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Tulare Lake Subbasin Hydrologic Model for Groundwater Sustainability Plan Development: Calibration and Predictive Simulations

Tulare Lake Groundwater Subbasin
Kings County, California

DRAFT

Prepared for:
Mid-Kings River Groundwater Sustainability Agency
Hanford, California

October xx, 2019
Project FR18161220

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Abbreviations and Acronyms

%	percent
bgs	below ground surface
CT	Critical Thresholds
CVHM	United States Geological Survey Central Valley Hydrologic Model
CVP	Central Valley Project
DWR	California Department of Water Resources
El Rico GSA	El Rico Groundwater Sustainability Agency
ETc	Crop Evapotranspiration
FMP	Simulation code module in the USGS MODFLOW-OWHM designed to simulate land use-based water demands (FARM Package)
ft/d	feet per day
ft^2/d	square feet per day
GHB	General Head Boundary
GSAs	groundwater sustainability agencies
GSP	Groundwater Sustainability Plan
GUI	Graphic User Interface
GWV	Environmental Simulations Inc.'s Groundwater Vistas™ Version 7 simulation code GUI
HCM	hydrogeologic conceptual model
IWFM	California Department of Water Resources' Integrated Water Flow Model simulation code
K	hydraulic conductivity
fc	coarse fraction
K_h	horizontal hydraulic conductivity
K_v	vertical hydraulic conductivity
MKRGSA	Mid-Kings River Groundwater Sustainability Agency
MO	Monitoring Objective
MODFLOW	USGS Modular finite-difference family of numerical simulation codes to calculate groundwater and surface water interaction
NRMS	Normalized root mean square error
MNW2	Version 2 of the MODFLOW multi-node well package
msl	mean sea level
PRISM	Parameter-elevation Regressions on Independent Slopes Model
RMS	root mean square
SFKRGSA	South Fork Kings River Groundwater Sustainability Agency
SFR	Streamflow Routing
SSR	sum of the square of the residuals
std dev	standard deviation
S_s	specific storage
S_y	specific yield
SGMA	Sustainable Groundwater Management Act of 2014
SWKGSA	Southwest Kings Groundwater Sustainability Agency
SWP	State Water Project
TCWA	Tri-County Water Authority
TLSB	Tulare Lake Groundwater Subbasin
TLSBHM	Tulare Lake Subbasin Hydrologic Model
USGS	United States Geological Survey

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1.0 Introduction

Wood Environment & Infrastructure Solutions, Inc. (Wood), has been retained by the Mid-Kings River Groundwater Sustainability Agency (MKRGSA) to prepare and document a hydrologic flow model of the Tulare Lake Groundwater Subbasin (TLSB) to aid local agencies in compliance with the Sustainable Groundwater Management Act of 2014 (SGMA). The TLSB is located primarily in Kings County, within the Tulare Lake Hydrologic Region of the San Joaquin Valley, California (Figure D1-1). This project is a cooperative effort among five groundwater sustainability agencies (GSAs) within the TLSB, including: El Rico GSA, MKRGSA, South Fork Kings River GSA (SFKRGSA), Southwest Kings GSA (SWKGSA), and Tri-County Water Authority (TCWA). Although the TLSB is the primary focus of this modeling study, the modeling effort encompasses portion of adjacent California Department of Water Resources (DWR)-defined groundwater subbasins including the Kings, Kaweah, Tule, Kern, and Westside subbasins.

1.1 Background

Included as part of SGMA was a requirement that the DWR identify groundwater basins and subbasins in conditions of critical overdraft. As defined by DWR, overdraft occurs where the average annual amount of groundwater extraction exceeds the long-term average annual supply of water to the basin. Effects of overdraft can include land subsidence, groundwater depletion, and/or chronic lowering of groundwater levels. DWR Bulletin 118 defines critical overdraft as "when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts."

Based on this criterion and a formal evaluation of groundwater basins across the state, the DWR found much of the Tulare Lake Hydrologic Region to be one of the most critically over-drafted regions of the state. The TLSB sits at the lowest point of the Tulare Lake Hydrologic Region and receives both surface water inflows from several streams (including Kings River, Kaweah River, Tule River, and Deer Creek) and the State Water Project (SWP), but also irrigation return flows (tailwater) draining from irrigated lands. Nonetheless, in most years, especially during frequent drought cycles, agricultural water demand exceeds the surface water inflows, leading to the drilling of wells to develop the groundwater resources to fulfill that unmet demand. In fact, under recent historical conditions, the average annual demand on groundwater resources significantly exceeds the average existing recharge to the groundwater system, leading the DWR to declare the TLSB critically over drafted, triggering the need to develop a Groundwater Sustainability Plan (GSP) by January 31, 2020, per SGMA requirements.

The Tulare Lake Subbasin Hydrologic Model (TLSBHM) developed for this project provides a quantitative tool for development and evaluation of alternative water management scenarios considered for the GSP. Additional model development and calibration will occur throughout the implementation of the GSP as additional data are collected.

1.2 Modeling Objectives

The objectives of the current modeling efforts were to:

1. Prepare a preliminary three-dimensional numerical surface water/groundwater flow model of the TLSB and portions of adjoining subbasins.
2. Calibrate the surface water/groundwater flow model for the period 1990-2016, with a focus on the "normal hydrology" period 1998 through 2010, for initial calibration using available groundwater elevation observations and stream flow observations.

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3. Provide a Baseline Forecast from 2017-2070 assuming continued recent land use and continued "normal hydrology" conditions modified to account for climate change. This forecast was utilized to establish Critical Thresholds (CT) and Monitoring Objectives (MO) throughout the Subbasin.
4. Provide a Project Forecast from 2017-2070 assuming continued recent land use, continued 1998 through 2010 "normal hydrology" conditions as modified to account for climate change, and additional Surface Water Supply and Aquifer Recharge resulting from several Projects assumed to be implemented throughout the TLSB and adjoining subbasin.
5. Compare the Baseline and Project Forecasts and estimate what additional Projects and/or management actions (such as land fallowing) may be required to obtain sustainability by 2040 and thereafter.

2.0 Hydrogeologic Conceptual Model

A hydrogeologic conceptual model (HCM) is a simplified description of the groundwater flow system, frequently in the form of a block diagram or cross-section with an accompanying narrative description of the function and interaction of the various components that comprise the hydrogeologic system (Anderson and Woessner, 1992). The nature of the HCM determines the dimensions of the numerical model and the design of the grid, the distribution of the hydrogeologic properties, and the definition and distribution (over space and time) of external and internal stresses and boundary conditions. The purpose of the HCM is to establish an initial understanding of the groundwater system and organize the associated data and information so that the system can be analyzed more effectively.

Figure D2-1 presents block diagrams that schematically represents key aspects of the HCM for the TLSBHM under both pre-development and current conditions. Details related to this HCM for the project include: (1) description of the model domain, (2) delineation of the hydrostratigraphic units within the model domain, (3) definition of sources and sinks and estimation of the water budget, and (4) narrative description of the flow system. Each of these items are discussed in the following subsections.

2.1 Basin Location and Study Area

The TLSB is located primarily in Kings County in the Tulare Lake Hydrologic Region of the San Joaquin Valley, California (Figure D2-2). The TLSB covers an area of approximately 533,760 acres or about 834 square miles. The TLSB in bounded by the Kings subbasin to the north, the Kaweah subbasin to the northeast, the Tule subbasin to the southeast, the Kern subbasin to the south, the Kettleman Plain subbasin to the southwest, and the Westside subbasin to the northwest.

As shown on the figure, the study area extends beyond the official TLSB boundaries (as delineated by the DWR) from 3 to 6 miles into adjacent subbasins to better evaluate interactions with groundwater in those adjacent areas. The study area includes approximately 151,880 acres (~237.3 square miles) of the Kaweah subbasin, approximately 119,360 acres (~186.5 square miles) of the Kings subbasin, approximately 126,600 acres (~197.8 square miles) of the Tule subbasin, approximately 81,760 acres (~127.8 square miles) of the Westside subbasin, and approximately 78,000 acres (~121.8 square miles) of the Kern subbasin.

The vertical extent of the study area is the freshwater hydrogeologic system, based on the United States Geological Survey (USGS) Central Valley Hydrologic Model (CVHM) (Faunt et al., 2009), and modified to be consistent with the findings of Tulare Lake bed de-designation studies (Schmidt, 2013, RWQCB, 2017). The

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depth zones that comprise the freshwater hydrogeologic system extend to a depth of about 3,000 feet below ground surface (bgs), but not reaching down into the deeper confined saline groundwater below.

2.2 Topography

The TLSB and surrounding area is generally located in the lowest portion of the San Joaquin Valley (Figure D2-3). Ground surface gently rises to the northeast from about 180 feet above mean sea level (msl) at the Tulare Lake bottom to about 300 feet above msl near Kingsburg. To the southwest, ground surface rises rapidly from the Tulare Lake bottom to about 500 feet near the Kettleman Hills. To the south, ground surface gently rises from the lake bottom to about 220 above msl at the Kern County line.

2.3 Geology

The TLSB is located in the south-central portion of the greater San Joaquin Valley. The valley was formed generally as a structural trough subsiding between two uplifts: the tectonically driven tilted block of the Sierra Nevada and the thrust belts of the Coast Ranges created by crustal shortening east of the San Andreas fault.

Episodic intrusion of the Pacific Ocean through land gaps along the northern and southern boundaries of the San Joaquin Valley occurred during Miocene and Pliocene times, allowing deposition of marine sediments to accumulate in the subsiding shallow sea environment of the San Joaquin basin. These deposits were subjected to deformation as the Sierra Nevada rose on the east and Coastal Range rose to the west and the valley trough subsided. The marine deposits are exposed in the west-side thrust belts, which typically reach elevations of 2,000 feet or less. Beneath the San Joaquin Valley, the top of the marine deposits are typically 3,000 feet or more below the valley floor, rising on the southeastern portion of the valley to cap the igneous rocks of the uplifted Sierra foothills.

As the land gaps closed in the mid-Pliocene, the continued uplift of the Sierra Nevada and Coast Ranges shed continental deposits to the San Joaquin Valley. These continental deposits, typically assigned to the Plio-Pleistocene Tulare Formation, have filled the valley trough in places with more than 3,000 feet of sediments. Where Pleistocene geologic features periodically cut off the route of major rivers and tributaries to the sea, widespread and sometimes extreme thicknesses of lacustrine sediments were deposited. Significant examples of these lacustrine deposits are the Tulare Lake bed clays, the Buena Vista clays, and the Corcoran Clay (sometimes referred to as the E-clay or modified E-clay).

2.3.1 Tulare Formation – Continental Deposits

Various investigators in the San Joaquin Valley have assigned ages and names to what they have identified as formations in their respective study areas. The Plio-Pleistocene Tulare Formation, which has its type section on the eastern slope of the North Dome of the Kettleman Hills (Woodring et al., 1940), has been correlated stratigraphically with other valley formations such as the Laguna Formation in the northeast portion of the valley (Woodring et al., 1940) and Kern River formations in the southeast portion of the valley (Bartow, 1991).

In the TLSB, the primary stratigraphic units containing usable groundwater include the Tulare Formation, older alluvium, and younger alluvium. The Tulare Formation is by far the thickest of these three. The bottom of the Tulare Formation has been defined by Woodring et al. (1940) as occurring just above the Mya interval of the primarily marine San Joaquin Formation, over which it conformably lies on the North Dome, just northwest of the Tulare Lake bed. The Tulare Formation/San Joaquin Formation contact dips steeply eastward from the Kettleman Hills, lying more than 3,000 feet beneath the trough in the Tulare

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Lake area (Croft and Gordon, 1968). Woodring et al. (1940) have defined the Tulare Formation as the uppermost continental deposits deformed by the folding associated with the Kettleman Hills. However, as noted by Davis et al. (1959), the upper contact of the Tulare Formation with younger continental deposits (older and younger alluvium) is not easily discerned because "at many places along the valley border the dips increase westward so gradually that only a rough separation can be effected between the valley alluvium and the Tulare Formation. Separation of the alluvium from the Tulare Formation beneath the valley is virtually impossible because of their lithologic similarity."

2.3.2 Lacustrine, Marsh, and Flood Deposits

In the TLSB, Croft and Gordon (1968) identified a number of lacustrine clays in the subsurface that they correlated to lacustrine clays identified by Woodring et al. (1940) in the Tulare Formation in Kettleman Hills. Croft and Gordon (1968) identified these in geophysical logs and named them the A- through F-clays, with the E-clay being equivalent to the diatomaceous Corcoran Clay. Though the A- through D-clays may be important locally in restricting downward movement of groundwater, by far the most important is the E-clay, which has been identified as a spatially extensive (about 3,500 square miles; Croft, 1972) and thick clay that separates regionally confined and unconfined groundwater zones in the southern San Joaquin Valley (Figure D2-4). The E-clay has been age-dated as mid-Pleistocene and is considered part of the Tulare Formation (Croft and Gordon, 1968). Beneath the Tulare Lake bed, there is a thick, nearly homogeneous deposit of lacustrine clays from ground surface to the San Joaquin Formation, including the E-Clay. However, the E-clay extends far beyond the shoreline of Tulare Lake (Croft, 1972).

2.3.3 Older and Younger Alluvium

The other continental deposits that have been identified in published reports as containing groundwater are the older and younger alluvium (Croft and Gordon, 1968). In the Tulare Lake area, these deposits are primarily Sierran in origin, being deposited by the major stream channels emanating from the Sierra Nevada. Some sediments may have Coast Range origin, but the axis of Tulare Lake bed is close to the Kettleman Hills, which leaves little room for Coast Range sediment deposition on the west side. The older alluvium is widespread throughout the San Joaquin Valley and in other areas represents deposition from both the Coast Ranges on the west side of the valley and the Sierra on the east. It typically overlies the Tulare Formation, though as mentioned earlier, there is no way to differentiate between the two in the subsurface. It is considered Pleistocene to Recent in age. Most of the groundwater withdrawn from the TLSB comes from the older alluvium/Tulare Formation complex.

The younger alluvium is generally thinner than the older alluvium and is present in current stream channels and as a veneer over the older alluvium as the deposits stretch to the west. The younger alluvium is primarily arkosic and contains groundwater only ephemerally or where underlying clays tend to restrict downward movement of recharging water. It is considered of Recent age.

2.3.4 Tulare Lake Bed

The Tulare Lake bed is the prominent sedimentary feature in the TLSB. It was a natural lake bed fed by streams from the east and south. Its elongate shape to the northwest reflects the subsidence of the valley trough east of the Kettleman Hills. Geologic cross-sections through the Tulare Lake bed (Croft, 1972; Croft and Gordon, 1968; Davis et al., 1959) illustrate the thick and continuous nature of the clay deposits beneath the lake bed (Figure D2-5).

Cross-section A-A' (Plate 4, Croft and Gordon, 1968) indicates uninterrupted lacustrine deposits from the surface to at least 2,200 feet bgs beneath the central portion of the lake. Cross-sections B-B' and C-C'

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(Plates 5 and 6, Croft and Gordon, 1968) illustrate the interfingering of the coarser sediments and the thinner clay zones along the periphery of the lake with the thick clay deposits beneath the lake. Though Croft and Gordon (1968) did not carry the E-clay through the lake deposits, Davis et al. (1959, Plate 10, Section G-G', Diatomaceous Clay) and Croft (1972, Plate 3, Section G-G', E-clay) felt they had enough evidence to map it beneath the lake. Davis et al. (1959) show it as being warped downward along the axis of the lake with a maximum thickness of 150 to 175 feet. These cross-sections indicate the Tulare Lake deposits form a clay "plug" across the center of the San Joaquin Valley that may be 15 miles wide, 8 miles long, and 0.5-mile deep at its maximum dimensions.

2.4 Hydrogeology

The hydrogeology of the TLSB is complex in that the only physical boundaries are the Kings River and the Kettleman Hills on the southwest edge of the TLSB. The remaining edges of the TLSB are based on political and water management areas. The Corcoran Clay underlies most of the TLSB and essentially subdivides the TLSB into two aquifer systems: an unconfined to semi-confined aquifer system above the Corcoran Clay and a confined aquifer system below the Corcoran Clay.

The Kings River appears to be a natural groundwater divide separating the TLSB and the Kings subbasin. In the unconfined aquifer, groundwater outflow from the Kings subbasin into the TLSB is primarily due to leakage from the Kings River. However, this groundwater predominantly flows along the course of the Kings River and therefore does not remain exclusive to the TLSB. In the confined aquifer, groundwater outflow from the Kings subbasin into the TLSB is also due to leakage from the Kings River in the northeast portion of the TLSB where the Corcoran Clay is not present. This groundwater has a strong downward vertical component that creates steep southward hydraulic gradients beneath the Corcoran Clay. This groundwater tends to remain resident in the TLSB confined aquifer.

The groundwater flow system for these two aquifer systems is summarized in the following subsections.

2.4.1 Unconfined Aquifer

The unconfined and semi-confined upper portion of the regional fresh-water aquifer are found above the Corcoran Clay. This upper portion of the regional freshwater aquifer is generally comprised of coarse- to medium-grained sediments (i.e., sand and gravel) with silt and clay interbeds.

Groundwater beneath the TLSB and surrounding areas is typically found between depths from 30 to 250 feet bgs, depending on location and time. A review was conducted of available DWR groundwater elevation contour maps of the unconfined aquifer from 1960 to 2010 and briefly described below (DWR, 2018). The maps show a persistent, large data gap beneath the Tulare Lake bed where there are few observations of groundwater levels due to a lack of wells.

- In 1990, groundwater was at an elevation of about 260 feet msl near Kingsburg, decreasing toward the Tulare Lake bottom (Figure D2-6a). Groundwater elevations beneath Hanford were about 170 feet msl and about 140 feet msl near Corcoran. There were several cones of depression in the water table near Hanford, north and south of Corcoran, and around Alpaugh. The Kings River appears to be a natural groundwater divide. In general, groundwater was flowing into the TLSB from the Kern, Kings, Kaweah, and Tule subbasins and out of the TLSB to the Westside subbasin.
- In 1995, groundwater was at an elevation of about 260 feet msl near Kingsburg, decreasing toward the Tulare Lake bottom (Figure D2-6a). Groundwater elevations beneath Hanford were

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about 150 feet msl and about 110 feet msl near Corcoran. The cone of depression in the water table between Hanford and Corcoran has merged into a single large depression. The Kings River continues to be a natural groundwater divide. In general, groundwater was flowing into the TLSB from the Kern, Kings, Kaweah, and Tule subbasins and out of the TLSB to the Westside subbasin.

- In 2000, groundwater was at an elevation of about 250 feet msl near Kingsburg, decreasing toward the Tulare Lake bottom (Figure D2-6a). Groundwater elevations beneath Hanford were about 150 feet msl and less than 100 feet msl near Corcoran. The Kings River continues to be a natural groundwater divide. In general, groundwater was flowing into the TLSB from the Kings, Kaweah, and presumably the Kern subbasins and out of the TLSB to Tule and Westside subbasins.
- In 2005, groundwater was at an elevation of about 260 feet msl near Kingsburg, decreasing toward the Tulare Lake bottom. Groundwater elevations beneath Hanford were about 140 feet msl, about 10 feet lower than in 2000 (Figure D2-6b). Throughout the TLSB, groundwater levels were about 10 or more feet lower than in 2000. The Kings River continues to be a natural groundwater divide. In general, groundwater was flowing into the TLSB from the Kings, Kaweah, and Tule subbasins and out of the TLSB to the Westside subbasin.
- In 2010, groundwater was at an elevation of about 250 feet msl near Kingsburg, decreasing toward the Tulare Lake bottom. Groundwater elevations beneath Hanford were about 130 feet msl and less than 10 feet msl near Corcoran (Figure D2-6b). Throughout the TLSB, groundwater levels were about 10 or more feet lower than in 2005. The Kings River continues to be a natural groundwater divide. In general, groundwater was flowing into the TLSB from the Kings, Kaweah, Tule, and presumably the Kern subbasins and out of the TLSB to the Westside subbasin.
- In 2016, groundwater was at an elevation of about 230 feet msl near Kingsburg, decreasing toward the Tulare Lake bottom. In the Hanford area, groundwater levels were about 110 feet msl, about 20 feet lower than in 2010. Cones of depression in the water table west, north, and southeast of Corcoran are still present and becoming deeper (-40 feet msl). The Kings River no longer is a natural groundwater divide. In general, groundwater was flowing into the TLSB from the Kings and Kaweah subbasins and out of the TLSB to the Kern, Tule, and Westside subbasins.

2.4.2 Confined Aquifer

The sediments below the Corcoran Clay comprise the lower confined portion of the regional fresh-water aquifer. This lower portion of the regional freshwater aquifer is generally comprised of clay, silt, sandy silt and clay, sand, silty/clayey sand, gravel, and sandy, silty and clayey gravel (Page, 1983).

There are few available maps showing groundwater elevations in the confined aquifer beneath the TLSB and surrounding areas (Harder, 2017). In fall 1998 and 1999, groundwater was at an elevation of about 100 feet msl near Corcoran, decreasing to the south towards an apparent pumping center near Alpaugh. In general, groundwater was flowing into the TLSB from the Kaweah subbasin and out of the TLSB to the Tule subbasin.

In fall 2010, groundwater was at an elevation of about -50 feet msl near Corcoran, decreasing towards an apparent pumping center southwest of Corcoran. In general, groundwater was flowing into the TLSB from the Kaweah and Tule subbasins.

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2.4.3 Subsidence

Land subsidence due to groundwater drawdown associated with heavy groundwater pumping has affected large areas of the San Joaquin Valley since the 1920s, including the TLSB (AFW, 2017). Between 1926 and 1970, there was approximately 4 feet of cumulative subsidence near Corcoran, 4 to 6 feet of subsidence near Hanford, and as much as 12 feet of subsidence near Pixley (Figure D2-7). Following the completion of the SWP and Central Valley Project (CVP), surface water became readily available and groundwater extraction was reduced, and subsidence due to groundwater drawdown was temporarily slowed or stopped.

In the past 10 to 25 years, groundwater pumping has once again been increasing, with associated resumption and acceleration of groundwater drawdown and associated subsidence. The subsidence was exacerbated during a moderate to severe drought from 2007 through 2009, and a severe to exceptional drought from 2012 through 2016. A Jet Propulsion Laboratory study of subsidence between June 2007 and December 2010 (JPL, 2012), indicated subsidence rates were as high as 8.5 inches per year in the vicinity of Corcoran (Figure D2-7). A more recent study by Jet Propulsion Laboratory (JPL, 2017) indicted that subsidence rates accelerated in some areas during the recent drought, with annual subsidence rates of 1 to 1.5 feet near Corcoran in 2015-2016 (Figure D2-8). Groundwater pumping and drawdown, and consequent subsidence, are anticipated to continue into the future at least until sustainable groundwater pumping is achieved. Due to inelastic soil behavior, subsidence is mostly irreversible even if groundwater pumping decreases and groundwater level recovers.

2.5 Surface Water Occurrence

Historically, river runoff from the Sierra Nevada collected in terminal lakes on the basin floor in the San Joaquin Basin creating vast regions of tule marshes and woodland wetlands. Tulare Lake, the largest terminal lake, received runoff from four major rivers: South Fork, Kaweah, Tule, and Kern Rivers (EPA, 2007). These rivers formed broad deltaic and alluvial fans as they emerged from the Sierra foothills forming multiple channels and sloughs that shifted periodically especially during flooding events (EPA, 2007). The natural hydrology of the Tulare Lake Basin has been extensively altered over the last 130 years for flood control, irrigation, land reclamation, and water conservation. Concerns about water supplies led to the construction of large dams and reservoirs on each of the four major rivers and channelization of the rivers for flood control and water banking have further modified the Tulare Basins hydrography (EPA, 2007). The surface water sources that supply the TLSB are primarily from man-made canals and diverted rivers.

2.5.1 Tulare Lake

Tulare Lake was the largest freshwater lake west of the Mississippi River estimated to encompass 790 square miles at its highest overflow level of 216 feet in 1862 and 1868 (EPA, 2007). The lake was very shallow and had no natural outlet when the water levels was below 207 feet (EPA, 2007). However, at 207 feet, the water could flow north into the San Joaquin River Basin. Increased diversion of water from the rivers and tributaries that previously flowed into Tulare Lake resulted in the lake drying up in the late 1800s except when occasionally flooded.

2.5.2 Kings River

The Kings River is a 133-mile long river, the largest river draining the southern Sierra Nevada. The Kings River has three main tributaries, the North Fork, Middle Fork, and South Fork, with the North and Middle Forks flowing north to the San Joaquin River and the South Fork flowing south to the old Tulare Lake bed. Significant water development structures, including the Pine Flat Dam, were constructed in the last

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century to control and modified the rivers flow. The Kings River lies along the boundary between the TLSB and Kings subbasin, a portion of the boundary between the TLSB and Westside subbasin, and a portion of the boundary between the TLSB and Kaweah subbasin (Figure D2-9a). Leakage of water from the Kings River and distributary canals provides significant groundwater recharge in the Kings, Kaweah, Westside, and Tulare Lake subbasin, resulting in complex groundwater flow patterns between the subbasins.

2.5.3 Kaweah River

The Kaweah River is a 100-mile long river in Tulare County and drains the southern Sierra Nevada. The Kaweah River begins as four forks in Sequoia National Park, then flows in a southwest direction to Lake Kaweah – the only major reservoir on the river – and into the San Joaquin Valley, where it diverges into multiple channels across an alluvial plain around Visalia. The lower course of the river and its many distributaries – including the St. John's River and Mill Creek – form the Kaweah Delta, a productive agricultural region in the Kaweah subbasin. Before the diversion of its waters for irrigation, the river flowed into Tulare Lake.

2.5.4 Tule River

The Tule River is a 71-mile long river in Tulare County and drains the southern Sierra Nevada. The Tule River has three main tributaries, the North Fork, Middle Fork, and South Fork, that in the past flowed into Tulare Lake. Currently, water in the Tule River now flows into Lake Success, a reservoir constructed in 1961 near Porterville, California, and only in times of above normal precipitation or snow melt is water released onto the dry Tulare Lake bed.

2.5.5 Canals and Pipelines

There are 34 rivers, streams, canals, and diversions entering and within the TLSB that deliver surface water to the TLSB (Figure D2-9a-c).

Water is imported into the TLSB using facilities of the SWP located west of the TLSB and the CVP. Water can also be exported out of the TLSB using the SWP and CVP facilities in combination with facilities developed by local water districts (EPA, 2007). The CVP imports San Joaquin River water into the TLSB through the Friant-Kern Canal and Delta water through the Delta-Mendota and San Luis Canals.

The Friant-Kern Canal is operated and maintained by the Friant Water Authority and is used to convey water from the San Joaquin River to Kern County. The canal originates at the Friant Dam, which is operated by the United States Bureau of Reclamation. The Friant-Kern Canal flows southeasterly along the western flank of the Sierra Nevada foothills through Fresno, Tulare, and Kern counties. The Friant-Kern Canal has a capacity of approximately 5,300 cubic feet per second (10,510 acre-feet per day [AF/d]), which decreases to about 2,500 cubic feet per second (4,959 AF/d) as demand decreases toward its end in the Kern River, near Bakersfield, California (AFW, 2017).

2.6 Climate

The climate in the TLSB is semi-arid characterized by hot, dry summers and cool moist winters and is classified as Mediterranean steppe climate (Köppen climate classification). The wet season occurs from November through March with 80 percent (%) of precipitation falling during this time frame (EPA, 2007). The valley floor often receives little to no rainfall in the summer months. Precipitation typically occurs from storms that move in from the northwest off the Pacific Ocean and occasionally storms from the southwest that contain warm sub-tropical moisture can produce heavy rains especially during El Nino episodes.

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Historical annual precipitation at the Hanford weather Station from 1899 to 2017 (Hanford, 2017) has ranged from a low of 3.37 inches in 1947 to a maximum of 15.57 inches in 1983 (Table 2-1). Monthly precipitation in the area ranges between 0 and 6.69 inches per month and averages about 8.28 inches per year. This results in an estimated 2 inches per year of infiltration into the unconfined aquifer. Figure D2-10 provides a map of the annual precipitation at the Hanford station from 1940 to 2017.

2.7 Land Use

Land use in the TLSB and surrounding areas is predominately agricultural with smaller urban areas. Land use was evaluated using DWR land use maps for 1990 through 2006 (DWR, 2016) and annual CropScape maps from 2006 through 2016 (CropScape, 2016). These maps were provided in Geographic Information System formats, allowing for aggregation of similar land uses (i.e., crop types) to simplify analysis (Figure D2-11a-d). A total of 33 land uses were identified and evaluated (Table 2-2). Of these land uses, 27 were assumed to be irrigated, while 6 land uses (open water, forests, etc.) were assumed to only receive precipitation.

The TLSB covers an area of approximately 533,760 acres or about 834 square miles. Between 1990 and 2016, the TLSB had an average of approximately 310,800 acres of crops, 7,110 acres of riparian or open water, 137,110 acres of fallow or non-developed land, and 22,130 acres of urban and industrial development (Table 2-2, Appendix D1). The mix of crops grown and fallow lands has changed over time as agricultural practices changed in response to agricultural markets and drought conditions. A chart of area by land use shows that fallow acreage increased significantly during the 2010-2016 drought, while riparian, cotton, and pasture acreage all decreased during the drought (Figure D2-12). Cotton showed the most change with a decrease of over 85,000 acres between 1995 and 2016. The data also show that the was an overall increase in permanent crops over time, with increases in young and mature Almonds from approximately 7,680 acres in 1995 to 42,300 acres in 2016. The total acreage of Pistachios also increased from 4,700 to 26,900 acres between 1995 and 2016; however, there was a loss of 4,220 acres of mature Pistachios with a concurrent increase of 26,400 acres of young Pistachios.

Annualized tables and charts of land use for the TLSB GSAs and the portions of the Westside, Kings, Kaweah, Tule, and Kern subbasins within the model domain are presented in Appendix D1.

2.8 Basin Water Budget

The basin water budget describes the inflows to and outflows from the subbasin hydrogeologic system. Inflow and outflow can occur from the hydraulic boundaries of the system, from various sources within the model domain such as rainfall, lakes, and leakage from rivers and canals, and from the exit points or sinks such as wells or drainage systems. The boundaries, sources, and sinks identified within the model domain are discussed below.

2.8.1 Inflows

Inflows consist of precipitation, surface water diversions for irrigation, intentional recharge, and leakage from streams and conveyances.

2.8.1.1 Precipitation

Precipitation can be a significant source of water to the TLSB and surrounding area. Given the large areal extent of the TLSB and surrounding area, it was determined that using a single weather station to estimate precipitation would be inadequate to represent the entire TLSB. Instead, the Parameter-elevation

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Regression on Independent Slopes Model (PRISM) database maintained by the Oregon State University was used to estimate monthly precipitation from January 1990 through December 2016 across the model domain (PRISM, 2017). The PRISM database contains monthly total precipitation for the entire United States using a 4-kilometer grid. The monthly precipitation values are statistically derived values based on local weather stations and corrections for topographic variations. A total of 304 PRISM data sets were downloaded for the model domain. The monthly precipitation data were summed by TLSB area to estimate the potential annual precipitation volume for each subbasin (Figure D2-13a). Maps of average monthly rainfall across the model domain for the months of January, March, May, July, September, and November shows that precipitation also vars spatially across the model domain (Figure D2-13b).

Not all rainfall is available for use by crops – some falls on impervious surface, some is taken up by dry soils, and some is intercepted by foliage and on evaporates before it can infiltrate. Monthly effective precipitation was estimated by multiplying the monthly PRISM data sets by the Precipitation / Effective Precipitation ratios presented in FAO 56 (Chapter 3, Table 6; Allen et al., 1998) and shown on Figure D2-14. A table and chart summarizing annual effective precipitation by subbasin within the model domain is presented on Figure D2-15. This shows that between 1990 and 2016, effective precipitation provided an average of 215,000 acre-feet (AF) of water across the model domain and as much as 500,000 AF of water in wet years.

2.8.1.2 Surface Water Diversions

Surface water diversion from external sources are the most significant source of water to the TLSB and surrounding area. There are 34 rivers, streams, canals, and diversions entering and within the TLSB that have recorded diversions (Figure D2-9a-c). Two primary data sources were employed for the surface water inflows and deliveries to the farms within the model domain:

- For lands within the TLSB itself, surface water delivery and diversion records were obtained by via direct contacts with the various GSAs (and member water management agencies within the GSAs) within the TLSB proper (Table 2-3). Those records were relatively complete from 1990 through 2016 for diversions off the Kings system and SWP. As shown on Table 2-3, during the period 1998 through 2010, the Kings River had six below normal water years, four average water years, and three above average water years. Over the 1998-2010 period is Kings River water years average 96% of normal, making this a "normal hydrology" period.
- For deliveries to lands located within the model buffer area (between the boundaries of the TLSB as defined by the DWR and the TLSBHM model domain boundaries), a combination of data gathered for GSAs whose footprint extended into the TLSB proper, and data mined from the California Central Valley Groundwater Surface Water Simulation (C2VSIM) Model (Brush et al., 2016) model for those GSAs and water management districts that lay completely outside the official TLSB boundary were utilized. The C2VSIM model surface water data covered from the beginning of the TLSBHM model period through the end of 2011 and was extended through the end of 2016 by correlation of those inflows with Kings River deliveries at Peoples weir. In general, inflows into this area from Kaweah and Tule Rivers, and Deer Creek were reconstructed from a variety of disparate data.

A table and chart summarizing annual surface water diversions by subbasin within the model domain is presented on Figure D2-16. Monthly surface water diversions by subbasin by GSA and subbasin are provide in Appendix D2. This shows that between 1990 and 2016, surface water diversions provided an

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average of 948,370 AF of water across the model domain and as much as 1,696,540 AF of water in wet years.

The surface water diversions are not delivered uniformly across the model domain spatially or temporally (Figure D2-17). During the 1990-2016 period, there are several areas that historically have not received any surface water diversions or have received intermittent deliveries of surface water (Figure D2-17).

2.8.1.3 Lake Bottom Water Storage

One unique feature of the TLSB is the utilization of certain portions of the historical lake bottom for storage of the excess surface water inflows that were not diverted by others. This stored surface water is later used as an irrigation supply. In some years, sufficient water can be stored in the lake bottom to eliminate the need for supplemental groundwater pumping to meet the irrigation demand.

As observed in historical aerial imagery, the area occupied and the locations of water storage changes from year to year, although certain areas to the south appear to be more regularly utilized by storage (Figure D2-18). This can result in significant volumes of stored water in some years. During the 1995–1999 period, over 1 million AF of water was stored on the lake bottom and used for irrigation. The greatest volume of water stored during the 27-year simulation period estimated to be approximately 464,650 AF in 2011. The importance of this conjunctive management capability is illustrated by the fact that the cumulative excess inflow stored in the lake bottom allowed lake bottom farmers to completely turn off their groundwater well fields between January 1995 and June 1999.

2.8.1.4 Intentional Recharge

Groundwater recharge in the TLSB also occurs from intentional percolation of surface water in infiltration ponds and water banks. The Corcoran Irrigation District (CID) has operated nine intentional recharge basins covering approximately 2,760 acres since the 1980s (Figure D2-19). Aerial photograph analysis shows that CID Ponds 1 and 2 are used on an approximately annual basis to recharge an estimated 23,540 acre-feet per year (AF/y) of excess surface water. The other ponds are typically dry except in extremely wet years such as 2005-2006, 2010-2011, and 2017. During the 1990-2016 simulation period, the CID Ponds percolated and estimated 616,100 AF of excess surface water.

Kings County Water District has been infiltrating Kings River flood waters along the Old Kings River channel since the 1940s (referred to as Condition 8). Condition 8 water is surface water that naturally would have infiltrated along the Old Kings River channel during high river flow years had the river not been diverted for irrigation. During the 1990-2016 simulation period, an estimated 206,730 AF of Condition 8 water has been infiltrated along the Old River Channel (Figure D2-20). In addition, Kings County Water District began operating a small but effective water bank on the Old Kings River Channel in 2002 (Figure D2-20). Since 2002, approximately 73,600 AF of water has been recharged via percolation through approximately 50 acres of ponds, and approximately 48,500 AF has been recovered utilizing five recovery wells. This leaves a positive balance of approximately 25,100 AF in the unconfined aquifer system as of 2016.

2.8.1.5 River and Canal Seepage

Seepage losses from river and canals provide another source of water to the TLSB and surrounding areas. There are over 290 miles of major streams and canals within the TLSB, in addition to many more miles of small distribution ditches on individual farms. Most to the stream and canals are unlined and can have significant seepage losses. There was little available information on seepage losses in the TLSB, although

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it has been noted that the Old River Channel, Peoples Ditch, and Lakeland Canal all have substantial losses near the headgates at Peoples Weir (personal communication, Mr. Dennis Mills).

2.8.2 Outflows

Outflows consist of evapotranspiration, agricultural pumping, municipal pumping, and agricultural drains.

2.8.2.1 Evapotranspiration

Crop evapotranspiration (ETc) or crop demand use is the largest outflow of water from the TLSB. ETc data are based on spatial distributions of different types of crops, as well as estimated rates of evapotranspiration for the Tulare Lake Subbasin area. Crop data comes from DWR data sets for Fresno, Kern, Kings, and Tulare counties (surveyed intermittently between 1990-2006) and from CropScape datasets (surveyed annually from 2007-2016). Monthly ETc rates varies by crop type and by season, typically peaking during the summer months. ETc rates in feet per month (ft/m) were estimated from published Irrigation Training & Research Center (ITRC) rates (ITRC, 2003) under normal year conditions for the region (Table 2-4).

