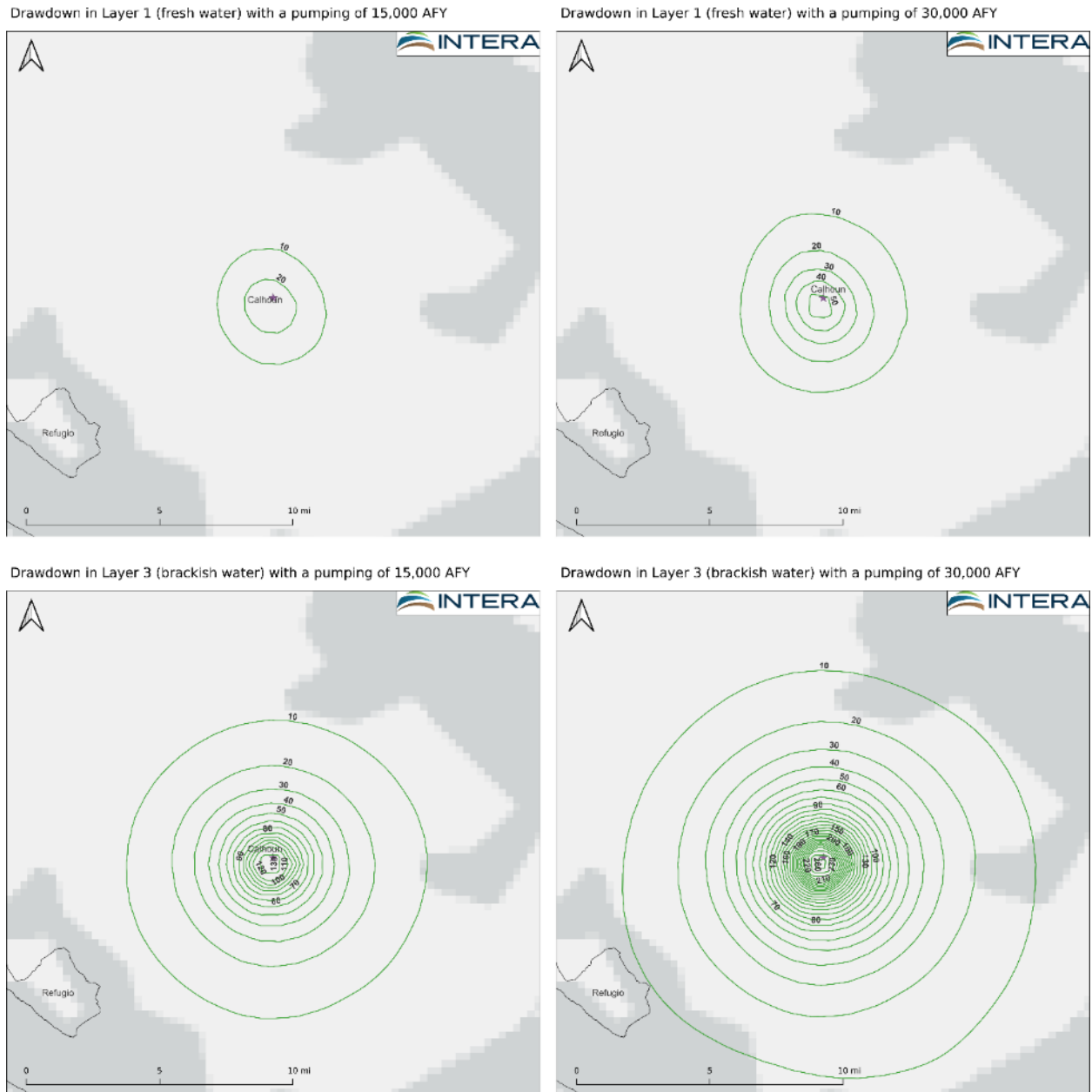


Figure B-1. Simulated drawdowns after 5-year pumping at well field #2 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

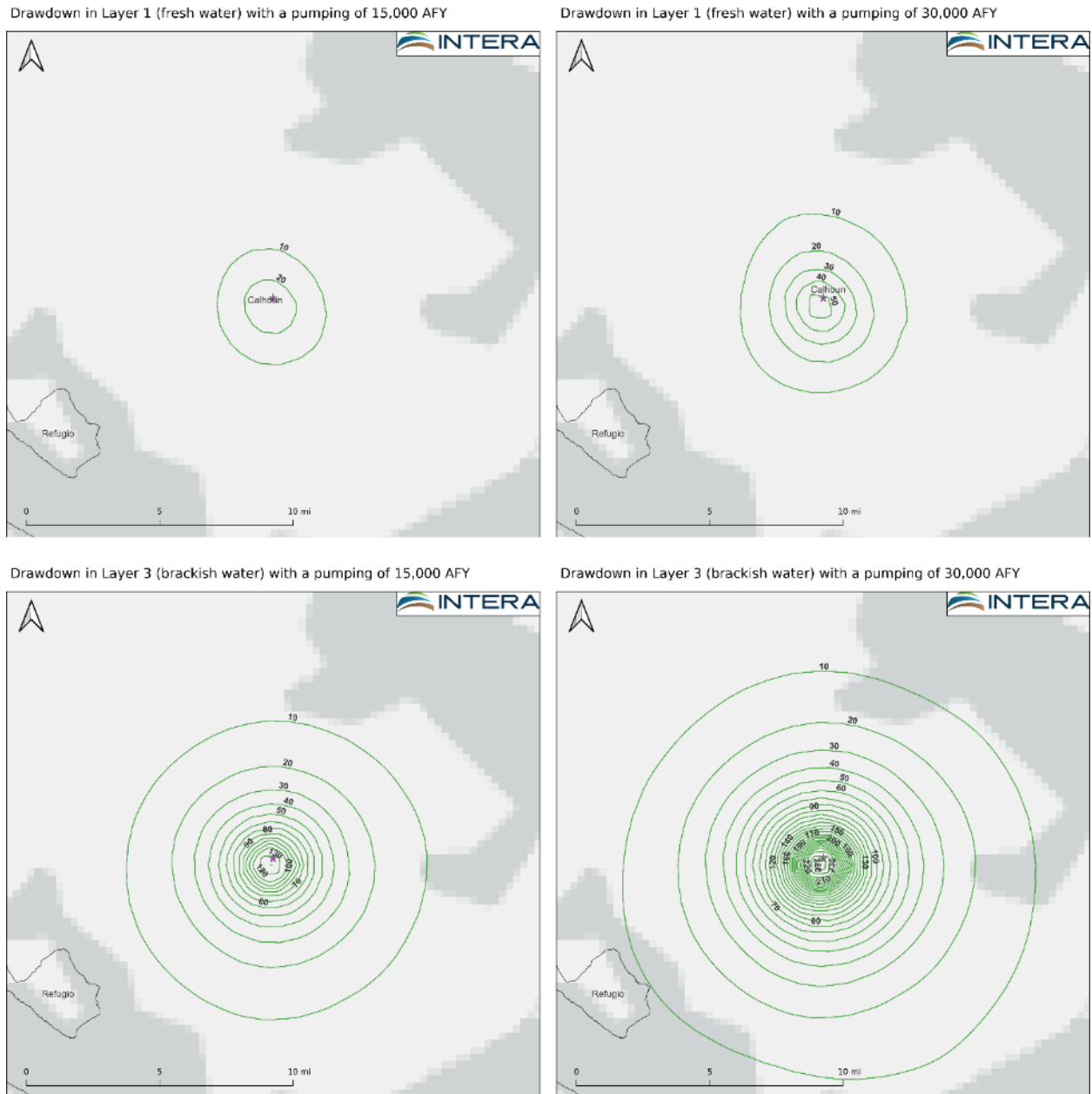


Figure B-2. Simulated drawdowns after 5-year pumping at well field #2 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

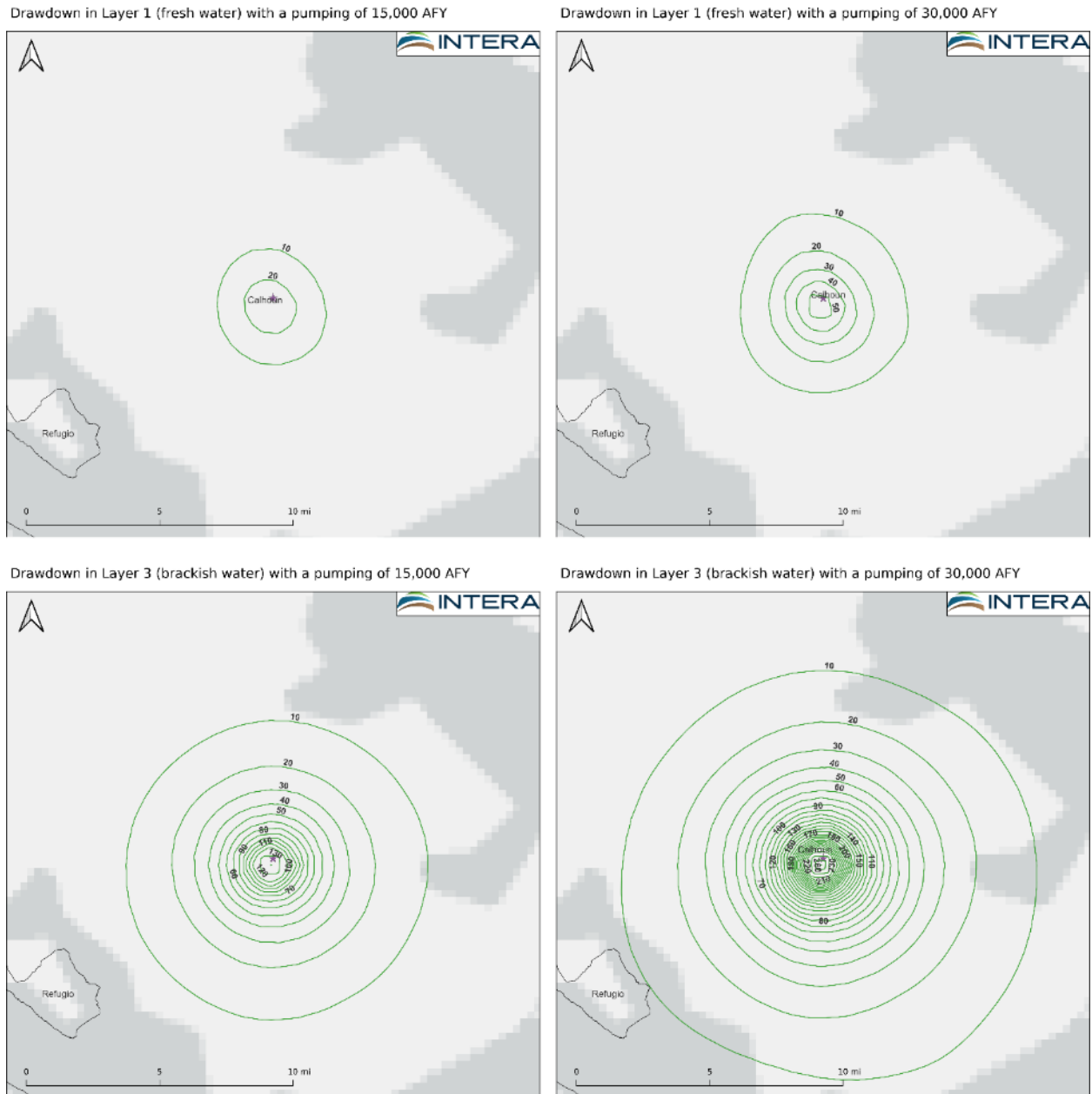


Figure B-3. Simulated drawdowns after 5-year pumping at well field #2 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

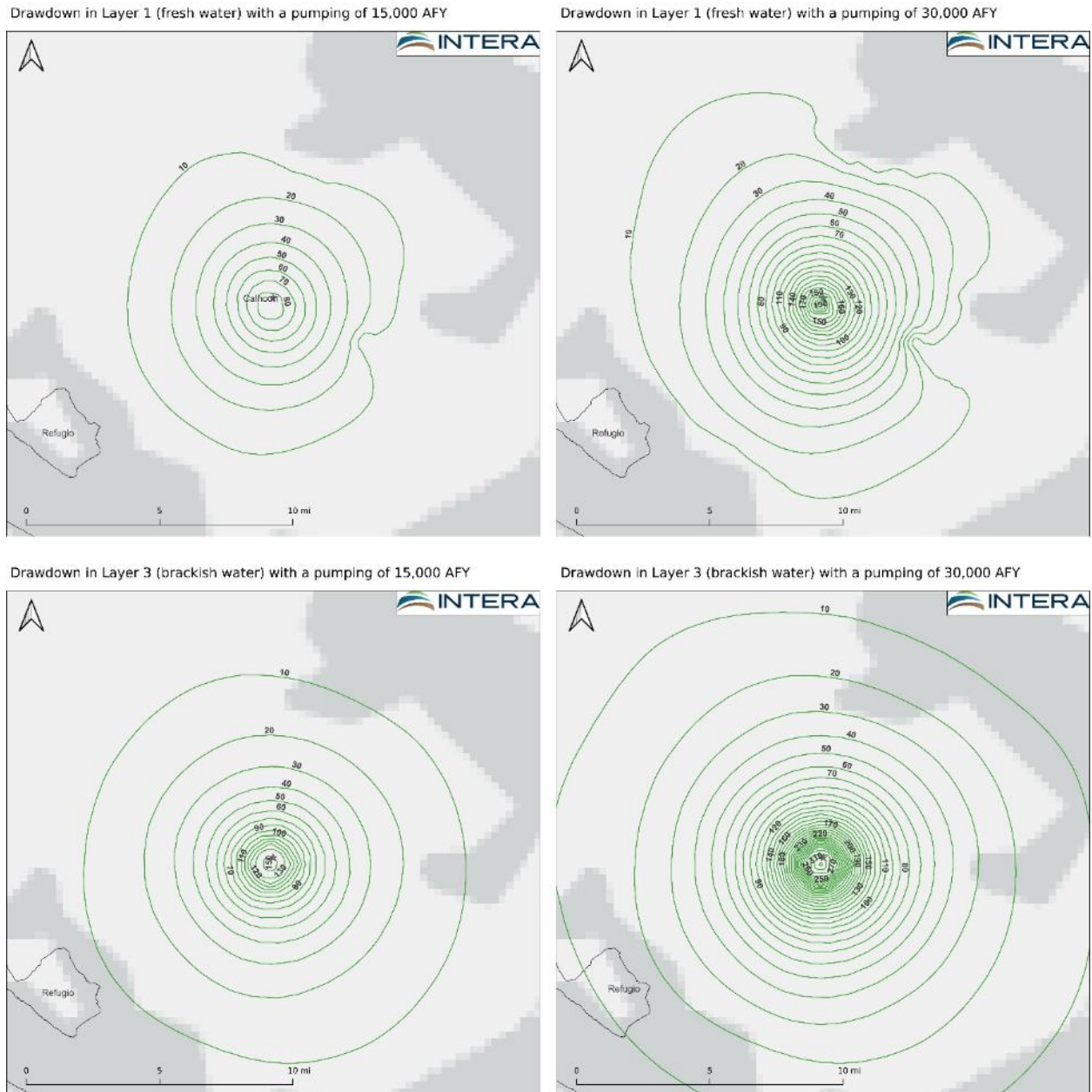
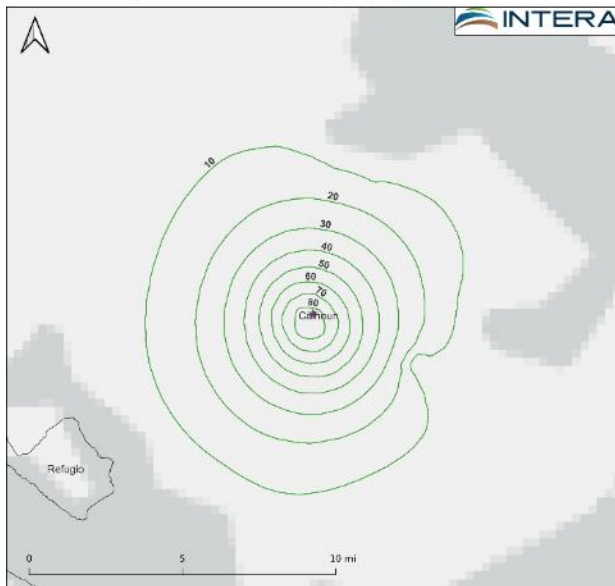
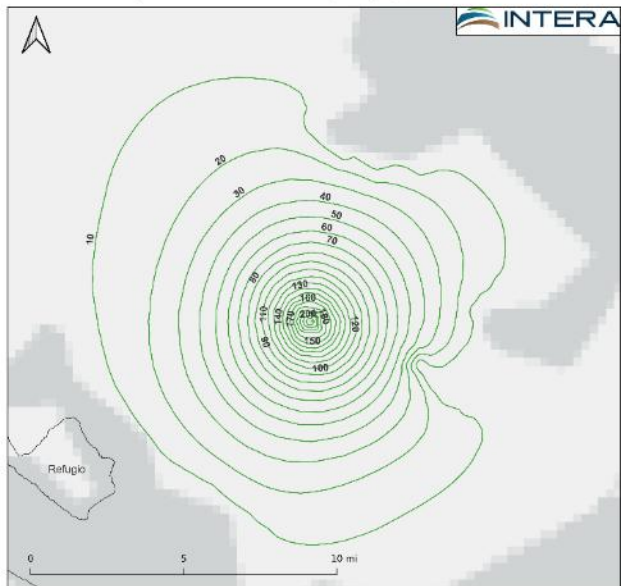