To calculate annual crop demand (ET), the annual crop (land use) acreage in each subbasin (Table 2-2) was multiplied by the annual crop ETc (in feet) for each crop type acreage (Table 2-4), yielding annual crop demand in acre-feet by crop type (Table 2-5). Between 1990 and 2016, the total irrigated crop demand in the TLSB ranged from 564,120 AF in 2015 to 1,072,440 AF in 2007 and had an average irrigated crop demand of approximately 879,020 AF (Table 2-5). The mix of crops grown and fallow lands has changed over time as agricultural practices changed in response to agricultural markets and drought conditions. A chart of annual crop acreage shows that total crop acreage has generally decreased since 2010 (Figure D2-12). Crop demand shows a similar pattern, generally decreasing from 2009 through 2015 (Table 2-5). Cotton showed the most change with a decrease of crop demand over 50% between 1995 and 2016. The data also show that during the 2011-2016 drought, there was an overall increase in row crop demand including tomatoes, peppers, small vegetables, onion, garlic, grain, and hay. In addition, the data show a large increase in ET demand from almonds, pistachios, and stone fruits. Annualized tables and charts of crop demand for the TLSB GSAs and the portions of the Westside, Kings, Kaweah, Tule, and Kern subbasins within the model domain are presented in Appendix D3.

2.8.2.2 Specified Agricultural Well Field Pumping

Agricultural pumping is typically not recorded over much of California, including the TLSB. However, there are 450 wells with reported production in eight well fields within the model domain including: El Rico GSA (99 wells), Creighton Ranch (52 wells), CID (98 wells), Angiola (51 wells), and Westlands Water District (WWD; 150 wells) (Figure D2-21). The El Rico GSA and CID well fields service local areas in the TLSB. The Creighton Ranch and Angola well fields, located in the Tule subbasin, service the Tule subbasin and also export significant amounts of groundwater to the TLSB. The WWD well field only services the Westside subbasin. The specified pumping from the agricultural well fields has varied significantly over time, ranging from 35,030 AF/y to 386,580 AF/y and averaging about 217,660 AF/y (Figure D2-22). The reduction in annual pumping coincides with the availability of surface flood waters (Figure D2-18). Appendix D4 presents an annualized summary of reported pumping by agricultural well fields within the model domain.

2.8.2.3 Specified Municipal Well Field Pumping

Municipal pumping of groundwater occurs in the TLSB by the cities of Hanford, Lemoore, Kingsburg, Stratford, and Corcoran (Figure D2-21). Specified pumping from the municipal well fields has been slowly

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increasing over time but has remained relatively consistent (Figure D2-22). The municipal pumping demand varies seasonally, peaking in the summer months. As noted in Section 2.4, municipal pump has created persistent cones of depression in the potentiometric surface near the cities of Hanford and Corcoran. Appendix D4 presents an annualized summary of pumping by municipal wells within the model domain as reported by the cities.

2.8.2.4 Estimated Agricultural Pumping

As noted above, agricultural pumping is typically not recorded over much of California, including the TLSB. However, agricultural pumping by subbasin can be estimated using a simple water balance approach where:

> ET Demand – Effective Precipitation – Surface Water Diversions – Lake Bottom Water Storage = Estimated Gross Agricultural Pumping Demand (Figure D2-23)

Although this simple water balance approach does not account for the areal distribution of surface water diversions or farm delivery requirements, it does provide a reasonable gross estimate of agricultural pumping on the subbasin scale. Based on this analysis, agricultural pumping in the TLSB from 1990 through 2016 has ranged from 64,910 to 647,000 AF/y and averaged approximately 418,830 AF/y.

2.8.2.5 Agricultural Drains

Agricultural drains are used in several areas across the model domain to keep soil from becoming waterlogged in the root zone. Typically, a tile or French drain system is used, with tiles buried approximately 4 to 6 feet bgs draining to sumps. Subsurface drainage collected in the sumps is pumped via pipeline to evaporation basins. Figure D2-24 shows the approximate location of known subsurface drains within the TLSB.

3.0 Simulation Code

In order to meet the model objectives discussed in Section 1.3, the groundwater flow model code must meet the following criteria:

- be able to simulate three-dimensional groundwater flow within the model domain,
- be well documented and verified against analytical solutions for specific flow scenarios,
- be accepted by regulatory agencies,
- be readily understandable and usable by others for simulation of future groundwater conditions, and
- have a readily available technical support structure.

The groundwater flow model codes MODFLOW2005-NWT (Harbaugh, 2005, and Niswonger et al., 2011) and MODFLOW-OWHM (MF-OWHM; Hanson et al., 2014) are two distinct versions from the well-known MODFLOW family of groundwater simulation codes. These codes were used to develop the TLSB model.

MODFLOW is a modular, finite-difference computer code developed by the USGS to simulate three-dimensional groundwater flow (McDonald and Harbaugh, 1988). The use of the MODFLOW family of codes is well documented in technical literature and is a de facto standard for groundwater flow modeling worldwide.

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MF-NWT is a particular version of MODFLOW that implements the Newton method for handling non-linearities in flow equations, which allows for very efficient solution of the flow equation including complexities such as unsaturated zone flow, eliminated the cell draining and re-wetting problems of earlier versions of MODFLOW (Niswonger et al., 2011). MF-OWHM is a relatively new version of MODFLOW (still under development) specifically developed to provide a flexible and robust approach to simulate conjunctive management of surface water and groundwater resources in an agricultural crop production setting (Boyce et al., 2016).

3.1 Model Code Selection

Once the decision was made to develop a model using the MODFLOW family of codes, the initial plan was to develop both a MODFLOW2005-NWT model and a MF-OWHM model to provide independent, yet complementary, methods for model development. This was planned due to the fact that both codes will share many of the same input files, only differing in how the farm irrigation pumping is specified. For the NWT model, the farm irrigation pumping requirement would be calculated externally in a de-coupled modeling approach, whereas with MF-OWHM, the farm irrigation pumping is calculated internally as a dynamic component.

The MF-NWT code would be employed to develop a "de-coupled" model of conjunctive surface water – groundwater management in the TLSB. In the de-coupled approach, the following four-step procedure is used to build surface boundary processes (irrigation, crop water use, return flows, etc.), build the irrigation well pumping file, and run the model to simulate system response:

- the crop ET demand calculated externally on a model cell-by-cell basis based on cropping patterns, crop coefficients, and reference ETc;
- effective precipitation and specified surface water deliveries are also calculated on a model cell-by-cell basis, irrigation pumping demand is calculated as the ET demand – effective precipitation - surface water supplies;
- the resulting cell-by-cell irrigation pumping demand is subsequently summed by area, and assigned to a hypothetical pumping well in the center of the area in the de-coupled model; and
- the model is run to simulate groundwater-system response (drawdown, loss of storage, subsidence) to the stresses (including municipal and irrigation pumping, natural recharge, intentional artificial recharge, recharge from stream and canal leakage, recharge from irrigation return flows.

The MF-OWHM code was investigated as a tool to dynamically simulate conjunctive management of surface water and groundwater resources in the TLSB. The MF-OWHM model employs basically the same input data sets used to calculate the ETc and irrigation pumping demands externally for the de-coupled MF-NWT model, but the MF-OWHM simulations are dynamic in the sense that the ETc and irrigation pumping are calculated internally within the model allowing for "feedback loops" between these two key stressors on the groundwater system. The MF-NWT de-coupled model does not address these types of feedback loops that actually can be occurring in the field.

The MF-OWHM, the code is currently undergoing enhancements to its capabilities and numerical methods. In January 2019, the USGS indicated that updated version of the model code (OWHM v2) would be available in March 2019. The most recent communication with the USGS indicated that the updated

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model code might not be ready until the end of October 2019, too late for the GSP schedule. Thus, further development of the MF-OWHM was suspended at the end of March and efforts were directed at completing the de-coupled MF-NWT model for the TLSB within the project schedule. The remainder of this report focusses on the de-coupled model development, application, and results.

3.2 Code Assumptions and Limitations

There are certain model code assumptions and limitations that must be considered when developing, applying, and interpreting a numerical model. Some key assumptions and limitations that may affect the site models are briefly discussed below.

Porous Media: The MODFLOW family of codes is limited simulation of saturated and unsaturated flow in porous media. It does not simulate flow through fractures or relatively impermeable bedrock.

Layer Continuity: MODFLOW requires that all layer extend from edge-to-edge of the model domain. This limits the ability to explicitly simulate formation pinch-outs or unconformities. Instead these features may be simulated using a hydraulic conductivity contrast.

Unsaturated Flow: The MODFLOW Unsaturated Zone Flow (UZF1) package can simulate flow in the unsaturated zone using an approximation to Richards' equation to simulate vertical unsaturated flow. The approach is limited in that unsaturated flow occurs in response to gravity, and there must be uniform hydraulic properties in the unsaturated zone for each vertical column of model cells. This limits the ability of the MODFLOW to simulate different properties of the thick unsaturated zone. The Brooks-Corey function is used to define the relation between unsaturated hydraulic conductivity and water content. Variables used by the UZF1 Package include initial and saturated water contents, saturated vertical hydraulic conductivity (K_v), and an exponent in the Brooks-Corey function. Residual water content is calculated internally by the UZF1 Package on the basis of the difference between saturated water content and specific yield (S_y).

The UZF1 Package is also substitution for the Recharge (RCH) and ET Packages of MODFLOW-2005. The UZF1 Package differs from the RCH Package in that an infiltration rate is applied at land surface instead of a specified recharge rate directly to ground water. The applied infiltration rate is further limited by the saturated K_v. The UZF1 Package differs from the ET Package in that evapotranspiration losses are first removed from the unsaturated zone above the evapotranspiration extinction depth, and if the demand is not met, water can be removed directly from ground water whenever the depth to ground water is less than the extinction depth. The UZF1 Package also differs from the ET Package in that water is discharged directly to land surface whenever the altitude of the water table exceeds land surface. Water that is discharged to land surface, as well as applied infiltration in excess of the saturated K_v, may be routed directly as inflow to specified streams or lakes if these packages are active; otherwise, this water is removed from the model similar to the Drain (DRN) Package.

Stress Periods: MODFLOW requires that temporally variable data be consistent within each stress period. This results in some temporally averaging of data. For example, stream flow or municipal pumping may vary hourly or daily in response to demand, while agricultural well field may pump nearly continuously for several months in a row. The averaging of transient stress into consistent monthly stress period tends to smooth out the hydraulic impacts of the transient stresses.

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3.3 Graphic Pre/Post-Processor

To facilitate the preparation and evaluation of each model simulation, Wood utilized the graphics pre/post processor GWVistas • Version 7 (GWV) by Environmental Simulations, Inc. (ESI, 2017). GWV is a Windows® program that utilizes a graphic user interface (GUI) to build and modify a database of model parameters. The model grid, hydraulic properties, and boundary conditions are input using the GUI, and then GWV creates the necessary MODFLOW and MT3DMS data input files. The input files generated by GWV are generic (standard) files compatible with USGS MF-NWT and MT3DMS. Wood also utilized some in-house utilities and Microsoft EXCEL spreadsheets to generate standard MODFLOW data input files for selected simulations and for post-processing simulation results. For example, PYTHON scripts were utilized to add and subtract the large matrices containing 27 years of monthly data worth of effective precipitation, surface water deliveries, and crop demand to estimate agricultural pumping. Similarly, an Excel spreadsheet was created to allocate the estimated agricultural pumping demand to hypothetical wells, and export file formatted for importation into GWV.

GWV was also utilized to post-process the model simulations. GWV can display the simulated head results as plan views and cross-sections. In plan view, the contour intervals and labels specified by the user and dry cells are denoted by a different color. In cross-section view, the water table surface is also plotted. Most outputs to the screen can be saved in a number of formats (DXF, WMF, PCX, SURFER, etc.) for utilization in other graphics programs.

4.0 Model Design

The following sections describe the numerical groundwater flow model for the TLSBHM. The model construction was based on the HCM presented in Section 2.0, with each of the key features described in that section represented numerically in the TLSBHM. This modeling effort is a revision to the preliminary groundwater model of the TLSB (Kings Model) developed in 2016-2018 on behalf of the Kings County Community Development Agency (AFW, 2018).

4.1 Model Domain / Grid

As described in Section 2.1, the TLSBHM model domain is centered on the TLSB and extends beyond the TLSB several miles, overlapping adjacent subbasins within the Tulare Lake Hydrologic Region (Figure D2-2). The model domain was extended beyond the TLSB so that model boundary conditions are sufficiently far away the area of interest in the TLSB; these areas beyond the extent of the TLSB henceforth are referred to as the "buffer areas" (Figure D2-2). The buffer areas extend approximately 3 miles beyond the DWR-defined TLSB boundaries on the north, south, and east sides; on the west and southwest sides, however, a large buffer area is not included because the alluvial groundwater basin is truncated by low-permeability geologic units on those side. The active model grid covers an area of approximately 1,091,320 acres (about 1,705 square miles) and is orientated due north to align the model grid with the predominant direction State Plane coordinate system of Township, Range, and Sections.

The preliminary Kings Model (AFW, 2018) exhibited some boundary condition interference along the eastern edge of the model. Hence the TLSBHM model grid was extended further east approximately 2.5 miles. In addition, some of the active model grid edges were modified to yield straighter lines to simplify specified boundary conditions. The resulting TLSBHM model grid consists of 281,750 active cells with uniform dimensions of 1,320 x 1,320 feet (¼ mile x ¼ mile, or 40-acres) (Figure D4-1). The complete model grid consists of 230 rows, 175 columns, and 7 layers.

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4.2 Model Layers

The purpose of model layers is to represent the hydraulic influence of stratigraphy at a scale appropriate to the model objectives. One way to think of "hydraulic influence" is how finer-grained deposits present resistance to flow, both laterally and vertically, and it is only through multiple model layers that one can simulated the vertical resistance to flow. It is understood that stratigraphic variations occur at scales that are both smaller and larger than that characterized for this model.

- Those hydrostratigraphic variations that are of the same scale or larger than the numerical grid cell size, for example the Corcoran Clay, are captured explicitly in model property variations.
- Those hydrostratigraphic variations that are much smaller than the model cell size, are not treated explicitly in the model, but rather their effect is incorporated into the model via appropriate assignment of large scale "effective" properties for the model cell as described above in Section 2.1.1. For example, say three 1- to 2- foot thick clay layer or lenses extend across a large portion of the 1,320-foot x 1,320-foot plan view area of a 50-foot thick model cell. To capture the hydraulic effect of those layers in the 50-foot thick model cell requires significantly reducing the K_v as guided by this conceptual model and application of the harmonic average as a lower bracket for significantly reducing K_v compared to what is in the CVHM model data that was provided to the TLSBHM modeling team by the USGS.

In addition to direct import of the CVHM hydraulic conductivity fields (based on the USGS sediment texture study) as the starting point for the model, refinements to the conceptual and numerical models of the site were based on consideration of several types of information. Supplement information considered included both recent and older USGS literature (Croft, 1972; Page, 1986), monitoring well perforation intervals in sub-areas of the site, and qualitative and quantitative information obtained directly from the GSAs.

The initial basis for the TLSBHM model layering scheme was based on a modified version of the CVHM (AWF, 2018). The modified CVHM model had 13 layers including 5 layers above the Corcoran Clay, 3 layers representing the Corcoran Clay, and 5 layers below the Corcoran Clay. The TLSBHM layering scheme was reduced from 13 layers to 7 layers to simplify the model and make it more consistent with the 3 to 4-layer models being developed for the Tule and Kaweah subbasins. The TLSBHM layer count was reduced by combining several thin layers into a single, thicker layer. For example, the 3 layers representing the Corcoran Clay in the CVHM model were combined into a single layer in the TLSBHM. Layer elevations and thicknesses were also modified in some areas based on local information. The resulting Cross-sections showing the model layering scheme and initial hydraulic conductivity distribution are shown on Figures D4-2 and D4-3.

4.3 Model Duration and Stress Periods

The TLSBHM simulates the period from 1990 through 2016 using 324 monthly stress periods (Table 4-1). The model simulates the period from 1990 to 1995 as a "run-up" period to stabilize the model hydraulics prior to the 1998-2010 focused calibration period. The model continues from 2010 through 2016 to bring the model up to date with current hydraulic conditions as required under SGMA.

4.4 Model Hydraulic Parameters

The initial hydraulic properties assigned to the TLSBHM were extracted from CVHM. The hydraulic parameters were only modified as necessary during the model calibration process to improve the fit

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between simulated and observed heads. As such, the model contains no more complexity than is justified by the available data, the model objectives, and the model results to date. Section 4.4.1 briefly describes how the USGS used textural information from thousands of boring logs to develop three-dimensional maps of the hydraulic properties.

The range of final hydraulic properties, hydraulic conductivity, K_v, storage, S_y, and porosity used as a result of the calibration process are briefly summarized in the following subsections.

4.4.1 Hydraulic Conductivity

Geologically speaking, the Central Valley is a large structural trough filled with sediments of Jurassic to Holocene age. These sediments reach thicknesses on the order of 15,000 feet in the San Joaquin Valley, and as much as 30,000 feet in the Sacramento Valley. In general, the Sacramento Valley is predominantly fine-grained and reflects more fine-grained volcanic-derived sediments, and in the San Joaquin Valley the areas of coarse-grained texture are more widespread than the areas of fine-grained texture and occur along the major rivers, especially on the eastern side.

The texture (particle size) of these sediments and how that texture varies spatially strongly impacts how groundwater flows in response to recharge and discharge stresses on the system. Therefore, the textural distribution of the basin-fill sediments was used to define the initial vertical and lateral hydraulic conductivity and storage property distributions for the TLSBHM domain.

To characterize the Central Valley basin-fill deposits, scientists from the USGS developed a geologic texture model to describe the coarseness or fineness of basin-fill materials that make up the hydrogeologic system, and then used it to estimate hydraulic properties (hydraulic conductivity and storage properties) for every cell in the model grid. To create a sediment texture model for the Central Valley, the USGS compiled and analyzed data and information from approximately 8,500 drillers' logs of boreholes ranging in depth from 12 to 3,000 feet below land surface (Faunt el al., 2009). The textural characterization focused on the variability and spatial distribution of the fraction of coarse sediments (fc) over 50-foot depth intervals. Figure D4-4 presents the fc for several of the model layers, and Figure D4-5 presents an oblique view of fc for the San Joaquin Valley, with the TLSBHM study area outlined in red. In general, there are two key aquifer systems, the upper unconfined and semi-confined aquifer and the deeper confined aquifer system, separated by the Corcoran Clay aquitard. On Figures D4-4 and D4-5, the Corcoran Clay horizon is found in model layers 6 through 8, with the unconfined and semi-confined shallow aquifer system in model layers 1 through 5 and the deeper confined aquifers in model layers 9 through 13.

The USGS generated estimates of hydraulic properties from their texture model developed for the CVHM. These values were imported directly into the TLSBHM to use as initial values prior to beginning model calibration. The initial hydraulic conductivity distribution utilized in the TLSBHM is shown on Figure D4-6.

Beneath the TLSB study area, previous studies have identified extensive deposits of fine-grained materials consisting of lacustrine and marsh sediments (Croft and Gordon, 1968; Croft, 1972; Page, 1986). A cumulative thickness of as much as 3,000 feet of these fine- grained deposits have been identified and include laterally extensive clay layers (A – F Clays). The A-, C-, and E-Clays (i.e., Corcoran Clay) cover much of the TLSBHM domain. During the calibration process, these studies and input from the TAC were utilized to adjust hydraulic properties derived from the USGS texture model to be more representative of the Tulare Lake bed and surrounding area (Figure D4-7). The following subsections provide a summary of the hydraulic properties for each of these depth intervals.

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4.4.1.1 Unconfined and Semi-Confined Aquifer Zones above the Corcoran Clay

Above the Corcoran Clay is the unconfined to semi-confined upper portion of the regional fresh-water aquifer. This upper portion of the regional freshwater aquifer is generally comprised of coarse- to medium-grained sediments (i.e., sand and gravel) with silt and clay interbeds.

According to the USGS CVHM, the grid-block-scale horizontal hydraulic conductivity (K_h), ranges from 8 to 75 feet per day (ft/d). These values span the lower range of a "good aquifer" as defined by Bear (1972). Figure D4-4 presents the K_h distribution derived from the USGS texture study for selected model layers. On Figure D4-4 (as well as Figure D4-6), a broad swath of lower permeability (low sand fraction) deposits is evident that run from the northwest side of the model domain trending to the southeast toward the southeast corner of the model domain. In this zone, the hydraulic conductivities derived from the CVHM are in the 5 to 25 ft/d range, which is closer to the range of a "poor aquifer" (Bear, 1972), and which appear to be lower than values obtained from pumping tests in these areas (Schmidt, 2013). In fact, the averaging of sediment texture (fc) over 50-foot depth intervals leads to "smoothing out" of permeability contrasts.

As described previously, it is important to recognize that even in the zones with a higher fraction of coarse textured sediments, clayey layers and lenses are found throughout the profile. This is especially important for estimating effective horizontal-to-vertical anisotropy of hydraulic conductivity for a numerical model layer thickness of 50 feet, which is the scale of vertical averaging that the USGS employed in their sediment texture study. So, even if say the fraction of coarse materials over a 50-foot depth interval is 90%, if that 10% fine fraction is concentrated in a few clay layers on the order of a foot thickness, then the effective K_v should tend toward the harmonic average of a clay and a sand (Freeze and Cherry, 1979). If the sand has a K_h of 90 ft/d and the clay layers have a K_h of 0.01 ft/d, then the effective K_v for that grid cell could be estimated using a layer-thickness weighted harmonic average as:

$$K_v \approx [50 / ((5/0.01) + (45/90))] = [\ 50/500.5] \approx 0.1 \text{ ft/d}$$

The effective K_h can be estimated as the layer-thickness weighted arithmetic average:

$$K_h \approx [\ (45x90) + (5x0.01)] / 50 \approx 90^* (45/50) = 81 \text{ ft/d}$$

These simple calculations indicate that it would be reasonable to expect very high anisotropy ratios (very low effective K_v), and indeed that is what was found during the model calibration process (see Section 5.0).

The storage properties above the Corcoran Clay do not vary nearly as much as the hydraulic conductivity in this portion of the aquifer. The S_y of the sediments above the Corcoran Clay (Layers 1 through 3) range from 0.08 to 0.3, while the specific storage (S_s) ranges between 1.5x10-5/feet and 7.3x10-3/feet.

4.4.1.2 Corcoran Clay Aquitard

The lateral extent and thickness of the Corcoran Clay are shown on Figure D2-4. While it is sometimes considered a continuous layer of low permeability sediments spanning across the San Joaquin Valley, in fact comparing these figures to the CVHM hydraulic conductivity maps for model layers 4 through 10 (Figures D4-4 through D4-6) clearly shows that the Corcoran Clay grades into coarse materials laterally, as well as above and below. They also show that some clay lenses exist above and throughout areas characterized as relatively "coarser" in the USGS texture study. Recognizing that the texture maps were

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developed from averaging fc over 50-foot depth intervals, this impacts the effective K_v used in the TLSBHM as described in the previous section.

This is consistent with recent investigations by the USGS in the San Joaquin Valley, which indicate that the groundwater conditions grade from unconfined, or water-table, at the shallowest depths to semi-confined with increasing depth, eventually grading into fully confined conditions beneath the Corcoran Clay. Geophysical well logs indicate that the Corcoran Clay, although probably the largest single confining bed, constitutes only a small percentage of the total cumulative thickness of clay layers in the fresh-water bearing unconsolidated sediments in the TLSB. Thus, it is more accurate to consider the confinement as the result of numerous overlapping clay lenses and beds. Further, the difference in hydraulic head directly above and below the Corcoran Clay is relatively small when compared to head differences between larger intervals of the deeper parts of the aquifer system. Again, rather than to explicitly simulate each of these thin clay layers and lenses discretely in the model, their impact on the flow system is simulated through the high anisotropy in hydraulic conductivity (very low K_v).

Hydraulic conductivity (K_h) values of the Corcoran Clay cells in the model domain from the USGS CVHM range from 0.5 to 10 ft/d, which is rather high for an aquitard material, and especially high considering that the harmonic average should be the guide for effective K_v. As mentioned in Section 4.4.1, hydraulic conductivity values at the depth horizon of the Corcoran Clay were adjusted during model calibration to improve the fit between the simulated and observed hydraulic heads over time.

In addition, as discussed in Section 2.3.4, Croft and Gordon (1968) identified uninterrupted lacustrine (clay) deposits from the surface to at least 2,200 feet bgs beneath the central portion of the Tulare Lake bed (Figure D2-5). These lacustrine deposits interfinger with coarser sediments and the thinner clay zones along the periphery of the lake with the thick clay deposits beneath the lake bed itself. The Corcoran Clay (E-Clay) has been identified as extending beneath the lake bed (Davis et al, 1959). show it as being warped downward along the axis of the lake with a maximum thickness of 150 to 175 feet. These cross sections indicate the Tulare Lake deposits form a clay "plug" across the center of the San Joaquin Valley that may be 15 miles wide, 8 miles long, and 0.5-mile deep at its maximum dimensions. This was incorporated into the TLSBHM (Figure D4-7).

Again, the storage properties do not vary as much as the hydraulic conductivity, with S_s of the Corcoran Clay and other sediments in this depth horizon ranging between 4.5x10-4/feet and 1.2x10-3/feet, with the S_y ranging from 0.10 to 0.15 where unconfined. Storage values were adjusted during model calibration to improve the fit between the simulated and observed hydraulic heads over time.

4.4.1.3 Confined Aquifer Beneath the Corcoran Clay

Hydraulic conductivities initially assigned to the model layers beneath the Corcoran Clay horizon were derived from the USGS CVHM. Conductivity values generally ranged from 20 to 40 ft/d, except for two broad regions of lower permeability. One of the areas with a predominance of low-K_h materials at depth is in the Westside subbasin to the west, and the other is beneath the southeast buffer areas near where Deer Creek enters the model domain. Again, the storage properties do not vary as much as the hydraulic conductivity, with S_s of the sediments below the Corcoran Clay ranging between $6.8x10^{-4}$/feet and $1.5x10^{-3}$/feet. Storage values were adjusted during model calibration to improve the fit between the simulated and observed hydraulic heads over time.

The TLSBHM groundwater model was initially assigned variable K_h values that ranged between $4.0x10^{-4}$ ft/d for aquitard clay units to 91 ft/d for aquifers, with the spatial distribution of the properties derived

from the CVHM. These values were modified as necessary during the calibration process to improve the model fit to observed groundwater elevations (Figure D4-7).

4.4.2 Storage

The TLSBHM groundwater model was initially assigned S_s values from the USGS CVHM. Initial S_s values ranged between $1.5x10^{-5}$ to $7.3x10^{-3}$ feet-1. These values are within the published range of values for the silty to sandy sediment types (Spitz and Moreno, 1996). S_s values were modified over a limited range during the model calibration process.

4.4.3 Specific Yield

The TLSBHM groundwater model was initially assigned S_y values from the USGS CVHM. Initial S_y values ranged between $7.9x10^{-2}$ to $3.0x10^{-1}$. These values are within the published range of values for the silty to sandy sediment types (Spitz and Moreno, 1996). S_y values were modified over a limited range during the model calibration process.

4.4.4 Porosity

The TLSBHM groundwater model was initially assigned porosity values from the USGS CVHM. Initial porosity values ranged between $9.1x10^{-2}$ to $2.9x10^{-1}$. These values are within the published range of values for the silty to sandy sediment types (Spitz and Moreno, 1996). Porosity values were modified over a limited range during the model calibration process.

4.5 Model Boundary Conditions

Significant hydraulic boundaries (sources and sinks) within the model domain that must be considered in the site numerical model include the inflows and outflows from surrounding subbasins, inflows and outflows of surface water, return flows and intentional recharge, and groundwater pumping. These boundaries are discussed in the following subsections.

4.5.1 General Head Boundaries

The MODFLOW General Head Boundary (GHB) package was utilized to simulate the north, south, and east edges of the model domain and represent the aquifer system beyond the model domain (Figure D4-8). For the TLSBHM, the GHBs were developed based on historical water level observations in well located within 2 miles of the model domain boundary. Figure D4-8 shows the locations of wells evaluated to develop the GHB boundary conditions. The GHBs were developed as a series of 19 GHB reaches. The GHB heads at the ends of each reach were interpolated on a monthly basis from the available hydrograph data. The GHB heads for each cell within a reach were then linearly interpolated between the end points. This resulted in a relative smooth variation in GHB heads along the length of each reach.

The GHB conductance term, which governs how much water can flow through the GHB, was calculated as:

Conductance = KLW/M in square feet per day (ft^2/d), where:

K is the hydraulic conductivity of the sediments (assumed to be 25 ft/d),

L is the GHB length or distance to the head value (assumed to be 1,320 feet),

W is the GHB width (assumed to be 1,320 feet), and

M is the saturated thickness of GHB layer (assumed to be 100 feet).

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4.5.2 River and Canal Boundaries

As noted above, several rivers and streams deliver surface water to cropped lands within the model domain. The most important of these is the Kings River, which enters the model domain on the northeast side, and it flows westward near the top of the model domain before turning southwest then southward in the western portion of the model domain. Other major surface water inflows are provided by the Kaweah River, the Tule River, Deer Creek, and Poso Creek. Figure D4-9 shows the locations of each of these surface water features; also shown are the major distributary canals that take the deliveries from the streams and rivers and distribute that water to the irrigation farmlands.

The MODFLOW River (RIV) package was utilized to simulate all the stream and canals that deliver water to cropped lands. The streams were developed as a series of RIV reaches, where each stream reach is composed on many model cells. The RIV package is a head dependent boundary and will allow water to enter groundwater via seepage (losing stream) or exit groundwater (gaining stream) based on river stage (Head) and a steam bed conductance term:

Conductance = KLW/M in ft^2/d, where:

K is the hydraulic conductivity of the sediments (assumed to be 1 to 10 ft/d),

L is the length of the river reach (variable in feet),

W is the river width (assumed to be 10 to 40 feet), and

M is the thickness of the river bed (assumed to be 10 feet).

The rivers were assumed to leak anytime there were surface water diversions down a particular river reach. Throughout the TLSB, almost all rivers are disconnected from groundwater and are losing rivers. Appendix D2 presents an annualized summary of river flow by reach within the model domain.

4.5.3 Agricultural Drains

The MODFLOW DRN package was utilized to simulate the agricultural drains within the model domain (Figure D2-24). The DRN package is a head dependent boundary condition that only collects groundwater above a specified elevation. Similar to GHBs, the rate of removal is governed by a conductance term:

Conductance = KLW/M in ft^2/d, where:

K is the hydraulic conductivity of the sediments (assumed to be 100 ft/d),

L is the length of the drain (assumed to be 1,320 feet),

W is the width of the drain (assumed to be 1,320 feet), and

M is the thickness of the drain bed (assumed to be 1 foot).

In areas where drains were simulated, if simulated groundwater rose to within 4 feet of ground surface, then groundwater was collected by the drains and assumed to be discharged to evaporation basins where it evaporated and was removed from the model domain.

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4.5.4 Groundwater Extraction

Groundwater extraction for municipal, industrial, and agricultural demand was simulated using the MODFLOW Multi-Node Well (MNW2) package. The MNW2 package is a powerful enhancement to the original MODFLOW well package in that it allows for simulation of wells screened across multiple model layers (aquifers). Thus, the MNW2 package will calculate inflows from each model layer within the screened interval as well as the calculating flow within the well casing, including flows from one layer to another when the well is not being pumped. In addition, the MNW2 package will automatically increase pumping from deeper intervals as shallower aquifers become dewatered until the pumping level in the well approaches a specified elevation (such as a pump setting.

4.5.4.1 Specified Pumping Wells

As discussed in Sections 2.8.2.2 and 2.8.2.3, there are 450 known municipal, industrial, recovery, and agricultural wells which have data on well construction as well as reported pumping rates over time (Figure D4-10). The pumping rates were specified for the municipal wells based on monthly historical pumping data obtained from the cities of Corcoran, Hanford, Kingsburg, Lemoore, and Stratford (Table 2-3), or reported monthly pumping data from irrigation districts such as CID, El Rico GSA, WWD, and reported pumping from well fields like Creighton Ranch and Angiola well fields (Table 2-6).

4.5.4.2 Hypothetical Agricultural Irrigation Wells

As discussed in Section 2.8.2.4, agricultural pumping is not typically recorded throughout most of the TLSB. As such agricultural pumping had to be estimated based on available cropping data using a water balance method. Recognizing that many more wells exist in the TLSB than those 450 known wells, an additional 1,126 hypothetical irrigation wells were uniformly distributed across the model domain on approximately 1-mile centers for those areas with unknown well completion intervals, resulting in the final well distribution as shown on Figure D4-11. The hypothetical wells were specified to be screened in the upper (above Corcoran) or lower (below Corcoran) aquifer zones based on statistics of well completions for the 238 known irrigation wells. In addition, approximately 25% of the hypothetical irrigation wells were specified to be completed across the Corcoran, producing groundwater from permeable intervals both above and below the aquitard, consistent with the completion statistics for the 238 known irrigation wells.

Crop Evapotranspiration Rates

Field crops (alfalfa, row crops, corn, cotton, etc.) are assigned on an annual basis in the model. For example, if the annual DWR crop survey/CropScape data indicate that corn was present in a particular model cell, then it was assumed that corn was the only crop within that cell for the full calendar year (12 stress periods). The applied evapotranspiration rates for that cell were assigned based on the monthly ETc rates for corn.

Permanent crops including vineyards, almonds, pistachios, pomegranates, and stone fruit (tree crops) are assumed to be fully mature at the beginning of the simulation in 1990 (based on 1994-1996 DWR crop data). As the model progresses forward in time, the available crop data changed, and the spatial distribution of crops also changed, with a recent trend to more permanent tree crops being planted. As the permanent crop grows from seedling to full maturity, the evapotranspiration rate was assumed to increase as well. The presence of a crop within a specific space in a cell was tracked over time by assigning crop IDs that reflect the number of years of maturity for each tree crop and using the intersect tool in ArcMap to see specific areas of overlap between year n tree crops and year n+1 tree crops. If an intersected area of the domain has almonds in year n and in year n+1, it's assumed that the almonds have matured in that particular portion of the cell.

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The crop data for the TLSB indicates that there was a substantial increase in the number of acres planted in tree crops during the 2010-2016 period (Section 2.8.2.1, Table 2-2). Rather than assuming full maturity and peak evapotranspiration rates for these new areas of tree crops, the ETc rates for these areas are assumed to be a fraction of the mature ETc rates.

For example, almonds are assumed to mature over 5-year period, so the first year that almonds are present in a portion of a model cell, they are assigned ETc rates that are 1/5th of the mature rate. If those almonds are still in the same area the next year, then they are assigned an ETc rate of 2/5ths of the mature rate, and so on. If almonds are in the same spot for 5 years, they are assumed to have the full ETc rates of a mature almond tree. Anything beyond 5 years, up to 25 years, uses the full maturity ETc rates. For instances where almonds have been in a portion of a cell more than 25 years, the almond trees are assumed to have been replanted, and start over at the 1-year, 1/5th mature ETc rates.

Almonds were assumed to mature over a 5-year period and were assumed to be replanted after 25 years. Pistachios were assumed to mature over a 13-year period and are assumed to remain in place for 100-years once they are planted. Pomegranates were assumed to mature over a 19-year period and were assumed to be replanted after 44 years. Stone fruits were assumed to mature over a 5-year period and were assumed to be replanted after 25 years.

Irrigated Areas/Irrigated Fractions

Area fractions within cells were used to compute an area-weighted average for crop ET Demand values within each cell, and to determine the irrigated areas of each cell for use with surface water delivery matrix processing. The crop distributions for each stress period were intersected with the active domain grid in ArcMap. Each cell containing crops was subdivided into multiple pieces, one for each crop type within the cell. The areas of each crop type within the cells were calculated for each stress period. The ET Demand for a single cell is computed as the area of the crop type times the rate of ETc for that crop, divided by the total area of the cell.

Irrigated areas also play a part in the surface water delivery preprocessing. Surface water deliveries were assumed to be spread evenly across the entire irrigated area of each GSA Area (or farm). Not all cells within a GSA may be fully irrigated; there may be a portion of a cell which is fallow, or contains non-irrigated land uses (winter wheat, native vegetation, urban areas). Therefore, the irrigated area of a cell can be used as a weighting factor against the full area of the cell to adjust the effective rates of surface water delivered within a specific cell in a GSA.

For example, if a GSA has a surface water delivery of 30,000 AF in the month of September, and the total irrigated area of the GSA is 10,000 acres, then the nominal rate of surface water delivery is 30,000 AF/30 days = 1,000 AF/d over an irrigated area of 10,000 acres. Going a step further, this becomes (1,000 AF/d) / (10,000 acres) = 0.1 ft/d rate of surface water delivery. For a cell where only half of the area is irrigated, the weighted surface water delivery rate for that cell would be 0.05 ft/d.

Agricultural Irrigation Pumping Demand

Monthly pumping rates for the hypothetical irrigation wells were computed based on crop ET Demand (Section 2.8.2.1) minus the sum of effective precipitation (Section 2.8.1.1), surface water deliveries (Section 2.8.1.2) and Lake Bottom Water Storage (Section 2.8.1.3). The logic behind the calculation of the hypothetical irrigation well pumping rates is summarized below.

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For each monthly stress period and each 40-acre model cell:

- Area Weighted Crop Acreage (acres) x Crop ETc (ft/m) = ET Demand (acre-feet per month [AF/m])
- [-ET Demand (AF/m) + Effective Precipitation (ft/m)] / Irrigation Efficiency = -Farm Demand (AF/m)

  (*notes: over most of the model domain, Irrigation Efficiency was assumed to be 75% from 1990 to 2000 and then increase to 85% from 2000 through 2016. Irrigation Efficiency from the lake bottom area was assumed to be 95% from 1990 through 2016. Excess Effective Precipitation is assumed lost to evaporation. Farm Demand is the volume of water needed to irrigate a field and meet crop demand due to inefficiencies in irrigation methods*)
- -Farm Demand (AF/m) + SW Deliveries AF/m) + Lake Bottom Storage Water (AF/m) =

  -Unmet Demand (AF/m) and +Return Flow (AF/m)

  (*notes: monthly SW Deliveries were summed by GSA and applied to irrigated areas within each GSA. Lake Bottom Water Storage typically occurred only during and following very wet years and was an additional water supply for the El Rico GSA and TCWA*)
- -Unmet Demand (AF/m) + Avg Return Flow/GSA (AF/m) = -Ag Pumping Demand (AF/m) and +Excess Applied Water (AF/m)

  (*notes: Return Flows were assumed to stay within each GSA. The monthly Average Return Flow/GSA (AF/m) = Sum of Return flow per GSA (AF/m) divided by GSA irrigated area*)

Typically, each hypothetical agricultural irrigation well was assigned a service area (or farm) consisting of 16 model cells totaling 1-square mile (Figure D4-12). The sum of the monthly Ag Pumping Demand (AF/m) for the 16 model cells was assigned to each hypothetical agricultural irrigation well. For some hypothetical agricultural irrigation well the cell count was more or less than 16 model cells due to boundaries no-flow boundaries or to eliminate hypothetical wells servicing only 1 or 2 cells.

In addition, there are several large areas (El Rico GSA, CID, SWKGSA, TCWA, and WWD) that were assumed to be operated as single service areas (or farms) with equal access to surface water and pumped groundwater within the service area. Several of the service areas supplied groundwater by wells located within the service area and/or by external well fields outside of the service area. For example, El Rico GSA is supplied groundwater from wells within the GSA and by the Creighton Ranch well field in the Tule subbasin. Likewise, both SWKGSA and TCWA are supplied groundwater from a few wells inside the GSAs and by the Angiola well field in the Tule Subbasin. CID and WWD are assumed to be supplied groundwater from the wells within each service area.

4.5.5 Deep Percolation and Intentional Recharge

Groundwater recharge occurs within the TLSB from deep percolation of applied water and intentional recharge. Intentional recharge occurs at specific locations including Apex Ranch, CID Ponds, and the Old Kings River (Section 2.8.1.4). Deep percolation of applied water occurs almost everywhere in the TLSBHM where there is active irrigation due to inefficient irrigation practices. There are three components to deep percolation including Farm Demand, Excess Applied Water, and Intentional Recharge. Deep percolation is estimated for each monthly stress period and each 40-acre model cell as follows:

- [+Farm Demand (AF/m) / (1-1/Irrigation Efficiency)] + Excess Applied Water (AF/m) + APEX/CID/Condition 8 Intentional Recharge (AF/m) = Deep Percolation (AF/m)

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(*notes: over most of the model domain 75% of Excess Applied Water was assumed to percolate and 25% was assumed to evaporate*)

Deep percolation is applied to the TLSBHM for each stress period and each model cell using the RCH Package.

4.5.6 Subsidence

Land subsidence due to extraction of groundwater was simulated using the MODFLOW Subsidence (SUB) package. The SUB Package simulates elastic (recoverable) compaction and expansion, and inelastic (permanent) compaction of compressible fine-grained beds (interbeds) within the aquifers. The compaction of the interbeds is caused by head or pore-pressure changes (changes in effective stress) within the interbeds. If the stress is less than the pre-consolidation stress of the sediments, the deformation is elastic; if the stress is greater than the pre-consolidation stress, the deformation is inelastic.

The SUB package parameters of:

Sk_e skeletal storage elastic,

Sk_i skeletal storage in elastic,

b_{equiv} combine thickness of delay interbeds within a model layer, and

n_{equiv} combine thickness of non-delay interbeds within a model layer

were derived from CVHM.

5.0 Model Calibration

Calibration of a groundwater flow model is a process through which the model is demonstrated to be capable of simulating the field-measured heads and flows that comprise the calibration targets. Calibration is accomplished by selecting a set of model parameters, boundary conditions, and stresses that produce simulated heads and fluxes that match field measurements within a pre-established range of error. Because of the multiplicity of parameters involved in the calibration process, a unique solution (e.g., one set of parameters) cannot be achieved. A brief discussion of the calibration of the groundwater flow model for the site is presented in the following subsections.

5.1 Model Calibration Criteria

The quantitative fit of the model to observed water level measurements is conducted through statistical analysis of the residuals, (the difference between observed and simulated water levels or heads) at specified observation locations, and in the case of transient calibration, with time. The residual is calculated as the observed value minus the simulated value; thus, a positive residual indicates that the simulated head value is less than the observed value, and vice-versa. The principal statistical measures of the residuals of all data points combined include the following:

- the mean of the residuals,
- the mean of the absolute value of the residuals,
- the standard deviation of the residuals,

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- the sum of the square of the residuals (SSR),
- the root mean square (RMS) error of the residuals,
- the min and max of the residuals,
- the range of the observed values, and
- normalized RMS error (NRMS) (e.g., the RMS error divided by the range of observed values or the standard deviation divided by the range in observed values).

There is no industry standard for determining when a numerical model is adequately calibrated. However, a commonly used rule of thumb criterion for acceptable calibration is a normalized RMS error of less than 10% (Anderson et al., 2015). The RMS is the square root of the SSR divided by the number of observations throughout the model divided by the range of observed water level measurements. In addition, a plot of observed versus computed head values should track close to a 45-degree line and generally fall within one standard deviation of the mean error.

A common qualitative (visual) measure of goodness of fit in numerical modeling is a comparison of observe and simulated values using hydrographs for individual wells. In addition, a map view plot of the average residuals may be used to help identify targets or areas where the residuals in the model domain are largest. Clusters or patterns of gradation of positive or negative residuals may suggest areas where model parameters need to be adjusted further.

5.2 1990-2016 Transient Model Calibration

The transient TLSBHM simulated the period January 1990 through December 2016 using 324 monthly stress periods (Table 4-1). The TLSBHM was calibrated to two data sets, one data set covering the 1990-2016 period and a second data set limited to the 1998-2010 "normal hydrology" period.
The 1990-2016 calibration period included 16,621 groundwater level observations collected from 593 observation wells across the model domain. The 1998-2010 "normal hydrology" calibration period included 7,028 groundwater level observations collected from 544 observation wells across the model domain. Most of the observation wells had little or no completion interval information, making it difficult to assign the observation to a particular model layer. Well with known completion intervals includes 81 wells above the Corcoran Clay and 69 wells below the Corcoran Clay. Although additional observation wells with groundwater elevation measurements are available, many were determined to have too short a record, too many spurious observations, or uncertain completion intervals and hence were not utilized.

Numerous model iterations were needed to calibrate the TLSBHM model. Various hydraulic parameters (K_h, K_v, S_s, S_y) and boundary conditions (RCH, GHB heads, SFR flows, and conductance) were incrementally modified using the manual trial and error method.

The calibration statistics for the entire 1990-2016 historical simulation period include a residual mean of -4.92 feet, a RMS error of 50.95 feet, a range of 575.33 feet, and a NRMS of 8.9%, meeting the calibration criteria of a NRMS of less than 10% (Figure D5-1a). A scattergram of observed and simulated values shows that most values fall within one standard deviation of the perfect 45-degree fit. A residual distribution chart shows that the residual error approximates a gaussian distribution with a slight bias to over predicting heads.

The calibration statistics for 1998-2010 "normal hydrology" calibration period include a residual mean of 2.58 feet, a RMS error of 46.285 feet, a range of 545.16 feet, and a NRMS of 8.5%, slightly better than

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for the 1990-2016 period, and meeting the calibration criteria of a NRMS of less than 10% (Figure D5-1b). A scattergram of observed and simulated values shows that most values are closer to the perfect 45-degree fit compared to the 1990-2016 period. A residual distribution chart shows that the residual error approximates a gaussian distribution with a slight bias to over predicting heads.

A qualitative comparison of observed and simulated heads in selected monitoring wells using hydrographs shows a reasonable fit for several wells, and poor fits for others (Figures D5-2a through D5-2g). In general, the hydrographs show that simulated heads are slightly under predicted above the Corcoran Clay (Figures D5-2a to D5-2c). Within the Corcoran Clay, the hydrographs show that simulated heads tend to start out lower than observed during the ramp-up period, but end up with a relatively good fit after 1998 (Figure D5-2d). Below the Corcoran Clay, the hydrographs show that simulated heads are generally on trend with the observed, although seasonal variations are not simulated very well (Figures D5-2e to D5-2g). Observed and simulated heads in selected all monitoring wells used for model calibration are provided in Appendix D5.

Simulated potentiometric surface maps with groundwater flow vectors from above and below the Corcoran Clay show how the general direction of groundwater flow between the subbasins for December 2015 (Figure D5-8). In general, above the Corcoran Clay, simulated groundwater flow is entering the TLSB from the north, east, and south, and leaving the TLSB to the west. Below the Corcoran Clay, simulated groundwater flow is also entering the TLSB from the north. The simulation results also show consistent cones of depression above the Corcoran Clay around pumping centers beneath the cities of Hanford, Lemoore, and Corcoran. There is also a large, persistent cone of depression beneath CID and lake bottom well fields southeast of the City of Corcoran along the border between the Tulare Lake and Tule subbasins.

The maps also show that there is a large area in the lake bottom area where groundwater appears to be mounding slightly and the groundwater flow vectors show little movement of groundwater above and below the Corcoran Clay (Figure D5-8). This area has been described as being under lain by an extensive sequence of lacustrine and marsh deposits (i.e., Tulare Lake bed "clay plug") that are relatively impervious. Thus, the apparent mounding may result from a zone of residual high heads that are draining more slowly than surrounding areas as groundwater levels are being drawn down due to pumping, recharge to the lake bottom, or it could result as a combination of both.

5.3 1998-2010 Water Balance Calculations

The calibrated transient TLSBHM was used to estimate the groundwater flows that occur between the TLSB and the adjoining subbasins (Figure D2-2). The following subsection present water balances for the TLSB itself, as well as for each adjoining subbasin, and net flows between the TLSB can be extracted from these results. Note that the protrusion of the Kaweah subbasin boundary into the TLSB and the presence of large wellfields near subbasin boundaries complicate the assessment of inter-basin flows.

5.3.1 Tulare Lake Subbasin

The 1990-2016 annualized net water balance for the TLSB shows that overall there is a net outflow of groundwater from the TLSB to the Westside, Kings, Tule, and Kern subbasins (Figure D5-4), while there is a net inflow of groundwater from the Kaweah subbasin. These overall results can be disaggregated to subbasin interactions above and below the Corcoran Clay. Above the Corcoran Clay, there is a net outflow of groundwater from the TLSB to the Westside, Kings, and Tule subbasins, and a net inflow of groundwater from the Kaweah subbasin. Below the Corcoran Clay, there is a net outflow of groundwater

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from the TLSB to the Westside, Kings, Tule, and Kern subbasins and a net inflow of groundwater from the Kaweah subbasin. The inflows and outflows of groundwater from below the Corcoran Clay are greater than those from above the Corcoran Clay.

The maps and water balance charts show that there is a net inflow of groundwater from the Tule subbasin to the TLSB because of the well fields along the boundary between the subbasins.

5.3.2 Westside Subbasin

Annualized net water balance for the portions of the Westside subbasin within the model domain shows that there is a net outflow from the Tulare Lake and Kings subbasins to the Westside subbasin (Figure D5-10). In general, the flow from the TLSB is greater than that from the Kings subbasin both above and below the Corcoran Clay, with greater groundwater flow below the Corcoran Clay. The potentiometric surface maps (Figure D5-8) show that the outflow of groundwater from the TLSB is due to both pumping in the Westside subbasin and leakage from the South Fork of the Kings River.

5.3.3 Kings Subbasin

Annualized net water balance for the portions of the Kings subbasin within the model domain shows that there is a net groundwater inflow to the TLSB from the Kings subbasin, with lesser amounts of groundwater outflow from the Kings subbasin to the Westside and Kaweah subbasins (Figure D5-11). In general, the groundwater inflow from the Kings subbasin is from both above and below the Corcoran Clay, with greater groundwater outflow below the Corcoran Clay. The potentiometric surface maps (Figure D5-8) show that above the Corcoran Clay, the outflow of groundwater from the TLSB is primarily due to leakage from the Kings River. Below the Corcoran Clay, the outflow of groundwater from the TLSB to the Kings subbasin is due to leakage from the Kings River (where the Corcoran Clay is not present) and general movement of groundwater around the relatively impermeable lake bottom sediments.

5.3.4 Kaweah Subbasin

Annualized net water balance for the portions of the Kaweah subbasin within the model domain shows that there is a net outflow of groundwater from the Tulare Lake and Tule subbasin to the Kaweah subbasin and a small inflow of groundwater from the Kings subbasin (Figure D5-12). In general, the flow from the TLSB is greater than that from the Tule subbasin both above and below the Corcoran Clay, with greater groundwater outflow below the Corcoran Clay. The potentiometric surface maps (Figure D5-8) show that a portion of the Kaweah subbasin protrudes into the TLSB. This complicates the calculation of inter-basin groundwater flow because there is both inflow and outflow between the Tulare Lake and Kaweah subbasins through this area. In addition, there is outflow of groundwater from the Kaweah subbasin to the TLSB due to a pumping center near the City of Corcoran.

5.3.5 Tule Subbasin

Annualized net water balance for the portions of the Tule subbasin within the model domain shows that there is a net groundwater outflow from the Tulare Lake and Kaweah subbasins to the Tule subbasin, with mixed groundwater inflow and outflow from the Kern subbasin (Figure D5-13). In general, the flow from the TLSB is greater than that from the Kaweah subbasin both above and below the Corcoran Clay, with greater groundwater flow below the Corcoran Clay. The potentiometric surface maps (Figure D5-8) show that the outflow of groundwater from the TLSB is primarily due to pumping wellfields southeast of the City of Corcoran and a pumping center east of the model domain in the vicinity of the City of Pixley.

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5.3.6 Kern Subbasin

Annualized net water balance for the portions of the Kern subbasin within the model domain shows that there is a net groundwater outflow from the TLSB to the Kern subbasin, with mixed groundwater inflow and outflow from the Tule subbasin (Figure D5-14). In general, the flow from the TLSB is greater than that from the Tule subbasin both above and below the Corcoran Clay, with greater groundwater flow below the Corcoran Clay. The water balance charts and potentiometric surface maps (Figure D5-8) show that during the 1990s, there was generally an outflow of groundwater above the Corcoran Clay from the TLSB to the Kern subbasin. Starting in the mid-2000s, the groundwater flow filed above the Corcoran Clay reversed and there was a net inflow from the Kern subbasin to the TLSB. Below the Corcoran Clay, the water balance charts and potentiometric surface maps show a general decline in the outflow of groundwater from the TLSB to the Kern subbasin.

5.3.7 Groundwater Storage

The simulated groundwater mass balance data were used to estimate the change in groundwater storage in the TLSB on an annual basis for the simulation period (Figure D5-4). The simulation results indicate that between 1990 and 2016, there was a net cumulative decrease in groundwater storage in the TLSB of approximately -2.9 million AF, with an average annual change in storage of approximately -107,560 AF/y. Note that following the wet years of 1995-98, 2005-06, and 2010-11 there was a small net increase in groundwater storage in the TLSB. However, starting in 1998, there has generally been a net negative change in storage, indicating continued overdraft conditions in the TLSB.

5.3.8 Subsidence

Simulated cumulative land subsidence due to extraction of groundwater was simulated for the period 1990-2006 (Figure D5-10). Throughout most of the TLSB, simulated cumulative subsidence was less than 2 feet. However, in the vicinity of the wellfields southeast of Corcoran in the Tule subbasin, simulated subsidence was as much as 9 feet. The simulation results also indicate up to 4 feet of subsidence in the Westside, Kaweah, and Kern subbasins. Charts of simulated subsidence over time was also calculated for the major municipal and agricultural wellfields in the TLSBHM (Figure D5-11). These charts show that there was 1 to 2 feet of cumulative subsidence in the vicinity of Hanford, Lemoore, and Stratford, while there was about 5 feet of subsidence at Corcoran, and up to 9 feet of subsidence at the Angiola and Creighton Ranch well fields in Tule subbasin. The charts also show a small seasonal pattern of elastic subsidence rebound. During the early simulation period (1990-1992) the simulated subsidence occurred at all locations and then stabilized from 1993 through 2001. Simulated subsidence at that time started to increase again after 2002 in a series of steps. Additional calibration of the model to subsidence is needed.

6.0 Sensitivity Analysis

A sensitivity analysis was conducted to evaluate the sensitivity of the model to a change in the estimated hydraulic conductivity and storage parameters. These values in the model were systematically modified over the plausible range of values for the sediment types present beneath the site, and the model was re-run. The sensitivity model run results were compared to the calibration model result to estimate the change in model calibration due to the change in the model parameter.

The sensitivity analysis results indicate that the aquifers above and below the Corcoran Clay are relatively sensitive to changes in K_h, while the Corcoran Clay is not sensitive, as shown by the change (delta) in the

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sum of square residual (Figure D6-1). The results indicate that little improvement in calibration could be expected by modifying the K_h parameters.

The model sensitivity is reversed with respect to K_v, with the Corcoran Clay heads relatively sensitive to changes in K_v, while the aquifers above and below the Corcoran Clay are relatively insensitive (Figure D6-1). The results indicate that a small improvement in calibration could be obtained by decreasing the K_v above the Corcoran Clay.

The sensitivity analysis results indicate that the model is also relatively sensitive to changes in aquifer S_s, with the change in sum of squares error increasing with lower values of storage (Figure D6-1). A small improvement in calibration could be obtained by decreasing the S_s above the Corcoran Clay.

The sensitivity analysis results indicate that the model is also relatively in sensitive to changes in the S_y of the unconfined aquifer above the Corcoran Clay, with the change in sum of squares error decreasing with lower values of S_y (Figure D6-1).

7.0 Predictive Simulations

The calibrated groundwater flow model was modified to develop two 54-year transient predictive simulations from 2017 through 2070: 1) a Baseline forecast to evaluate potential undesirable impacts from maintaining the recent land use under "normal hydrology" conditions (i.e., the status quo); and 2) a Projects forecast to evaluate potential impacts of implementing alternative land uses and projects to obtain groundwater sustainability. Both forecast models consist of 649 monthly stress periods starting with December 2016 and ending with December 2070. The SGMA requires that any forecast model start with current conditions. The models were started in December 2016 to permit the importation of the calibration simulations results as the start for the forecast models. The forecast models assume multiple repeating 14-year cycles of "normal hydrology" (e.g. precipitation, stream flow, surface water deliveries, and boundary conditions) from 1998 to 2010 (Figure D7-1), starting with using 2011 hydrology as an analog for 2017, which was a wet year. A summary of the forecast year and associated "normal hydrology" analog year is presented on Table 7-1. The forecast models were developed as described below.

7.1 Baseline Forecast Scenario

The TLSBHM Baseline Forecast model represents conditions that assume land use recovering from the 2010-2015 drought conditions to "normal hydrology" conditions in the first few years of the simulation, and maintaining these "normal hydrology" conditions for the duration of the simulations. The Baseline Forecast model were developed as described in the following subsections.

7.1.1 Baseline Forecast Land Use

A review of historical land use shows that major cropping acreage patterns have changed significantly over the past decades (Figure D2-12). Acreage of cotton, pasture, and dairy fodder decreased, especially during the 2011-2016 drought. During this same period, acreage of almonds, pistachios, pomegranates, and fallow land increased. Note that the more recent plantings of almonds, pistachios, pomegranates have not yet reached maturity and associated increased water demand (Section 4.5.4.2).

During this early Baseline Forecast stress periods, the acreage of corn and cotton that had been fallowed during the drought was assumed to be replanted, except for the acreage that had been converted to permanent crops. In addition, the water demand of more recently planted acreage of almonds, pistachios, and pomegranates was assumed to increase as the trees matured as discussed in Section 4.5.4.2.

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For crop maturation, tree crops are assumed to continue to mature on a 25-year cycle (except for pistachios which can produce for over 100 years) and continuously mature forward in time. All other crops/land use is assumed to revert to whatever the land use was in the seed year for that particular forecast year. For example, assume there is a new patch of almonds planted in 2016 (crop zone 201). In 2021, it will be in its sixth year of existence, so it's assigned the ETc rate of 6-year old almonds (crop zone 206). The other crops around this patch of almonds will revert to whatever was planted there in 2001, since 2001 is the seed year for the forecast year 2021. Three years from then, the patch of almonds is now mature and assigned an ETc rate for mature almonds (crop zone 209), while the nearby crops are represented by seed year 2004 (corresponding to 2024). Further into the forecast, the almonds will be in their 25th year of existence in 2041 (crop zone 225), while the surrounding crops will be represented by seed year 2007. That same patch of almonds will be replaced, cycle back to being represented by first year almond ETc rates (crop zone 201), and since it's 2042, the other crops are represented by whatever was planted in 2008. A chart of Baseline Forecast crop acreage is presented on Figure D7-2. Note that the crop acreage chart shows a repeating cycle of replanting of permanent tree crops.

7.1.2 Baseline Forecast Municipal Pumping

Baseline Forecast municipal water demand for the cities of Hanford, Lemoore, and Corcoran were assumed to vary seasonally at the average of 2011-2015 pumping rates. Municipal pumping was assumed to increase slowing with populations growth at a rate of 0.3% per year.

7.1.3 Baseline Forecast Hypothetical Irrigation Pumping

Baseline Forecast agricultural irrigation pumping was calculated as discussed in Section 4.5.4.2, with one variation. In the calibration model, there was available groundwater pumping data for the individual wells and well fields servicing the El Rico GSA, CID, SWKGSA, TCWA, and WWD, which indicated that not all wells in each service area were pumping equally. In the Baseline Forecast, the month forecast agricultural pumping demand for each of these service areas was summed and then divided equally amongst the wells and well fields servicing each area. While this approach many not replicate the individual historical pumping from each well in a service area, it does provide a reasonable approach to allocate forecast groundwater agricultural pumping in each service area and thus a reasonable estimate of groundwater system demand.

7.1.4 Baseline Forecast General Head Boundary

As shown on Table 7-1, the Baseline Forecast uses historical years as analogs for the hydrology conditions in the forecast. For example, 2019 is assumed to have hydrology similar to 1999. However, the GHB heads in 1999 are many feet higher than those in 2016 when the Baseline Forecast model starts. To correct for this head discrepancy, the general head boundaries for the Baseline Forecast model were developed by calculating the difference in monthly heads for each stress period of the calibration simulation, and then adding that difference to the forecast GHB head from the previous month. This allows the Baseline Forecast GHBs to have a similar change in heads between stress periods as the calibration model, but from a different initial (2016) elevation. For example, the Baseline Forecast GHB heads for simulation year 2019 are based on the heads difference for the analog year 1999. If the head difference for GHB cell 1001 between December 1998 and Jan 1999 was 0.55 feet in the calibration model, then 0.55 feet was added to the GHB cell 1001 head for the December 2018 to yield the January 2019 GHB head. Thus the resulting Baseline Forecast GHBs exhibit a change in heads similar to that for the calibration model analog year, but from a different initial condition.

7.1.5 Baseline Forecast of Climate Change

The SGMA guidelines require that climate change be considered in any forecasts of future land uses. The California Natural Resources Association (CNRA) has developed a set of tools that can apply change factors to historical precipitation, ET demand, and surface water delivery data to make historical data consistent with forecasted conditions under climate change. The CNRA has developed two climate change factor data sets, one for 2030 and one for 2070.

7.1.5.1 Effective Precipitation

The Baseline Forecast monthly effective precipitation data set was processed through the CNRA python script/ArcGIS tool. The tool takes monthly data and processes it using change factors, which vary temporally and spatially. For model cells that cross multiple change factor grid cells, an area-weighted average change factor is applied. The change factors for a 2030 forecast were used for the forecast period January 2017-December 2030 (forecast stress periods 2-169) while the change factors for a 2070 forecast were used for the forecast period January 2031-December 2070 (stress periods 170-649).

7.1.5.2 Crop Evapotranspiration

The Baseline Forecast monthly ETc data set was processed through the CNRA python script/ArcGIS tool. The tool takes monthly data and processes it using change factors, which vary temporally and spatially. Since the "normal hydrology" Baseline Forecast scheme rotates through a series of years from 1997 to 2010 (with a 2011-based year for 2017), each ETc distribution for the Baseline forecast is unique when accounting for tree crop maturation. For model cells that cross multiple change factor grid cells, an area-weighted average change factor is applied. The change factors for a 2030 forecast were used for the forecast period January 2017-December 2030 (forecast stress periods 2-169) while the change factors for a 2070 forecast were used for the forecast period January 2031-December 2070 (stress periods 170-649).

7.1.5.3 Surface Water Deliveries

The Baseline Forecast surface water delivery data set incorporates a reduction in historical surface water allocations to SWKGSA and TCWA due the sale of water rights. The Baseline Forecast surface water delivery data set all GSAs outside of the TLSB were not modified. CNRA change factors for surface water deliveries do not vary spatially, and are simply a multiplier applied to the historical SW delivery volume. Different change factors are available for 2030 and 2070 climate change forecasted conditions. Like the effective precipitation and ET DEmand data sets, the 2030 change factors were used for the forecast period January 2017-December 2030 (forecast stress periods 2-169) while the change factors for a 2070 forecast were used for the forecast period January 2031-December 2070 (stress periods 170-649). The Baseline Forecast of surface water deliveries is shown on Figure D7-3.

7.1.6 Baseline Forecast Simulation Results

A comparison of simulated potentiometric surface maps from above and below the Corcoran Clay for December 2015 (Figure D5-3) with simulated Baseline Forecast potentiometric surface maps from above and below the Corcoran Clay for June 2040 (Figure D7-4) show that the groundwater elevations beneath the TLSB above and below the Corcoran Clay are projected to decline about 25 feet and 50 feet, respectively, during the 25-year simulation period. Dewatered areas in the upper aquifer on the east side of the model domain (mostly in the Kaweah and Tule subbasins) are projected to expanded and migrate into deeper intervals. The cones of depression above and below the Corcoran Clay in the Lemoore, Creighton Ranch, and Angiola well field areas are projected to become more pronounced.

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Simulated Baseline Forecast potentiometric surface maps from above and below the Corcoran Clay for December 2070 (Figure D7-5) show that the groundwater elevations beneath the TLSB above and below the Corcoran Clay are projected to decline about 50 feet and 150 feet, respectively, during the 54-year simulation period. Dewatered areas in the upper aquifer in the Kaweah and Tule subbasins are projected to expanded significantly and migrate into deeper intervals. The cones of depression above and below the Corcoran Clay in the Westside subbasin, Creighton Ranch, and Angiola well field areas are projected to become much more pronounced.

Simulated Baseline Forecast hydrographs for selected compliance wells in the vicinity of the cities of Corcoran, Hanford, and Lemoore show a continued gradual decline in groundwater elevations in the unconfined aquifer above and below the Corcoran Clay, with seasonal variations much greater below the Corcoran Clay (Figure D7-6). Over the 54-year simulation period, the hydrographs above the Corcoran Clay show approximately 150 feet of decline in the Corcoran area, about 100 feet of decline in the Hanford area, and about 115 feet of decline in the Lemoore area. Over the same period, the hydrographs below the Corcoran Clay show about 195 feet of decline in the Corcoran area, about 120 feet of decline in the Hanford area, and about 190 feet of decline in the Lemoore area.

The Baseline Forecast simulation results indicate that subsidence will continue over the next 54 years under continued existing conditions. A map of cumulative subsidence from 2017-2040 shows that the is about 2 to 6 feet of additional subsidence over most of the TLSB, with up to 12 feet of additional subsidence in the Lemoore area and Angiola and Creighton Ranch wells fields in the Tule Subbasin (Figure D7-7). Baseline Forecast subsidence in the lake bottom area are minimal. As much as 18 feet of additional subsidence may occur in the vicinity of the lake bottom wells fields. A map of cumulative subsidence from 2017-2070 shows that the is about 2 to 16 feet of additional subsidence over most of the TLSB, with up to 20 feet of additional subsidence in the Lemoore area and Angiola and Creighton Ranch wells fields in the Tule subbasin (Figure D7-7).

Simulated Baseline Forecast subsidence hydrographs for continuous global positioning satellites (cGPS) compliance point near the cities of Corcoran and Lemoore wells show that under continued existing conditions, subsidence rate remain consistent during the forecast period (Figure D7-8).

The Baseline Forecast simulation groundwater mass balance data were used to estimate the change in groundwater storage in the TLSB on an annual basis for the 54-year forecast simulation period (Figure D7-9). Under the Baseline Forecast assumptions described above, between 2017 and 2070, there could be an annual average of about 259,000 AF/y of groundwater storage depletion, and as much as 14 million AF of cumulative storage depletion from the TLSB.

In summary, the Baseline Forecast simulation results indicate continued overdraft conditions in the TLSB, with chronic lowering of groundwater levels, continued reduction of groundwater in storage, continued land subsidence, and possibly degraded groundwater quality. Thus, the Baseline Forecast indicates that sustainable groundwater conditions in the TLSB cannot be achieved without changes in groundwater usage and management.

7.2 Forecast Project Simulations

Multiple Project forecast simulations were created iteratively by modifying the Baseline Forecast and incorporating various potential Projects and Management Actions developed by the GSAs for the TLSB and surrounding subbasins (see Section 7.6). The objectives of the Projects and Management Actions are to obtain groundwater sustainability (defined as stable groundwater elevations with minimal changes in

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storage, land subsidence, and water quality degradation over time) by 2040 through a combination of increase water supplies and demand reduction.

Potential projects and management action considered include:

- Above ground surface water storage projects,
- Intentional recharge basins,
- On-Farm Recharge,
- Aquifer Storage and Recovery (ASR), and
- Agricultural demand reductions.

The combined Projects were assumed to provide an annual average of 39,500 AF/y of increases water supply, 38,000 AF/y of groundwater recharge, and about 26,900 AF/y of agricultural demand reduction for a total of 104,400 AF/y, or approximately 97% of the 1990-2016 annual average change in storage of 107,560 AF/y (Figure D5-4). The proposed Projects annual average increase is water supply totals 77,500 AF/y or about 72% of the 1990-2016 annual average change in storage. The Proposed Projects are described below by TLSB GSA.

Mid-Kings River GSA

The MKRGSA has proposed constructing a groundwater recharge facility in the northeast portion of the GSA (Figure D7-10). The proposed recharge facility was assumed to be constructed on about 1,500 acres of land in four 5-year phases starting in 2020. Full build out would be completed in 2035. Due to conversion of irrigated crop land to recharge basins, the recharge facility construction is estimated to result in a permanent annual agricultural demand reduction of about 4,500 AF once completed. The facility was assumed to recharge Kings River flood waters with an assumed percolation rate of approximately 1-foot per day for a 150-day period from March through July when flood waters are typically available based on the historical hydrology cycles used to construct the forecast (Figure D7-11). Flood water were assumed to be available about every 6 to 7 years. Total recharge capacity would increase in 5-year phases from an initial 50,000 AF to an estimated 200,000 AF during flood years when fully built out. Annual average project yield is estimated to be about 38,000 AF/y (Table 7-2) and was simulated in the Project forecast using the RCH package.

El Rico GSA

The El Rico GSA has proposed constructing an intermittent surface water storage facility to store Kings River flood water when available (Figure D7-10). The proposed surface water storage facility was assumed to be constructed by 2030 using raised 6-foot berms to enclose approximately 6,400 acres of land. The land would continue to be farmed during non-flood years, so the net average agricultural demand reduction is estimated to be about 8,400 AF/y. The surface water storage facility was assumed to store approximately 40,000 AF of Kings River flood waters at a rate of about 8,000 AF/m during a 150-day period from March through July when flood water are typically available based on the historical hydrology cycles used to construct the forecast (Figure D7-11). Because of the clayey nature of the Lake Bottom sediments, infiltration of storage water was assumed to be de minimis. Annual average project yield is estimated to be about 8,780 AF/y (Table 7-2). This additional surface water supply was added to the Baseline Forecast surface water deliveries for the El Rico GSA.

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South Fork Kings River GSA

The SFKRGSA has proposed a number of small projects including aquifer storage and recovery (ASR) wells, new surface water storage facilities, and land fallowing. The potential projects for SFKRGSA were very conceptual in nature. The location of the potential ASR well field(s) and potential recharge and recovery rates has not been identified. The locations of potential surface water storage facilities and land fallowing areas were also undefined. Hence, for forecast modeling purposes, a single large surface water storage facility was assumed to be constructed in the southeast portion of the GSA (Figure D7-11). The simulated surface water storage facility was assumed to be constructed by 2030 using raised 6-foot berms to enclose approximately 10,000 acres of land. Approximately half of this land was assumed to already be fallow, so the net agricultural demand reduction is estimated to be about 15,000 AF/y after 2030. Because of the clayey nature of the sediments in this area, infiltration of storage water was assumed to be de minimis. The surface water storage facility was assumed to store approximately 60,000 AF of Kings River flood waters at a rate of about 12,000 AF/m from March through July when flood water are typically available based on the historical hydrology cycles used to construct the forecast (Figure D7-11). Annual average project yield is estimated to be about 13,170 AF/y (Table 7-2). This additional surface water supply was added to the Baseline Forecast surface water deliveries for the SFKRGSA.

Tri-County Water Authority

The TCWA has proposed constructing a new surface water storage facility over the middle portion of the GSA (Figure D7-11). The simulated surface water storage facility was assumed to be constructed by 2030 using raised 6-foot berms to enclose approximately 13,340 acres of fallow land, so there was no net agricultural demand reduction. Because of the clayey nature of the sediments in this area, infiltration of storage water was assumed to be de minimis. The surface water storage facility was assumed to store approximately 80,000 AF of Kings River flood waters at a rate of about 16,000 AF/m from March through July when flood water are typically available based on the historical hydrology cycles used to construct the forecast (Figure D7-11). Annual average project yield is estimated to be about 17,561 AF/y (Table 7-2). This additional surface water supply was added to the Baseline surface water deliveries for the TCWA and SWKGSA.

Surrounding Subbasins

As shown on Figure D2-2, the TLSB is surround by the Westside, Kings, Kaweah, Tule, and Kern subbasins. It was assumed that these surrounding subbasins would also implement projects similar in scope and yield as those proposed for the TLSB in order to obtain groundwater sustainability. Since all the surrounding subbasins were developing potential projects as part of their GSPs, there was insufficient time to coordinate with the surrounding subbasins and implement their proposed projects into the TLSBHM Project Forecast model. Therefore, for simplicity, it was assumed that each surrounding subbasin would implement projects that would yield additional surface water supplies similar to what is proposed for the TLSB, or approximately 72% of the 1990-2016 annual average change in storage estimated for that portion of each subbasin within the TLSBHM (Figures D5-4 through D5-9). It was further assumed that the surrounding subbasin projects would be implement outside of the TLSBHM model domain and that the additional water supply would be imported into the TLSBHM domain as addition surface water deliveries. The assumed surrounding subbasin additional water supplies include:

- Westside subbasin 60,330 AF/y
- Kings Subbasin 50,960 AF/y
- Kaweah subbasin 114,400 AF/y

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- Tule subbasin 104,220 AF/y
- Kern subbasin 35,720 AF/y

This additional surface water supply was added to the Baseline surface water deliveries for the surrounding subbasins.

Programmatic Agricultural Demand Reduction

Programmatic agricultural demand reduction is also a potential management option for the TLSB GSAs. As the GPS was prepared, there was no specific rules or governance to guide simulation of programmatic agricultural demand reduction. Therefore, for simplicity, it was assumed that a programmatic agricultural demand reduction policy would take several years to develop, and that programmatic agricultural demand reduction would not start until 2026. Starting in 2026, it was assumed that programmatic agricultural demand reduction would be implemented and would reduce agricultural demand by approximately 2% per year, ending in 2038 with a total agricultural demand reduction of 25%. It was further assumed that this programmatic agricultural demand reduction would be implemented in the surrounding subbasins at the same time.

Programmatic agricultural demand reduction was implemented in the Projects forecast model by multiplying the projects ET Demand data set by a matrix multiplier that maintained 100% from 2017-2025, then decreased by 2% decrease per year starting in 2026 and ending in 2037 at 75%, and then maintained 75% for the remainder of the forecast. The multiplier was applied to all crop types and all subbasins uniformly.

7.2.1 Projects Forecast Land Use

Land use under the Project Forecast is identical to that used in the Baseline Forecast with two exceptions: (1) lands utilized for most of the projects was assumed to go out of production as the projects are built out over time (Figure D7-10), and (2) programmatic agricultural demand reduction as described above.

7.2.2 Project Forecast Municipal Pumping

The Project Forecast municipal water demand for the cities of Hanford, Lemoore, and Corcoran is identical to that used in the Baseline Forecast. Municipal pumping was assumed to increase slowing with populations growth at a rate of 0.3% per year.

7.2.3 Project Forecast Hypothetical Irrigation Pumping

The Project Forecast of agricultural irrigation pumping was calculated in an identical manner as for the Baseline Forecast, assuming increased surface water deliveries from the Projects and programmatic reduction in agricultural demand. The available surface water supplies were increased by the proposed Project yields as described in Section 7.2.1. During flood events, additional stored surface water was assumed to be available to supplement surface water deliveries the month following storage, less evaporative losses. For example, the volume of water stored in the proposed SFKGSA surface water pond during March 2031 (about 1.2 feet over 10,000 acres) would be available to be redistributed as additional surface water supply to SFKGSA in April 2013 minus open water evaporation for March (about 0.38 feet). This assumption allows the proposed Project surface water storage to be depleted in a timely manner by both evaporation and re-use.

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7.2.4 Project Forecast General Head Boundary

The Project Forecast GHBs were calculated in an identical manner as for the Baseline Forecast with one modification. As described in Section 7.1.4, the general head boundaries for the Baseline Forecast model were developed by calculating the difference in monthly heads for each stress period of the calibration simulation, and then adding that difference to the forecast GHB head from the previous month. This allows the forecast GHBs to have a similar change in heads between stress periods as the calibration model, but from a different initial (2016) elevation. This same process was used for the Project Forecast GHBs with the addition of a head change factor that assumes projects were implemented in the subbasins surrounding the TLSB subbasins resulting in a gradual stabilization (or "soft landing") of heads around 2040. The head change factor had a value of 100% from 2017 through 2026, and then decreased by 5% per year until 2040 where the head change factor was fixed at 25% for the duration of the simulation. The resulting Project Forecast GHBs show a more gradual decrease in the rate of decline compared to the Baseline GHBs (Figure D7-12).

7.2.5 Project Forecast of Climate Change

The SGMA guidelines require that climate change be considered in any forecasts of future land uses. The same CNRA climate change factor data sets for 2030 and 2070 used in the Baseline Forecast were applied to the Project Forecast ET demand, and surface water delivery data. The CNRA corrected effective precipitation results remained identical to the Baseline Forecast.