Figure B-4. Simulated drawdowns after 30-year pumping at well field #2 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

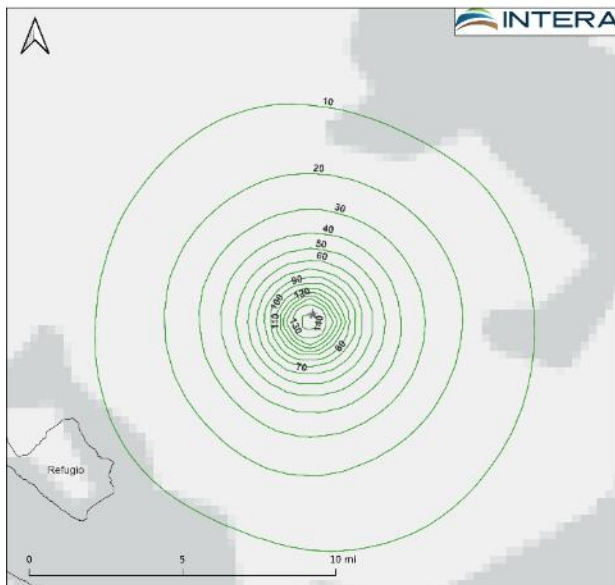
Drawdown in Layer 1 (fresh water) with a pumping of 15,000 AFY



Drawdown in Layer 1 (fresh water) with a pumping of 30,000 AFY



Drawdown in Layer 3 (brackish water) with a pumping of 15,000 AFY



Drawdown in Layer 3 (brackish water) with a pumping of 30,000 AFY

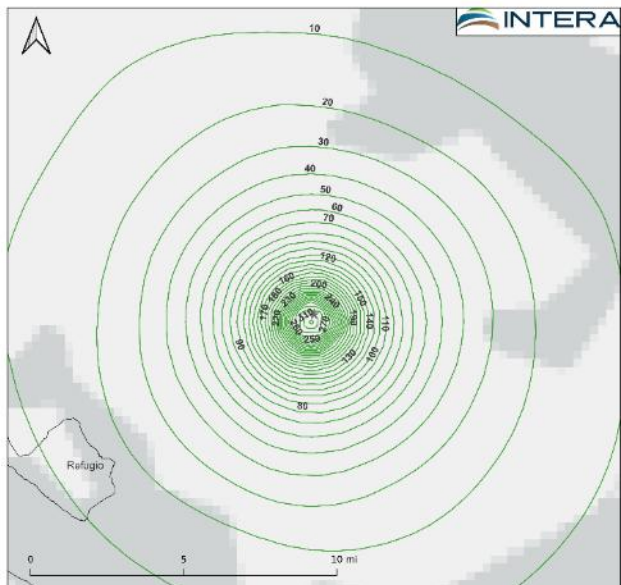
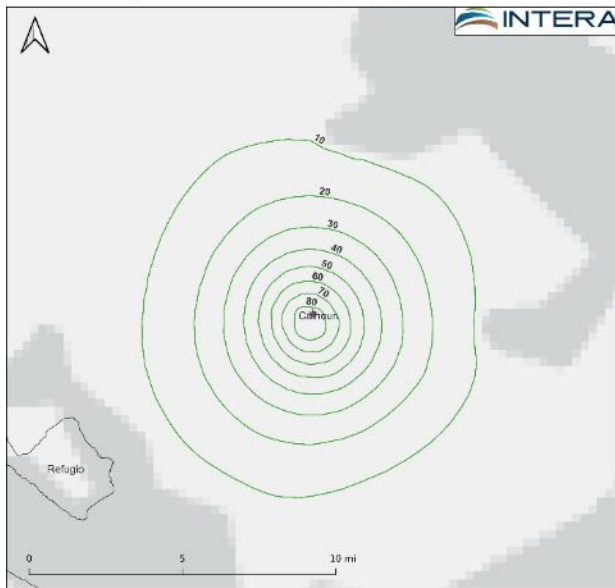
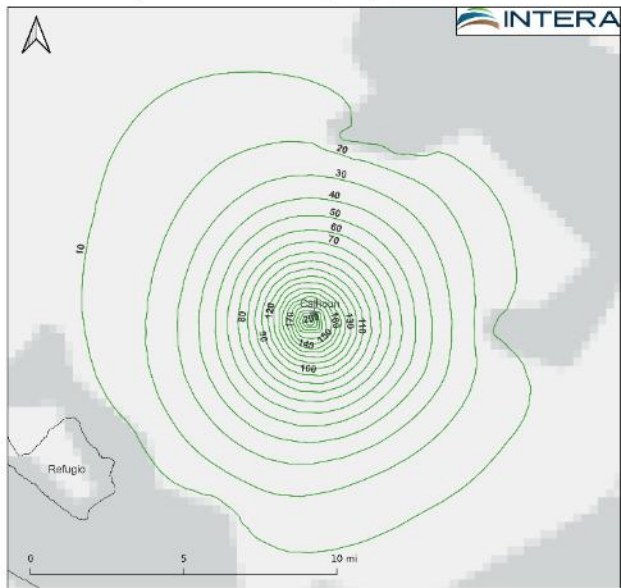


Figure B-5. Simulated drawdowns after 30-year pumping at well field #2 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

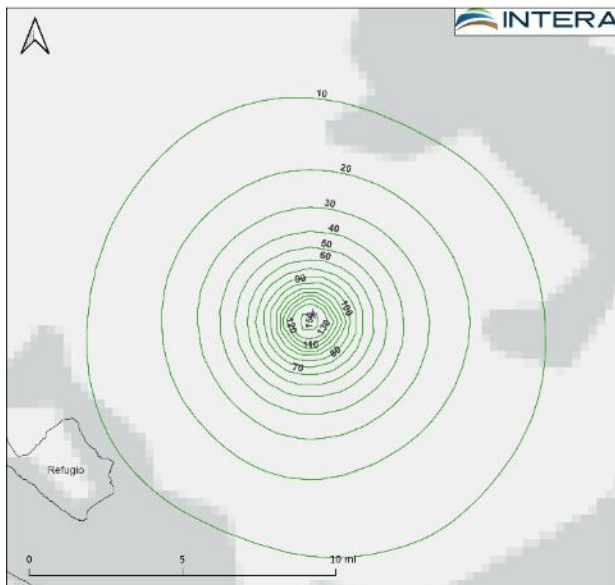
Drawdown in Layer 1 (fresh water) with a pumping of 15,000 AFY



Drawdown in Layer 1 (fresh water) with a pumping of 30,000 AFY



Drawdown in Layer 3 (brackish water) with a pumping of 15,000 AFY



Drawdown in Layer 3 (brackish water) with a pumping of 30,000 AFY

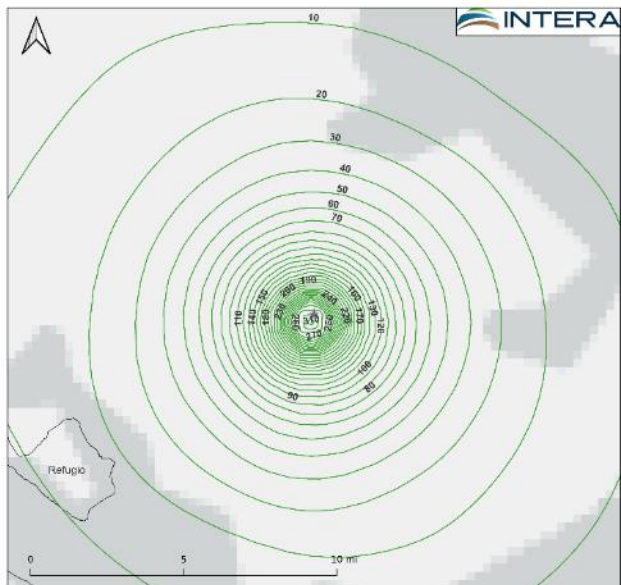


Figure B-6. Simulated drawdowns after 30-year pumping at well field #2 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

Appendix C. Comparisons of Alternative Method to Represent Recharge and Discharge on Land Surface at Well Field #3.

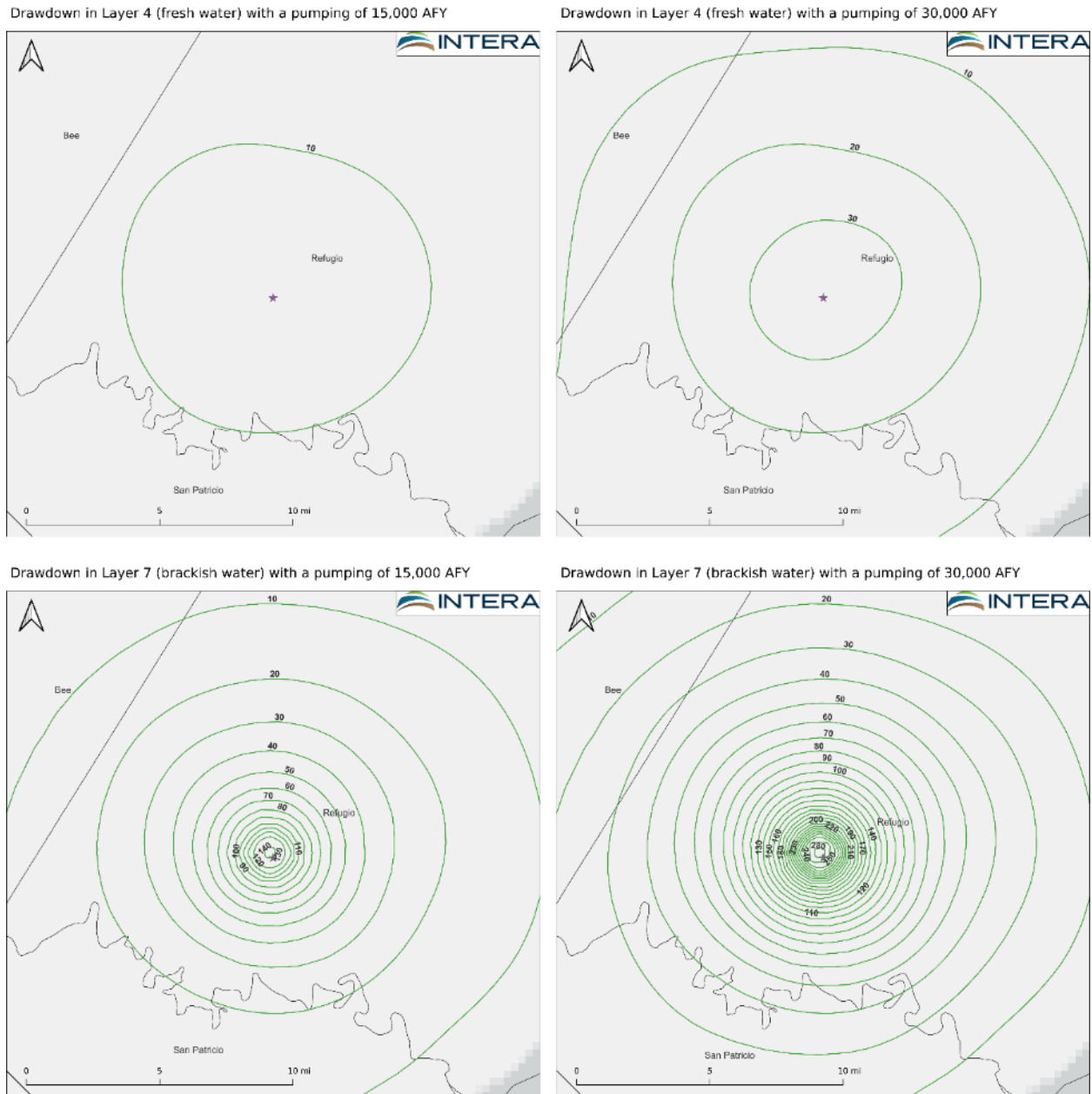


Figure C-1. Simulated drawdowns after 5-year pumping at well field #3 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