7.2.6 Project Forecast Simulation Results

As discussed in Section 7.2, multiple Project Forecast simulations were created iteratively by modifying the Baseline Forecast and incorporating various potential projects and management actions developed by the GSAs for the TLSB and surrounding subbasins. The Project Forecast scenarios evolved as follows:

1. Project Forecast Scenario 1: The Baseline Forecast was modified by added Projects and associated land fallowing in the TLSB only (discussed below). The simulation results showed a continued lowering of groundwater levels, reduction of groundwater in storage, continued land subsidence, and increased outflow to surrounding subbasins.
2. Project Forecast Scenario 2: The Project Forecast was further modified with GHBs that caused an asymptotic flatting (i.e., soft landing) of the GHB heads in 2040, representing the effects of assumed Projects in other subbasins. The modification of the GHBs simulation results showed only a slight reduction of groundwater level declines compared to Project Forecast Scenario 1, with continued reduction of groundwater in storage, continued land subsidence, and continued outflow to surrounding subbasins.
3. Project Forecast Scenario 3: The Project Forecast was further modified by assuming each surrounding subbasin implemented projects that would yield additional surface water supplies similar to what is proposed for the TLSB, or approximately 72% of the 1990-2016 annual average change in storage estimated for that portion of each subbasin within the TLSBHM. The simulation results showed a substantial reduction of groundwater level declines over time compared to Project Forecast Scenarios 1 and 2, but with continued declining groundwater levels, reduction of groundwater in storage, continued land subsidence, and continued outflow to surrounding subbasins, after 2040.
4. Project Forecast Scenario 4: The Project Forecast was further modified by implementing programmatic agricultural demand reductions which resulted in a gradual decline in agricultural demand throughout the TLSB and surrounding subbasins by 25% by 2040. The simulation results

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showed a substantial reduction of groundwater level declines over time compared to Project Forecast Scenarios 1 through 3, resulting in stable groundwater elevations throughout most of the TLSB and surrounding subbasins, with significantly reduced reduction of groundwater in storage, and significantly reduced land subsidence,. These results are presented below.

A comparison of simulated potentiometric surface maps from above and below the Corcoran Clay for the Baseline Forecast for June 2040 (Figure D7-4) with simulated Project Forecast Scenario 4 (hereafter referred to simply as the Project Forecast) potentiometric surface maps from above the Corcoran Clay for June 2040 (Figure D7-13) show that the simulated groundwater elevations beneath the TLSB above the Corcoran Clay are about the same or slightly higher under the Project Forecast compared to the Baseline Forecast. Dewatered areas in the upper aquifer on the east side of the model domain (mostly in the Kaweah and Tule subbasins) are projected to be less extensive compared to the Baseline Forecast. Simulated groundwater elevations beneath the TLSB below the Corcoran Clay are about 25 to 50 feet higher under the Project Forecast compared to the Baseline Forecast. In addition, the cones of depression above and below the Corcoran Clay in the Lemoore, Creighton Ranch, and Angiola well field areas are projected to less pronounced.

A comparison of simulated potentiometric surface maps from above and below the Corcoran Clay for the Baseline Forecast for December 2070 (Figure D7-5) with simulated Project Forecast potentiometric surface maps from above the Corcoran Clay for December 2070 (Figure D7-14) show that the simulated groundwater elevations beneath the TLSB above the Corcoran Clay are up to 25 feet higher in the Project Forecast compared to the Baseline Forecast. Dewatered areas in the upper aquifer on the east side of the model domain (mostly in the Kaweah and Tule subbasins) are projected to be less extensive compared to the Baseline Forecast. Simulated groundwater elevations beneath the TLSB below the Corcoran Clay are about up to 75 feet higher under the Project Forecast compared to the Baseline Forecast. In addition, the cones of depression above and below the Corcoran Clay in the Lemoore, Creighton Ranch, and Angiola well field areas are projected to significantly reduced.

Simulated Project Forecast hydrographs for selected compliance wells in the vicinity of the cities of Corcoran, Hanford, and Lemoore show a gradual stabilization of groundwater elevations in the unconfined aquifer above and confined below the Corcoran Clay, with seasonal variations much greater below the Corcoran Clay (Figure D7-15). Over the 54-year simulation period, the hydrographs above the Corcoran Clay show approximately 15 feet of decline in the Corcoran area, about 25 feet of decline in the Hanford area, and about 60 feet of decline in the Lemoore area. Over the same period, the hydrographs below the Corcoran Clay show about 30 feet of decline in the Corcoran area, about 25 feet of decline in the Hanford area, and about 20 feet of decline in the Lemoore area.

The Project Forecast simulation results indicate that subsidence will continue over the next 54 years under the assumed forecast conditions. A map of simulated cumulative subsidence from 2017-2040 shows that there is about 2 to 4 feet of additional subsidence over most of the TLSB, with up to 8 feet of additional subsidence in the Lemoore area and Angiola and Creighton Ranch wells fields in the Tule subbasin (Figure D7-16). This is significantly less compared to the Baseline Forecast (Figure D7-7). Project Forecast subsidence in the lake bottom area in minimal. As much as 8 feet of additional subsidence may occur in the vicinity of the lake bottom wells fields. A map of cumulative subsidence from 2017-2070 shows that the is about 2 to 10 feet of additional subsidence over most of the TLSB, with up to 14 feet of additional subsidence in the Lemoore area and Angiola and Creighton Ranch wells fields in the Tule subbasin (Figure D7-16).

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Simulated Project Forecast subsidence hydrographs for continuous GPS compliance point near the cities of Corcoran and Lemoore wells show that under Project conditions, the subsidence continues to occur (Figure D7-17), but at significant reduced rates compared to the Baseline Forecast (Figure D7-8).

The Project Forecast simulation groundwater mass balance data were used to estimate the change in groundwater storage in the TLSB on an annual basis for the 54-year forecast simulation period (Figure D7-18). Under the Project Forecast assumptions described above, between 2017 and 2070, there would continue to be an annual average of about 41,920 AF/y of groundwater storage depletion (a reduction of 84% compared to the Baseline Forecast), and as much as 2.26 million AF of cumulative storage depletion from the TLSB.

In summary, the Project Forecast simulation results indicate that overdraft conditions in the TLSB will be eliminated, with stable groundwater levels by 2040. While there continues to be some reduction of groundwater in storage, the forecast that groundwater levels remain relatively stable through 2070 indicates that the continued reduction in groundwater in storage is also sustainable. Likewise, although some land subsidence will continue over time, the forecast that groundwater levels remain relatively stable through 2070 indicates that the continued subsidence is also sustainable. Thus, the Project Forecast indicates that sustainable groundwater conditions in the TLSB can be achieved by 2040 with implementation of the proposed Projects and Management Actions.

7.2.7 Historical vs Projects Forecast Simulation Comparison

A comparison of the 1998-2010 "normal hydrology" period of the historical model, 2017-2070 Baseline Forecast, and 2017-2070 Project Forecast was made using the annual average gross water balance data for each simulation (Table 7-3). The Baseline and Projects forecast models both assumed that land fallowed during the 2011-2016 drought would be put back into production, and that overall crop demand would increase due to the maturation of permanent crop as described in Section 7.1.1. The increase in ET demand was also exacerbated by climate change. This resulted in a slight average decrease in irrigated acreage (97%) but an average annual increase in farm demand (104%) in the Baseline Forecast model compared to the historical model (Table 7-3). At the same time, the Baseline Forecast average surface water deliveries were assumed to be reduced (97%) as described in Section 7.1.5.3. As a result, the Baseline Forecast has a net average increase in agricultural pumping demand (135%) compared to the historical model. Overall, the Baseline Forecast has greater farm demand, reduced surface water supply, reduced deep percolation, increased pumping, and increased inter-basins losses; resulting in a greater average annual overdraft compared to the historical model (Table 7-3).

Due to the land use changes as described in Section 7.2.1, the Projects forecast had a net average decrease in irrigated acreage (96%), and a smaller increase in ET demand (69%) and farm demand (75%) compared to the historical model. At the same time, the Projects forecast average surface water deliveries were assumed to increase (102%) due to implementation of the projects as described in Section 7.2. As a result, the Projects forecast has a net average decrease in agricultural pumping demand (75%) compared to the historical model. Overall, the Projects Forecast has lower farm demand, increased surface water supply, increased deep percolation, reduced pumping, and increased inter-basins losses; resulting in a and a reduced average annual overdraft compared to the historical model (Table 7-3).

The results of the Projects forecast simulation indicate that under the assumed forecast conditions, implementation of the proposed projects to increase surface water supply and recharge coupled with agricultural demand reductions can significantly reduce overdraft to sustainable levels in the Tulare Lake

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subbasin as evidenced by the stabilization of groundwater levels throughout most of the subbasin (Figure D7-15, GSP Appendix H) and the reduction of subsidence (Figure D7-17).

7.2.8 Simulated Change in Storage and Sustainable Yield

A comparison of the average annual change in storage (overdraft) and total pumping for the 1998-2010 "normal hydrology" period of the historical model, 2017-2070 Baseline Forecast, and 2017-2070 Project Forecast was made using the annual average gross water balance data for each simulation (Table 7-3). The difference between total pumping and overdraft is an estimate of the sustainable yield.
During the 1998-2010 "normal hydrology" period, the average change in storage was -92,000 AF/y with total estimated pumping of -364,160 AF/y, resulting in an average annual sustainable yield of -271,170 AF/y. During the Baseline Forecast 2035-2045 period, the average change in storage was -339,540 AF/y with total estimated pumping of -485,600 AF/y, resulting in an average annual sustainable yield of -146,060 AF/y. During the Project Forecast 2035-2045 period, the average change in storage was -578,480 AF/y with total estimated pumping of -278,370 AF/y, resulting in an average annual sustainable yield of -220,520 AF/y.

8.0 Data Limitations

Groundwater models are designed to estimate changes over time in groundwater levels, flow directions, and storage given a set of inflows (precipitation, surface water, under flow in, etc.) and outflows (evapotranspiration, pumping, underflow out, etc.). Prior to the SGMA there were no requirements to manage or report groundwater usage. As a result, most GSAs do know the location, construction, and pumping history of many pumping wells within their GSAs. Furthermore, most GSAs often do not have a good historical accounting of which parcels have received surface waters and at what rates. Hence, these inputs and outputs need to be approximated by other means than direct measurement.

The data utilized for construction and calibration of the TLSBHM were provided by various private parties, public agencies, and data extracted from existing numerical models of the area including DWR's 2014 release of C2VSim in the Coarse Grid version, USGS CVHM, the Kaweah Delta Water Conservation District model (Fugro West, 2005), and the preliminary Tule subbasin and Westside subbasin models. Other numerical models adjacent to and/or covering portions of the TLSBHM are known to exist, but were unavailable for this effort. The data gathering effort also occurred before many GSAs were organized, so it is likely that some data were unavailable at the time the model was developed. It is anticipated that as the TLSBHM is reviewed and utilized that some corrections of input data will be necessary and that additional data, unavailable at the time, will need to be incorporated into the model.

Much of the hydrologic data used to construct and calibrate the TLSBHM are based on estimates or inferred from multiple data sources. As noted above, most GSAs do not know the historical delivery of surface water to various parcels within the GSAs. Hence it was necessary to assume that all irrigated parcels received some surface water allotment. Likewise, the location, construction, and pumping history of most of the irrigation wells in the TLSBHM domain are not known. Hence hypothetical irrigation well locations were assumed to be distributed with relatively uniform spacing across the model domain. The hypothetical irrigation wells were also assumed to have completion intervals and frequency similar to that of a small subset of wells with known constructions. Hypothetical irrigation wells pumping was estimated based on a water balance method using estimated agricultural demand based on reported crop type minus the assumed distribution of surface water supplies. While these simplifying assumptions and estimates are reasonable given the sparseness of measurements, they add uncertainty to the model.

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Overtime, under the SGMA, more accurate spatial and temporal groundwater pumping, and surface water delivery data should be collected and utilized to construct and update groundwater models of the TLSB. As the models are populated with actual measurement instead of estimate, the models will become more useful tool for managing groundwater in the subbasin.

9.0 Summary of Model Reliability

The TLSBHM is an approximation of existing conditions beneath and in the vicinity of the TLSB. It covers a large area with very dynamic hydrologic conditions that have significant changes over the simulation period. Due to a lack of historical data, much of the data utilized to construct the model had to be inferred from alternative data sets. Given the uncertainty of these estimates, the model can approximate on average, but not completely reproduce, all observations across the entire site area under all conditions. Overall, the TLSBHM can reliably predict groundwater elevations in response to various hydrologic conditions within the calibration period based on the available data and estimates. However, forecast simulations with extreme ranges in hydrologic conditions (i.e., severe drought conditions or extreme flooding) may produce less reliable results.

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Tables

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Table 2-1
Historical Hanford Precipitation

Tulare Lake Subbasin GSP Model
Kings County, California

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1899	M	M	M	M	M	M	M	M	0	0.67	M	0.87	M
1900	1.38	0	1.18	1.04	M	M	M	M	M	M	M	M	M
1901	M	M	M	M	M	M	M	T	1.04	T	M	0.15	M
1902	0.4	2	1.78	0.47	0.09	M	0	M	0	0.36	1.67	0.56	M
1903	1.31	0.38	1.71	0.5	0	0	0	0	0	0.05	0.47	0.15	4.57
1904	0.52	2.03	2.05	0.72	0	0	0	0	2.48	0.84	0.31	1.16	10.11
1905	1.28	1.09	2.1	0.56	0.65	0	0	0	0.07	0	1.16	0.23	7.14
1906	1.59	1.92	4.05	0.62	2.06	0.02	0	0	0	0	M	M	M
1907	M	M	M	M	M	M	M	M	M	M	M	M	M
1908	M	M	M	M	M	M	M	M	M	M	M	0.31	M
1909	M	M	M	M	M	M	M	M	M	M	M	M	M
1910	M	M	M	M	M	M	M	M	M	M	M	M	M
1911	M	M	M	M	M	M	M	M	M	M	M	M	M
1912	M	0.02	3.24	1.52	0.27	0	0	0	0	0	0.61	0.21	M
1913	1.26	1.55	0.34	0.78	0.76	0.06	0.08	0	M	M	M	1.35	M
1914	4.36	1.25	0.37	0.11	M	1.06	0	0	0	0	0.02	M	M
1915	M	M	0.3	1.37	M	M	M	M	M	M	M	M	M
1916	4.68	M	M	M	0.16	M	M	0.28	0.47	1.09	M	1.35	M
1917	M	M	M	M	0.31	M	M	M	M	M	M	M	M
1918	M	4.5	3.43	M	M	M	M	M	0.88	0.12	M	M	M
314	M	M	1.01	0.15	0.1	M	M	M	M	M	M	M	M
1920	M	2.72	3.05	0.24	M	M	M	M	M	M	M	M	M
1921	M	0.89	M	M	0.87	M	M	M	M	M	M	M	M
1922	M	M	M	M	M	M	M	T	M	M	M	M	M
1923	M	M	M	2.43	M	M	M	M	M	M	M	0.22	M
1924	M	M	1.86	M	0	M	M	T	0	0.65	M	2.12	M
1925	M	M	1.58	M	M	M	0	M	0	M	M	M	M
1926	0.82	1.44	0.2	2.67	T	0	0	0	0	0.76	3.67	0.65	10.21
1927	1.33	2.52	2.04	0.18	0.06	T	0	0.04	T	1.67	1.63	0.78	10.25
1928	0.09	0.96	1.55	0.08	0.1	0	0	0	0	T	1.47	1.69	5.94
1929	0.81	0.61	1.4	0.81	0	0.24	T	0	0.03	0	0	0.42	4.32
1930	1.66	1	1.66	0.15	0.37	0	0	0.02	0.38	0.07	0.67	0.3	6.28
1931	2.32	0.72	0.07	0.91	0.2	1.12	0	0.08	0.08	0	1.36	2.54	9.4
1932	1.85	1.52	0.47	0.71	0.13	0	0	0	0	0	0.28	0.93	5.89
1933	3.12	0.16	0.72	0.28	0.41	0.07	0	0	0	0.15	0	1.01	5.92
1934	0.17	1.53	0.05	0	0.22	0.14	0	0	0	1.06	2.15	1.84	7.16
1935	2.5	1.77	2	2.05	0	0	0.03	0	0.06	0.51	0.4	0.89	10.21
1936	0.66	4.7	0.97	0.55	T	T	0	0	0	1.84	0	2.87	11.59
1937	1.95	2.46	2.23	0.22	0	0	0	0	0	0.11	0.21	2.16	9.34
1938	1.76	3.51	4.59	1.15	0.11	0.17	0.07	0	0.13	0.19	0.19	1.42	13.29
1939	1.54	0.77	1.44	0.82	T	0.12	0	0	0.04	0.57	0.06	0.22	5.58
1940	3.53	3.61	0.99	0.18	T	T	0	0	0	0.85	T	3.61	12.77
1941	1.51	3.9	2.05	2.41	T	T	0	T	0	0.9	0.57	3.11	14.45
1942	1.21	0.88	0.94	1.19	0.16	0	0	M	0	0	0.43	1.1	M
1943	2.73	1.14	3.35	0.87	0	0	0	0	0	0.03	0.22	1.03	9.37
1944	1.28	2.97	0.22	0.86	0.28	0.23	0	0	0.02	0.23	2.25	0.97	9.31
1945	0.26	2.71	1.81	0.16	0.1	0.17	0	0	T	0.71	1.15	1.51	8.58
1946	0.34	1.53	2.56	0.07	0.41	0	0.11	0	0	1.33	1.1	2.06	9.51
1947	0.41	0.49	0.56	0.11	0.41	0	0	0	T	0.59	0.29	0.51	3.37
1948	0	0.44	1.46	1.55	0.54	0	0	0	0	0.03	0.01	0.99	5.02
1949	0.51	0.85	1.94	0.07	0.53	0	0	T	0	0	0.6	0.68	5.18
1950	1.93	1.13	1.1	0.4	0	0	0.08	0	0	0.34	0.63	1.06	6.67
1951	1.24	0.76	0.22	1.17	0.07	0	0	0	0	0.08	1.11	2.39	7.04
1952	3.08	0.27	2.18	0.79	0.01	0.02	T	0	0.17	0.05	0.65	2.96	10.18
1953	1.1	0.27	0.34	0.83	0.29	0.02	T	0	0	0.02	1.01	0.09	3.97
1954	1.89	0.78	2.21	0.52	0.34	0.08	0	0	0	0	0.66	1.61	8.09
1955	3.25	1.31	M	M	0.9	0	0	M	0	0.02	0.92	4.67	M
1956	1.2	0.38	0.1	0.73	0.83	0	0	0	0	0.72	0	0.15	4.11
1957	1.39	1.17	0.56	0.67	0.63	0	0	0	0	0.2	1.39	1.41	7.42
1958	1.85	2.3	3.92	2.04	0.24	0	0	T	0.88	0	0.23	0.16	11.62
1959	0.86	1.9	0.11	0.52	T	0	0	T	0.11	0	0	0.17	3.67
1960	0.8	1.71	0.61	0.57	0	0	0.02	0	0	0.53	2.61	0.03	6.88
1961	1.34	0.22	0.67	0.22	0.37	0	0	0	0	0	1.11	1.28	5.21
1962	0.71	4.88	1.06	0	0.11	0	0	0	0.01	0.1	0	0.19	7.06
1963	1.19	1.68	1.37	2.88	0.56	0.17	0	0	0.33	0.75	1.23	0.29	10.45
1964	0.61	0.02	0.94	0.64	0.2	0	0	0.34	0	0.95	1.31	1.44	6.45
1965	1.18	0.33	0.33	1.6	0	0	0	0.05	0.07	0.05	2.15	1.97	7.73
1966	0.63	0.71	0.1	0	0.07	0.06	0.04	0	0.29	0	1.28	2.57	5.75
1967	1.41	0.05	2.42	2.95	0.07	0.23	0	0	0.31	0	1.99	0.5	9.93

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1968	0.57	0.64	1	0.5	0.08	0	0	0	0	1.33	0.98	1.64	6.74
1969	6.69	4.54	0.79	0.85	0.32	0.21	0.07	0	0.15	0.05	0.51	0.7	14.88
1970	1.6	1.33	1.42	0.16	0	T	T	0	0	T	2.4	1.23	8.14
1971	0.35	0.19	0.23	0.4	1.44	0	0	T	0.04	0.06	0.41	1.87	4.99
1972	0.04	0.35	0	0.23	0	0	0	0	0.24	0.21	2.9	0.65	4.62
1973	M	2.29	2.2	0.12	M	M	0	0	0	M	M	M	M
1974	2.97	0.11	1.75	0.03	0	0	0	0	0	0.65	0.24	1.4	7.15
1975	0.09	2.26	M	0.49	0	0	0	0	0.96	M	0.05	0.22	M
1976	T	2.94	0.19	1.47	0.03	0.51	0	0.22	1.47	0	1.15	0.96	8.94
1977	0.59	0.03	0.43	0	0.91	0.07	0	0	0	0.05	0.66	2.85	5.59
1978	2.22	5.05	4.12	1.71	0	0	0	0	1.1	0	0.79	0.5	15.49
1979	2.19	1.61	1.16	0.03	0	0	0.04	0	0.08	0.41	0.62	0.41	6.55
1980	2.9	2.71	1.28	0.05	0.04	0	0	0	0	0.09	0	0.2	7.27
1981	1.77	0.86	2.1	0.68	0.17	0	0	0	0	0.76	1.08	0.29	7.71
1982	0.84	0.38	3.52	1.75	0	0.45	0.18	0	0.64	1.03	2.15	0.71	11.65
1983	3.74	2.59	3.39	1.63	0.04	0	0	0.05	0.82	0.43	1.66	1.22	15.57
1984	0.01	0.42	0.27	0.18	0	0	0	0	0	M	M	M	M
1985	0.59	M	0.7	0.12	0	0	M	0	T	M	2.11	0.66	M
1986	1.46	2.6	3.43	0.5	0	0	T	T	0.15	0	0.21	0.77	9.12
1987	1.77	2.07	2.02	0.06	0.13	0.05	0	0	0	0.58	0.47	1.7	8.85
1988	1.37	0.4	0.93	1.99	0.07	0	0	0	0	0	1.31	2.29	8.36
1989	0.17	1.04	0.85	0.02	0.39	0	0	T	0.67	0.32	0.2	0	3.66
1990	1.66	1.1	0.3	0.97	0.87	0	T	T	T	0.01	0.22	0.15	5.28
1991	0.31	0.12	6.62	0.19	T	0.12	0	0	0.11	0.41	0.14	M	M
1992	1.4	2.82	0.85	0.1	T	0	0.01	0.01	T	0.58	T	2.62	8.39
1993	3.88	2.48	2.16	0.07	0.08	0.3	0	0	0	0.24	0.64	0.66	10.51
1994	0.94	1.45	1.02	0.72	0.66	0	T	0	1.06	0.35	1.54	0.33	8.07
1995	4.7	0.51	4.77	0.65	0.87	0.04	T	0	T	0	T	1.59	13.13
1996	1.68	2.89	2.27	0.85	0.1	T	0	0	0	2.43	0.69	3.27	14.18
1997	3.02	0.12	0.21	0	0	T	T	0	0.06	0.09	1.96	1.8	7.26
1998	2	4.05	2.63	1.68	1.31	0.44	0	0	T	0.68	0.63	0.65	14.07
1999	3.01	0.56	0.43	1.37	0	0	0	T	0.01	0	0.15	T	5.53
2000	1.8	3.28	1.59	0.97	0.48	0.35	0	0	0.03	1.31	T	0.05	9.86
2001	1.98	1.48	1.24	1.12	0	0	0.09	0	T	0.18	1.84	1.99	9.92
2002	0.87	0.31	1.04	0.03	0.01	0.82	0	0	0	0	1.42	1.14	5.64
2003	0.24	1.08	1.01	1.5	0.62	0	T	0.07	0	0	0.49	2	7.01
2004	2	2.18	0.29	0.02	0.01	0	0	0	0	2.06	0.52	2.23	9.31
2005	2.63	1.58	2.24	0.71	0.83	0	0	T	0.01	0.01	0.19	2.07	10.27
2006	3.54	0.55	2.72	3.39	0.53	0	0	0	0	0.06	0.22	1.01	12.02
2007	0.65	0.89	0.26	0.33	0.01	0	0	0.12	0.37	0.35	0.12	1.32	4.42
2008	2.18	1.18	T	0	0.11	0	0	0	0	0.15	1.04	1.49	6.15
2009	0.8	1.86	0.2	0.02	0.41	0.22	0	0	0.18	1.32	0.28	1.42	6.71
2010	2.64	1.91	0.34	1.65	0.17	0	0	0	0	0.64	1.32	6.46	15.13
2011	1.52	1.53	2.87	0.3	0.4	1.04	0	0.08	0.01	0.55	0.8	0.06	9.16
2012	M	M	M	1.39	0.03	M	T	0	0	0.28	0.49	1.9	M
2013	0.22	0.48	0.79	0.08	0.17	0	0	0	0.01	T	0.33	0.16	M
2014	0.3	1.38	0.27	0.35	T	0	0	0	0.03	0	0.94	2.52	5.79
2015	0.08	0.72	0.02	0.77	0.1	0	0.45	0	0	0.38	0.91	1.4	4.83
2016	2.56	0.58	1.99	0.57	0.02	0.09	0	0	0	0.76	0.4	1.6	8.57
2017	3.7	2.8	0.31	1.02	0.36	0.01	0	0.01	0.17	0.06	0.21	0.08	8.73
Mean	1.59	1.5	1.47	0.75	0.25	0.09	0.01	0.01	0.15	0.38	0.82	1.24	8.28
Min	6.69	5.05	6.62	3.39	2.06	1.12	0.45	0.34	2.48	2.43	3.67	6.46	15.57
	1969	1978	1991	2006	1906	1931	2015	1964	1904	1996	1926	2010	1983
Max	0	0	0	0	0	0	0	0	0	0	0	0	3.37
	1948	1900	1972	2008	2018	2015	2017	2016	2016	2014	1980	1989	1947

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Table 2-2
Historical Land Use

Tulare Lake Subbasin GSP Model
Kings County, California

Tulare Lake Subbasin	1990-1995 (Acres)	1996-1998 (Acres)	1999-2006 (Acres)	2007 (Acres)	2008 (Acres)	2009 (Acres)	2010 (Acres)	2011 (Acres)	2012 (Acres)	2013 (Acres)	2014 (Acres)	2015 (Acres)	2016 (Acres)	Average (Acres)
Tulare Lake Subbasin														
Alfalfa Hay and Clover	41,604	32,564	54,301	72,459	80,600	71,504	69,685	38,789	42,131	49,318	35,820	29,665	24,245	**45,987**
Almonds (Adolescent)			2,908			5,127	7,927	3,222	4,464	7,476	6,526	6,222	5,365	**2,470**
Almonds (Mature)	7,682	5,241	4,550	12,897	11,825	9,826	8,374	10,140	10,818	11,441	12,876	15,046	15,105	**7,852**
Almonds (Young)		3,278	9,290	16,538	25,966	14,678	20,887	13,968	14,564	20,341	17,678	16,983	21,576	**9,557**
Berries	20								1	2		0		**5**
Carrot Single Crop								11	5	12	2	2	16	**2**
Citrus (no ground cover)			25		13	14	4	120	29	100	89	22	9	**21**
Corn and Grain Sorghum	14,280	38,896	29,349	39,271	31,762	34,643	23,031	33,780	29,175	27,566	22,638	18,826	17,400	**25,404**
Cotton	159,534	180,960	124,764	109,605	88,304	72,441	98,167	105,541	88,993	89,317	63,385	44,532	73,720	**118,794**
Dairy Single Crop*	3,816	4,077	4,385											**2,438**
Fallow Land*	193,695	138,392	89,606	65,169	85,144	99,688	90,192	152,391	172,697	172,486	195,172	237,790	200,972	**136,159**
Forest*	420	809	2,955	6	5	46	5			1		4	0	**952**
Grain and Grain Hay	28,708	48,533	62,962	19,266	27,870	27,406	25,980	7,758	9,968	11,194	12,213	21,196	19,069	**34,833**
Melons	250	56	284				14	2	11	7	797	18	86	**170**
Misc. field crops	17,116	12,819	51,311		2			0			2			**18,531**
Onions and Garlic	457	479	770			7	1,358	411	302	94	502	149	644	**483**
Open Water*	5,568	9,092	8,968	5,576	4,296	4,049	5,434	7,703	5,443	5,045	6,824	5,919	5,435	**6,637**
Pasture and Misc. Grasses	2,500	5,029	5,615	50,688	44,232	66,944	53,080	14,680	13,368	15,355	33,551	15,744	13,743	**14,473**
Pistachio (Adolescent)								170	218	370	882	3,575	3,836	**335**
Pistachio (Mature)	4,694	3,808	3,804	6,096	1,907	934	404	394	380	348	330	485	469	**2,888**
Pistachio (Young)		1,580	4,390	4,351	4,259	8,527	8,083	12,985	14,676	15,878	19,195	22,678	22,570	**6,247**
Pomegranates (Adolescent)											3	16	27	**2**
Pomegranates (Young)				61	1,705	545	256	5,012	804	1,395	2,207	1,312	3,111	**608**
Potatoes, Sugar beets, Turnip etc..	5,736	1	209	6		3		9		41		2	2	**1,331**
Riparian*		668	1,120	517	134	398	615	226	138	313	239	248	194	**477**
Small Vegetables	1,599	647	4,518	20	2	13	212	142	133	244	165	78	198	**1,643**
Stone Fruit (Adolescent)			1,478			14	66	100	125	69	47	191	170	**412**
Stone Fruit (Mature)	7,070	4,985	3,854	1,314	544	168	18	3	23	41	23	27	39	**3,206**
Stone Fruit (Young)		1,827	4,185	672	1,609	1,573	2,502	1,077	712	1,641	1,340	1,183	713	**1,770**
Tomatoes and Peppers	5,634	1,627	14,676	117	2	110	12	21,482	23,670	7,114	11,922	19,211	23,420	**9,203**
Urban, Industrial*	12,654	17,391	19,875	33,427	34,711	44,471	32,218	32,091	28,576	29,366	33,901	30,530	30,930	**22,128**
Wine Grapes with 80% canopy	2,948	3,226	5,779	5,588	3,499	2,240	2,746	5,361	9,228	4,655	6,472	4,672	10,985	**4,565**
Winter Wheat*				72,238	67,458	50,451	64,526	48,212	45,118	44,530	30,950	19,420	21,690	**17,207**
Tulare Lake Subbasin Irrigated Crop Acreage	**299,832**	**345,557**	**389,021**	**338,951**	**324,102**	**316,717**	**322,806**	**275,156**	**263,796**	**264,018**	**248,665**	**221,837**	**256,519**	**310,792**
Tulare Lake Subbasin Total Crop Acreage	**515,986**	**515,986**	**515,931**	**515,883**	**515,849**	**515,821**	**515,796**	**515,779**	**515,768**	**515,759**	**515,751**	**515,747**	**515,741**	**496,788**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year

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Table 2-3
Historical Kings River Diversions

Tulare Lake Subbasin GSP Model
Kings County, California

Kings River Water Years	GSA	Mid Kings River					South Fork Kings							Southwest Kings									
	Agency	Peoples Ditch Company	Last Chance Water Ditch Company				Stratford Irrigation District	Empire West Side Irrigation District			Lemoore Canal & Irrigation Company			Dudley Ridge Water District-Monthly Diversions Assumed									
	Diversion	*Peoples Canal- MKRGSA Total*	*Last Chance Canal- MKRGSA Total*	*Lakeside IWD*	Imported Water	Mid Kings	Stratford Canal	Empire West Side ID total from SWP	Empire West Side Canal	Westlake Canal	Lemoore Canal	Imported Water	South Fork Kings River	*Blakeley Canal-Kings River & Lateral A*	TLBWSD Lateral C (T203	Dudley Ridge State Turnout (DR-1), T201	Dudley Ridge State Turnout (DR-1B), T202	Dudley Ridge State Turnout (DR-1A), T204	Dudley Ridge State Turnout (DR-2), T205	Dudley Ridge State Turnout (Paramount), T207	Dudley Ridge State Turnout (DR-3), T208	Imported Water, Alrigiola/Green Valley Well Fields, City of Lemoore and Westlands RD 761	Southwest Kings
		(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)
71%	1966	107,763	50,356	-	-	158,119	2,158	-	4,770	3,604	96,079	-	106,612	20,559	-	-	-	-	-	-	-	-	20,559
197%	1967	136,889	78,468	-	-	215,358	3,947	-	9,622	5,861	109,323	-	128,753	29,187	-	-	-	-	-	-	-	-	29,187
49%	1968	75,809	31,878	-	-	107,688	3,540	1,780	13,636	12,718	91,478	-	123,153	19,692	0	3,312	949	2,372	11,388	9	5,694	-	43,416
256%	1969	107,636	61,339	-	-	168,975	1,139	50	2,878	6,056	87,537	-	97,659	534	0	3,942	1,130	2,824	13,554	11	6,777	-	28,771
78%	1970	76,723	38,772	-	-	115,495	1,884	3,548	5,359	7,305	93,441	-	111,538	0	0	5,077	1,455	3,637	17,456	15	8,728	-	36,366
69%	1971	86,815	35,321	-	-	122,137	4,376	5,391	4,665	10,280	96,498	-	121,210	10,521	0	5,158	1,478	3,695	17,735	15	8,867	-	47,469
50%	1972	51,631	38,190	-	-	89,820	4,062	5,216	6,188	5,133	80,465	-	101,065	20,920	0	5,333	1,528	3,820	18,335	15	9,168	-	59,119
125%	1973	139,667	62,672	-	-	202,339	4,411	5,233	5,964	6,543	86,382	-	108,534	22,249	0	4,429	1,269	3,172	15,228	13	7,614	-	53,973
122%	1974	137,406	68,454	-	-	205,860	4,082	4,085	9,291	10,508	102,115	-	130,081	37,966	0	8,390	2,404	6,010	28,849	24	14,425	-	98,069
92%	1975	109,458	43,937	-	-	153,395	4,570	5,803	8,763	10,939	104,388	-	134,463	36,603	0	10,191	2,920	7,300	35,040	29	17,520	-	109,602
32%	1976	37,828	2,255	-	-	40,083	4,284	5,811	5,915	5,004	70,925	-	91,940	22,247	0	7,770	2,226	5,566	26,716	22	13,358	-	77,906
23%	1977	43,393	9,542	-	-	52,935	2,203	2,120	1,598	557	42,067	-	48,545	8,903	0	3,633	1,041	2,603	12,493	10	6,246	-	34,930
201%	1978	125,769	71,577	-	-	197,346	2,859	409	10,627	9,312	80,567	-	103,774	26,094	0	7,455	2,136	5,340	25,632	21	12,816	-	79,494
101%	1979	125,680	64,463	-	-	190,143	6,434	1,565	15,449	9,523	107,578	-	140,549	52,496	0	9,685	2,775	6,938	33,302	28	16,651	-	121,876
178%	1980	101,388	64,365	-	-	165,753	3,981	805	16,100	11,566	103,714	-	136,165	53,639	0	10,061	2,883	7,207	34,594	29	17,297	-	125,710
61%	1981	89,091	47,482	-	-	136,572	4,435	7,966	7,841	9,437	89,111	-	118,790	42,806	0	9,213	2,640	6,599	31,677	26	15,839	-	108,800
181%	1982	127,200	65,413	-	-	192,613	4,479	4,379	9,396	20,983	100,153	-	139,389	41,213	0	6,968	1,997	4,992	23,960	20	11,980	-	91,130
261%	1983	60,994	48,013	-	-	109,007	3,808	0	6,097	10,389	58,631	-	78,926	22,250	0	7,026	2,013	5,033	24,157	20	12,078	-	72,577
115%	1984	97,831	53,649	-	-	151,480	2,533	0	2,801	3,800	99,362	-	108,496	10,003	0	8,116	2,326	5,814	27,907	23	13,954	-	68,144
73%	1985	105,362	39,583	-	-	144,944	4,869	4,677	5,209	6,827	103,148	-	124,731	34,288	0	7,791	2,232	5,581	26,788	22	13,394	-	90,096
190%	1986	111,962	62,457	-	-	174,419	7,329	2,070	7,345	16,723	87,761	-	121,227	27,361	0	6,427	1,841	4,604	22,098	18	11,049	-	73,398
45%	1987	70,406	24,792	-	-	95,198	5,177	3,961	4,959	10,982	90,541	-	115,620	28,582	0	5,816	1,666	4,166	19,996	17	9,998	-	70,242
48%	1988	60,312	21,844	-	-	82,156	3,953	3,128	4,457	2,949	76,554	-	91,041	21,261	0	6,030	1,728	4,319	20,733	17	10,367	-	64,456
53%	1989	60,579	19,935	-	-	80,514	0	2,700	0	-	56,519	-	59,219	13,458	0	7,168	2,054	5,134	24,645	21	12,323	-	64,802
40%	1990	53,292	9,909	-	-	63,201	0	2,979	0	-	34,465	-	37,444	6,485	0	4,606	1,320	3,299	15,836	13	7,918	14,540	54,016
63%	1991	45,654	18,622	-	-	64,276	1,760	199	1,006	964	31,492	-	35,420	5,941	0	1,670	479	1,196	5,743	5	2,871	8,181	26,085
41%	1992	49,394	9,361	-	-	58,755	1,759	1,219	0	0	37,968	-	40,945	6,003	0	1,696	486	1,215	5,831	5	2,915	6,095	24,245
149%	1993	147,363	53,498	-	-	200,860	5,070	2,467	4,314	8,612	91,166	-	111,629	30,546	0	2,917	836	2,090	10,031	8	5,016	6,480	57,925
50%	1994	69,510	30,738	-	-	100,248	2,997	1,499	3,808	6,811	76,550	-	91,666	26,295	0	3,834	1,099	2,747	13,184	11	6,592	11,642	65,404
202%	1995	143,785	102,300	-	-	246,085	6,123	1,468	6,419	1,410	85,049	-	100,469	34,039	0	5,715	1,637	4,094	19,650	16	9,825	8,131	83,107
122%	1996	166,765	95,338	-	-	262,103	6,774	1,681	5,576	5,778	105,398	-	125,206	41,813	0	6,886	1,973	4,933	23,677	20	11,839	14,505	105,645
155%	1997	133,158	85,505	20,657	-	239,321	7,460	0	8,239	2,079	89,117	-	106,896	25,259	0	7,895	2,262	5,655	27,146	23	13,573	11,319	93,132
181%	1998	141,107	77,863	29,871	-	248,841	5,578	488	4,596	8,447	75,590	-	94,698	17,157	3,528	6,955	1,993	4,982	23,916	20	11,958	11,348	81,857
74%	1999	101,773	62,938	12,119	-	176,830	4,971	2,858	6,135	3,624	95,504	-	113,092	25,132	0	7,958	2,280	5,701	27,363	23	13,681	10,280	92,418
90%	2000	108,835	82,526	13,181	-	204,541	4,598	1,619	2,184	4,566	99,074	-	112,041	21,426	0	7,397	2,119	5,299	25,433	21	12,717	10,299	84,711
59%	2001	73,419	31,031	7,017	-	111,467	4,959	1,674	1,993	2,680	58,979	-	70,285	11,377	0	6,030	1,728	4,319	20,732	17	10,366	10,306	64,875
67%	2002	99,376	52,020	5,354	-	156,751	4,104	1,265	1,364	2,202	74,196	-	83,131	13,083	0	6,930	1,986	4,964	23,828	20	11,914	10,291	73,016
83%	2003	104,545	54,735	13,325	-	172,605	4,356	1,292	752	3,362	63,511	-	73,273	8,256	0	6,657	1,907	4,768	22,888	19	11,444	10,359	66,299
61%	2004	79,743	27,306	5,667	-	112,717	2,019	3,206	1,650	1,480	58,257	-	66,611	12,382	0	6,383	1,829	4,572	21,946	18	10,973	10,072	68,176
148%	2005	131,193	54,799	24,547	-	210,539	5,619	3,451	2,664	1,946	98,279	-	111,958	24,480	0	7,366	2,111	5,276	25,327	21	12,663	11,115	88,360
172%	2006	129,571	65,459	24,718	-	219,748	6,065	2,954	5,417	2,368	96,857	-	113,661	34,147	0	7,766	2,225	5,563	26,702	22	13,351	11,115	100,891
40%	2007	84,144	20,918	3,312	-	108,374	4,836	1,876	3,810	4,727	70,288	-	85,536	25,308	0	6,090	1,745	4,363	20,940	17	10,470	9,975	78,909
72%	2008	81,364	29,000	6,764	-	117,128	2,037	852	1,470	1,081	59,988	-	65,428	10,209	0	5,292	1,516	3,791	18,195	15	9,097	10,016	58,131
79%	2009	85,743	30,617	5,829	-	122,189	2,047	148	1,811	1,771	49,297	-	55,074	7,997	0	3,982	1,141	2,852	13,691	11	6,846	12,178	48,699
121%	2010	113,146	42,817	16,103	-	172,066	4,318	2,545	3,644	2,900	90,694	-	104,101	17,655	0	4,144	1,187	2,969	14,249	12	7,125	42,300	89,641
180%	2011	163,801	79,589	23,764	-	267,154	4,979	1,364	4,625	4,947	109,605	-	125,519	43,781	0	3,373	966	2,416	11,597	10	5,799	34,012	101,953
49%	2012	80,025	30,309	4,595	-	114,929	4,203	1,151	4,594	2,289	71,207	-	83,443	22,689	0	2,775	795	1,988	9,543	8	4,771	51,435	94,006
41%	2013	49,246	12,881	110	-	62,236	0	536	0	0	43,206	-	43,741	3,284	0	3,591	1,029	2,572	12,346	10	6,173	19,602	48,606
32%	2014	27,801	8,824	0	-	36,626	0	158	0	0	17,905	-	18,062	567	0	2,136	612	1,530	7,345	6	3,672	23,852	39,720
21%	2015	12,430	-	0	-	12,430	0	326	0	0	14,759	-	15,085	184	0	3,271	937	2,343	11,247	9	5,623	31,718	55,333
75%	2016	67,310	20,567	2,986	-	90,863	0	-	0	0	42,532	-	42,532	-	-	-	-	-	-	-	-	34,248	34,248
204%	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Annual Averages	93,943	44,985	4,312		143,240	3,669	2,156	4,804	5,315	77,554		93,499	20,737	68	5,535	1,586	3,965	19,033	16	9,516	8,734	69,598