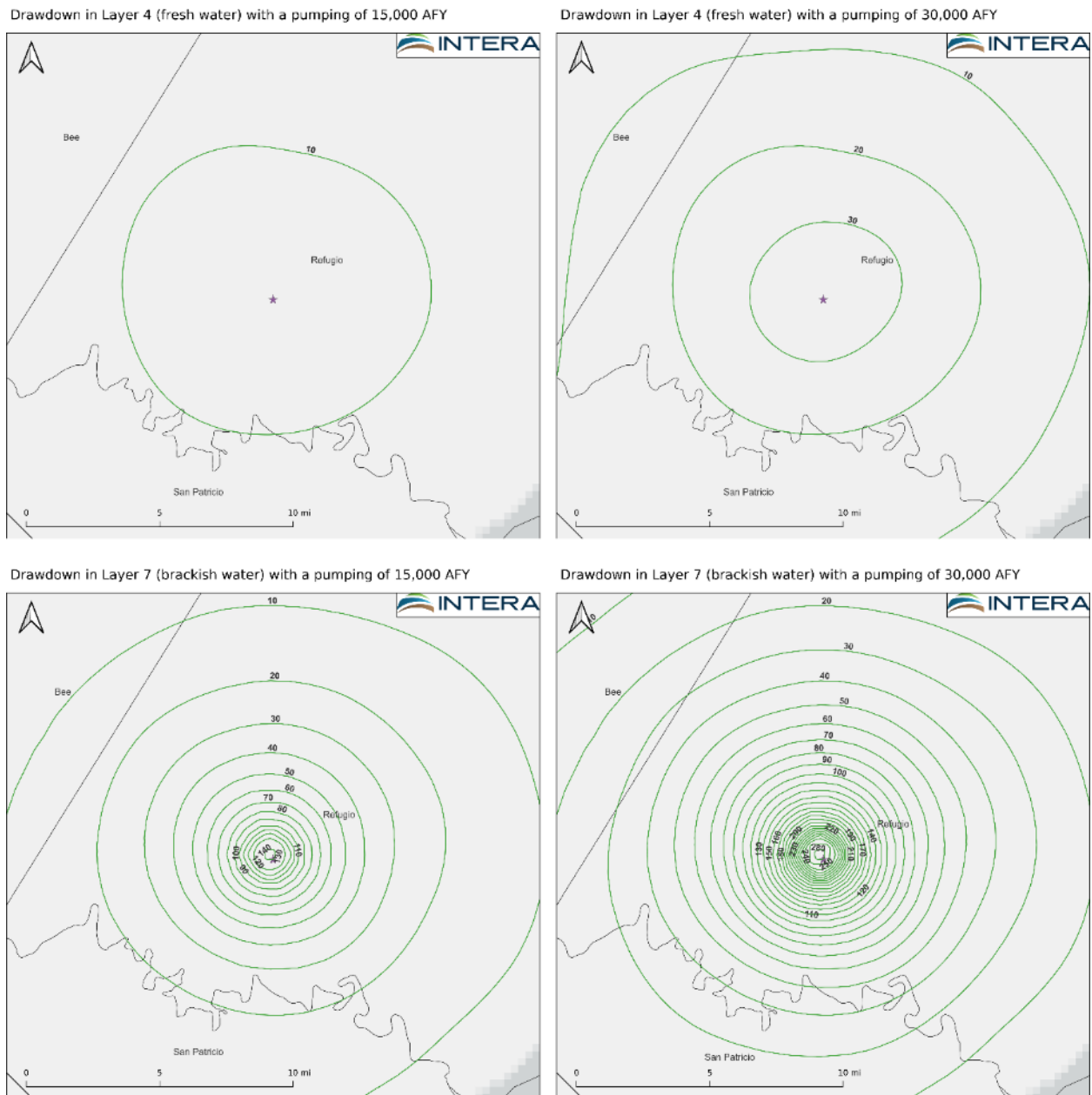


Figure C-2. Simulated drawdowns after 5-year pumping at well field #3 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

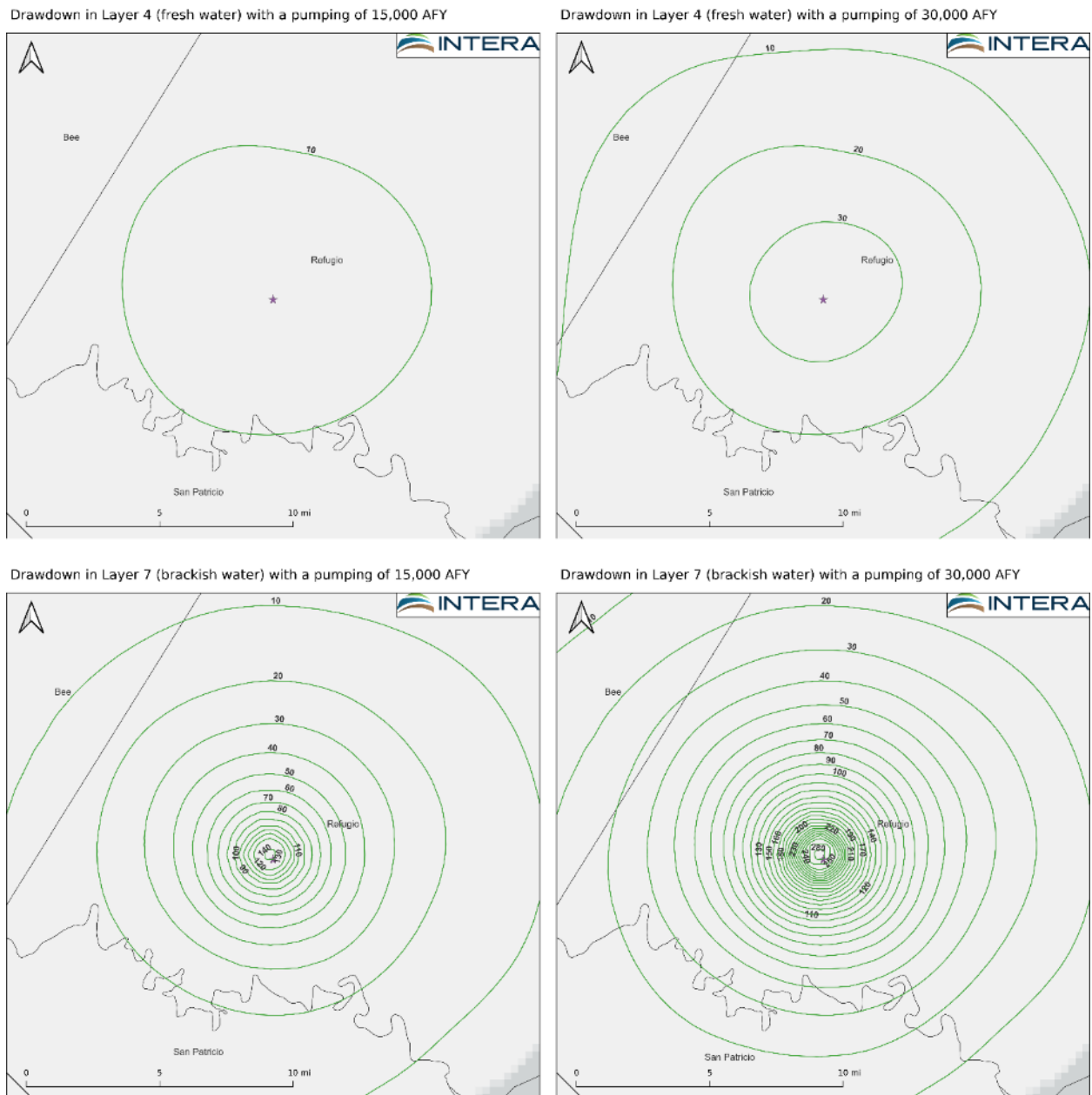


Figure C-3. Simulated drawdowns after 5-year pumping at well field #3 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

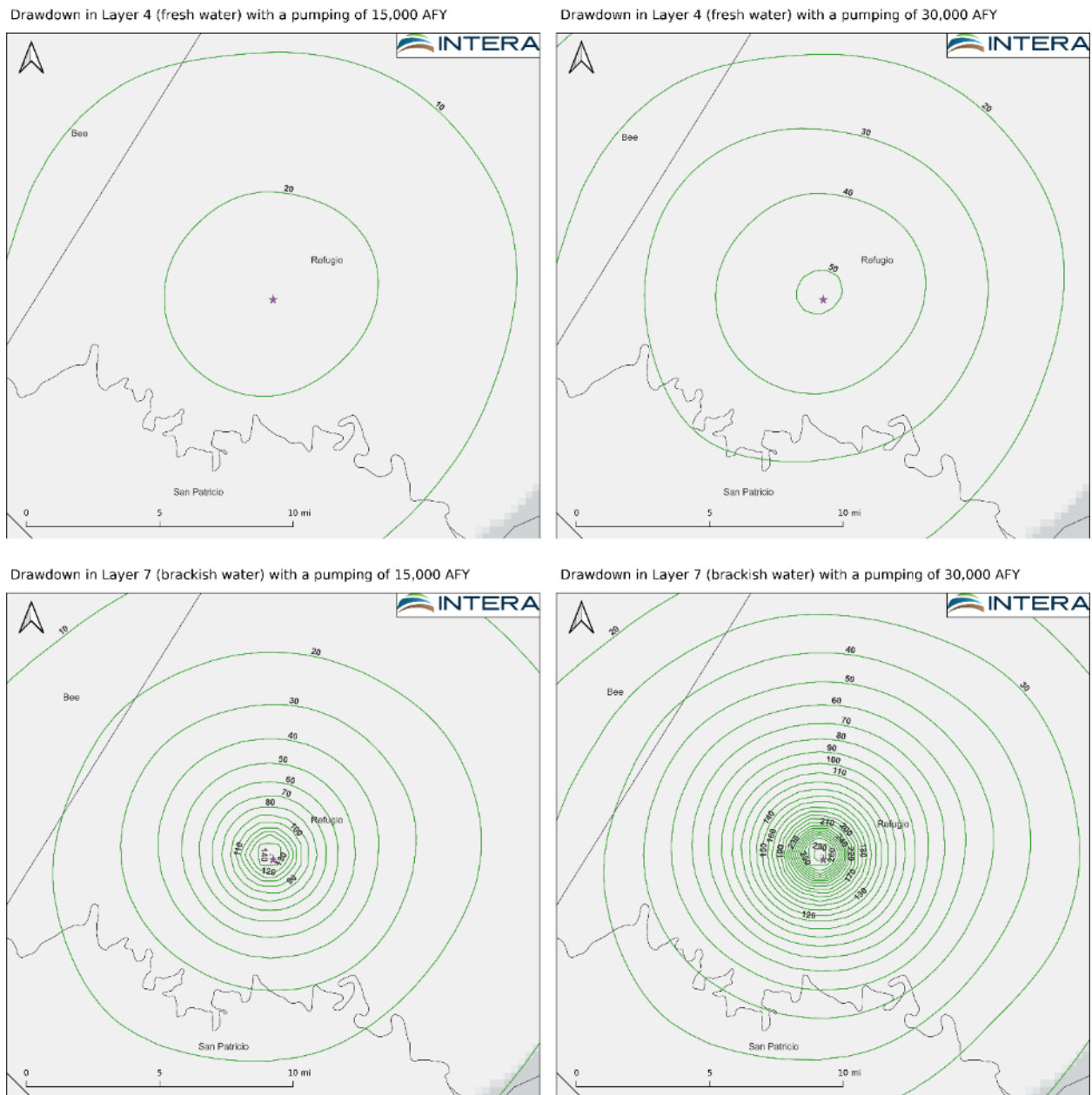


Figure C-5. Simulated drawdowns after 30-year pumping at well field #3 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

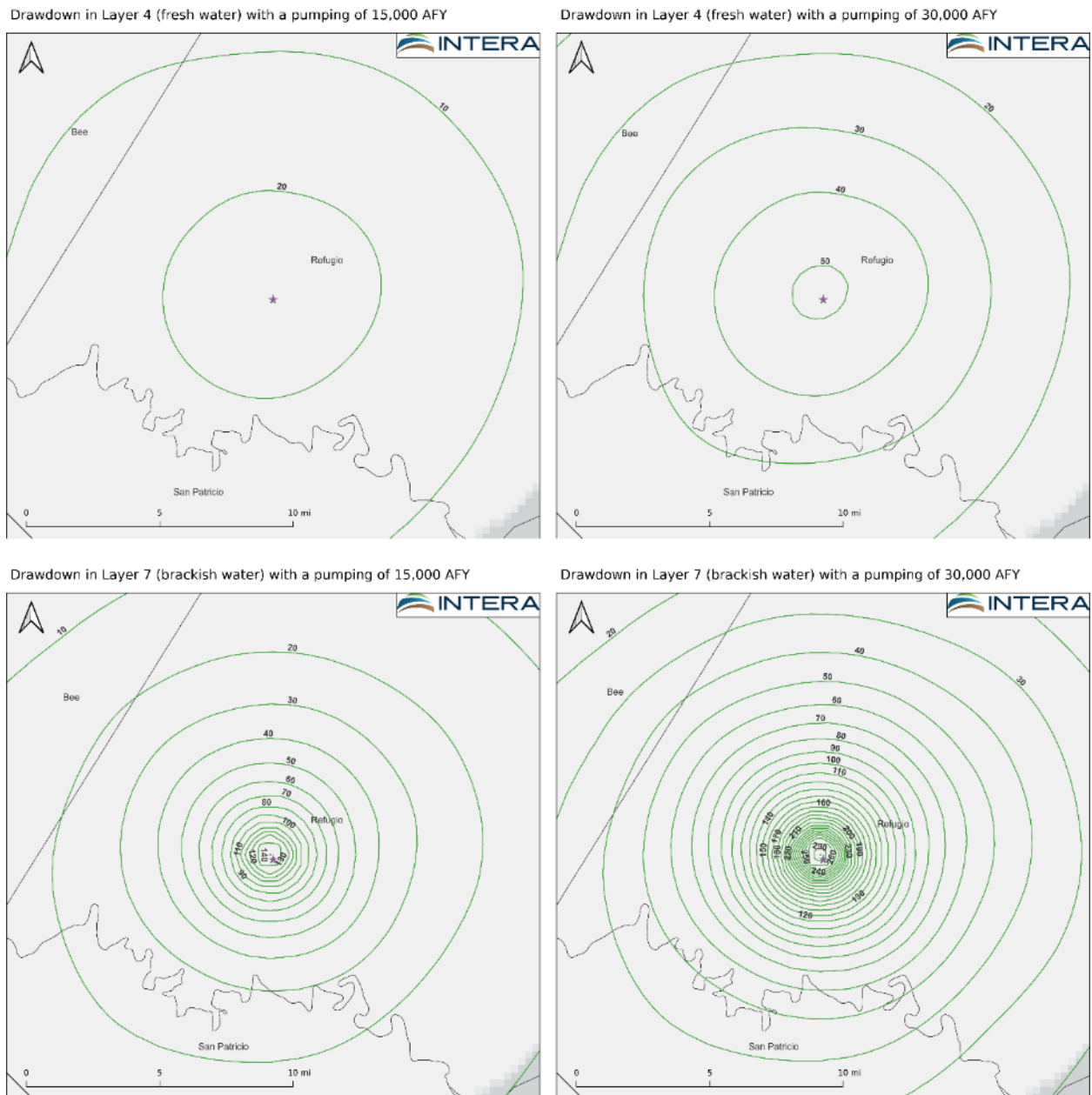


Figure C-6. Simulated drawdowns after 30-year pumping at well field #3 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

Appendix D. Comparisons of Alternative Method to Represent Recharge and Discharge on Land Surface at Well Field #4.

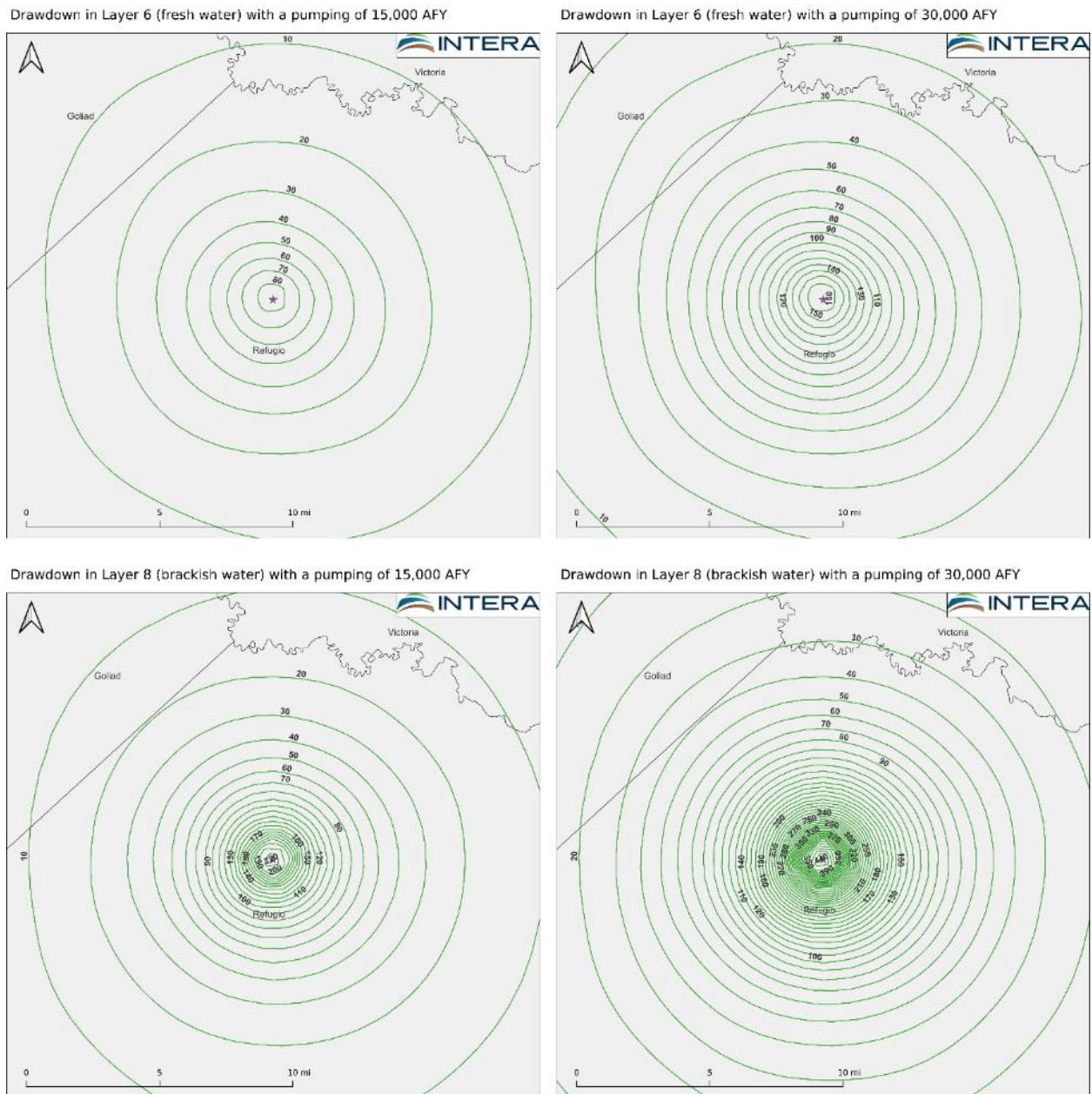


Figure D-1. Simulated drawdowns after 5-year pumping at well field #4 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

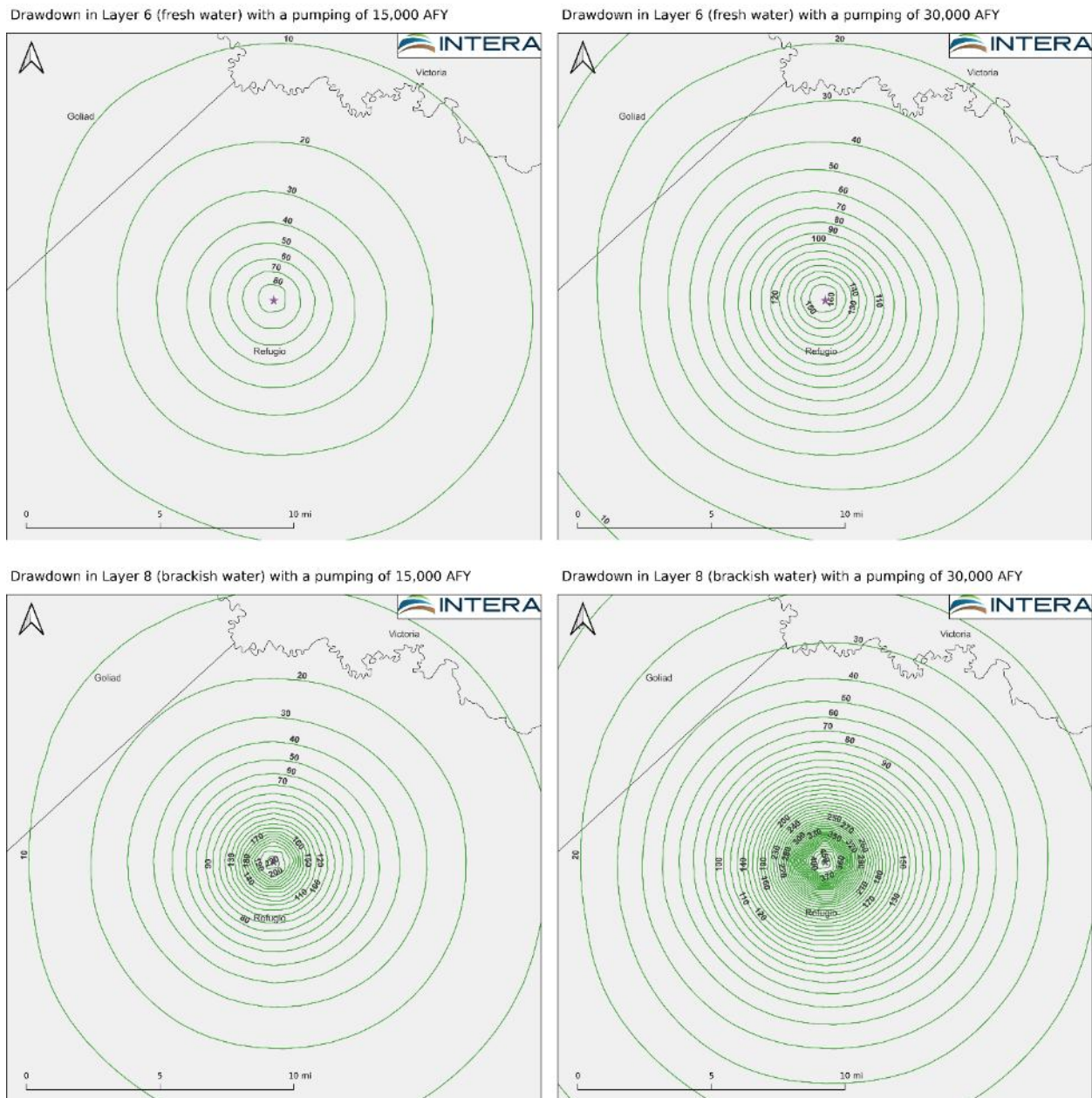


Figure D-2. Simulated drawdowns after 5-year pumping at well field #4 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

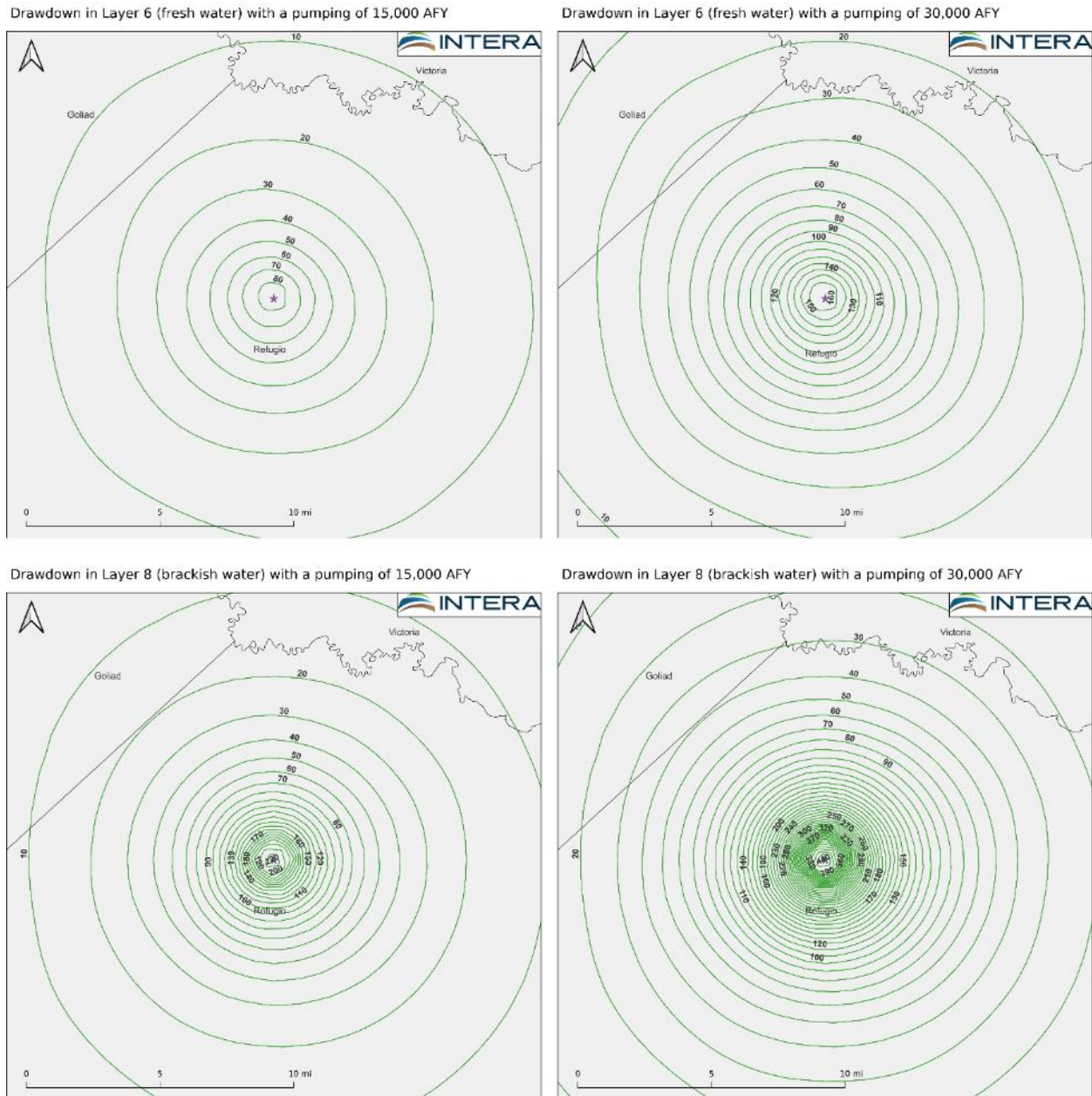


Figure D-3. Simulated drawdowns after 5-year pumping at well field #4 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