Kings River Water Years	GSA	El Rico													Tri-County									
	Agency																							
	Diversion	*Empire Weir No. 2 (over #2 weir to river extension, River Water) Modified Total (Empire Weir No. 2 minus Tri County Kings River Water)*	*TLBWSD Lateral A, T200 (State Water)-Modified Total (SWP Total for Lateral A minus Tri County Entitlement. Then 20% taken to Blakeley Canal)*	*TLBWSD Lateral B, T206 (State Water)-Modified Total (SWP Total for Lateral B minus Tri County Entitlement)*	Lakelands Canal-Total	Tulare Lake Canal	*Melga Canal-Diversion of Peoples Canal, El Rico GSA Total*	Kern River	*Deer Creek-30% of Deer Creek Total*	Tule River-El Rico	Kaweah River	*Loan Oak/New Deal- Diversion of Last Chance, El RicoGSA Total*	Imported Water	El Rico	Poso Creek	*TLBWSD Lateral A, T200 (State Water)-Assumed Full Entitlement-25% to Lateral A*	*TLBWSD Lateral B, T206 (State Water)-Assumed Full Entitlement-75% to Lateral B*	Tule River-Tri County	*Deer Creek-70% of Deer Creek Total*	White River	Kings River-Tri County	Other Water	Imported Water	Tri-County	***Annual Totals***
		(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)	(AF/Y)
71%	1966	2,404	-	-	14,225	17,831	71,842	-	-	-	-	21,581	-	127,884	-	-	-	-	-	-	-	-	-	0	413,173
197%	1967	82,883	-	-	71,671	42,476	91,260	-	-	-	-	33,629	-	321,919	-	-	-	-	-	-	-	-	-	0	695,217
49%	1968	4,673	6,208	10,256	17,218	49,218	50,540	-	-	-	-	13,662	-	151,775	-	923	2,768	-	-	-	-	-	-	3,690	429,722
256%	1969	196,219	1,751	2,893	40,568	0	71,757	-	-	-	-	26,288	-	339,477	-	260	781	-	-	-	-	-	-	1,041	635,924
78%	1970	0	0	0	52,483	0	51,149	-	-	-	-	16,617	-	120,248	-	0	0	-	-	-	-	-	-	0	383,648
69%	1971	0	28,648	47,329	28,610	490	57,877	-	-	-	-	15,138	-	178,091	-	4,257	12,771	-	-	-	-	-	-	17,028	485,935
50%	1972	1,099	62,463	103,195	0	7,305	34,420	-	-	-	-	16,367	-	224,849	-	9,282	27,846	-	-	-	-	-	-	37,128	511,981
125%	1973	530	27,591	45,583	19,101	31,948	93,111	-	-	-	-	26,860	-	244,723	-	4,100	12,300	-	-	-	-	-	-	16,400	625,968
122%	1974	14,906	34,058	56,123	55,482	28,336	91,604	-	0	-	-	29,337	-	309,845	0	5,157	15,472	1,402	0	0	0	0	-	22,032	765,886
92%	1975	11,905	53,639	89,737	41,833	53,125	72,972	-	0	-	-	18,830	-	342,042	0	7,224	21,671	224	0	0	2,642	0	-	31,760	771,261
32%	1976	0	28,360	47,863	3,493	45,170	25,219	-	0	-	-	967	-	151,071	0	3,541	10,624	0	0	0	9,154	0	-	23,320	384,320
23%	1977	1,732	11,813	21,197	0	4,003	28,929	-	0	-	-	4,090	-	71,762	0	635	1,905	0	0	0	950	0	-	3,490	211,662
201%	1978	33,029	2,139	3,073	31,904	49,511	83,846	-	3,000	-	-	30,676	-	237,179	1,500	624	1,873	2,476	7,000	1,000	11,956	0	-	26,430	644,222
101%	1979	2,523	55,518	97,690	34,336	32,856	83,787	-	0	-	-	27,627	-	334,337	0	4,271	12,814	185	0	0	6,575	0	-	23,846	810,750
178%	1980	41,153	20,733	34,111	37,277	29,258	67,592	-	1,800	-	-	27,585	-	259,729	900	3,163	9,488	2,611	4,200	600	2,819	0	-	23,780	711,136
61%	1981	8,761	78,820	140,237	9,180	19,710	59,394	-	0	742	78,485	20,349	-	415,677	0	5,033	15,099	223	0	0	8,983	0	-	29,338	809,178
181%	1982	45,602	21,698	36,788	54,659	77,268	84,800	-	5,660	63,476	171,808	28,034	-	589,793	2,830	2,598	7,793	3,090	13,207	1,887	12,547	0	-	43,951	1,056,876
261%	1983	238,616	278	522	21,919	1,333	40,663	-	12,150	193,800	114,301	20,577	-	644,159	6,075	0	0	340	28,350	4,050	0	0	-	38,815	943,484
115%	1984	17,704	1,265	1,917	42,516	0	65,220	-	19,804	17,566	120,846	22,992	-	309,830	9,902	303	909	0	46,210	6,601	0	0	-	63,925	701,875
73%	1985	16,118	49,527	84,042	20,108	29,821	70,241	-	0	367	73,859	16,964	-	361,048	0	5,881	17,644	826	0	0	1,586	0	-	25,937	746,756
190%	1986	28,395	23,163	41,528	50,896	51,205	74,641	-	5,144	43,384	71,918	26,767	-	417,043	2,572	1,269	3,806	1,701	12,004	1,715	11,054	0	-	34,121	820,207
45%	1987	18,250	35,048	60,441	27,104	57,023	46,938	-	0	0	44,445	10,625	-	299,874	0	3,517	10,550	0	0	0	9,366	0	-	23,432	604,366
48%	1988	8,209	23,389	40,544	18,863	17,816	40,208	-	0	0	25,873	9,362	-	184,264	0	2,207	6,622	0	0	0	984	0	-	9,814	431,730
53%	1989	0	44,142	75,859	7,458	0	40,386	-	0	0	24,550	8,544	-	200,939	0	4,605	13,814	150	0	0	0	1,580	-	20,149	425,623
40%	1990	0	21,271	37,168	15,114	0	35,528	-	0	0	39,853	4,247	-	153,181	0	1,810	5,430	0	0	0	0	4,556	-	11,796	319,638
63%	1991	344	1,536	2,855	6,143	2,870	30,436	-	0	0	28,897	7,981	-	81,060	0	16	49	604	0	0	1,604	0	-	2,274	209,115
41%	1992	0	19,688	35,181	0	0	32,930	-	279	0	23,442	4,012	-	115,532	140	1,156	3,469	0	652	93	0	0	-	5,510	244,987
149%	1993	25,174	31,782	58,745	66,990	44,555	68,080	-	101	0	108,379	22,928	-	426,703	50	565	1,694	1,155	235	34	6,919	2,575	-	13,226	810,344
50%	1994	15,625	15,834	28,204	0	49,718	38,072	-	0	0	28,376	-	-	175,829	0	990	2,970	0	0	0	6,098	0	-	10,058	443,205
202%	1995	51,722	34,276	59,720	52,969	48,240	75,670	-	2,285	13,777	149,232	-	-	487,891	1,142	3,032	9,095	6,040	5,331	762	4,902	0	-	30,303	947,854
122%	1996	33,027	60,026	107,966	61,767	36,006	81,522	-	1,847	236	139,238	-	-	521,635	924	3,055	9,165	1,913	4,311	616	2,219	0	-	22,202	1,036,790
155%	1997	19,089	5,679	2,107	32,557	25,047	65,232	-	9,220	40,122	66,638	-	-	265,690	4,610	1,895	5,684	1,701	21,513	3,073	4,729	0	-	43,206	748,244
181%	1998	4,514	5,745	17,487	32,918	16,707	75,570	-	5,590	26,731	58,340	-	-	243,601	2,795	1,057	3,171	2,083	13,042	1,863	50	0	-	24,061	693,058
74%	1999	4,359	59,502	140,451	8,184	13,492	49,810	-	0	2,235	51,184	-	-	329,217	0	95	286	274	0	0	167	0	-	822	712,379
90%	2000	16,796	39,928	86,346	35,062	33,304	56,416	-	871	2,900	48,050	-	-	319,674	435	3,935	11,804	1,166	2,032	290	0	0	-	19,663	740,630
59%	2001	21,146	21,658	39,067	2,122	38,045	38,433	-	0	8	20,131	-	-	180,610	0	1,027	3,082	0	0	0	3,044	3,000	-	10,154	437,390
67%	2002	14,150	20,707	33,324	46,842	9,542	45,043	-	0	490	73,770	-	-	242,267	0	2,004	6,011	124	0	0	0	190	-	8,329	563,493
83%	2003	13,153	14,887	44,894	36,750	45,188	48,228	-	0	1,248	49,413	-	-	254,241	0	2,152	6,455	790	0	0	6,652	160	-	16,209	582,626
61%	2004	17,145	22,857	42,460	40,917	16,768	40,719	-	0	1,106	59,030	-	-	241,003	0	265	795	559	0	0	0	5,293	-	6,912	495,419
148%	2005	73,872	27,755	75,546	42,290	64,243	67,430	-	1,767	2,372	86,750	-	-	442,024	884	116	347	1,680	4,123	589	10,632	1,235	-	19,605	872,486
172%	2006	70,800	22,444	52,463	80,614	74,920	69,623	-	2,392	17,135	171,601	-	-	561,992	1,196	126	378	795	5,581	797	14,253	0	-	23,126	1,019,418
40%	2007	21,586	20,496	39,927	17,889	31,676	46,218	-	0	153	39,474	-	-	217,420	0	50	149	0	0	0	18,083	63	-	18,345	508,584
72%	2008	9,553	9,155	11,833	8,051	5,282	41,851	-	0	158	37,662	-	-	123,545	0	156	468	828	0	0	4,756	0	-	6,208	370,440
79%	2009	855	8,865	13,750	22,036	99	43,482	-	0	1,383	62,389	-	-	152,859	0	7	21	0	0	0	0	0	-	28	378,849
121%	2010	34,789	9,185	32,026	38,210	37,297	55,771	-	0	5,059	102,754	-	-	315,091	0	2	7	1,676	0	0	10,587	282	-	12,555	693,453
180%	2011	89,121	13,902	25,964	88,052	78,409	83,250	-	0	11,316	140,553	-	-	530,567	0	68	205	-	0	0	0	0	-	273	1,025,466
49%	2012	24,964	16,910	43,921	3,483	15,977	39,616	-	0	200	60,683	-	-	205,755	0	57	170	-	0	0	0	0	-	227	498,360
41%	2013	0	10,771	13,062	58,140	0	27,281	-	-	-	-	-	-	109,253	0	58	174	-	0	0	0	0	-	232	264,069
32%	2014	0	1,858	3,681	41,472	0	12,461	-	-	-	-	-	-	59,473	0	38	115	-	0	0	0	0	-	154	154,035
21%	2015	0	605	0	21,076	0	2,493	-	-	-	-	-	-	24,175	0	45	0	-	0	0	0	0	-	45	107,068
75%	2016	-	-	-	32,114	0	27,677	-	-	-	-	-	-	59,791	0	-	-	-	0	0	0	0	-	0	227,433
204%	2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Annual Averages	26,210	21,684	40,175	31,229	26,107	54,847	0	1,383	8,586	45,614	10,052		268,189	705	1,816	5,446	666	3,227	470	3,333	364		16,175	590,701

Notes

1.) Values highlighted have been modifed.
2.) Values with "0" indicate no surface water delivery to the best of our knowledge.
3.) Values with "-" have no verified data.
4.) Total flow from Peoples Canal is split 60% to Mid Kings, 40% to Melga.
5.) Last Chance Diversion is split 50% between Mid Kings and El Rico.
6.) Blakeley has added State Water from Lateral A for Southwest.
7.) Total flow from Deer Creek split 30% to El Rico, 70% to Tri County.
8.) Tule River for El Rico includes the total of Elk Bayou and TID Spill.
8.) SWP from TLBWSD Split Through out Tri County & Southwest Kings.
9.) Kings River water in Tri County was subtracted from the total in Empire Weir No. 2. 1976 and 2010 are 0 for Emipire Weir No. 2 because of negative values.
10.) Lakeside is a portion of Kaweah River, Reduced Total Kaweah River between Mid Kings and El Rico
11.) Additional Tule River flow data added for Tri County
12.) Empire West Side ID total from SWP reduce annual totals by 10%
13.) Dudley Ridge Water District reduce annual totals by 10%
14.) Lateral A (T200) & Lateral B (T206) reduce annual totals by 18% for El Rico & Tri County
15.) Modifications to Peoples Canal and Last Chance as a result of discussions with Mid Kings River GSA 02/14/2019

Key

Wet Year
Dry Year
Average Precipaction
GSA Annual Totals
Kings River Watershed Total

Average Annual

816,660
423,464
686,577

Reduction in Entitlement	
Empire West Side ID Total from SWP	10%
Dudley Ridge State Turnouts	10%
Lateral A & B for El Rico & Tri County	18%

Table 2-4
Crop Evapotranspiration Values

Tulare Lake Subbasin GSP Model
Kings County, California

	January (inches)	February (inches)	March (inches)	April (inches)	May (inches)	June (inches)	July (inches)	August (inches)	September (inches)	October (inches)	November (inches)	December (inches)
Reference Eto	0.82	2.22	4.5	6.73	8.52	8.23	8.34	7.62	5.8	4.2	1.28	0.84
Crop Etc												
Fallow Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Almonds	0.83	0.85	2.71	3.91	6.75	6.39	6.58	6.08	3.92	2.25	0.75	0.83
Pistachio	0.83	0.66	1.92	1.13	2.77	5.91	8.17	7.65	5.26	2.99	0.81	0.83
Grain and Grain Hay	0.89	2.09	4.67	6.86	3.84	0.14	0.20	0.09	0.08	0.38	0.84	0.89
Cotton	0.88	0.64	1.88	0.75	1.62	4.68	8.17	7.70	5.35	1.52	0.78	0.87
Corn and Grain Sorghum	0.88	0.64	2.89	1.16	2.83	7.00	8.06	5.12	0.38	0.38	0.78	0.87
Misc. field crops	0.88	0.64	2.89	1.16	2.77	7.32	7.56	3.03	0.08	0.38	0.78	0.87
Alfalfa Hay and Clover	0.88	2.12	4.31	5.78	7.25	7.02	7.01	6.34	4.80	2.01	1.33	0.91
Pasture and Misc. Grasses	0.89	1.64	3.37	5.17	7.83	7.64	7.74	7.00	5.32	3.25	1.18	0.87
Small Vegetables	0.88	1.29	4.07	1.25	0.02	0.11	0.18	1.08	1.54	1.84	1.61	0.90
Potatoes, Sugar beets, Turnip etc..	0.88	0.92	3.13	6.72	8.84	8.58	7.58	0.18	0.08	0.37	0.77	0.86
Onions and Garlic	0.88	1.88	4.10	5.48	4.80	0.56	0.18	0.08	0.08	0.37	1.34	0.88
Citrus (no ground cover)	0.83	1.98	3.96	4.69	5.54	5.76	5.72	5.24	3.91	3.14	1.47	0.86
Tomatoes and Peppers	0.88	0.63	2.57	0.70	4.39	8.12	7.42	0.78	0.08	0.37	0.77	0.86
Wine Grapes with 80% canopy	0.84	0.66	2.17	1.42	4.18	6.06	6.00	4.82	2.74	0.40	0.75	0.84
Dairy Single Crop	1.03	1.94	3.48	4.67	4.50	6.71	7.72	6.32	3.91	2.27	1.24	1.14
Carrot Single Crop	1.02	1.60	3.14	5.95	4.79	5.75	6.16	4.36	3.70	2.85	1.77	1.19
Carrot Double Cropping	0.54	1.40	2.93	4.41	5.84	3.59	2.71	3.53	3.12	2.60	1.41	1.12
Dairy Double Cropping	0.59	1.59	3.26	4.65	3.57	5.27	7.87	6.81	3.71	0.77	0.59	0.67
Urban, Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Urban, Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Riparian	0.00	0.01	3.49	6.13	8.33	8.23	8.34	7.62	5.74	3.91	1.02	0.10
Open Water	0.82	2.22	4.50	6.73	8.52	8.23	8.34	7.62	5.80	4.20	1.58	0.84
Average All Crops	0.85	1.29	3.19	3.66	4.56	5.37	5.84	4.23	2.67	1.56	1.05	0.90

ETc	January (ft/d)	February (ft/d)	March (ft/d)	April (ft/d)	May (ft/d)	June (ft/d)	July (ft/d)	August (ft/d)	September (ft/d)	October (ft/d)	November (ft/d)	December (ft/d)
Reference Eto	0.00220	0.00661	0.01210	0.01869	0.02290	0.02286	0.02242	0.02048	0.01611	0.01129	0.00356	0.00226
Crop Etc												
Fallow Land	0	0	0	0	0	0	0	0	0	0	0	0
Almonds	0.00223	0.00253	0.00728	0.01086	0.01815	0.01775	0.01769	0.01634	0.01089	0.00605	0.00208	0.00223
Pistachio	0.00223	0.00196	0.00516	0.00314	0.00745	0.01642	0.02196	0.02056	0.01461	0.00804	0.00225	0.00223
Grain and Grain Hay	0.00239	0.00622	0.01255	0.01906	0.01032	0.00039	0.00054	0.00024	0.00022	0.00102	0.00233	0.00239
Cotton	0.00237	0.00190	0.00505	0.00208	0.00435	0.01300	0.02196	0.02070	0.01486	0.00409	0.00217	0.00234
Corn and Grain Sorghum	0.00237	0.00190	0.00777	0.00322	0.00761	0.01944	0.02167	0.01376	0.00106	0.00102	0.00217	0.00234
Misc. field crops	0.00237	0.00190	0.00777	0.00322	0.00745	0.02033	0.02032	0.00815	0.00022	0.00102	0.00217	0.00234
Alfalfa Hay and Clover	0.00237	0.00631	0.01159	0.01606	0.01949	0.01950	0.01884	0.01704	0.01333	0.00540	0.00369	0.00245

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Tulare Lake Subbasin GSP Model
Kings County, California

	January (inches)	February (inches)	March (inches)	April (inches)	May (inches)	June (inches)	July (inches)	August (inches)	September (inches)	October (inches)	November (inches)	December (inches)
Reference Eto	0.82	2.22	4.5	6.73	8.52	8.23	8.34	7.62	5.8	4.2	1.28	0.84
Crop Etc												
Pasture and Misc. Grasses	0.00239	0.00488	0.00906	0.01436	0.02105	0.02122	0.02081	0.01882	0.01478	0.00874	0.00328	0.00234
Small Vegetables	0.00237	0.00384	0.01094	0.00347	0.00005	0.00031	0.00048	0.00290	0.00428	0.00495	0.00447	0.00242
Potatoes, Sugar beets, Turnip etc..	0.00237	0.00274	0.00841	0.01867	0.02376	0.02383	0.02038	0.00048	0.00022	0.00099	0.00214	0.00231
Onions and Garlic	0.00237	0.00560	0.01102	0.01522	0.01290	0.00156	0.00048	0.00022	0.00022	0.00099	0.00372	0.00237
Citrus (no ground cover)	0.00223	0.00589	0.01065	0.01303	0.01489	0.01600	0.01538	0.01409	0.01086	0.00844	0.00408	0.00231
Tomatoes and Peppers	0.00237	0.00188	0.00691	0.00194	0.01180	0.02256	0.01995	0.00210	0.00022	0.00099	0.00214	0.00231
Wine Grapes with 80% canopy	0.00226	0.00196	0.00583	0.00394	0.01124	0.01683	0.01613	0.01296	0.00761	0.00108	0.00208	0.00226
Dairy Single Crop	0.00276	0.00578	0.00936	0.01296	0.01211	0.01863	0.02076	0.01698	0.01085	0.00611	0.00344	0.00305
Carrot Single Crop	0.00274	0.00476	0.00844	0.01652	0.01288	0.01598	0.01657	0.01173	0.01027	0.00765	0.00490	0.00320
Carrot Double Cropping	0.00144	0.00416	0.00788	0.01226	0.01570	0.00998	0.00729	0.00950	0.00867	0.00700	0.00393	0.00301
Dairy Double Cropping	0.00158	0.00474	0.00877	0.01291	0.00958	0.01463	0.02115	0.01831	0.01029	0.00207	0.00165	0.00180
Urban, Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Urban, Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Riparian	0.00000	0.00004	0.00938	0.01703	0.02240	0.02286	0.02242	0.02048	0.01595	0.01052	0.00284	0.00026
Open Water	0.00220	0.00661	0.01210	0.01869	0.02290	0.02286	0.02242	0.02048	0.01611	0.01129	0.00439	0.00226
Average All Crops	0.00229	0.00383	0.00858	0.01016	0.01227	0.01491	0.01569	0.01138	0.00742	0.00420	0.00293	0.00243

Note:
Grass reference Eto based on typical year, CIMIS Zone 16 monthly evapotranspiration. Irrigation Training and Research Center, California Polytechnic State University, San Luis Obispo.

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Table 2-5
Historical Evapotranspiration Demand

Tulare Lake Subbasin GSP Model
Kings County, California

Tulare Lake Subbasin	1990-1995 (Acft/Y)	1996-1998 (Acft/Y)	1999-2006 (Acft/Y)	2007 (Acft/Y)	2008 (Acft/Y)	2009 (Acft/Y)	2010 (Acft/Y)	2011 (Acft/Y)	2012 (Acft/Y)	2013 (Acft/Y)	2014 (Acft/Y)	2015 (Acft/Y)	2016 (Acft/Y)	Average (Acft/Y)
Tulare Lake Subbasin														
Alfalfa Hay and Clover	172,519	135,032	225,167	300,041	333,752	296,086	288,555	160,621	174,457	204,219	148,325	122,839	100,395	**190,580**
Almonds (Adolescent)			8,113			11,218	19,864	8,127	10,631	18,529	16,937	15,155	13,714	**6,332**
Almonds (Mature)	26,791	18,278	15,869	47,030	43,122	35,832	30,537	36,976	39,450	41,720	46,956	54,869	55,084	**28,083**
Almonds (Young)		2,287	6,480	12,062	26,125	15,445	17,964	13,431	14,580	18,458	17,621	15,779	20,206	**8,292**
Berries	47								2	6		1		**11**
Carrot Single Crop								37	16	41	7	6	56	**6**
Citrus (no ground cover)			91		42	46	14	405	99	335	300	74	32	**74**
Corn and Grain Sorghum	36,877	100,450	75,793	101,418	82,027	89,467	59,478	87,236	75,344	71,190	58,462	48,619	44,935	**65,605**
Cotton	463,179	525,386	362,232	320,870	258,511	212,071	287,383	308,970	260,527	261,476	185,559	130,368	215,815	**345,645**
Dairy Single Crop*	14,290	15,268	16,421											**9,129**
Fallow Land*														**-**
Forest*														**-**
Grain and Grain Hay	50,167	84,811	110,025	33,572	48,563	47,755	45,271	13,518	17,369	19,505	21,282	36,934	33,228	**60,837**
Melons	413	92	468				21	3	16	10	1,182	27	128	**275**
Misc. field crops	40,450	30,296	121,265		5			1			4			**43,795**
Onions and Garlic	807	846	1,359			12	2,417	731	538	167	893	266	1,146	**854**
Open Water*														**-**
Pasture and Misc. Grasses	10,799	21,726	24,256	218,974	191,082	289,198	229,306	63,417	57,751	66,333	144,942	68,014	59,370	**62,524**
Pistachio (Adolescent)								213	315	559	1,290	4,713	5,704	**474**
Pistachio (Mature)	15,229	12,354	12,341	17,831	5,680	2,825	1,236	1,283	1,237	1,135	1,075	1,412	1,374	**9,256**
Pistachio (Young)		394	2,265	1,091	1,370	2,454	2,395	3,729	5,770	7,498	8,281	8,231	9,024	**2,477**
Pomegranates (Adolescent)											5	23	41	**3**
Pomegranates (Young)				11	303	99	52	901	210	376	537	567	746	**141**
Potatoes, Sugar beets, Turnip etc..	18,604	4	676	19		10		29		127		7	7	**4,317**
Riparian*														**-**
Small Vegetables	2,835	1,147	8,009	33	3	20	340	227	212	390	264	126	317	**2,905**
Stone Fruit (Adolescent)			4,238			28	138	232	291	171	106	414	425	**1,166**
Stone Fruit (Mature)	25,350	17,875	13,818	4,560	1,886	584	64	11	80	141	79	95	136	**11,485**
Stone Fruit (Young)		1,310	3,001	466	1,234	1,217	1,879	1,010	547	1,250	1,186	913	667	**1,308**
Tomatoes and Peppers	12,971	3,747	33,791	261	5	246	26	47,851	52,725	15,847	26,555	42,793	52,168	**20,892**
Urban, Industrial*														**-**
Wine Grapes with 80% canopy	7,586	8,301	14,872	14,203	8,893	5,692	6,980	13,625	23,455	11,832	16,450	11,874	27,920	**11,683**
Winter Wheat*														**-**
Tulare Lake Subbasin Irrigated ET Demand	**884,626**	**964,336**	**########**	**########**	**########**	**########**	**993,918**	**762,584**	**735,624**	**741,315**	**698,299**	**564,117**	**642,636**	**879,019**
Tulare Lake Subbasin GSA Total ET Demanc	**898,916**	**979,604**	**########**	**########**	**########**	**########**	**993,918**	**762,584**	**735,624**	**741,315**	**698,299**	**564,117**	**642,636**	**888,148**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year

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Table 2-6
Annual Specified Well field Pumping

Tulare Lake Subbasin GSP Model
Kings County, California

Date	El Rico GSA Well Field (AF/Y)	Creighton Ranch Well Field (AF/Y)	Corcorian ID Well Field (AF/Y)	Angiola Well Field (AF/Y)	Westlands Well Field (AF/Y)	Municipal Well Fields (AF/Y)	Apex Ranch Well Field (AF/Y)
1990	70,716	27,222	87,977	34,500	67,131	9,370	--
1991	57,509	38,484	84,438	23,396	98,656	9,109	--
1992	80,012	27,255	72,348	33,494	98,344	9,666	--
1993	11,395	4,035	14,248	5,956	44,056	10,208	--
1994	48,043	17,986	78,297	16,389	72,674	10,928	--
1995	2,897	905	7,145	-	27,589	10,775	--
1996	-	-	20,261	-	28,516	12,719	--
1997	-	-	15,586	-	27,000	12,775	--
1998	-	-	2,484	-	20,988	11,555	--
1999	-	-	33,406	-	37,185	13,087	--
2000	14,910	2,849	40,672	6,784	43,392	13,421	--
2001	89,799	41,120	64,353	23,244	65,947	13,895	--
2002	68,933	35,843	64,736	26,537	66,530	26,701	-
2003	32,420	10,856	62,246	22,429	40,841	19,349	526
2004	82,875	47,511	74,007	26,805	42,115	18,777	912
2005	-	468	20,138	662	14,744	16,536	-
2006	-	72	14,034	141	16,526	15,822	6,939
2007	69,863	40,266	85,434	32,894	40,373	17,221	6,319
2008	92,269	52,980	79,362	32,502	63,519	18,432	5,435
2009	78,097	45,292	81,493	37,798	69,904	16,354	7,677
2010	36,129	17,740	29,669	22,568	34,895	15,271	6,345
2011	606	314	7,328	11,336	15,509	17,042	-
2012	95,154	52,325	70,008	19,388	55,298	17,467	9,044
2013	100,275	66,005	78,175	30,528	70,940	18,411	4,970
2014	108,976	68,726	69,880	27,695	94,077	16,930	298
2015	116,254	61,050	67,982	30,220	90,723	16,146	-
2016	126,886	53,113	67,982	29,047	93,853	14,555	-
Count	99	52	98	51	150	30	5

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Table 4-1
Tulare Lake Subbasin Hydrologic Model Stress Periods

Tulare Lake Subbasin GSP Model
Kings County, California

Date	Stress Period	Days	Date	Stress Period	Days
Jan-90	1	31	Jan-04	169	31
Feb-90	2	28	Feb-04	170	29
Mar-90	3	31	Mar-04	171	31
Apr-90	4	30	Apr-04	172	30
May-90	5	31	May-04	173	31
Jun-90	6	30	Jun-04	174	30
Jul-90	7	31	Jul-04	175	31
Aug-90	8	31	Aug-04	176	31
Sep-90	9	30	Sep-04	177	30
Oct-90	10	31	Oct-04	178	31
Nov-90	11	30	Nov-04	179	30
Dec-90	12	31	Dec-04	180	31
Jan-91	13	31	Jan-05	181	31
Feb-91	14	28	Feb-05	182	28
Mar-91	15	31	Mar-05	183	31
Apr-91	16	30	Apr-05	184	30
May-91	17	31	May-05	185	31
Jun-91	18	30	Jun-05	186	30
Jul-91	19	31	Jul-05	187	31
Aug-91	20	31	Aug-05	188	31
Sep-91	21	30	Sep-05	189	30
Oct-91	22	31	Oct-05	190	31
Nov-91	23	30	Nov-05	191	30
Dec-91	24	31	Dec-05	192	31
Jan-92	25	31	Jan-06	193	31
Feb-92	26	29	Feb-06	194	28
Mar-92	27	31	Mar-06	195	31
Apr-92	28	30	Apr-06	196	30
May-92	29	31	May-06	197	31
Jun-92	30	30	Jun-06	198	30
Jul-92	31	31	Jul-06	199	31
Aug-92	32	31	Aug-06	200	31
Sep-92	33	30	Sep-06	201	30
Oct-92	34	31	Oct-06	202	31
Nov-92	35	30	Nov-06	203	30
Dec-92	36	31	Dec-06	204	31
Jan-93	37	31	Jan-07	205	31
Feb-93	38	28	Feb-07	206	28
Mar-93	39	31	Mar-07	207	31

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Tulare Lake Subbasin GSP Model
Kings County, California

Date	Stress Period	Days	Date	Stress Period	Days
Apr-93	40	30	Apr-07	208	30
May-93	41	31	May-07	209	31
Jun-93	42	30	Jun-07	210	30
Jul-93	43	31	Jul-07	211	31
Aug-93	44	31	Aug-07	212	31
Sep-93	45	30	Sep-07	213	30
Oct-93	46	31	Oct-07	214	31
Nov-93	47	30	Nov-07	215	30
Dec-93	48	31	Dec-07	216	31
Jan-94	49	31	Jan-08	217	31
Feb-94	50	28	Feb-08	218	29
Mar-94	51	31	Mar-08	219	31
Apr-94	52	30	Apr-08	220	30
May-94	53	31	May-08	221	31
Jun-94	54	30	Jun-08	222	30
Jul-94	55	31	Jul-08	223	31
Aug-94	56	31	Aug-08	224	31
Sep-94	57	30	Sep-08	225	30
Oct-94	58	31	Oct-08	226	31
Nov-94	59	30	Nov-08	227	30
Dec-94	60	31	Dec-08	228	31
Jan-95	61	31	Jan-09	229	31
Feb-95	62	28	Feb-09	230	28
Mar-95	63	31	Mar-09	231	31
Apr-95	64	30	Apr-09	232	30
May-95	65	31	May-09	233	31
Jun-95	66	30	Jun-09	234	30
Jul-95	67	31	Jul-09	235	31
Aug-95	68	31	Aug-09	236	31
Sep-95	69	30	Sep-09	237	30
Oct-95	70	31	Oct-09	238	31
Nov-95	71	30	Nov-09	239	30
Dec-95	72	31	Dec-09	240	31
Jan-96	73	31	Jan-10	241	31
Feb-96	74	29	Feb-10	242	28
Mar-96	75	31	Mar-10	243	31
Apr-96	76	30	Apr-10	244	30
May-96	77	31	May-10	245	31
Jun-96	78	30	Jun-10	246	30
Jul-96	79	31	Jul-10	247	31
Aug-96	80	31	Aug-10	248	31
Sep-96	81	30	Sep-10	249	30

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Tulare Lake Subbasin GSP Model
Kings County, California

Date	Stress Period	Days	Date	Stress Period	Days
Oct-96	82	31	Oct-10	250	31
Nov-96	83	30	Nov-10	251	30
Dec-96	84	31	Dec-10	252	31
Jan-97	85	31	Jan-11	253	31
Feb-97	86	28	Feb-11	254	28
Mar-97	87	31	Mar-11	255	31
Apr-97	88	30	Apr-11	256	30
May-97	89	31	May-11	257	31
Jun-97	90	30	Jun-11	258	30
Jul-97	91	31	Jul-11	259	31
Aug-97	92	31	Aug-11	260	31
Sep-97	93	30	Sep-11	261	30
Oct-97	94	31	Oct-11	262	31
Nov-97	95	30	Nov-11	263	30
Dec-97	96	31	Dec-11	264	31
Jan-98	97	31	Jan-12	265	31
Feb-98	98	28	Feb-12	266	29
Mar-98	99	31	Mar-12	267	31
Apr-98	100	30	Apr-12	268	30
May-98	101	31	May-12	269	31
Jun-98	102	30	Jun-12	270	30
Jul-98	103	31	Jul-12	271	31
Aug-98	104	31	Aug-12	272	31
Sep-98	105	30	Sep-12	273	30
Oct-98	106	31	Oct-12	274	31
Nov-98	107	30	Nov-12	275	30
Dec-98	108	31	Dec-12	276	31
Jan-99	109	31	Jan-13	277	31
Feb-99	110	28	Feb-13	278	28
Mar-99	111	31	Mar-13	279	31
Apr-99	112	30	Apr-13	280	30
May-99	113	31	May-13	281	31
Jun-99	114	30	Jun-13	282	30
Jul-99	115	31	Jul-13	283	31
Aug-99	116	31	Aug-13	284	31
Sep-99	117	30	Sep-13	285	30
Oct-99	118	31	Oct-13	286	31
Nov-99	119	30	Nov-13	287	30
Dec-99	120	31	Dec-13	288	31
Jan-00	121	31	Jan-14	289	31
Feb-00	122	29	Feb-14	290	28
Mar-00	123	31	Mar-14	291	31

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Tulare Lake Subbasin GSP Model
Kings County, California