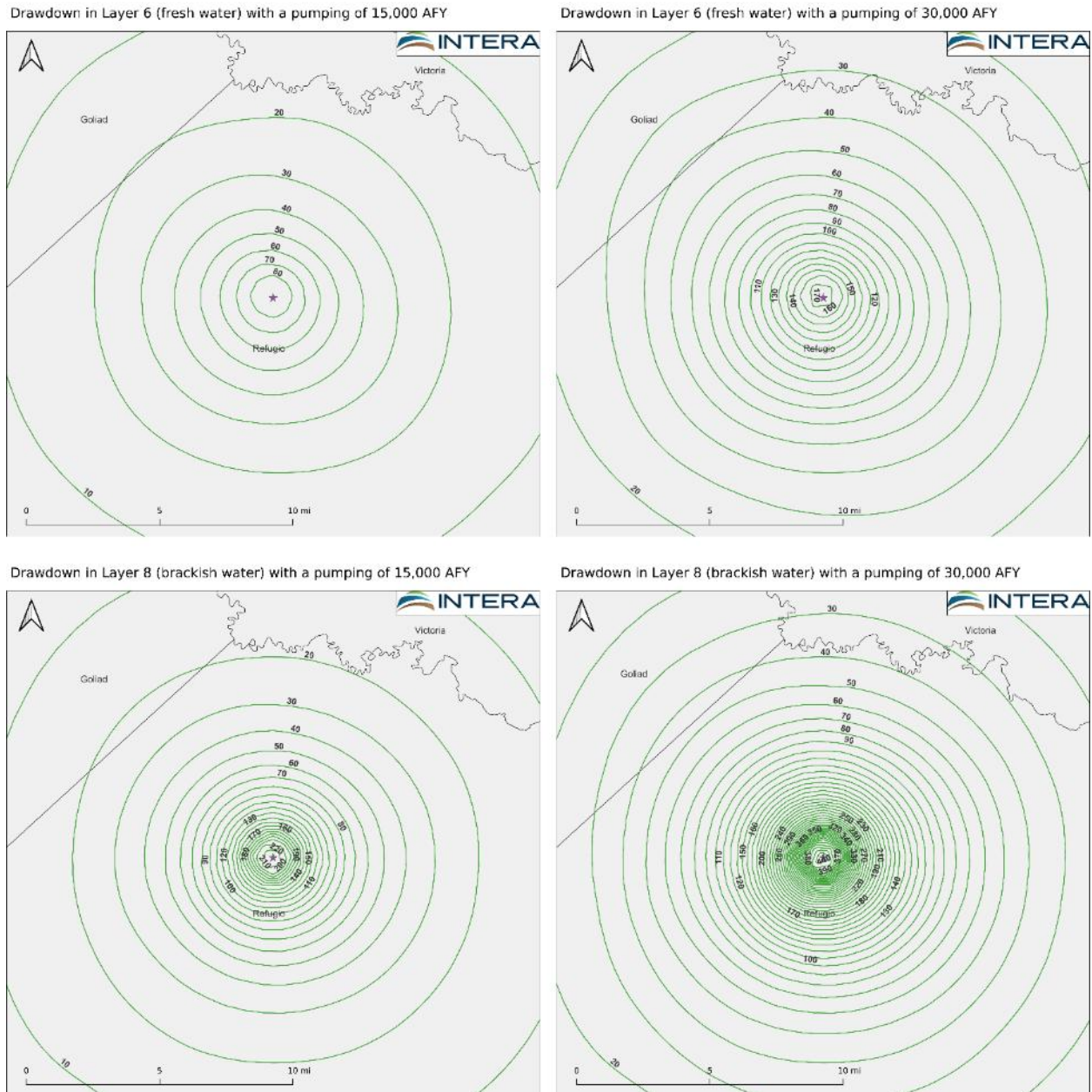
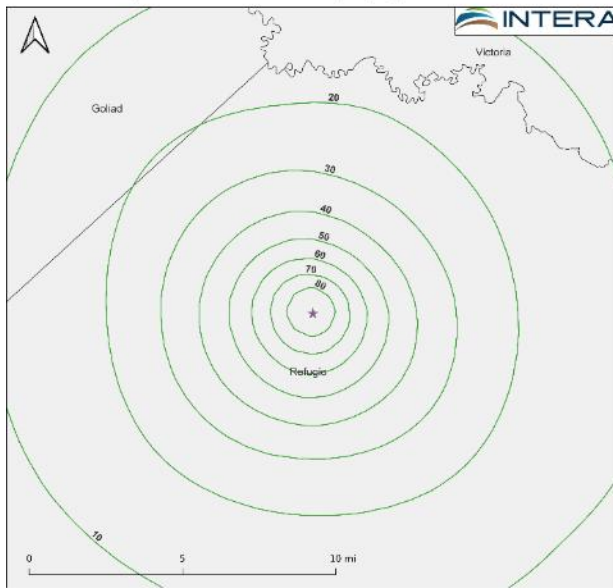
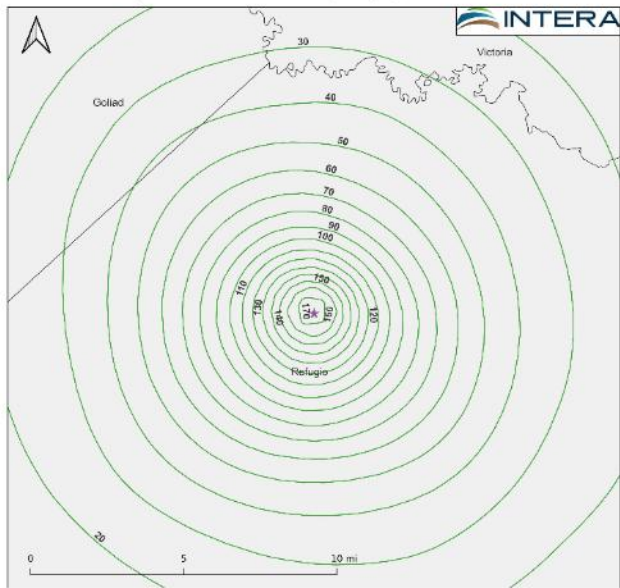


Figure D-4. Simulated drawdowns after 30-year pumping at well field #4 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

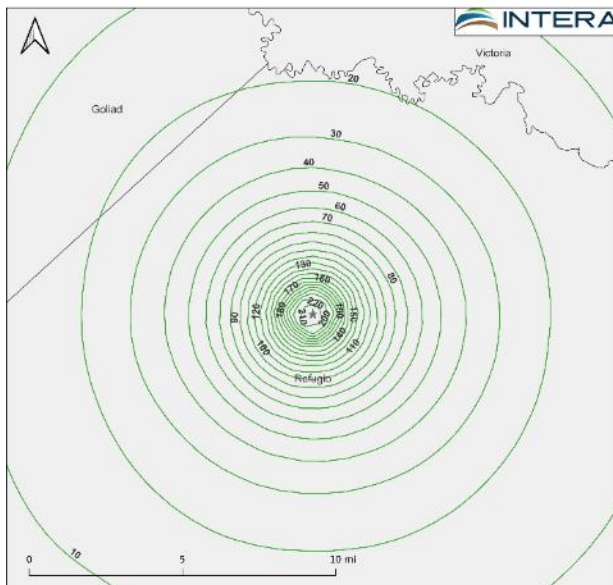
Drawdown in Layer 6 (fresh water) with a pumping of 15,000 AFY



Drawdown in Layer 6 (fresh water) with a pumping of 30,000 AFY



Drawdown in Layer 8 (brackish water) with a pumping of 15,000 AFY



Drawdown in Layer 8 (brackish water) with a pumping of 30,000 AFY

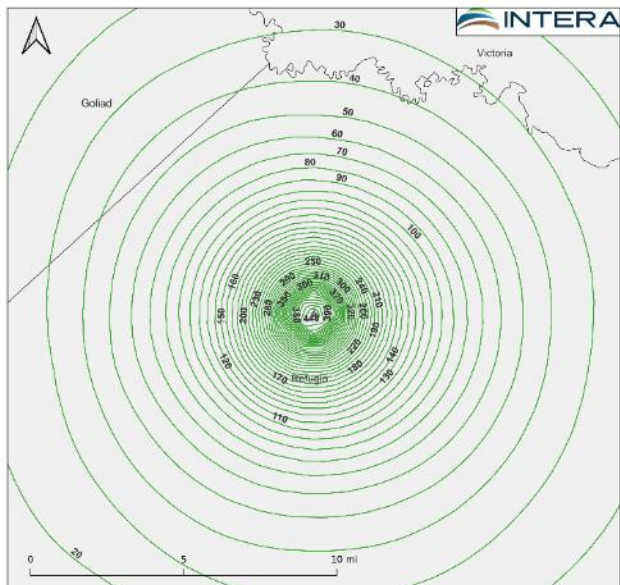
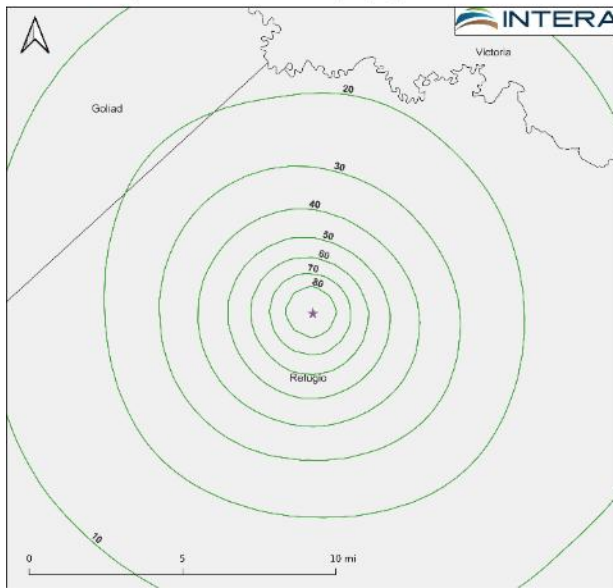
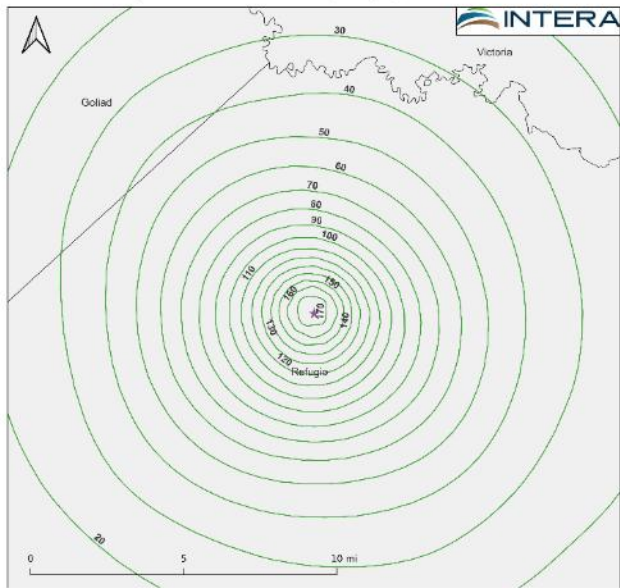


Figure D-5. Simulated drawdowns after 30-year pumping at well field #4 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

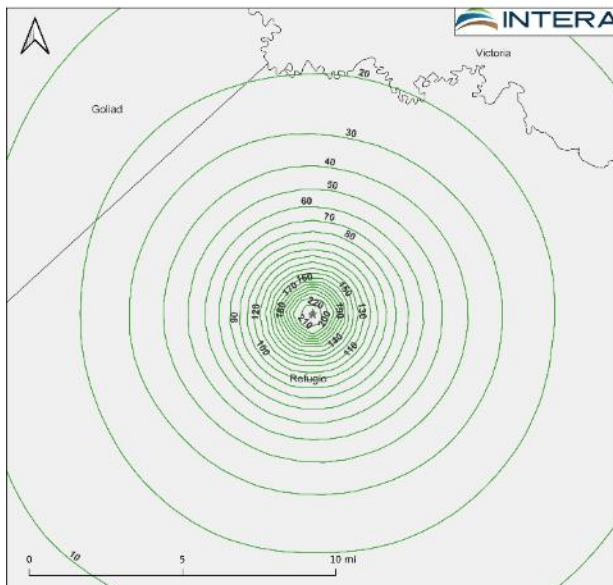
Drawdown in Layer 6 (fresh water) with a pumping of 15,000 AFY



Drawdown in Layer 6 (fresh water) with a pumping of 30,000 AFY



Drawdown in Layer 8 (brackish water) with a pumping of 15,000 AFY



Drawdown in Layer 8 (brackish water) with a pumping of 30,000 AFY

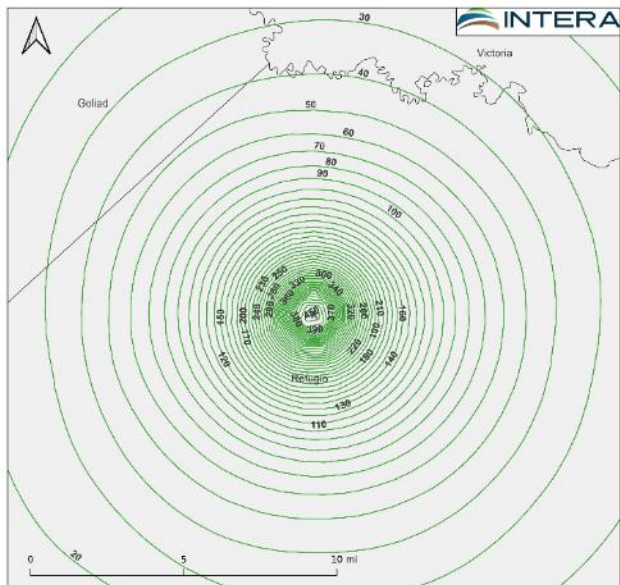


Figure D-6. Simulated drawdowns after 30-year pumping at well field #4 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

Appendix E. Comparisons of Alternative Method to Represent Recharge and Discharge on Land Surface at Well Field #5.

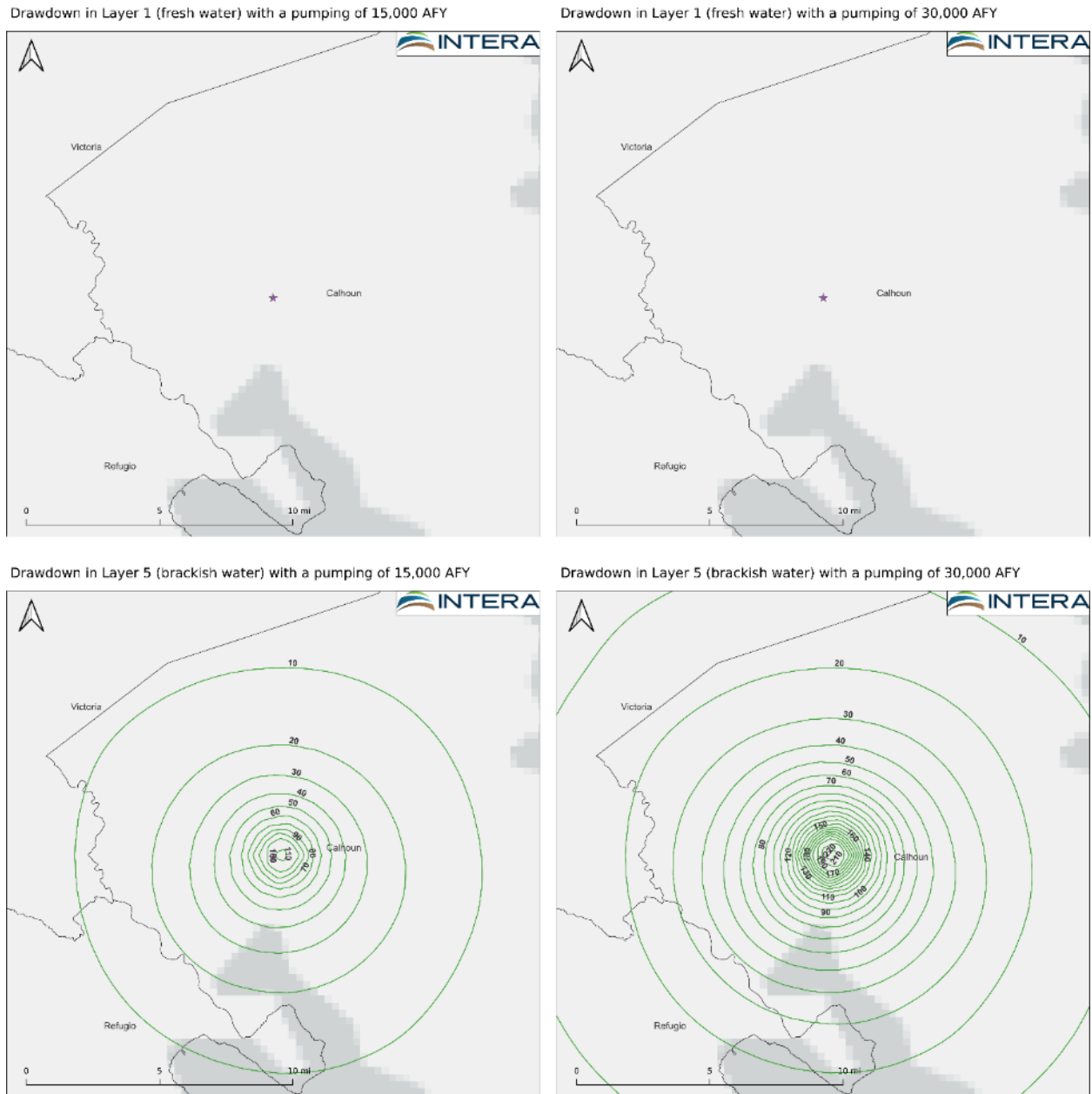


Figure E-1. Simulated drawdowns after 5-year pumping at well field #5 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

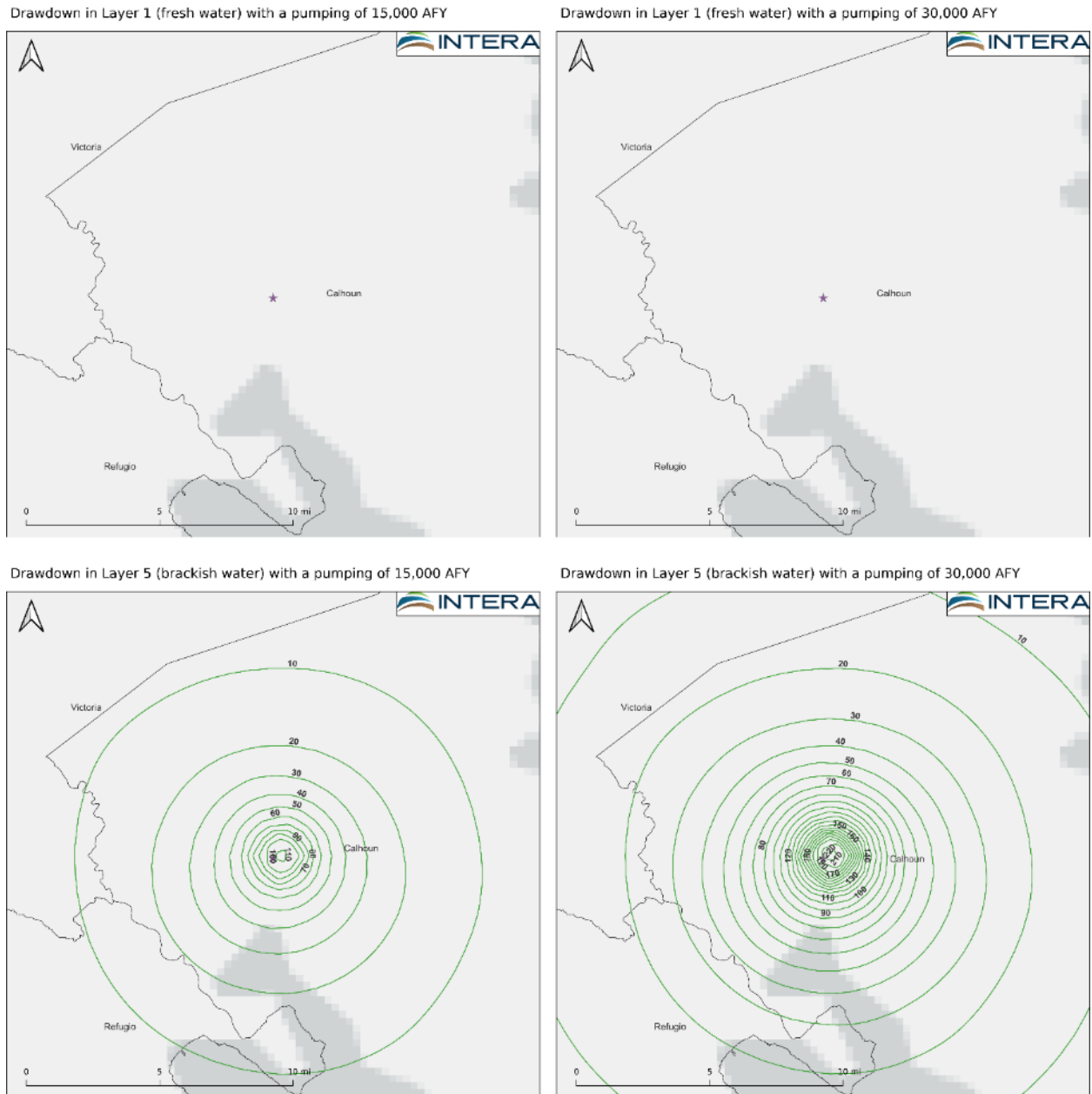


Figure E-2. Simulated drawdowns after 5-year pumping at well field #5 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

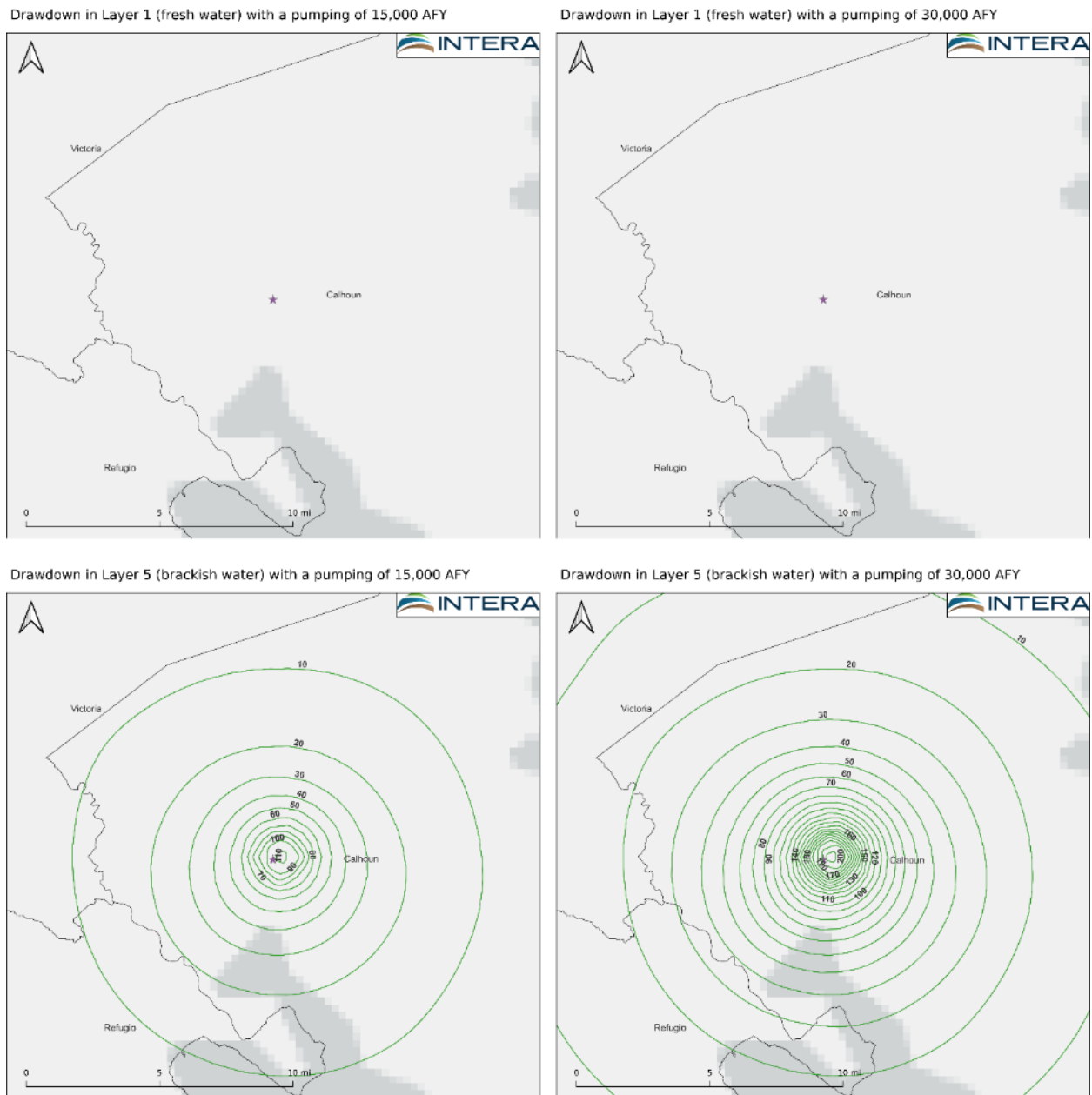


Figure E-3. Simulated drawdowns after 5-year pumping at well field #5 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

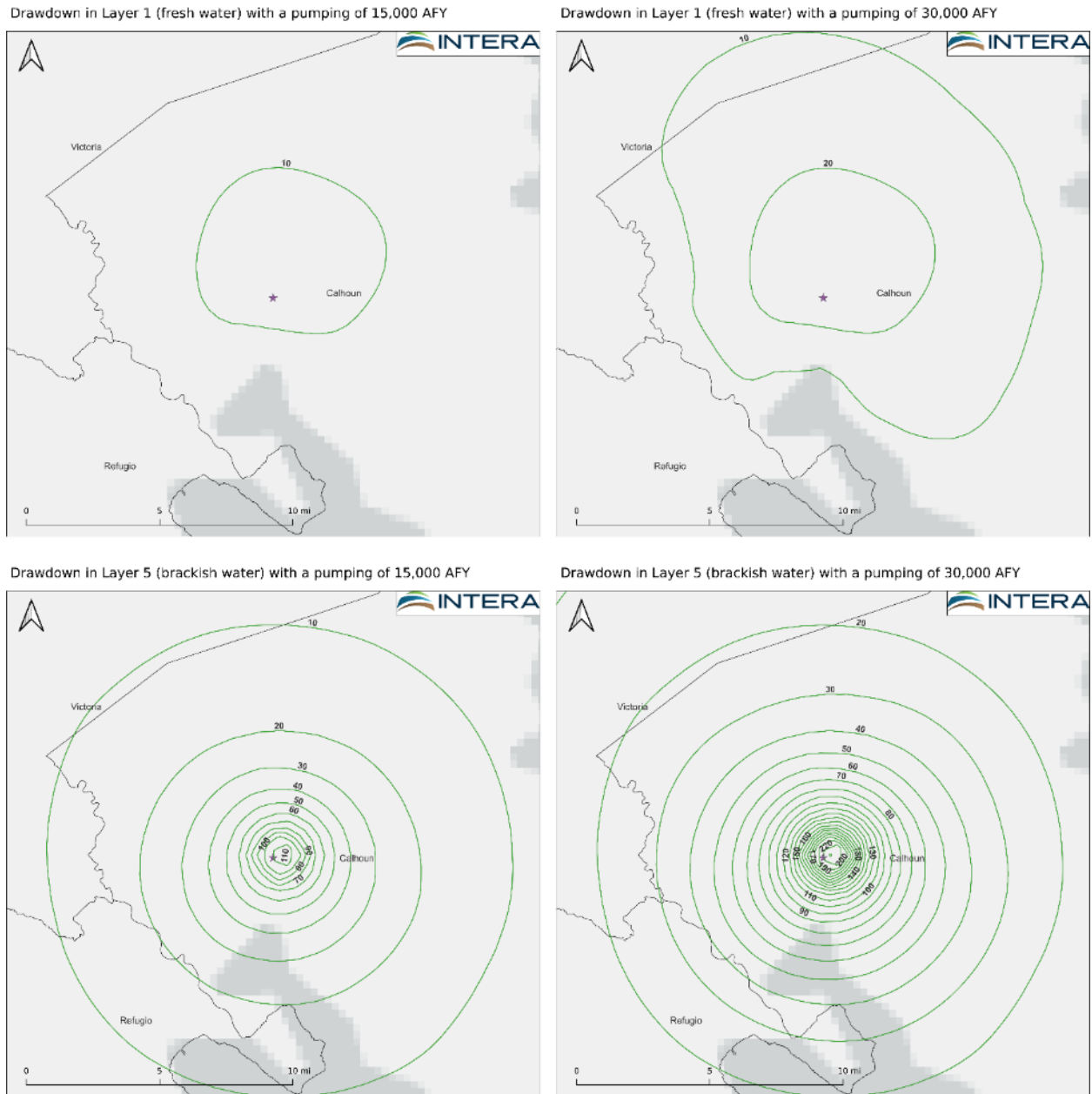


Figure E-4. Simulated drawdowns after 30-year pumping at well field #5 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

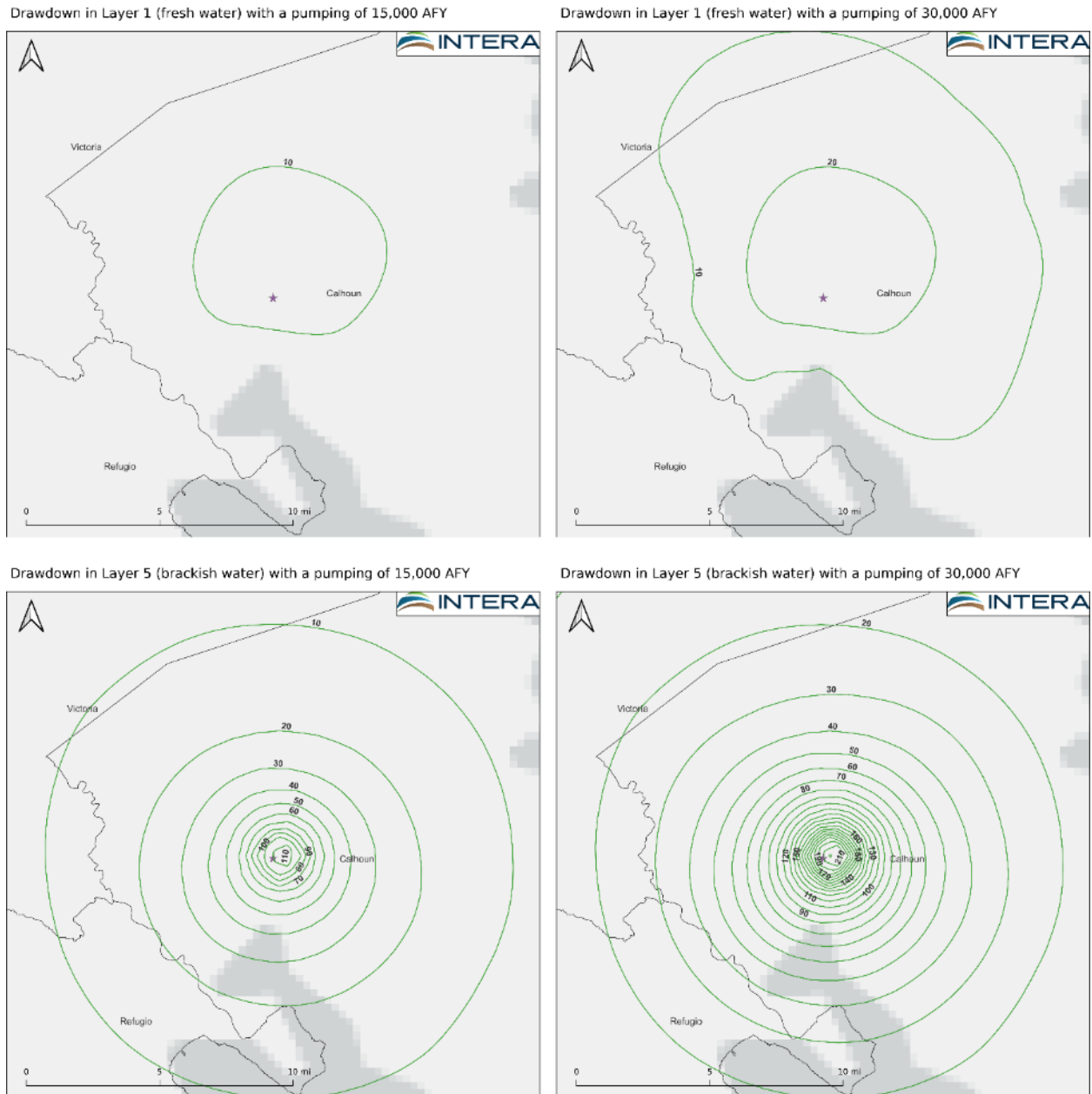


Figure E-5. Simulated drawdowns after 30-year pumping at well field #5 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