Date	Stress Period	Days	Date	Stress Period	Days
Apr-00	124	30	Apr-14	292	30
May-00	125	31	May-14	293	31
Jun-00	126	30	Jun-14	294	30
Jul-00	127	31	Jul-14	295	31
Aug-00	128	31	Aug-14	296	31
Sep-00	129	30	Sep-14	297	30
Oct-00	130	31	Oct-14	298	31
Nov-00	131	30	Nov-14	299	30
Dec-00	132	31	Dec-14	300	31
Jan-01	133	31	Jan-15	301	31
Feb-01	134	28	Feb-15	302	28
Mar-01	135	31	Mar-15	303	31
Apr-01	136	30	Apr-15	304	30
May-01	137	31	May-15	305	31
Jun-01	138	30	Jun-15	306	30
Jul-01	139	31	Jul-15	307	31
Aug-01	140	31	Aug-15	308	31
Sep-01	141	30	Sep-15	309	30
Oct-01	142	31	Oct-15	310	31
Nov-01	143	30	Nov-15	311	30
Dec-01	144	31	Dec-15	312	31
Jan-02	145	31	Jan-16	313	31
Feb-02	146	28	Feb-16	314	29
Mar-02	147	31	Mar-16	315	31
Apr-02	148	30	Apr-16	316	30
May-02	149	31	May-16	317	31
Jun-02	150	30	Jun-16	318	30
Jul-02	151	31	Jul-16	319	31
Aug-02	152	31	Aug-16	320	31
Sep-02	153	30	Sep-16	321	30
Oct-02	154	31	Oct-16	322	31
Nov-02	155	30	Nov-16	323	30
Dec-02	156	31	Dec-16	324	31
Jan-03	157	31	Jan-16	313	31
Feb-03	158	28	Feb-16	314	29
Mar-03	159	31	Mar-16	315	31
Apr-03	160	30	Apr-16	316	30
May-03	161	31	May-16	317	31
Jun-03	162	30	Jun-16	318	30
Jul-03	163	31	Jul-16	319	31
Aug-03	164	31	Aug-16	320	31
Sep-03	165	30	Sep-16	321	30

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Tulare Lake Subbasin GSP Model
Kings County, California

Date	Stress Period	Days	Date	Stress Period	Days
Oct-03	166	31	Oct-16	322	31
Nov-03	167	30	Nov-16	323	30
Dec-03	168	31	Dec-16	324	31

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Table 7-1
2017 - 2070 Forecast Model Hydrology Sequence

Tulare Lake Subbasin GSP Model
Kings County, California

Stress Period	Forecast Year	Hydrology Conditions	Normal Kings River Flow (AF)	CNRA Change Factor	Kings River Flow CNRA (AF)
1	2017	2011	1,037,113	1.004167	1,041,434
2	2018	2010	706,083	1.016667	717,851
3	2019	1999	763,007	0.998333	761,735
4	2020	2000	777,871	1.010833	786,298
5	2021	2001	456,607	1.013333	462,695
6	2022	2002	582,769	1.015000	591,510
7	2023	2003	603,080	1.014167	611,624
8	2024	2004	515,426	1.038333	535,184
9	2025	2005	901,509	1.001667	903,011
10	2026	2000	777,871	1.010833	786,298
11	2027	2007	526,947	1.008333	531,338
12	2028	2008	379,491	1.001667	380,123
13	2029	2009	387,005	1.015000	392,810
14	2030	2010	706,083	1.016667	717,851
15	2031	1997	757,901	0.983333	745,269
16	2032	1998	704,676	0.989167	697,042
17	2033	1999	763,007	0.996667	760,463
18	2034	2000	777,871	1.021667	794,725
19	2035	2001	456,607	1.016667	464,217
20	2036	2002	582,769	0.974167	567,714
21	2037	2003	603,080	0.974167	587,500
22	2038	2004	515,426	1.002500	516,714
23	2039	2005	901,509	0.993333	895,499
24	2040	2000	777,871	1.021667	794,725
25	2041	2007	526,947	1.000833	527,386
26	2042	2008	379,491	1.002500	380,440
27	2043	2009	387,005	0.991667	383,780
28	2044	2010	706,083	1.012500	714,909
29	2045	1997	757,901	0.983333	745,269
30	2046	1998	704,676	0.989167	697,042
31	2047	1999	763,007	0.996667	760,463
32	2048	2000	777,871	1.021667	794,725
33	2049	2001	456,607	1.016667	464,217
34	2050	2002	582,769	0.974167	567,714
35	2051	2003	603,080	0.974167	587,500
36	2052	2004	515,426	1.002500	516,714
37	2053	2005	901,509	0.993333	895,499
38	2054	2000	777,871	1.021667	794,725
39	2055	2007	526,947	1.000833	527,386

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Tulare Lake Subbasin GSP Model
Kings County, California

Stress Period	Forecast Year	Hydrology Conditions	Normal Kings River Flow (AF)	CNRA Change Factor	Kings River Flow CNRA (AF)
40	2056	2008	379,491	1.002500	380,440
41	2057	2009	387,005	0.991667	383,780
42	2058	2010	706,083	1.012500	714,909
43	2059	1997	757,901	0.983333	745,269
44	2060	1998	704,676	0.989167	697,042
45	2061	1999	763,007	0.996667	760,463
46	2062	2000	777,871	1.021667	794,725
47	2063	2001	456,607	1.016667	464,217
48	2064	2002	582,769	0.974167	567,714
49	2065	2003	603,080	0.974167	587,500
50	2066	2004	515,426	1.002500	516,714
51	2067	2005	901,509	0.993333	895,499
52	2068	2000	777,871	1.021667	794,725
53	2069	2007	526,947	1.000833	527,386
54	2070	2008	379,491	1.002500	380,440

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Table 7-2
2017 - 2070 Project Forecast Model - Project Development and Yields

Tulare Lake Subbasin GSP Model
Kings County, California

Year	Kings River Hydrology % Normal Flows	Kings River Hydrology Flood Years	Project Descriptions	Mid Kings GSA Proposed Recharge (AF)	El Rico GSA Existing Ponds (AF)	El Rico GSA Proposed 6,400 AC SW Pond (AF)	South Fork Kings GSA Proposed 10,000 AC SW Pond (AF)	TCWA GSA Proposed 13,340 AC SW Pond (AF)	New Project Total SW Supply (AF)
2017	180%			0	0	0	0	0	0
2018	121%			0	0	0	0	0	0
2019	74%			0	0	0	0	0	0
2020	90%		Construct 340 acres of Perc Basins	0	0	0	0	0	0
2021	59%			0	0	0	0	0	0
2022	67%			0	0	0	0	0	0
2023	83%			0	0	0	0	0	0
2024	61%			0	0	0	0	0	0
2025	148%	Flood		50,000	71,000	0	0	0	0
2026	90%		Construct 340 acres of Perc Basins	0	0	0	0	0	0
2027	40%			0	0	0	0	0	0
2028	72%		Construct 6,400, 10,000, and 13,400	0	0	0	0	0	0
2029	79%		acres of SW Ponds	0	0	0	0	0	0
2030	121%		Construct 340 acres of Perc Basins	0	0	0	0	0	0
2031	155%	Flood		150,000	71,000	40,000	60,000	80,000	180,000
2032	181%	Flood		150,000	71,000	40,000	60,000	80,000	180,000
2033	74%			0	0	0	0	0	0
2034	90%			0	0	0	0	0	0
2035	59%		Construct 340 acres of Perc Basins	0	0	0	0	0	0
2036	67%			0	0	0	0	0	0
2037	83%			0	0	0	0	0	0
2038	61%			0	0	0	0	0	0
2039	148%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2040	90%			0	0	0	0	0	0
2041	40%			0	0	0	0	0	0
2042	72%			0	0	0	0	0	0
2043	79%			0	0	0	0	0	0
2044	121%			0	0	0	0	0	0
2045	155%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2046	181%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2047	74%			0	0	0	0	0	0
2048	90%			0	0	0	0	0	0
2049	59%			0	0	0	0	0	0
2050	67%			0	0	0	0	0	0
2051	83%			0	0	0	0	0	0
2052	61%			0	0	0	0	0	0

Tulare Lake Subbasin GSP Model
Kings County, California

Year	Kings River Hydrology % Normal Flows	Kings River Hydrology Flood Years	Project Descriptions	Mid Kings GSA Proposed Recharge (AF)	El Rico GSA Existing Ponds (AF)	El Rico GSA Proposed 6,400 AC SW Pond (AF)	South Fork Kings GSA Proposed 10,000 AC SW Pond (AF)	TCWA GSA Proposed 13,340 AC SW Pond (AF)	New Project Total SW Supply (AF)
2053	148%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2054	90%			0	0	0	0	0	0
2055	40%			0	0	0	0	0	0
2056	72%			0	0	0	0	0	0
2057	79%			0	0	0	0	0	0
2058	121%			0	0	0	0	0	0
2059	155%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2060	181%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2061	74%			0	0	0	0	0	0
2062	90%			0	0	0	0	0	0
2063	59%			0	0	0	0	0	0
2064	67%			0	0	0	0	0	0
2065	83%			0	0	0	0	0	0
2066	61%			0	0	0	0	0	0
2067	148%	Flood		200,000	71,000	40,000	60,000	80,000	180,000
2068	90%			0	0	0	0	0	0
2069	40%			0	0	0	0	0	0
2070	72%			0	0	0	0	0	0
			Project Annual Average	38,043	15,435	8,780	13,171	17,561	39,512
			2035-2045 Average	36,364	12,909	7,273	10,909	14,545	32,727

Table 7-3
Average Water Balance Comparison - Historical VS Forecast

Tulare Lake Subbasin GSP Model
Kings County, California

	Average Values	Units	Calibration 1998-2010	Forecasts 2035-2045 Baseline	Forecasts 2035-2045 Projects	Baseline vs Historical	Projects vs Historical	Projects vs Baseline
Agricultural Demand	Initial Acres	(acres)	369,189	357,357	357,357	97%	97%	100%
	Removed for Projects	(acres)	--	--	-48,978	--	--	--
	Ag Demand Reduction	(acres)	--	--	-50,776	--	--	--
	Irrigated Acres	(acres)	**369,189**	**357,357**	**257,603**	97%	70%	72%
	ET Demand	(af/yr)	1,041,791	967,864	716,820	93%	69%	74%
	Effective Precipitation	(af/yr)	62,398	53,147	45,836	85%	73%	86%
	Irrigation Efficiency	(%)	87%	92%	92%	106%	106%	100%
	Total Farm Demand	**(af/yr)**	**1,010,979**	**1,049,575**	**756,592**	104%	75%	72%
Water Supply	SW Supply	(af/yr)	587,401	582,984	582,984	99%	99%	100%
	Existing SW Ponds	(af/yr)	26,228	12,909	12,909	49%	49%	100%
	Additional Projects SW	(af/yr)	--	--	32,727	--	--	100%
	Total SW Supply	**(af/yr)**	**613,629**	**595,893**	**628,620**	97%	102%	105%
Deep Percolation	Stream Leakage	(af/yr)	150,104	117,911	79,857 [1]	79%	53%	68%
	Ag Deep & RT Flow Perc	(af/yr)	103,032	105,753	172,539	103%	167%	163%
	Intentional Recharge	(af/yr)	31,440	24,422	62,255	78%	198%	255%
	Total Deep Percolation	**(af/yr)**	**284,576**	**248,086**	**314,651**	87%	111%	127%
Pumping Demand	Muni Pumping	(af/yr)	-14,855	-14,933	-14,933	101%	101%	100%
	Ag Pumping	(af/yr)	-349,309	-470,665	-263,441	135%	75%	56%
	Total Pumping	**(af/yr)**	**-364,164**	**-485,598**	**-278,374**	133%	76%	57%
External Losses	Agricultural Drains	(af/yr)	-9,311	-1,440	-37,202 [1]	--	--	--
	Net Inter-Basin Flow	(af/yr)	-904	-31,652	-17,358	--	--	--
	Total Losses	**(af/yr)**	**-10,215**	**-33,092**	**-54,560**	--	--	--
	Delta Storage	**(af/yr)**	**-92,990**	**-339,541**	**-57,848**	365%	62%	17%
	Sustainable Yield	**(af/yr)**	**-271,174**	**-146,057**	**-220,526**	54%	81%	151%

[1] Decrease in Stream Leakage off-set by increase in Drain Flow due to rising groundwater levels

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Figures

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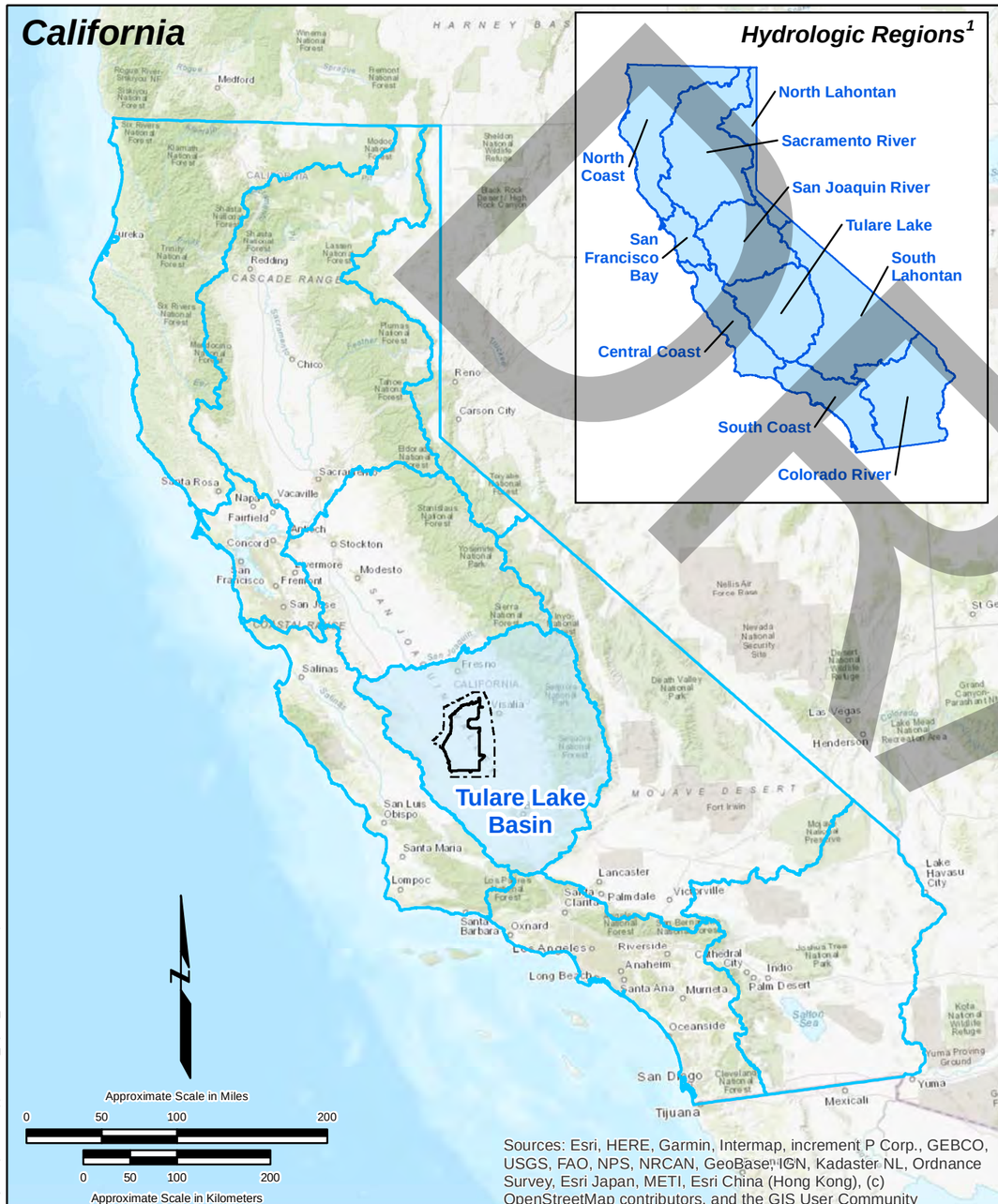

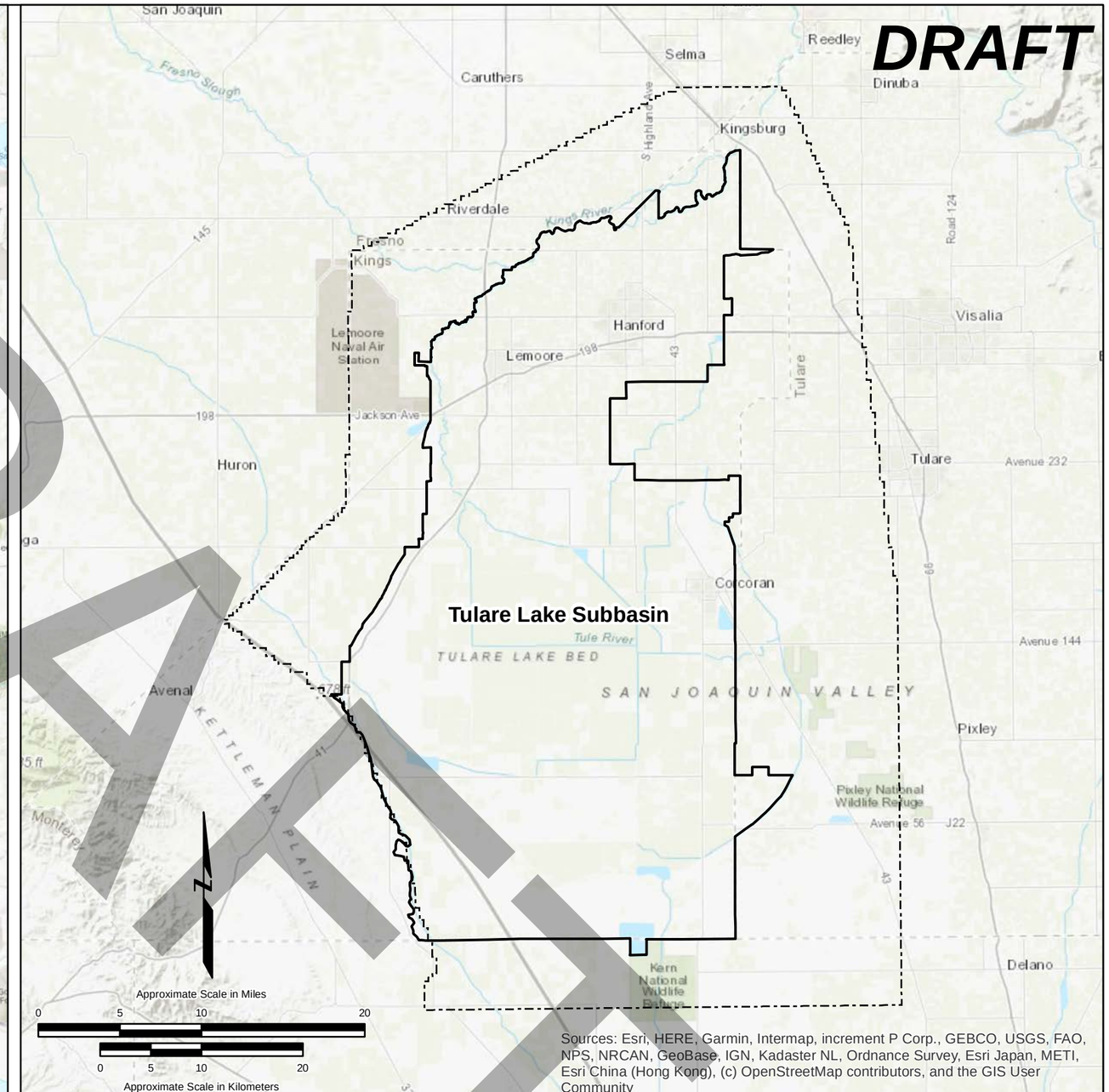

Explanation

- Hydrologic region
- Subbasin boundary
- Study Area

Note:
1) Hydrologic region dataset obtained from California Department of Water Resources (CA DWR), September 12, 2018.
https://data.ca.gov/dataset/hydrologic-regions

Site Location Map
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR18161220
		Figure **D1-1**

Date: 9/7/2019 Printed by: elizabeth.chapman
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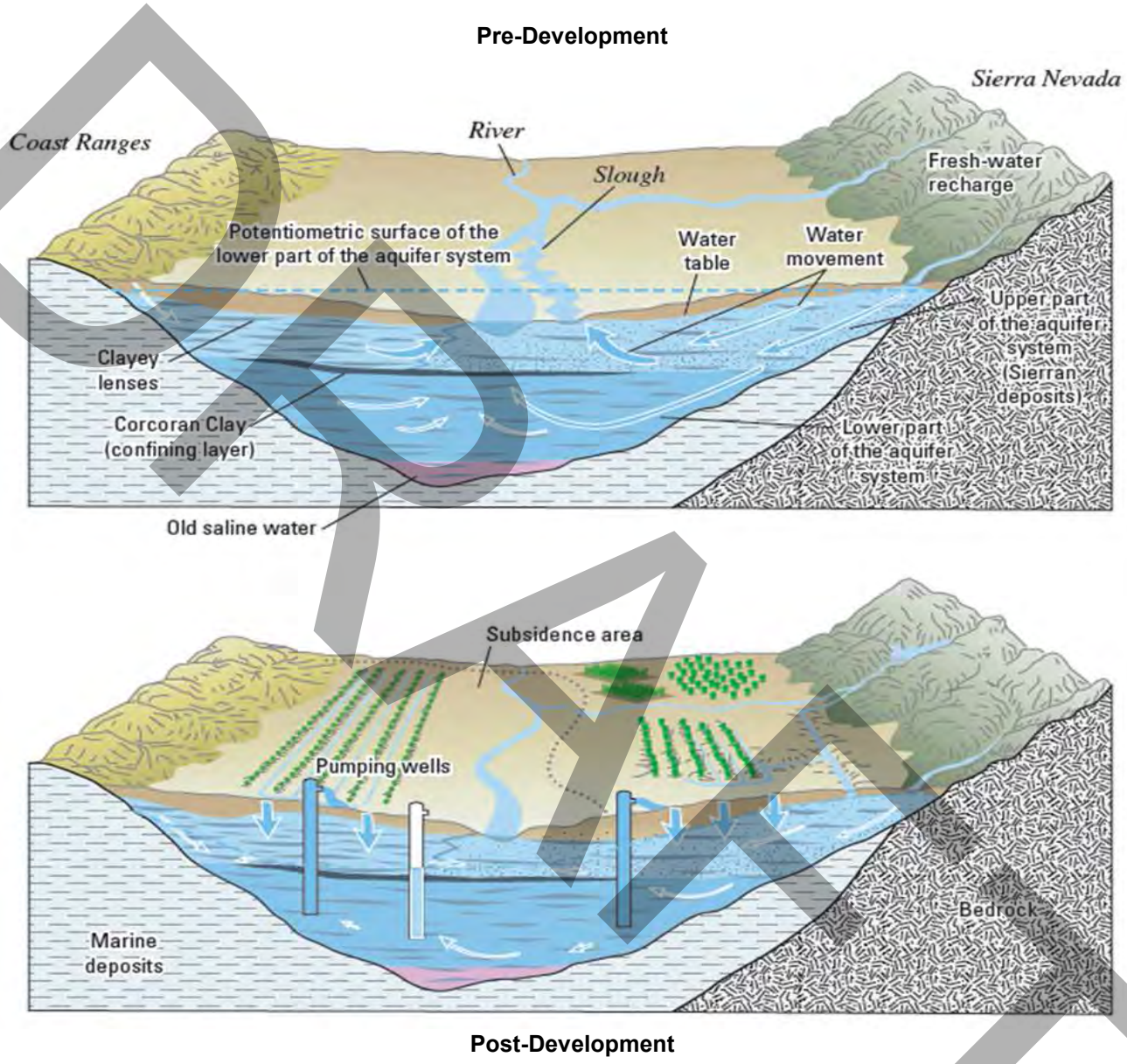

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Pre-Development and Post-Development Hydrogeologic Conceptual Model for the San Joaquin Valley

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 08/26/2019	Project No.: FR18161220
		Figure **D2-1**

adapted from Fig. A9, USGS Prof. Paper 1766

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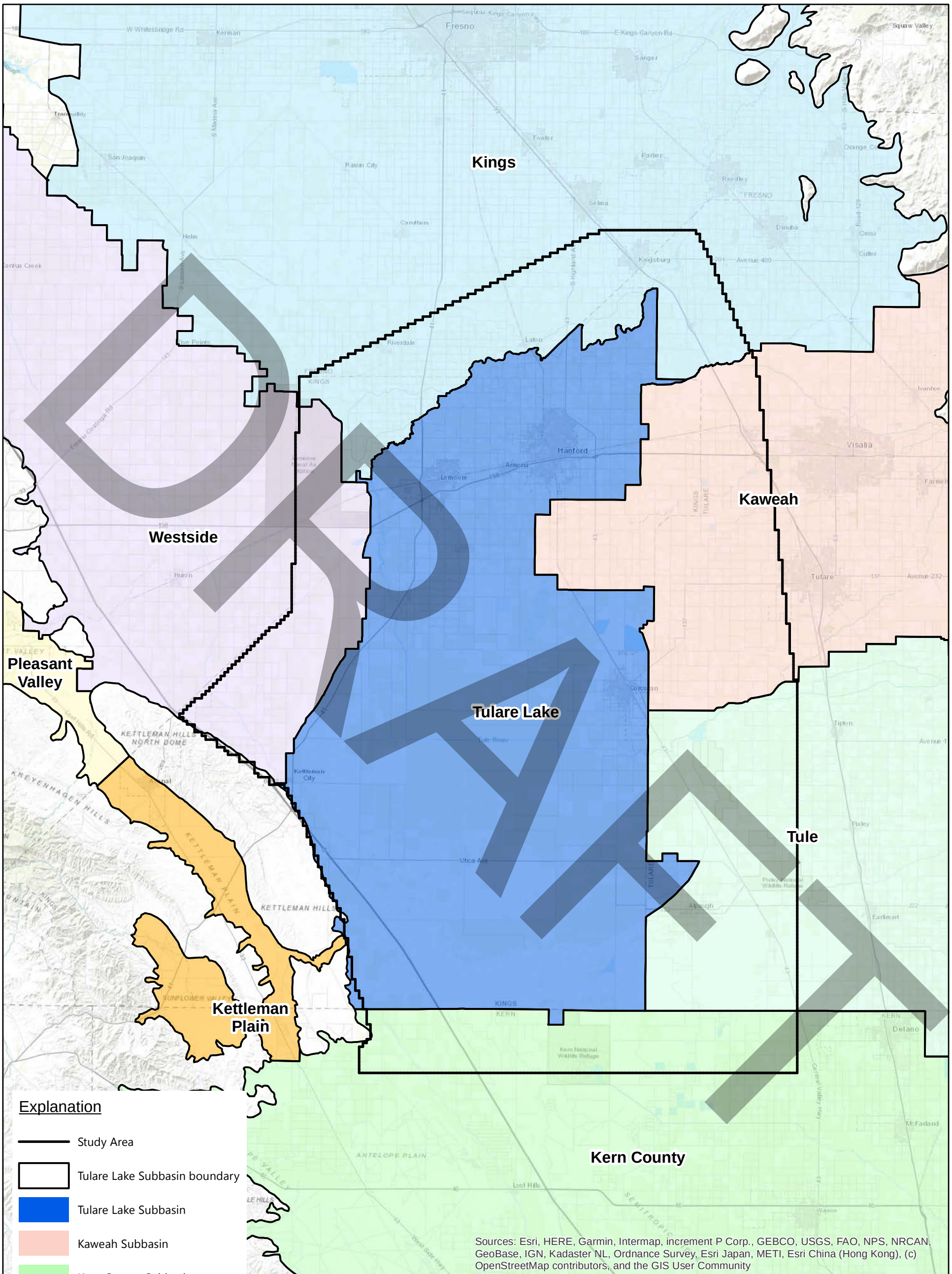

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Explanation

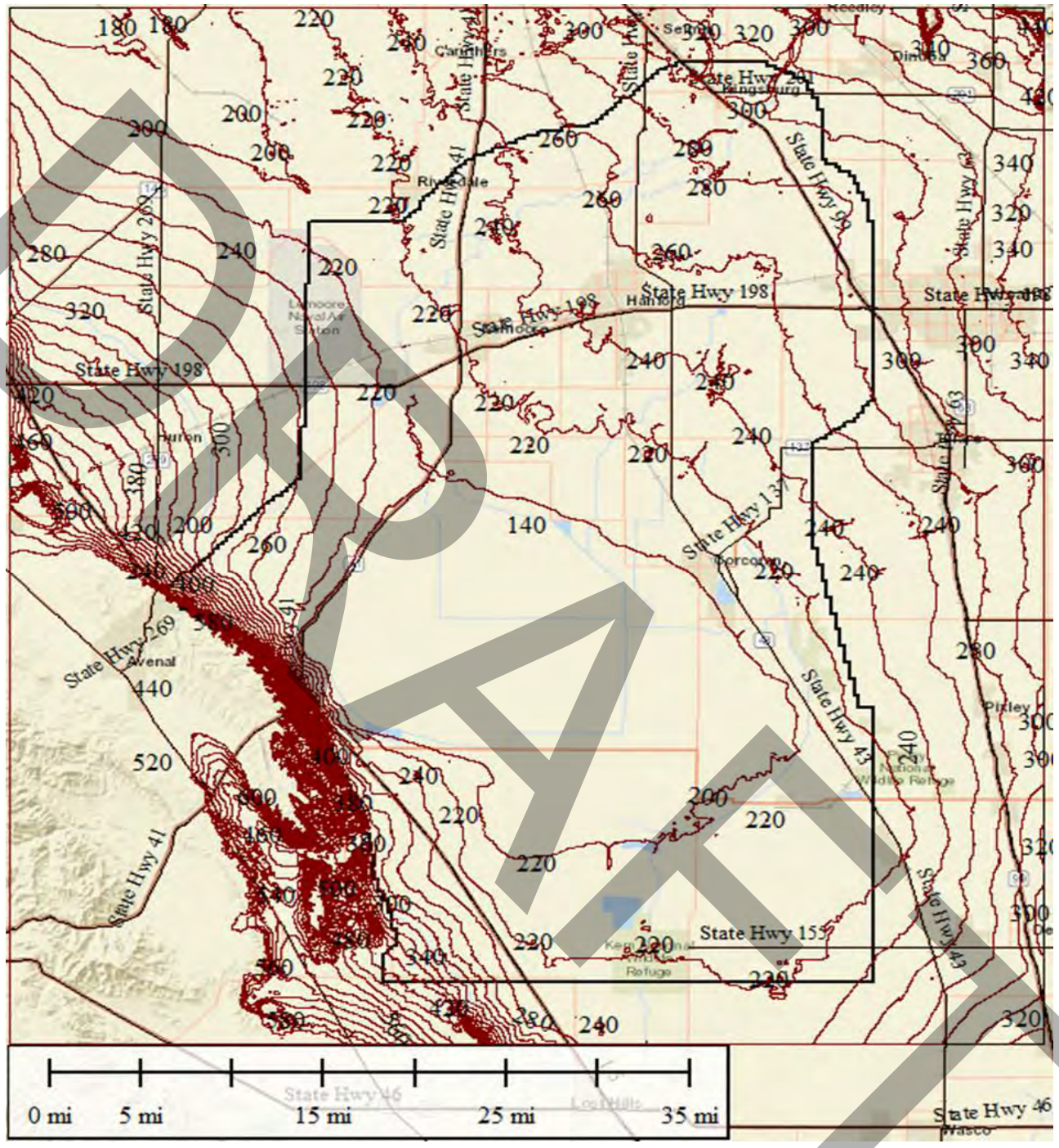
- Study Area
- Tulare Lake Subbasin boundary
- Tulare Lake Subbasin
- Kaweah Subbasin
- Kern County Subbasin
- Kettleman Plain Subbasin
- Kings Subbasin
- Pleasant Valley Subbasin
- Tule Subbasin
- Westside Subbasin

Approximate Scale in Miles
0 2½ 5 10
0 2½ 5 10
Approximate Scale in Kilometers

Tulare Lake Subbasin Hydrologic Model Study Area

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: SCM	Date: 10/11/2019	Project No.: FR18161220
wood.		Figure D2-2



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Legend

Model Area

Surface Topography

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-3**

Date: 9/7/2019 Printed by: elizabeth.chapman
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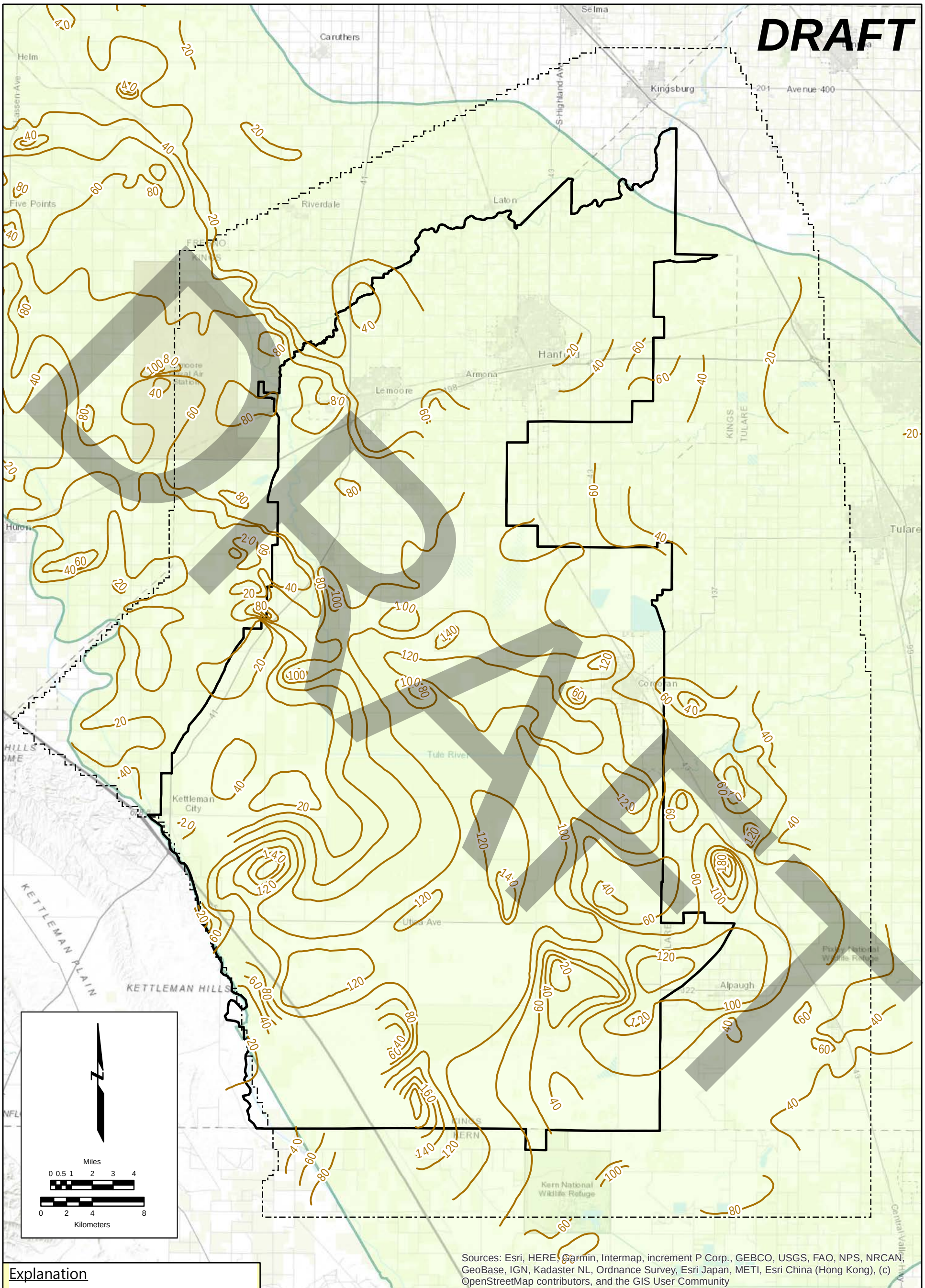


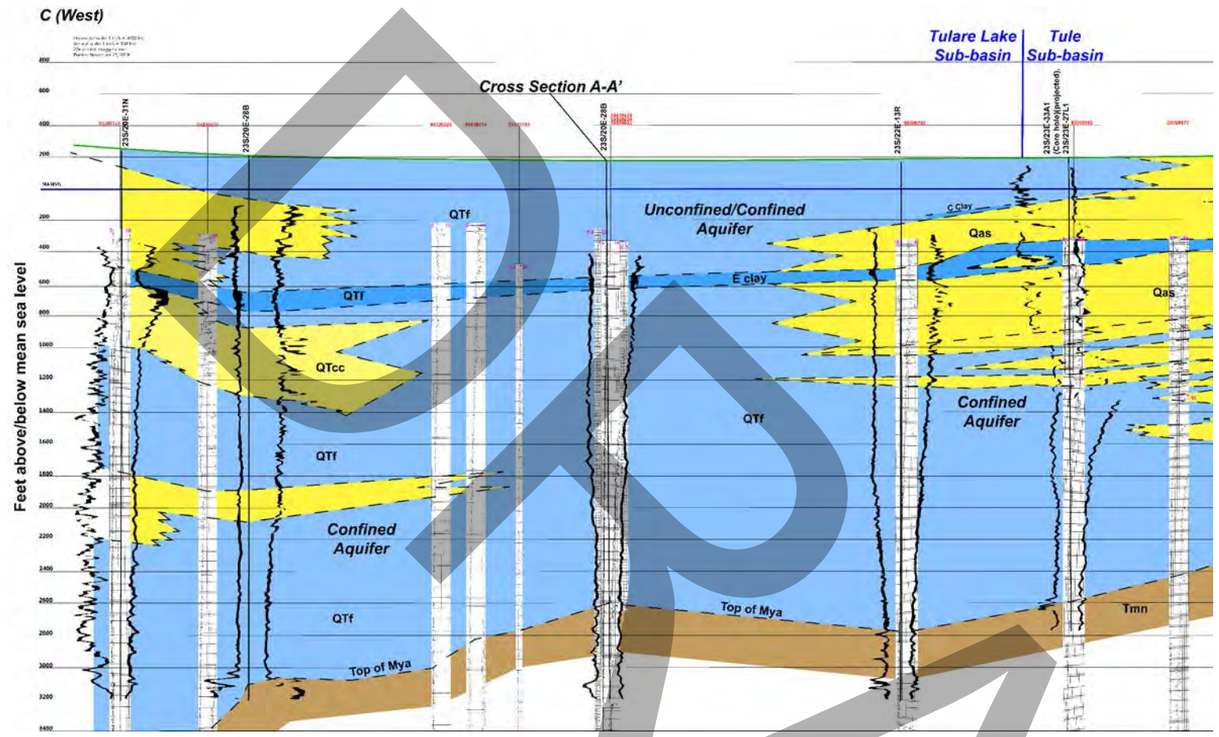
Explanation

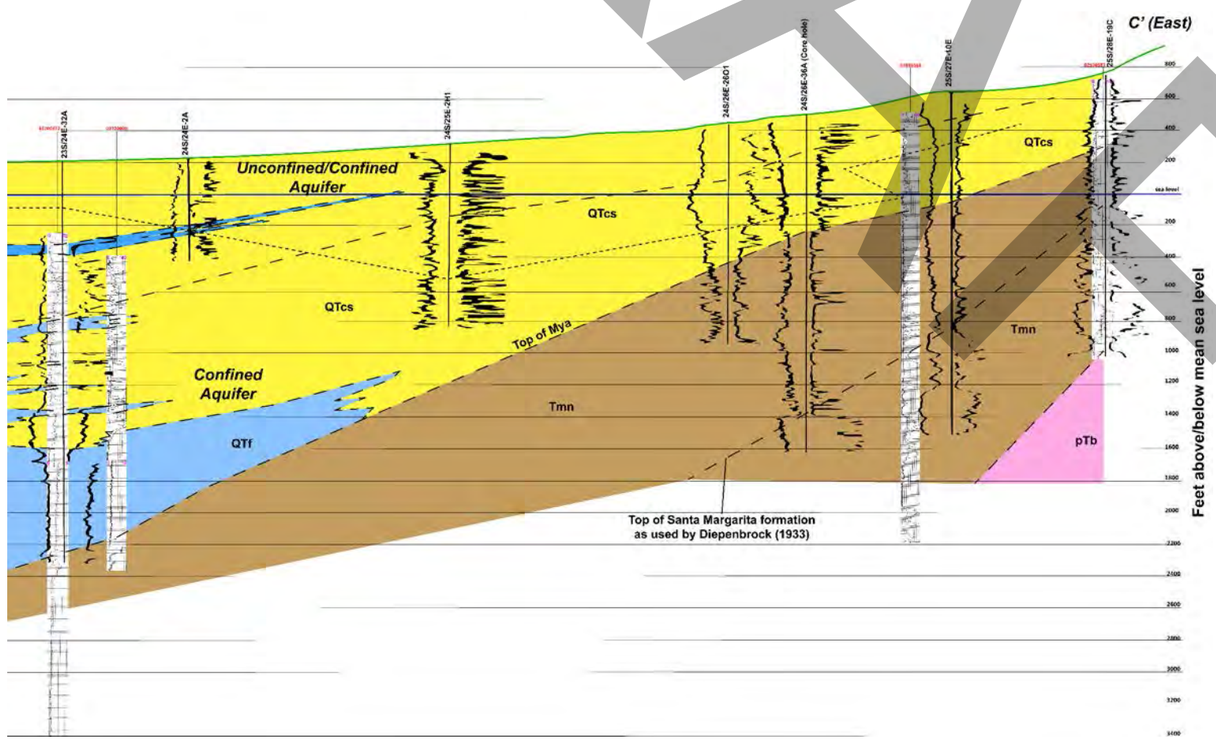
- Boundary of Tulare Lake Subbasin
- Study Area
- Extent of E-Clay
- E-Clay Thickness in Feet

Lateral Extent and Thickness of E-Clay

Tulare Lake Subbasin Hydrologic Model
Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR16181220
		Figure **D2-4**





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Explanation

- Coarse-grained alluvium / Tulare Formation
- San Joaquin Formation
- Alluvium / Tulare Formation lacustrine sediments
- Regional clay marker beds as defined by Croft (1972)
- Crystalline basement
- **25S/21E-1N** — CA DWR well name
- **03120281** — CA DOGGR well APN
- **0 30** — Electric log resistivity scale (ohmmeters)

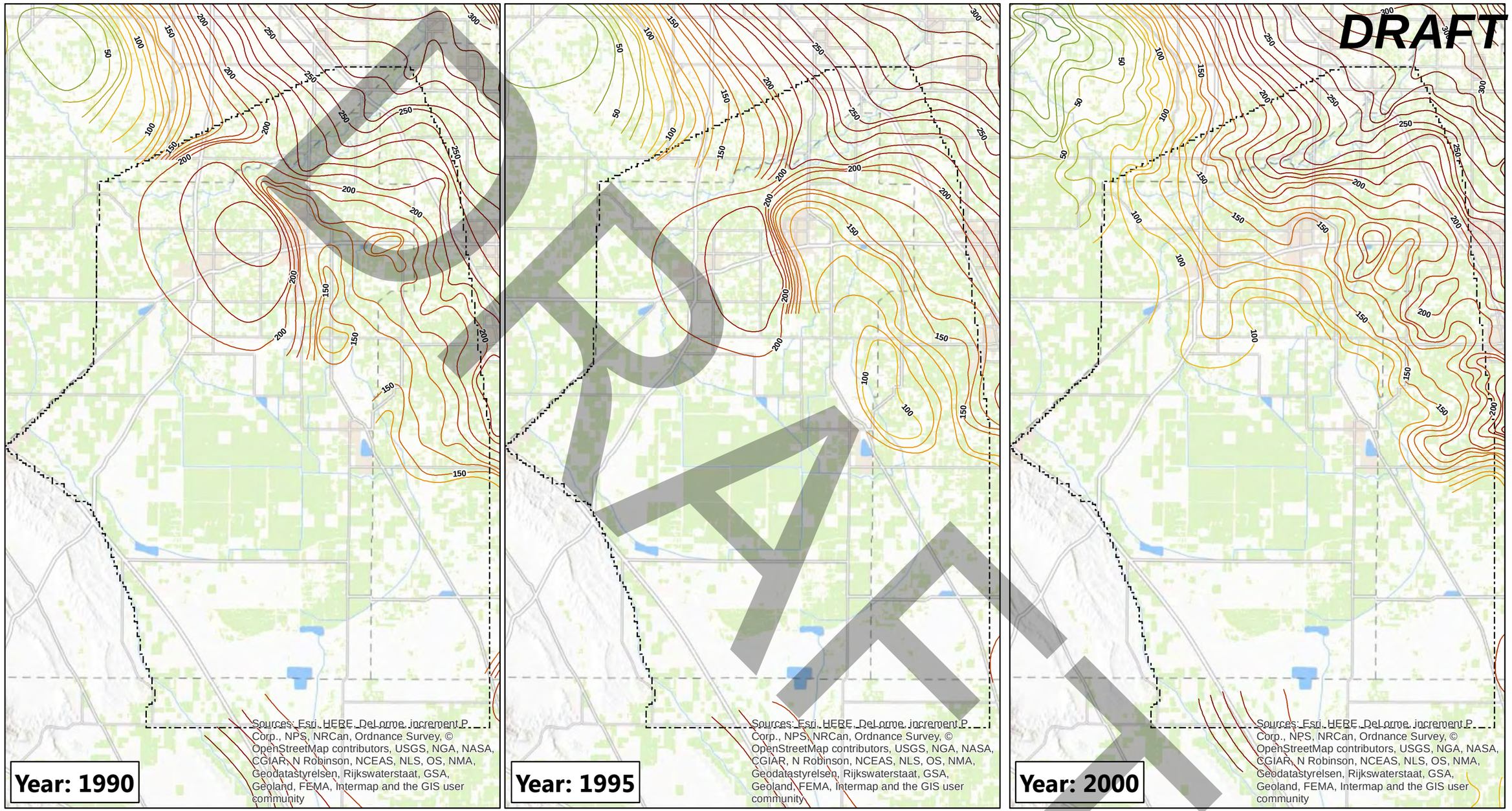
Notes:
1) Contacts dashed where inferred.
2) CA DWR = California Department of Water Resources.
2) CA DOGGR = Division of Oil, Gas, and Geothermal Resources, California Department of Conservation.

North - South Geologic Cross-Section Through the Tulare Lake Bed

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR18161220
		Figure **D2-5**

Date: 9/7/2019 Printed by: elizabeth.chapman
Path: N:_FR_projects\FR18s\FR18161220\gis\maps\2019\AppendixD_figD2-5_xsecC-C'.mxd



Explanation

Study Area

Groundwater elevation (FMSL)

700

-350

APPROXIMATE SCALE IN MILES

0 5 10 20

0 5 10 20

APPROXIMATE SCALE IN KILOMETERS

N

Historical DWR Groundwater Elevation Maps Unconfined Aquifer

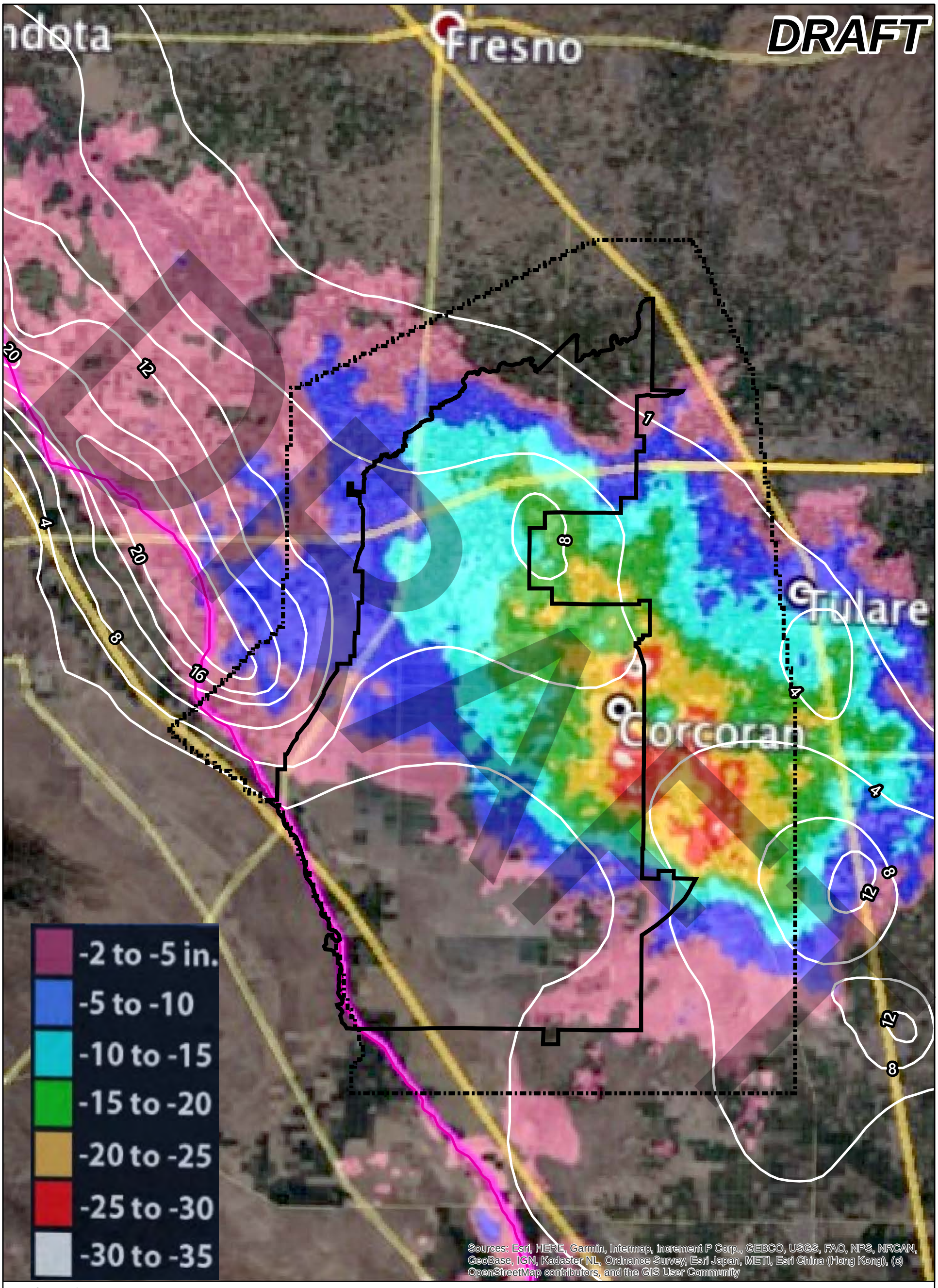
Tulare Lake Subbasin Hydrologic Model

Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR18161220
		Figure **D2-6**

Date: 9/7/2019 Printed by: elizabeth.chapman
Path: N:_FR_projects\FR18s\FR18161220\gis\maps\2019\AppendixD_figD6_RecentGroundwaterConditions_1990_1995_2000.mxd

Date: 9/7/2019 Printed by: elizabeth.chapman
Path: N:_FR_projects\FR18s\FR18161220\gis\maps\2019\AppendixD_figD7_Historical Subsidence San Joaquin Valley.mxd



Explanation

- Boundary of Tulare Lake Subbasin
- Study Area
- California Aqueduct
- White line shows historical subsidence data from 1926-1970 (ft.)

Miles: 0, 2.5, 5, 10
Kilometers: 0, 3.5, 7, 14

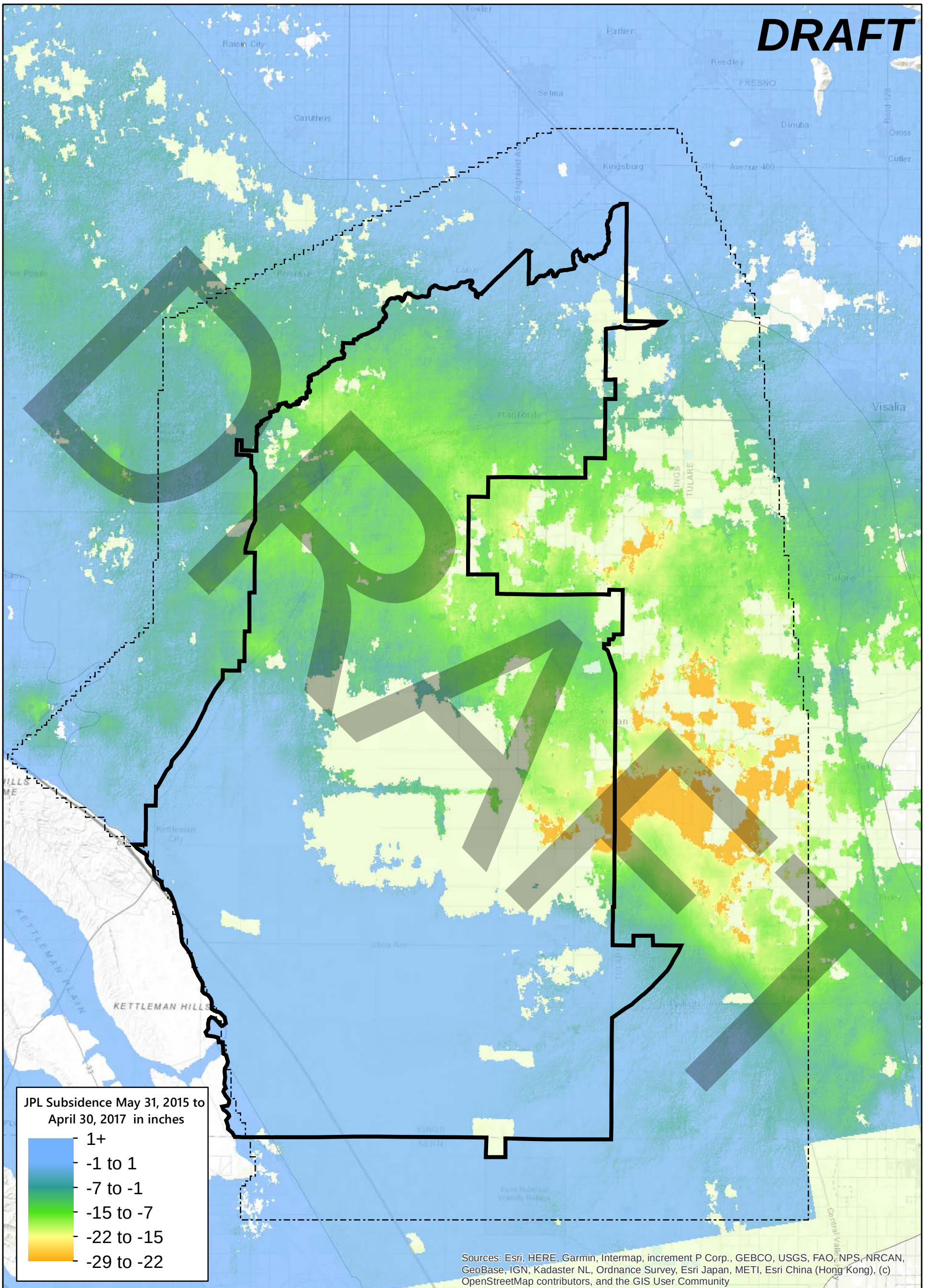
Notes:
PALSAR Satellite imaging taken from NASA's Jet Propulsion Labratory (JPL) dataset accessed from https://water.ca.gov/LegacyFiles/groundwater/docs/NASA_REPORT.pdf on July 16, 2019

Subsidence in the San Joaquin Valley 2007 to 2010

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR16181220
		Figure **D2-7**

Date: 10/11/2019 Printed by: elizabeth.chapman
Path: N:_FR_projects\FR18s\FR18161220\gis\maps\2019\AppendixD_figD-8_Recent Subsidence San Joaquin Valley.mxd



Explanation

Boundary of Tulare Lake Subbasin

Study Area

Miles: 0, 2.5, 5, 10
Kilometers: 0, 3.5, 7, 14

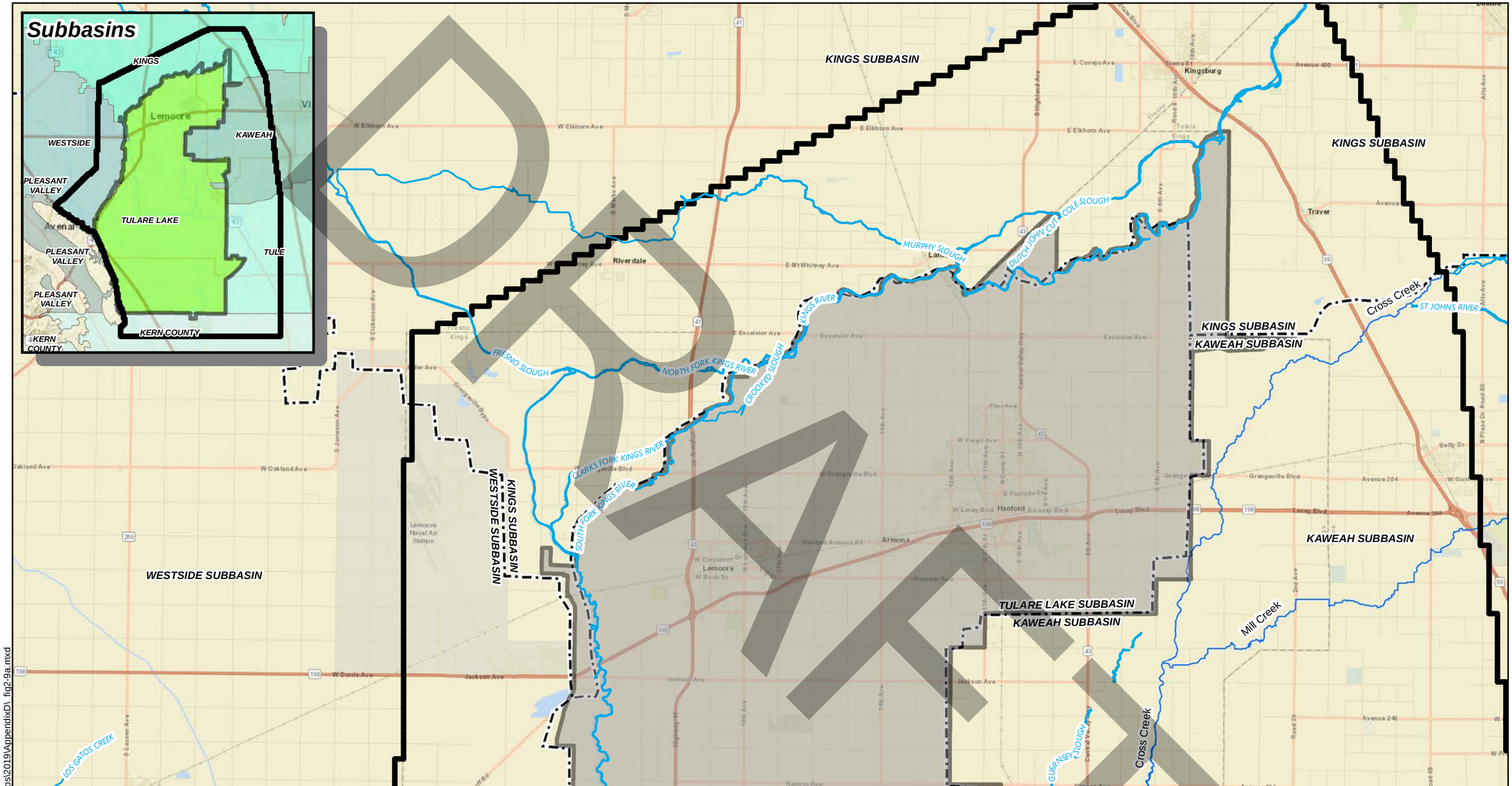
Notes:
NASA's Jet Propulsion Labratory (JPL) dataset accessed from Department of Water Resources https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub on July 15, 2019

Subsidence of the San Joaquin Valley 2015 to 2017

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 10/11/2019	Project No.: FR16181220

Figure **D2-8**



DRAFT

Explanation

- River/Lake [1]
- Study Area
- Tulare Lake subbasin boundary
- Boundaries of adjacent subbasins

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

APPROXIMATE SCALE IN MILES
0 1 2 4
0 1 2 4
APPROXIMATE SCALE IN KILOMETERS

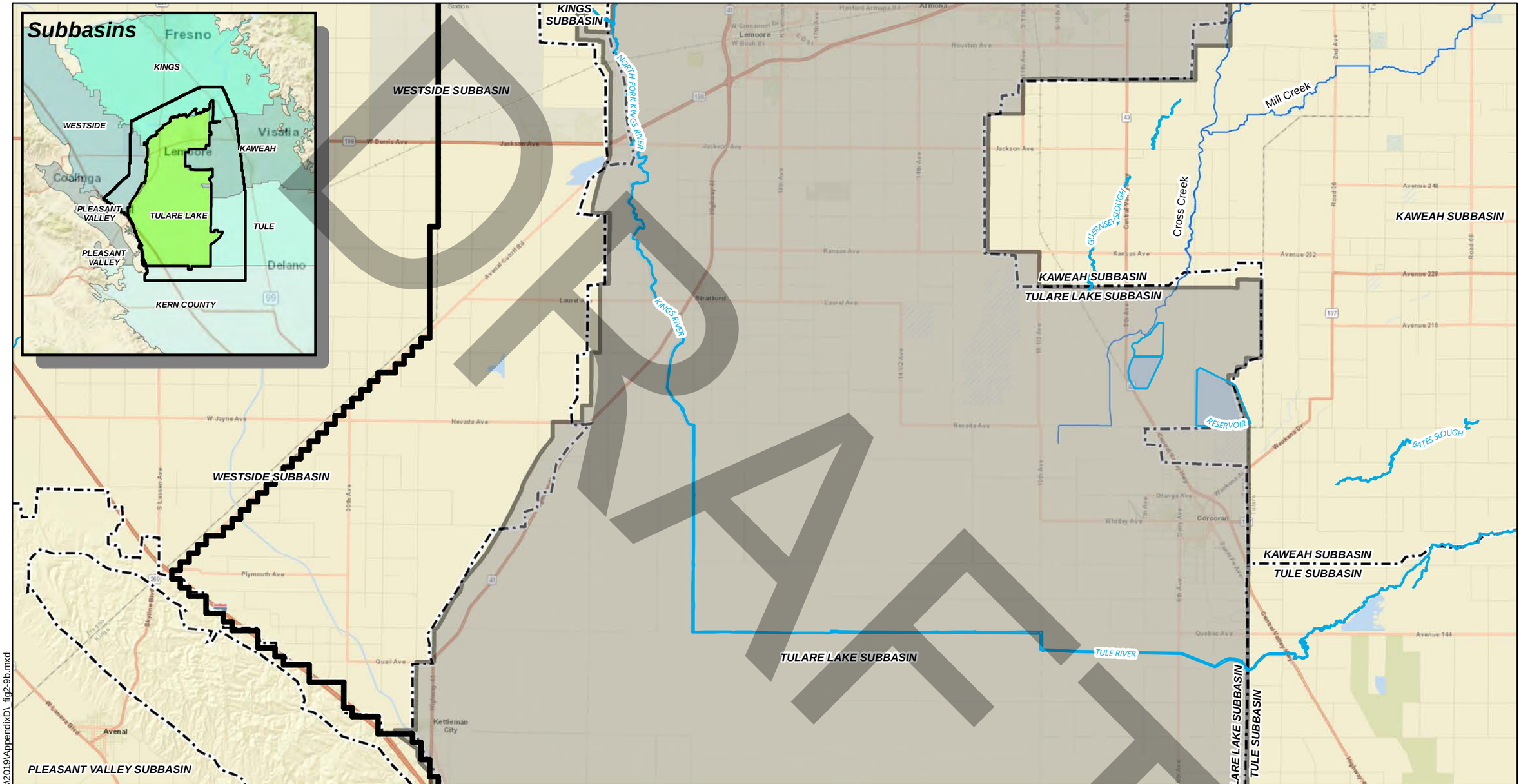
N

Notes:
1. Data accessed from the National Hydrography Dataset (2018)

Simulated Major Streams and Distribution Channels
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR18161220
		Figure **D2-9a**

N:_FR_projects\FR18s\FR18161220\gis\maps\2019\AppendixD_fig2-9a.mxd



Explanation

- River/Lake [1]
- Study Area
- Tulare Lake subbasin boundary
- Boundaries of adjacent subbasins

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

APPROXIMATE SCALE IN MILES
0 1 2 4
0 1 2 4
APPROXIMATE SCALE IN KILOMETERS

N

Notes:
1. Data accessed from the National Hydrography Dataset (2018)

Simulated Major Streams and Distribution Channels

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/7/2019	Project No.: FR18161220
		Figure **D2-9b**

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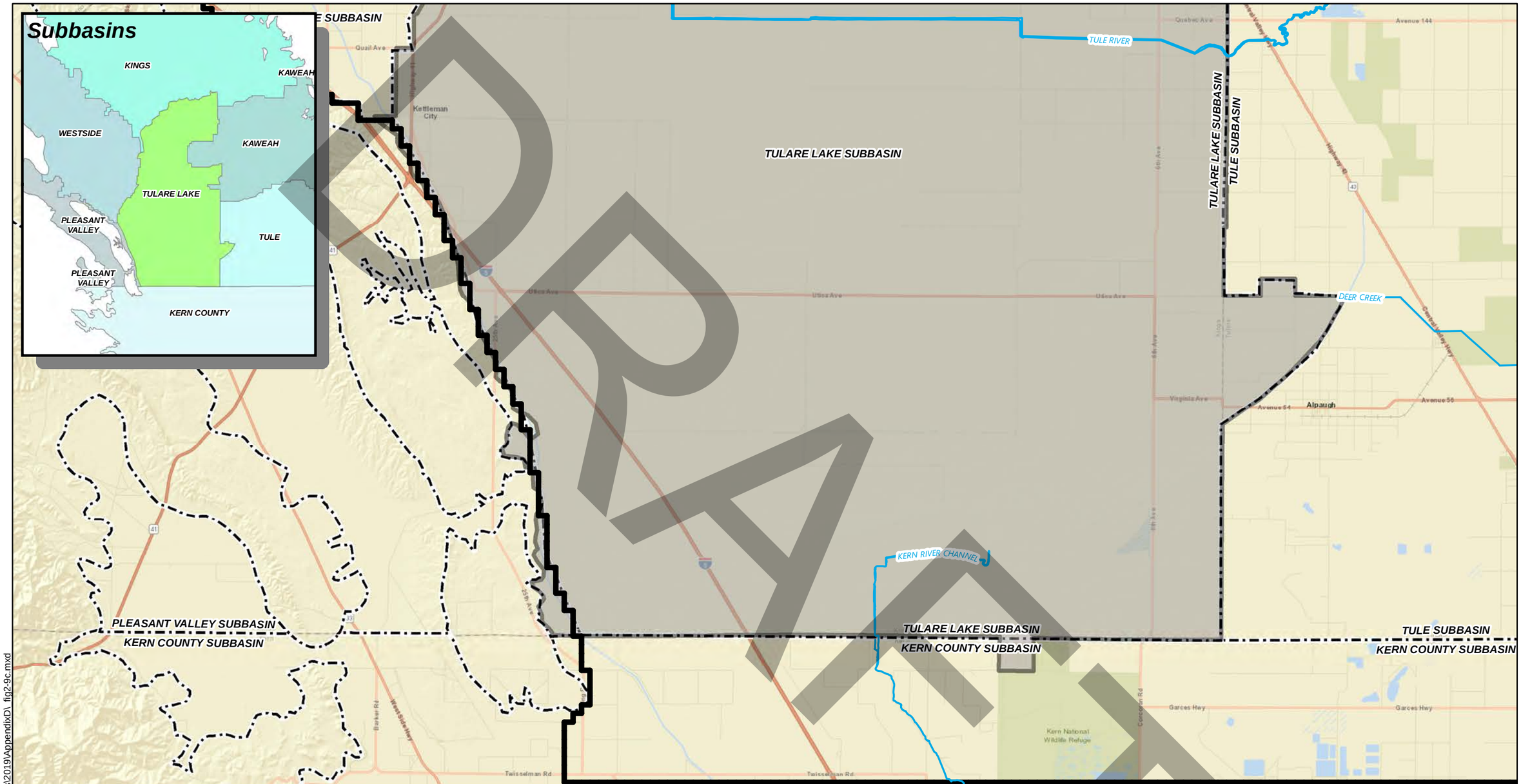


DRAFT

Explanation

- River/Lake [1]
- Study Area
- Tulare Lake subbasin boundary
- Boundaries of adjacent subbasins

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

APPROXIMATE SCALE IN MILES
0 1 2 4
0 1 2 4
APPROXIMATE SCALE IN KILOMETERS

N

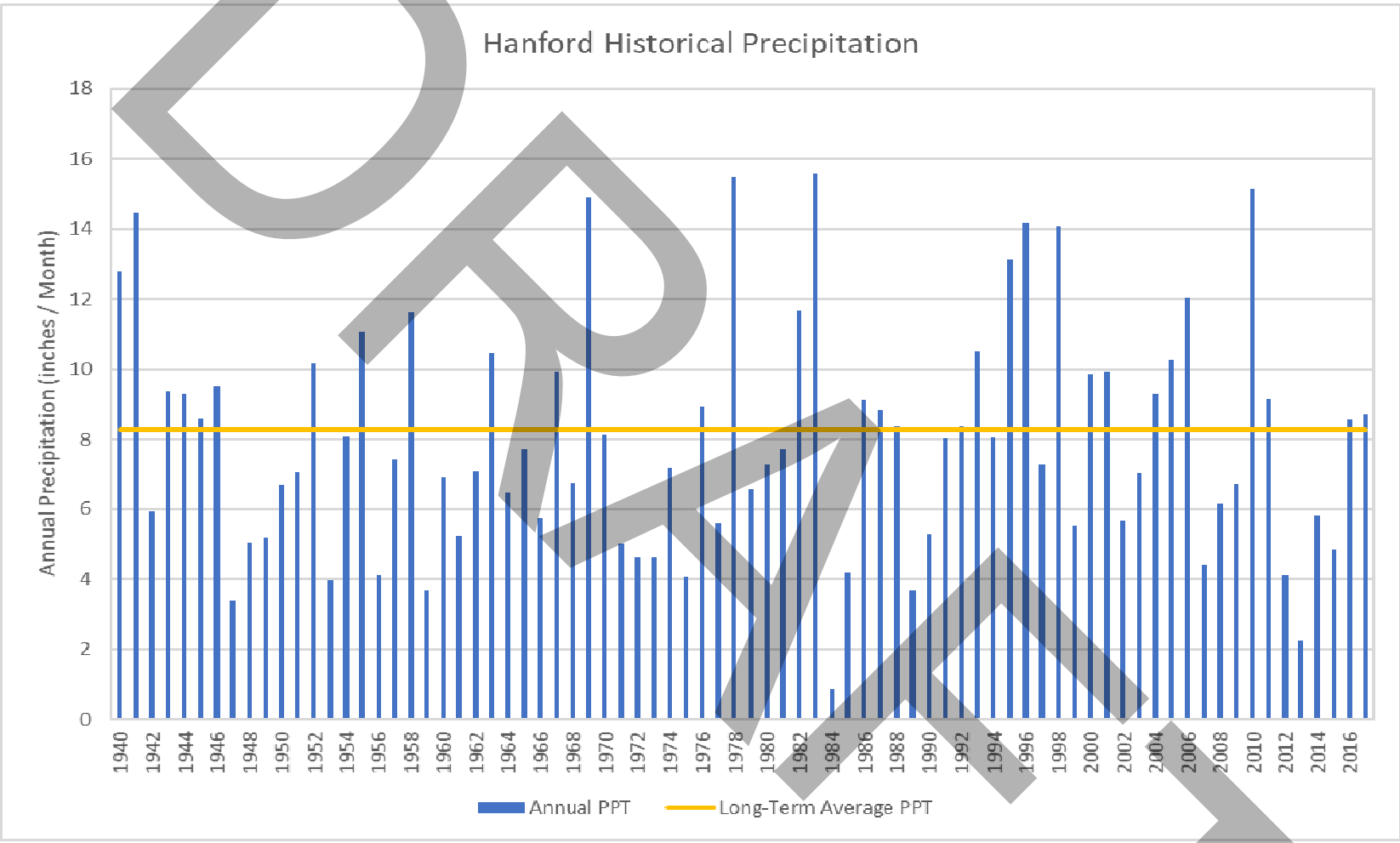
Notes:
1. Data accessed from the National Hydrography Dataset (2018)

Simulated Major Streams and Distribution Channels
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D2-9c**

N:\ FR_projects\FR18s\FR18161220\gis\maps\2019\AppendixD\ fig2-9c.mxd

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 2-10 Hanford PPT 9/7/2019

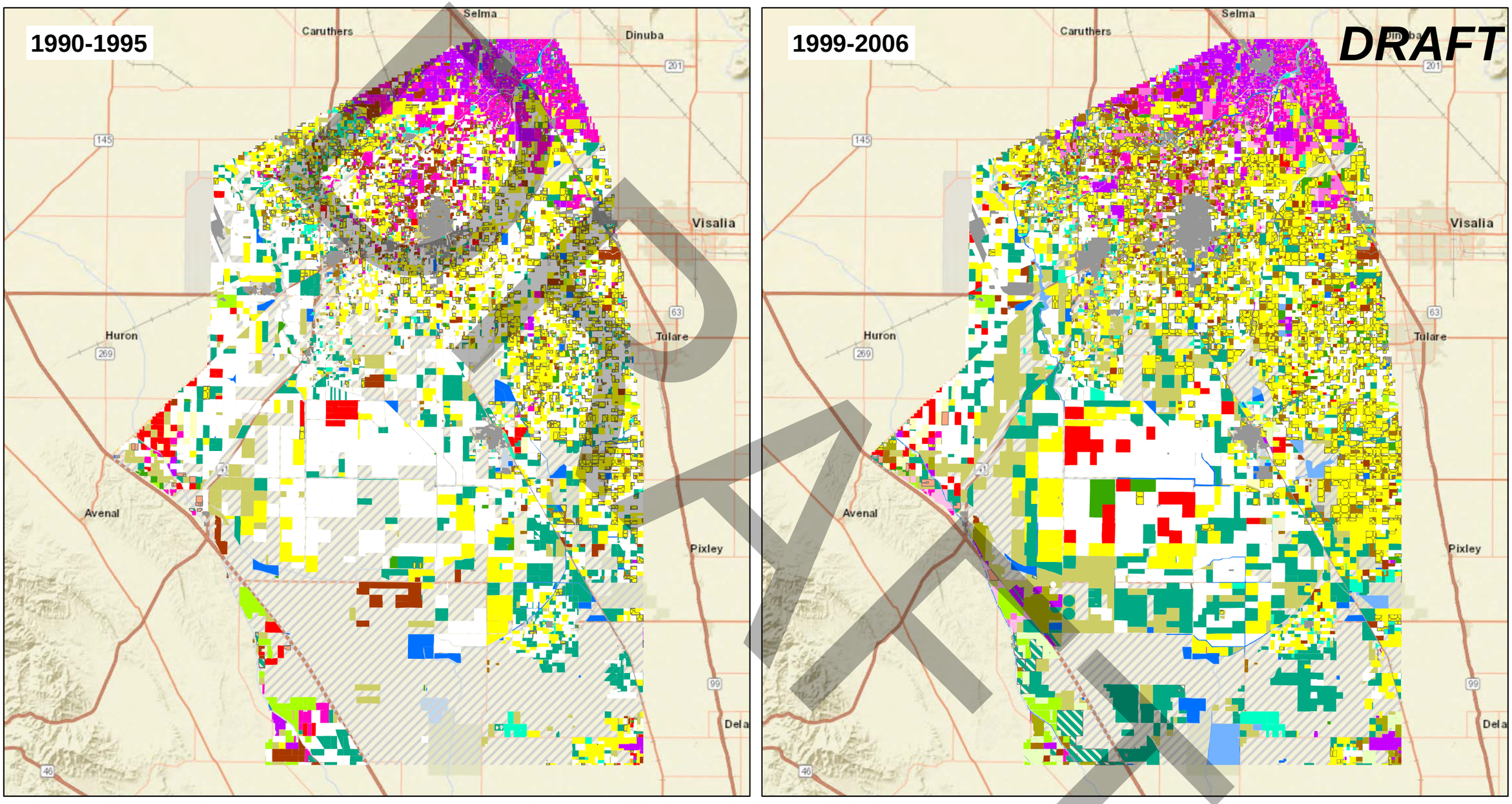


DRAFT

Historical Annual Precipitation of Hanford, California

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-10**



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Explanation

- Alfalfa Hay and Clover
- Almonds (Young)
- Almonds (Adolescent)
- Almonds (Mature)
- Berries
- Carrot Single Crop
- Citrus (no ground cover)
- Corn and Grain Sorghum
- Cotton
- Dairy Single Crop
- Fallow Land
- Forest
- Grain and Grain Hay
- Melons
- Misc. field crops
- Onions and Garlic
- Open Water
- Pasture and Misc. Grasses
- Pistachio (Young)
- Pistachio (Adolescent)
- Pistachio (Mature)
- Pomegranates (Young)
- Pomegranates (Adolescent)
- Potatoes, Sugar beets, Turnip etc..
- Riparian
- Small Vegetables
- Stone Fruit (Young)
- Stone Fruit (Adolescent)
- Stone Fruit (Mature)
- Tomatoes and Peppers
- Urban, Commercial
- Urban, Industrial
- Wine Grapes with 80% canopy
- Winter Wheat