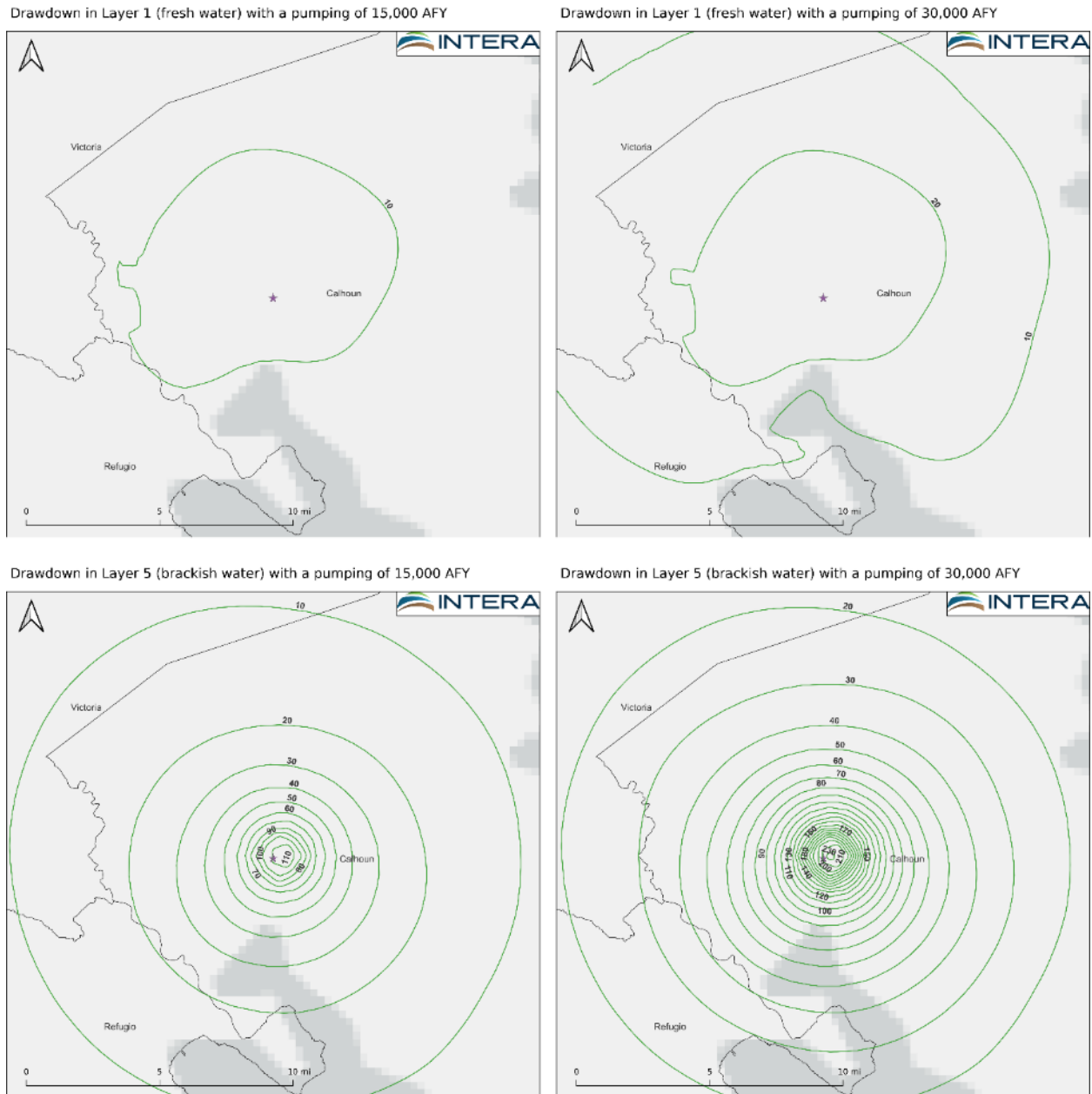


Figure E-6. Simulated drawdowns after 30-year pumping at well field #5 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

Appendix F. Comparisons of Alternative Method to Represent Recharge and Discharge on Land Surface at Well Field #6.

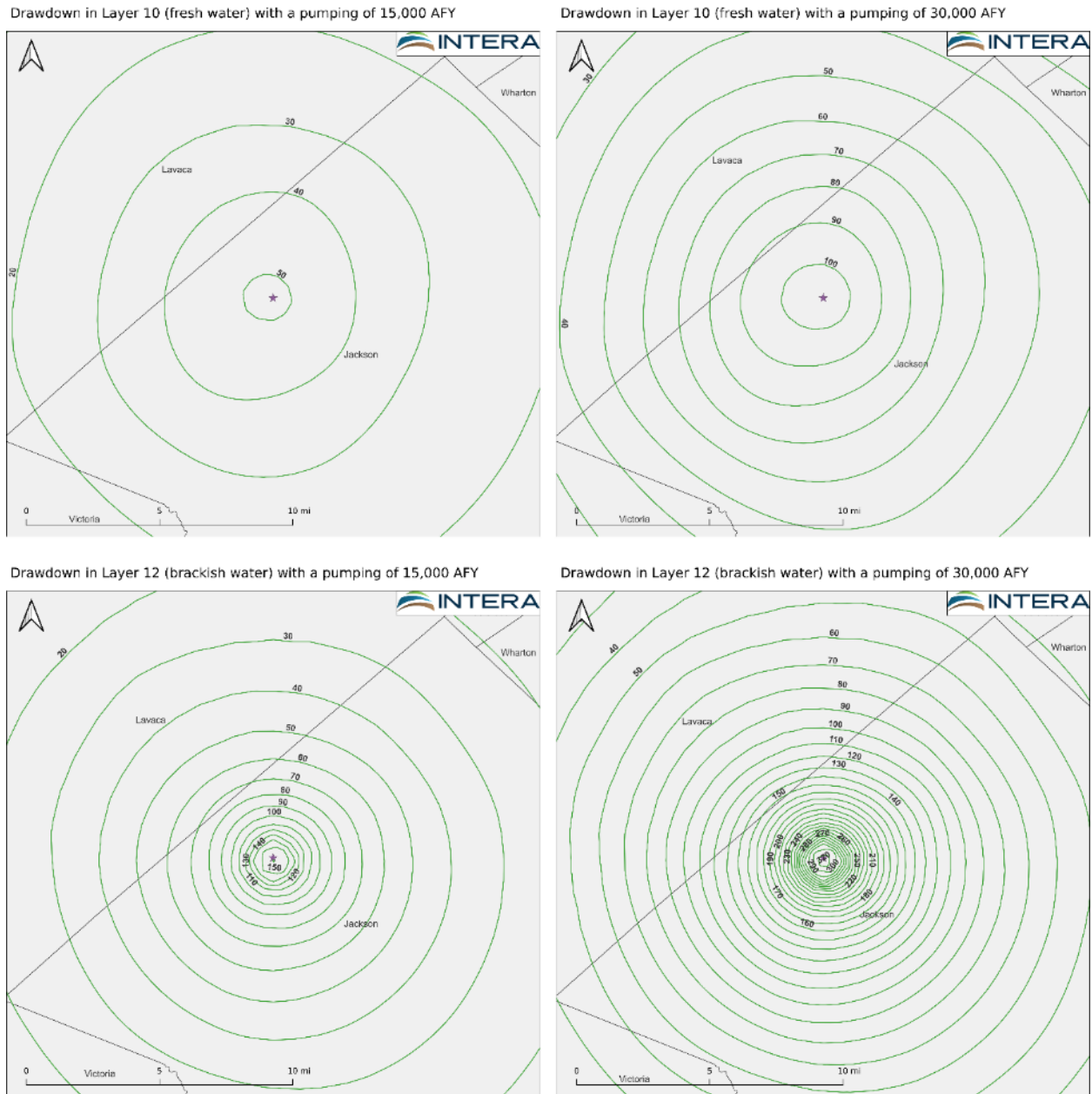


Figure F-1. Simulated drawdowns after 5-year pumping at well field #6 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

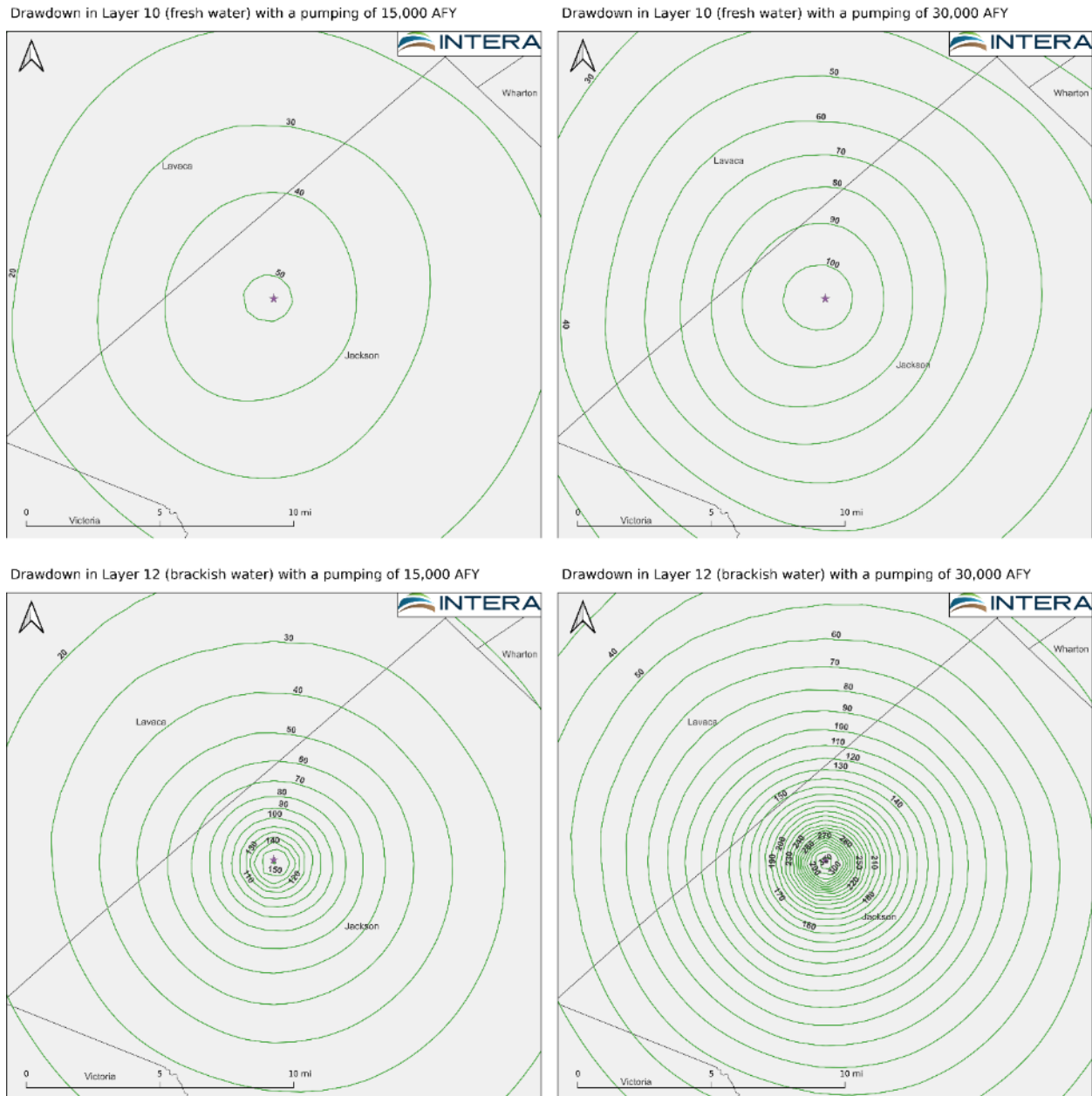


Figure F-2. Simulated drawdowns after 5-year pumping at well field #6 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

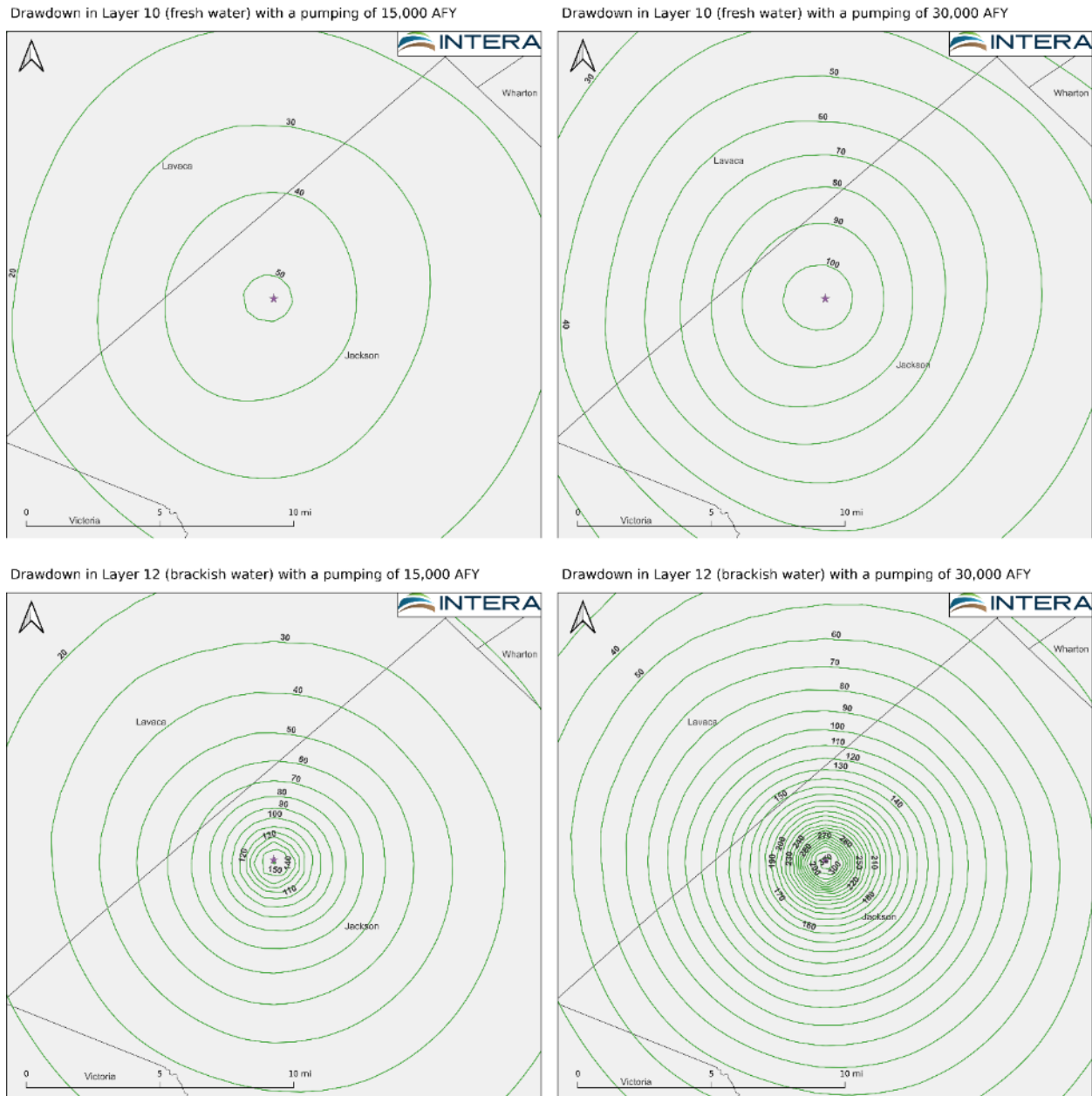


Figure F-3. Simulated drawdowns after 5-year pumping at well field #6 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.

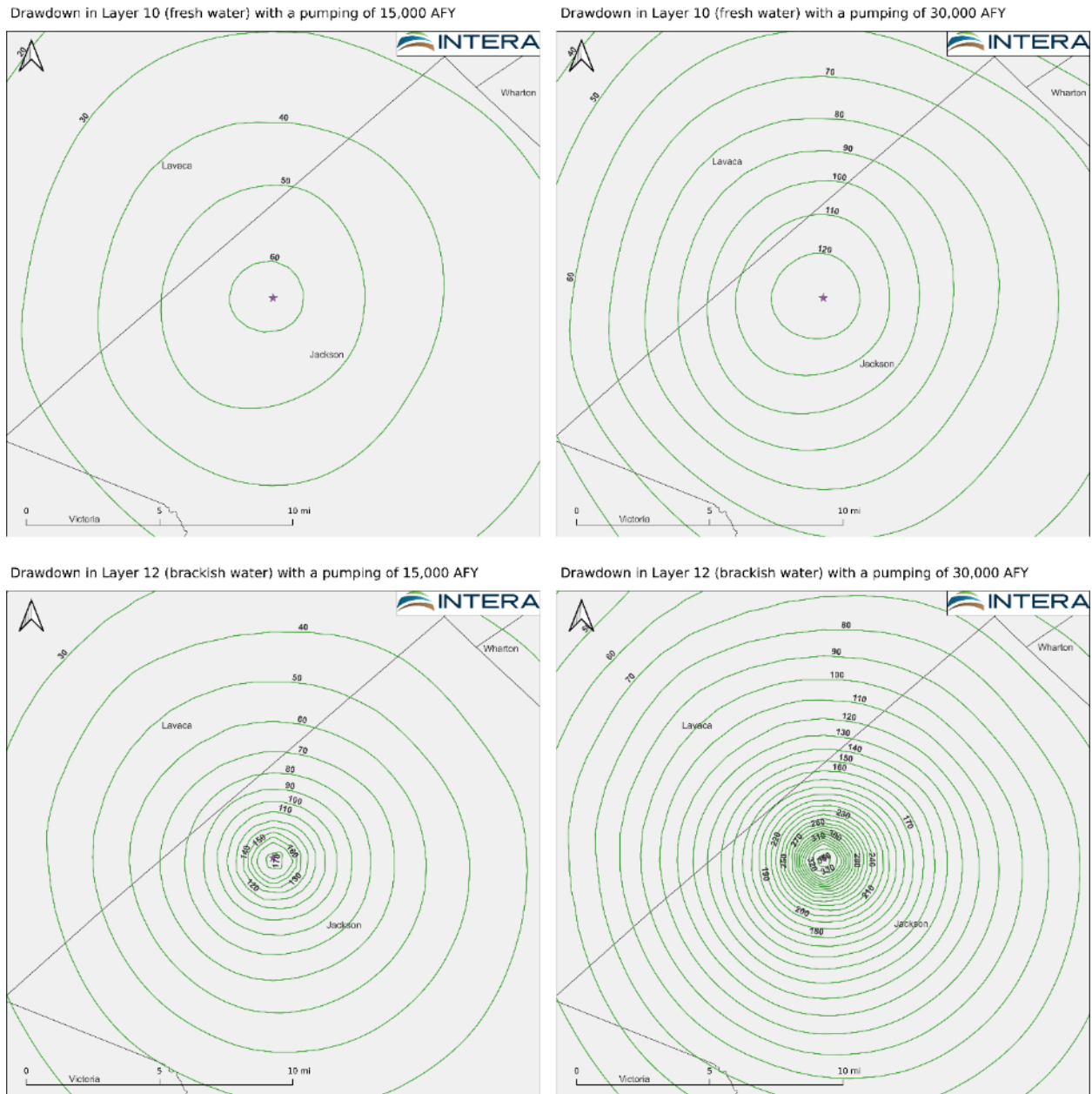


Figure F-4. Simulated drawdowns after 30-year pumping at well field #6 at a rate of 15,000 AFY (left) and 30,000 AFY (right). GHB is used for cells at land surface to represent recharge and discharge.

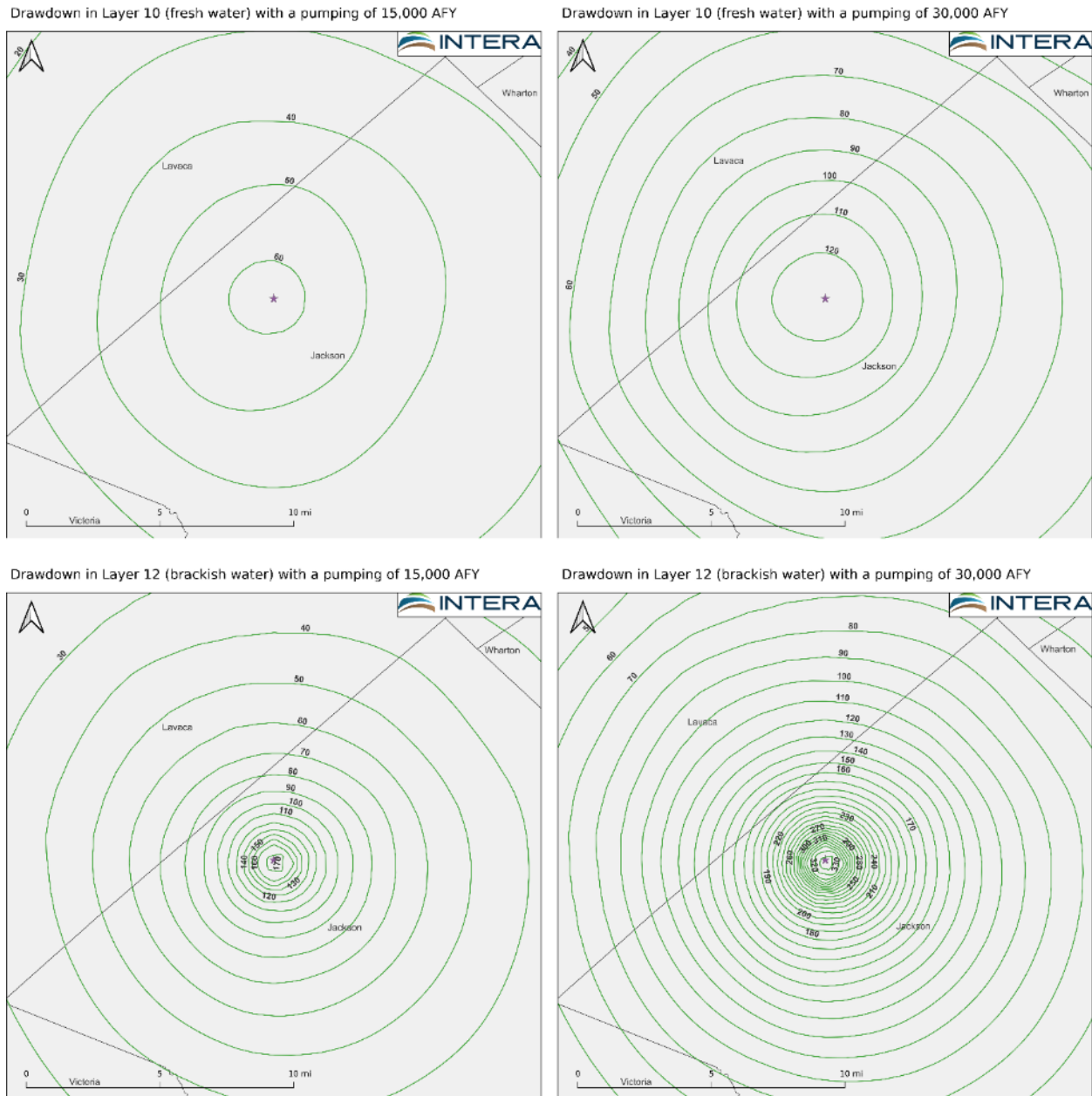


Figure F-5. Simulated drawdowns after 30-year pumping at well field #6 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. GHB is used for cells at land surface to represent discharge.

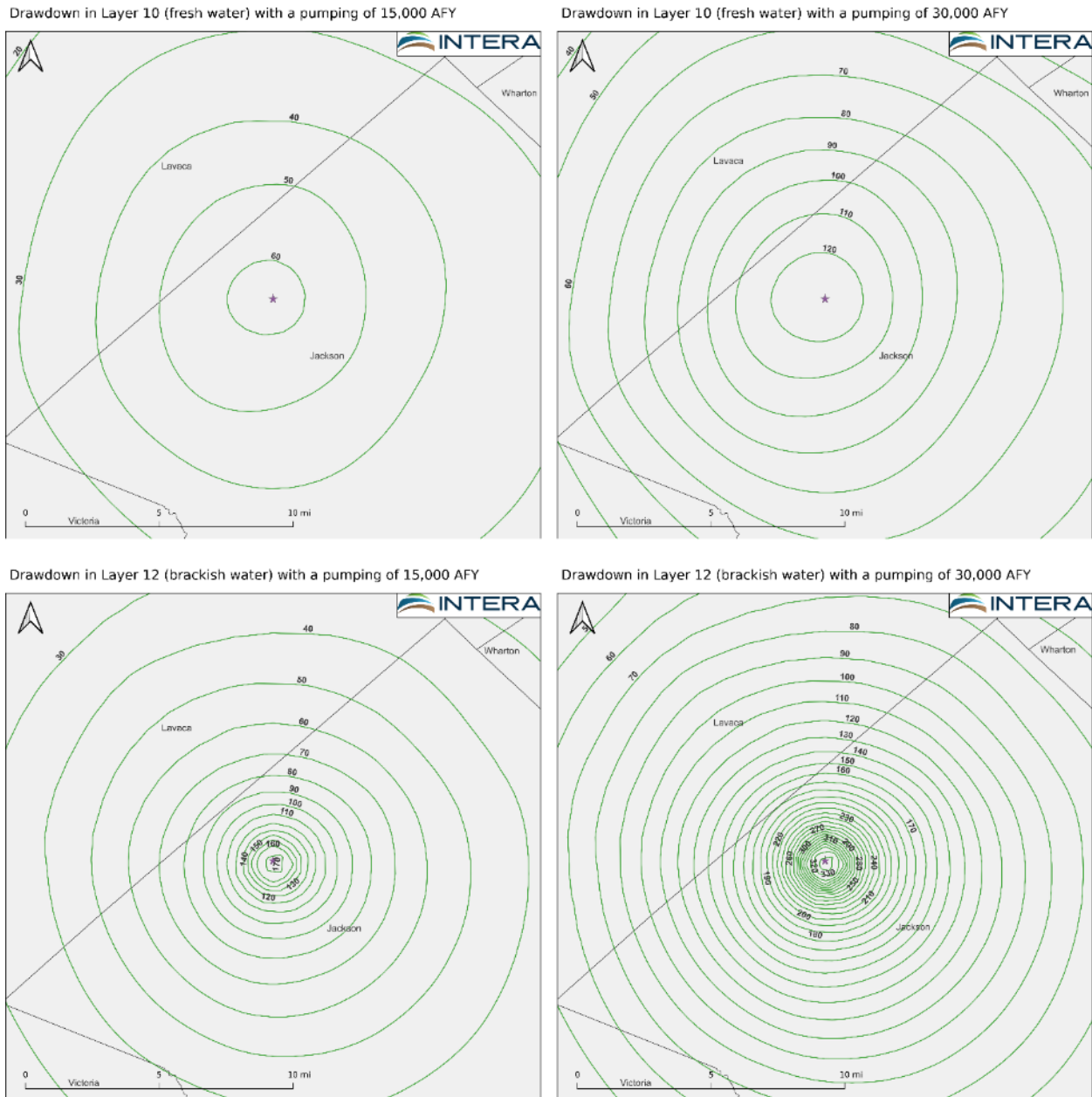


Figure F-6. Simulated drawdowns after 30-year pumping at well field #6 at a rate of 15,000 AFY (left) and 30,000 AFY (right). RCH is used for cells at land surface to represent recharge. WEL is used for cells at land surface to represent discharge.