N

0 20,000 40,000

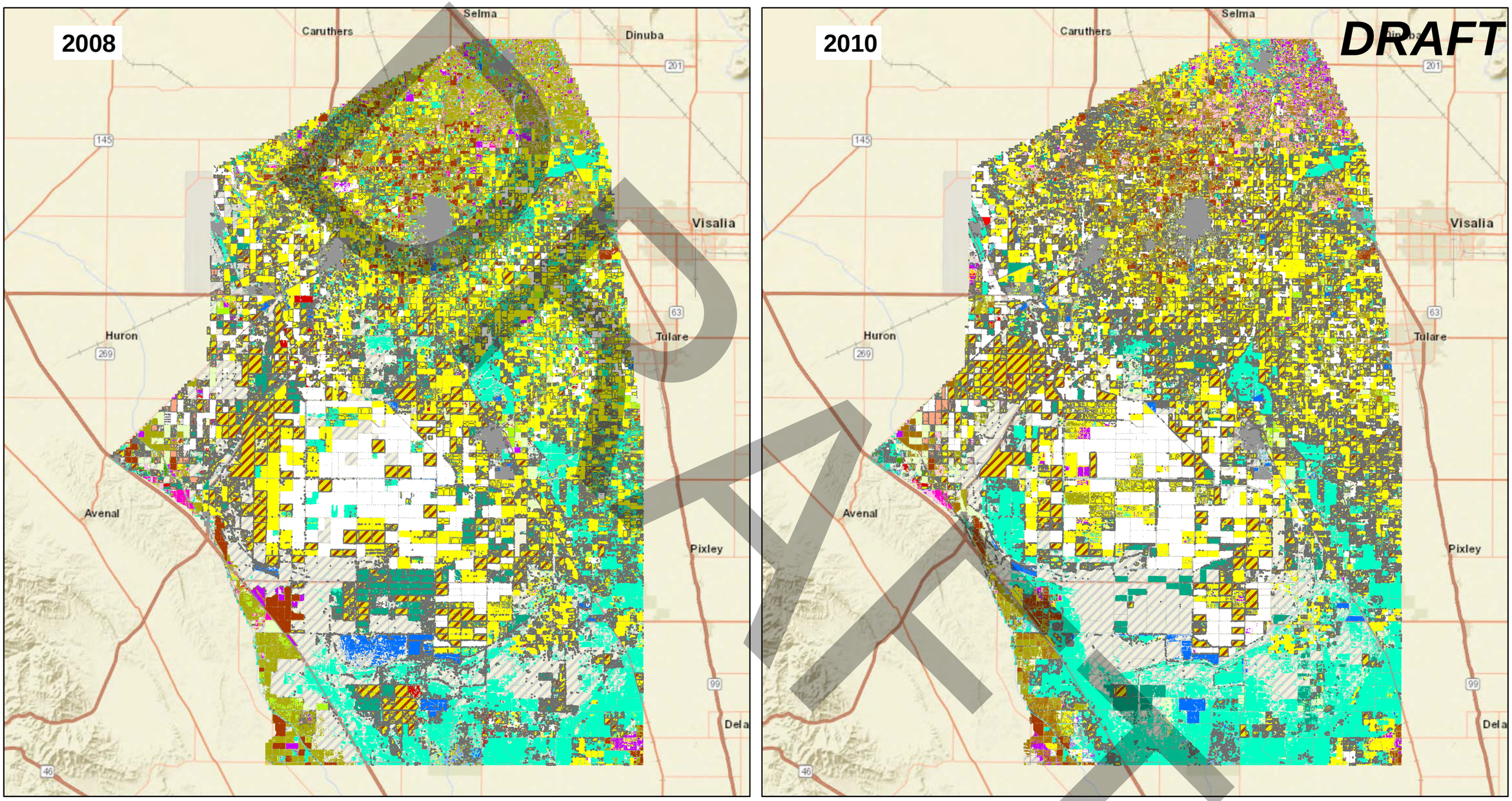
APPROXIMATE SCALE IN FEET

Crop Distributions

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: jmp	Date: 3/26/2019	Project No.: FR18161220
		Figure **D2-11a**

\\fsn-fs1\Graphics\ FR_projects\FR18s\FR18161220\gis\maps\2018\Hydrogeologic Conceptual Model\Arcmap 10.4\ fig3-8a CropDistributions rev.mxd



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Explanation

- Alfalfa Hay and Clover
- Almonds (Young)
- Almonds (Adolescent)
- Almonds (Mature)
- Berries
- Carrot Single Crop
- Citrus (no ground cover)
- Corn and Grain Sorghum
- Cotton
- Dairy Single Crop
- Fallow Land
- Forest
- Grain and Grain Hay
- Melons
- Misc. field crops
- Onions and Garlic
- Open Water
- Pasture and Misc. Grasses
- Pistachio (Young)
- Pistachio (Adolescent)
- Pistachio (Mature)
- Pomegranates (Young)
- Pomegranates (Adolescent)
- Potatoes, Sugar beets, Turnip etc..
- Riparian
- Small Vegetables
- Stone Fruit (Young)
- Stone Fruit (Adolescent)
- Stone Fruit (Mature)
- Tomatoes and Peppers
- Urban, Commercial
- Urban, Industrial
- Wine Grapes with 80% canopy
- Winter Wheat

N

0 20,000 40,000

APPROXIMATE SCALE IN FEET

Crop Distributions

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: jmp	Date: 3/26/2019	Project No.: FR18161220
		Figure **D2-11b**

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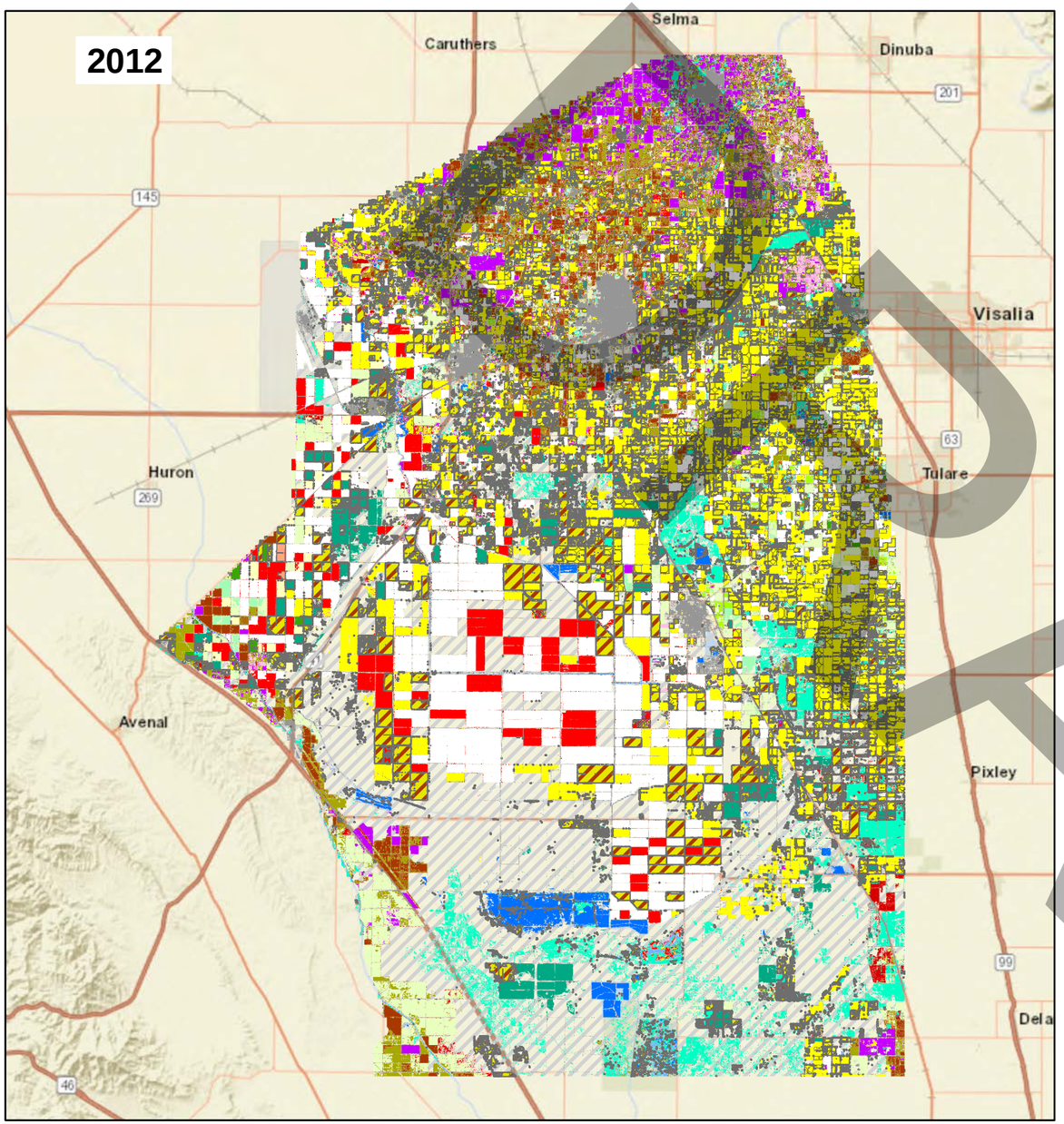

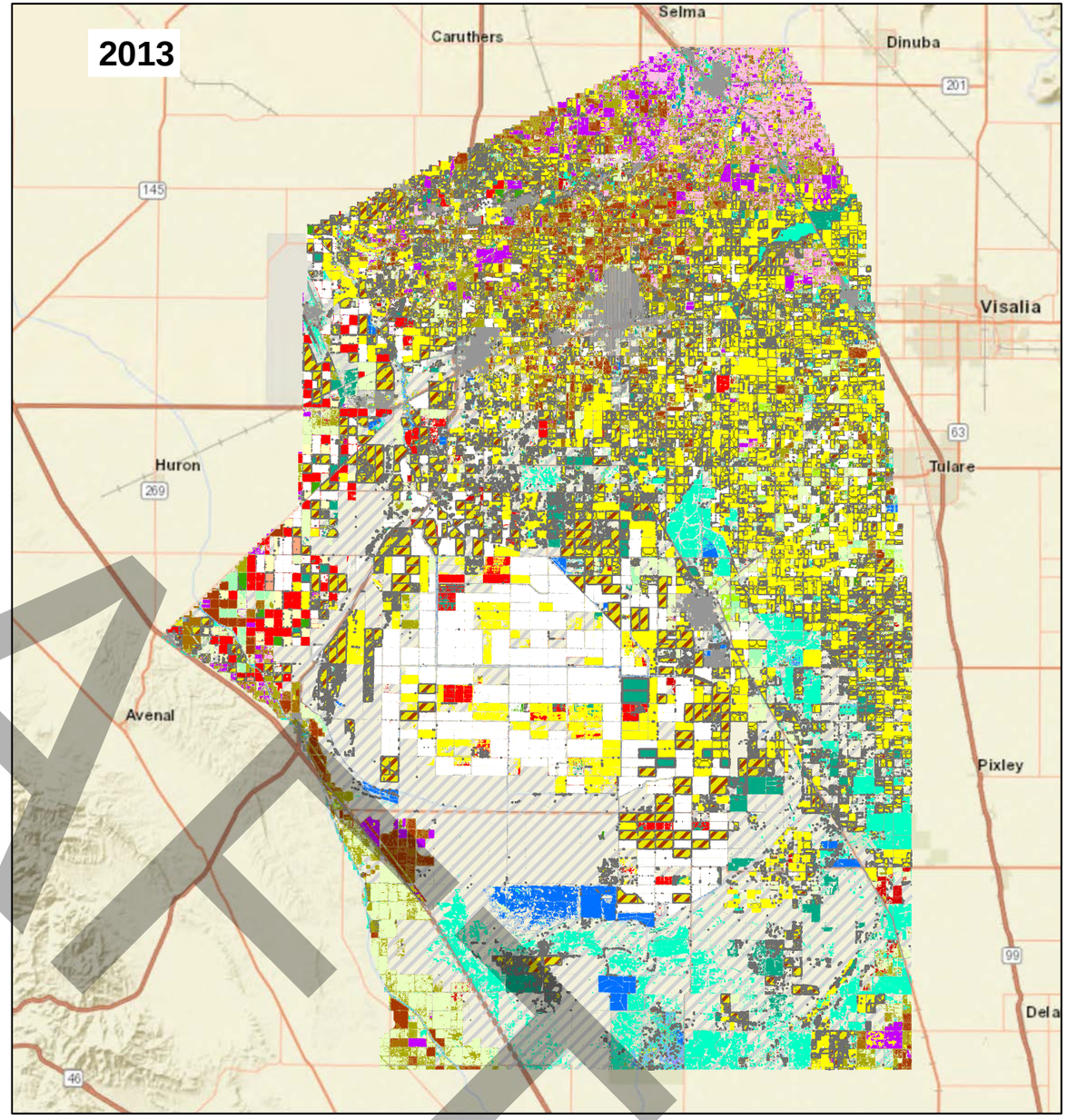

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

Explanation

- Alfalfa Hay and Clover
- Almonds (Young)
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- Almonds (Mature)
- Berries
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- Melons
- Misc. field crops
- Onions and Garlic
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- Pasture and Misc. Grasses
- Pistachio (Young)
- Pistachio (Adolescent)
- Pistachio (Mature)
- Pomegranates (Young)
- Pomegranates (Adolescent)
- Potatoes, Sugar beets, Turnip etc..
- Riparian
- Small Vegetables
- Stone Fruit (Young)
- Stone Fruit (Adolescent)
- Stone Fruit (Mature)
- Tomatoes and Peppers
- Urban, Commercial
- Urban, Industrial
- Wine Grapes with 80% canopy
- Winter Wheat

N

0 20,000 40,000

APPROXIMATE SCALE IN FEET

Crop Distributions

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: jmp	Date: 3/26/2019	Project No.: FR18161220
		Figure **D2-11c**

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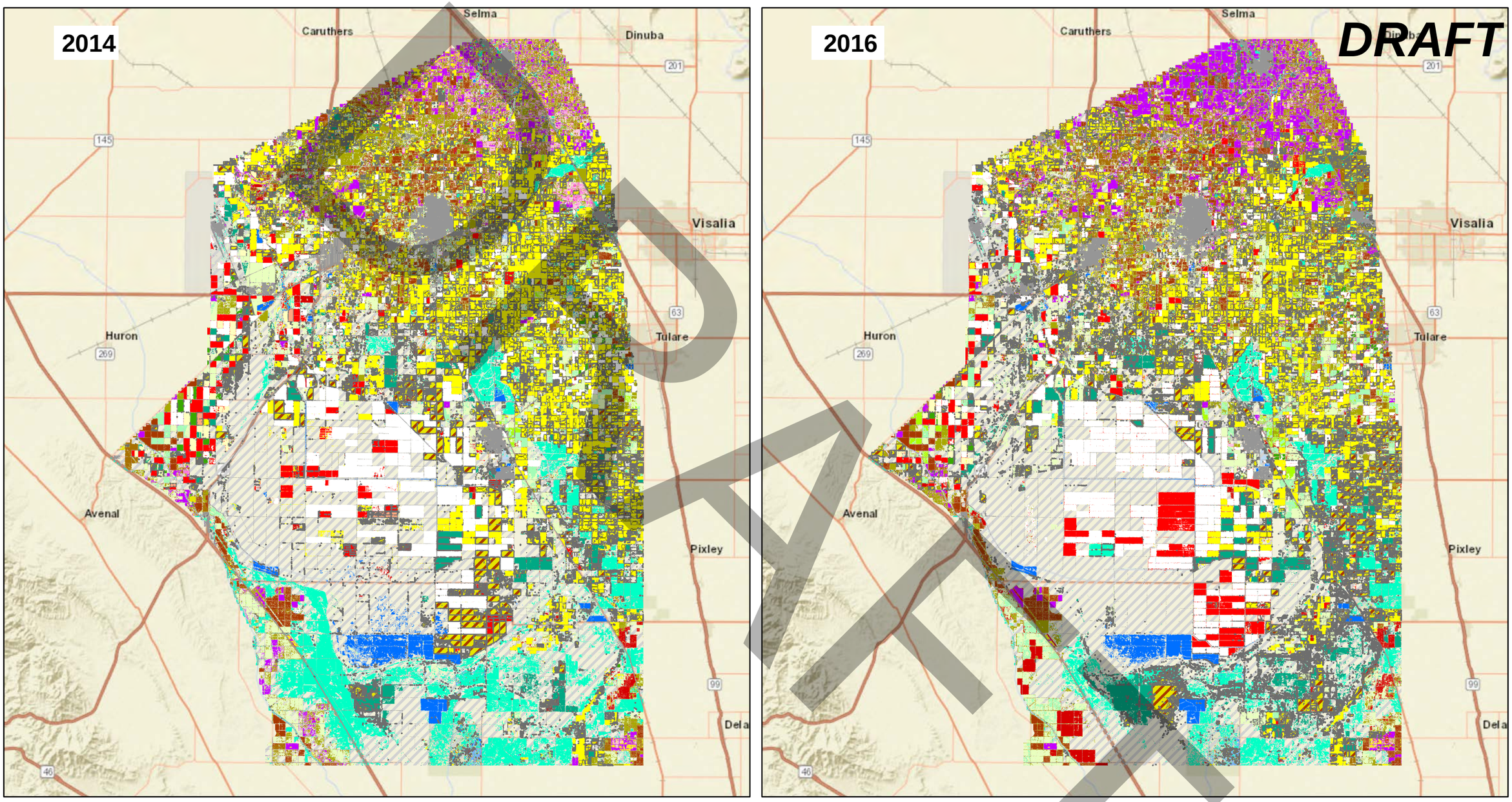
\\fsn-fs1\Graphics\ FR projects\FR18s\FR18161220\gis\maps\2018\Hydrogeologic Conceptual Model\Arcmap 10.4\ fig3-8c CropDistributions rev.mxd



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

Explanation

- Alfalfa Hay and Clover
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- Almonds (Mature)
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- Melons
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- Onions and Garlic
- Open Water
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- Pistachio (Mature)
- Pomegranates (Young)
- Pomegranates (Adolescent)
- Potatoes, Sugar beets, Turnip etc..
- Riparian
- Small Vegetables
- Stone Fruit (Young)
- Stone Fruit (Adolescent)
- Stone Fruit (Mature)
- Tomatoes and Peppers
- Urban, Commercial
- Urban, Industrial
- Wine Grapes with 80% canopy
- Winter Wheat

N

0 20,000 40,000

APPROXIMATE SCALE IN FEET

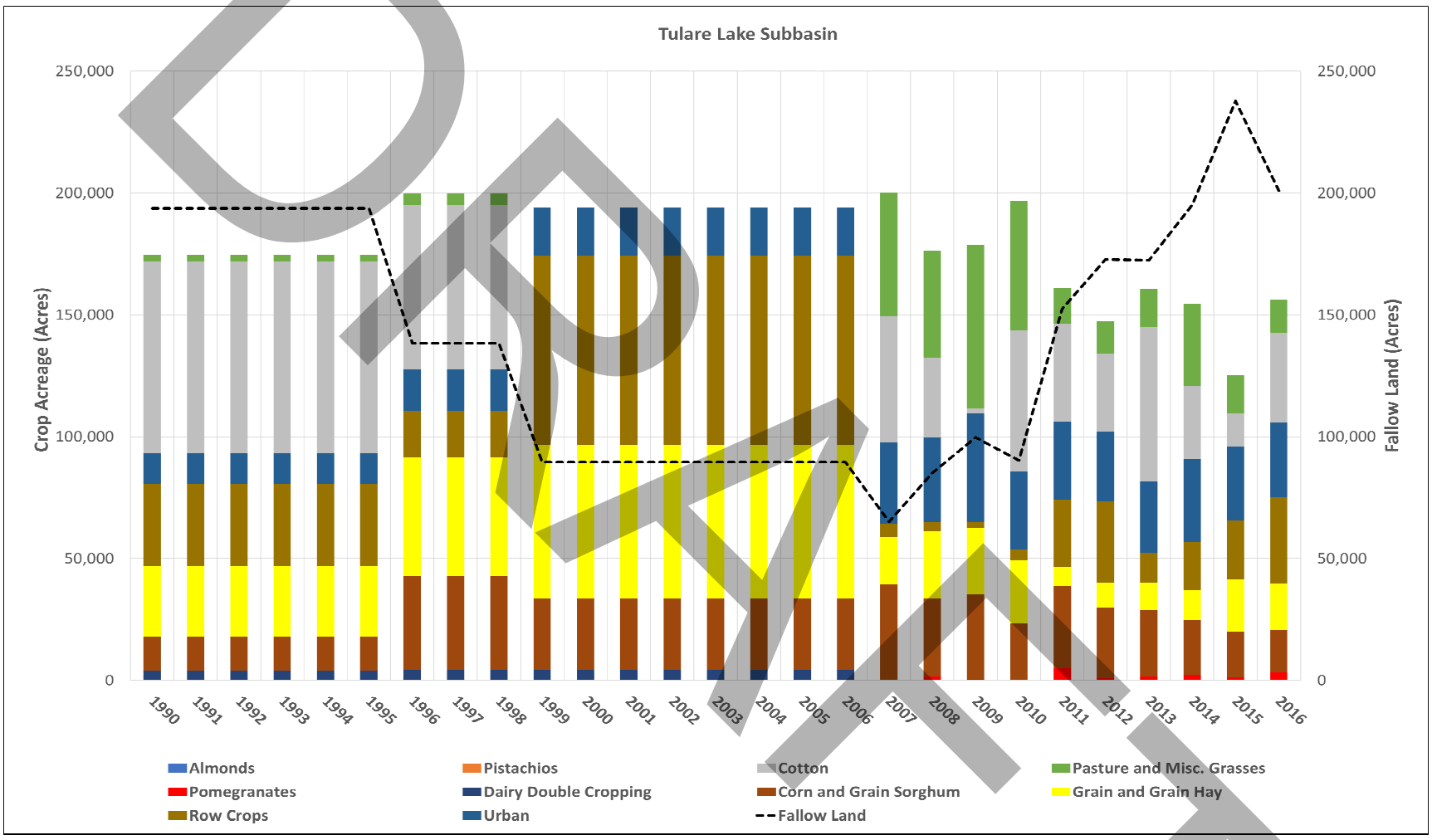
Crop Distributions

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: jmp	Date: 3/26/2019	Project No.: FR18161220
		Figure **D2-11d**

\\fsn-fs1\Graphics\ FR projects\FR18s\FR18161220\gis\maps\2018\Hydrogeologic Conceptual Model\Arcmap 10.4\ fig3-8d CropDistributions rev.mxd

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 2-12 HstoricalCrop Acreage 9/7/2019



DRAFT

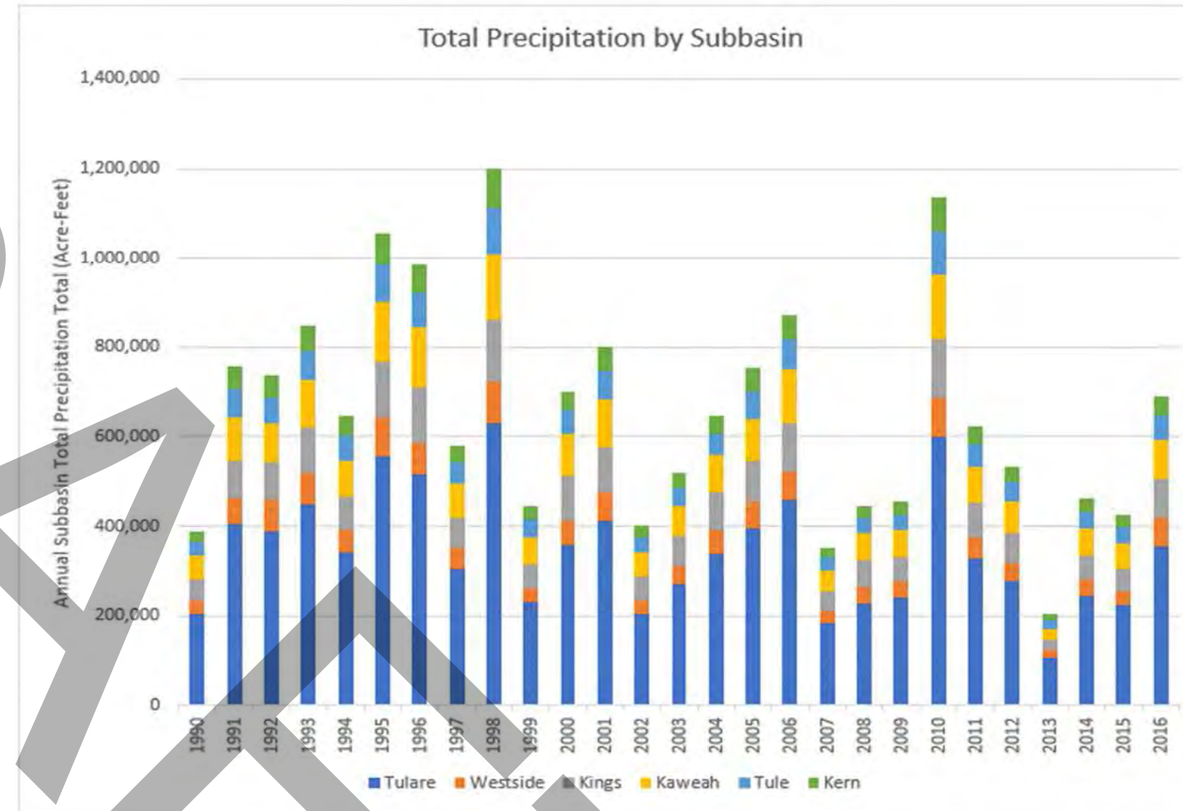
Historical Crop Acreage in Model Domain

Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-12**

ANNUAL TOTAL PRECIPITATION (ACRE-FEET)

SP	Tulare	Westside	Kings	Kaweah	Tule	Kern	Total
1990	205,446	28,212	48,930	51,309	30,947	24,023	388,867
1991	405,080	57,267	83,913	96,137	63,627	50,916	756,939
1992	390,074	67,498	84,716	87,700	57,619	48,389	735,997
1993	447,720	71,443	101,727	105,426	65,907	54,792	847,015
1994	340,437	50,626	75,966	80,699	54,192	45,398	647,318
1995	556,440	85,801	126,208	134,572	83,809	68,943	1,055,774
1996	517,621	70,468	123,183	132,981	78,164	62,576	984,993
1997	304,204	46,045	70,190	75,198	46,704	38,101	580,442
1998	628,620	94,415	137,547	149,223	102,104	88,545	1,200,453
1999	231,988	30,280	53,202	60,123	39,033	32,569	447,196
2000	358,410	53,273	99,777	96,159	51,600	40,115	699,334
2001	411,922	63,322	101,366	106,449	63,662	52,859	799,578
2002	205,011	30,798	53,013	53,586	32,171	26,641	401,219
2003	270,548	40,570	66,233	68,593	40,425	33,269	519,638
2004	339,269	53,188	82,590	83,239	49,381	40,603	648,271
2005	394,033	61,121	90,935	93,355	60,700	53,816	753,960
2006	457,938	64,091	108,085	119,504	69,821	52,995	872,434
2007	184,578	26,460	44,432	46,579	29,322	21,777	353,148
2008	228,631	37,419	58,349	59,869	35,246	27,247	446,762
2009	240,260	36,916	55,236	59,739	34,814	29,497	456,461
2010	598,897	88,582	130,029	144,182	96,270	80,046	1,138,006
2011	328,748	46,550	76,276	80,288	51,437	40,143	623,442
2012	277,729	39,653	66,630	72,324	43,489	33,195	533,019
2013	108,142	15,048	22,376	25,747	19,794	14,606	205,713
2014	243,088	37,368	54,143	61,105	38,200	29,654	463,558
2015	223,458	29,592	51,681	58,217	35,773	25,262	423,982
2016	356,639	60,978	87,691	88,184	53,105	44,307	690,904
min	108,142	15,048	22,376	25,747	19,794	14,606	205,713
max	628,620	94,415	137,547	149,223	102,104	88,545	1,200,453
mean	342,775	51,370	79,793	84,833	52,864	42,973	654,608

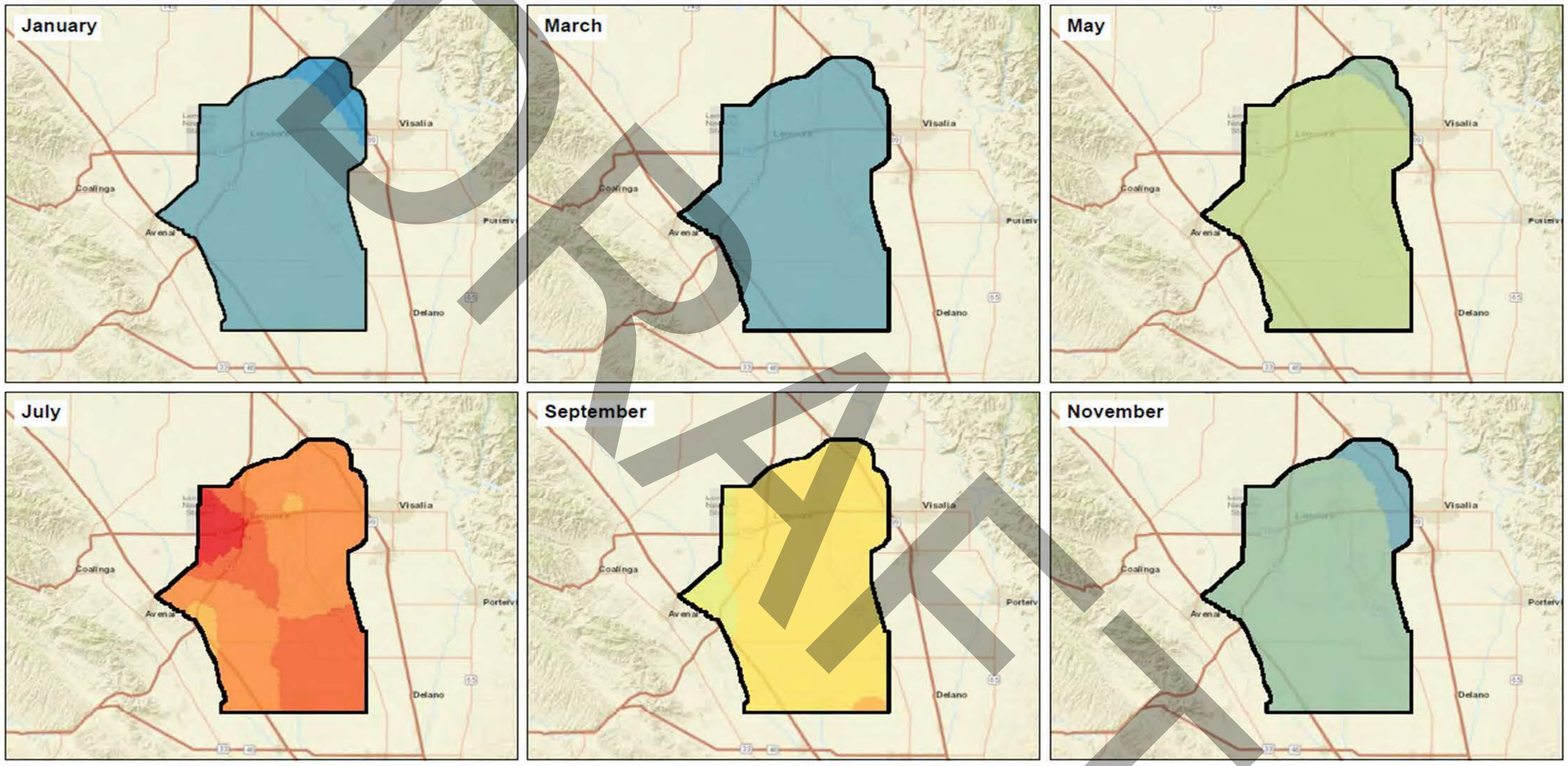


Estimated Annual Total Precipitation by Subbasin

Tulare Lake Subbasin Groundwater Sustainabilty Plan

Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-13a**



Explanation

Model Domain

Precipitation (feet per day)

- 5.1e-003 - 1.0e-002
- 2.1e-003 - 5.0e-003
- 1.1e-003 - 2.0e-003
- 5.1e-004 - 1.0e-003
- 2.1e-004 - 5.0e-004
- 1.1e-004 - 2.0e-004
- 5.1e-005 - 1.0e-004
- 2.1e-005 - 5.0e-005
- 1.1e-005 - 2.0e-005
- 7.0e-006 - 1.0e-005

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

N

0 50,000 100,000

APPROXIMATE SCALE IN FEET

Estimated Annual Total Precipitation by Subbasin

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 09/07/19	Project No.: FR18161220
		Figure **D2-13b**

C:\AModelKing&Report\Figures_fig_2_8_PrecipitationAcrossDomain.mxd

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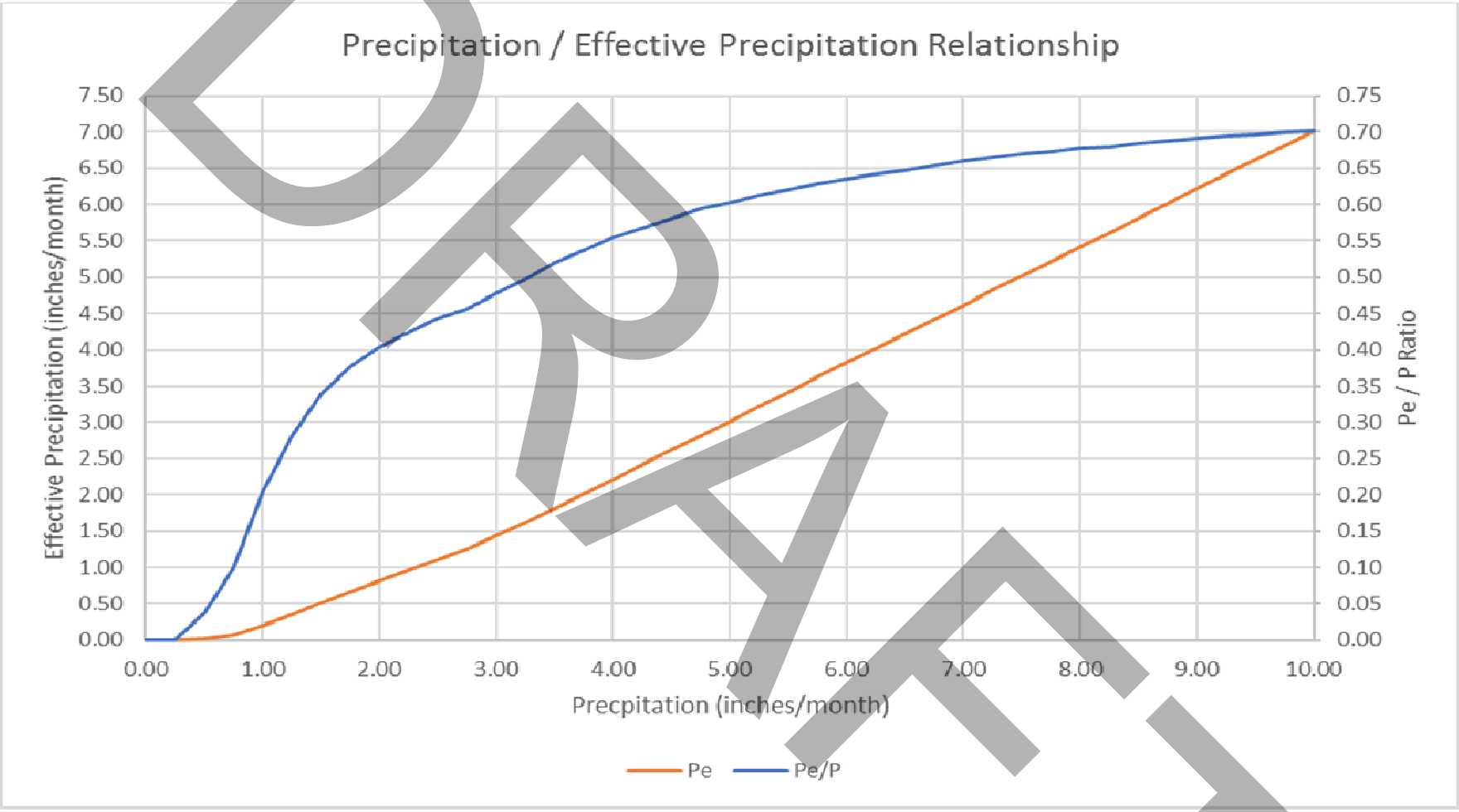
N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 2-14 PPT-Pe 9/7/2019



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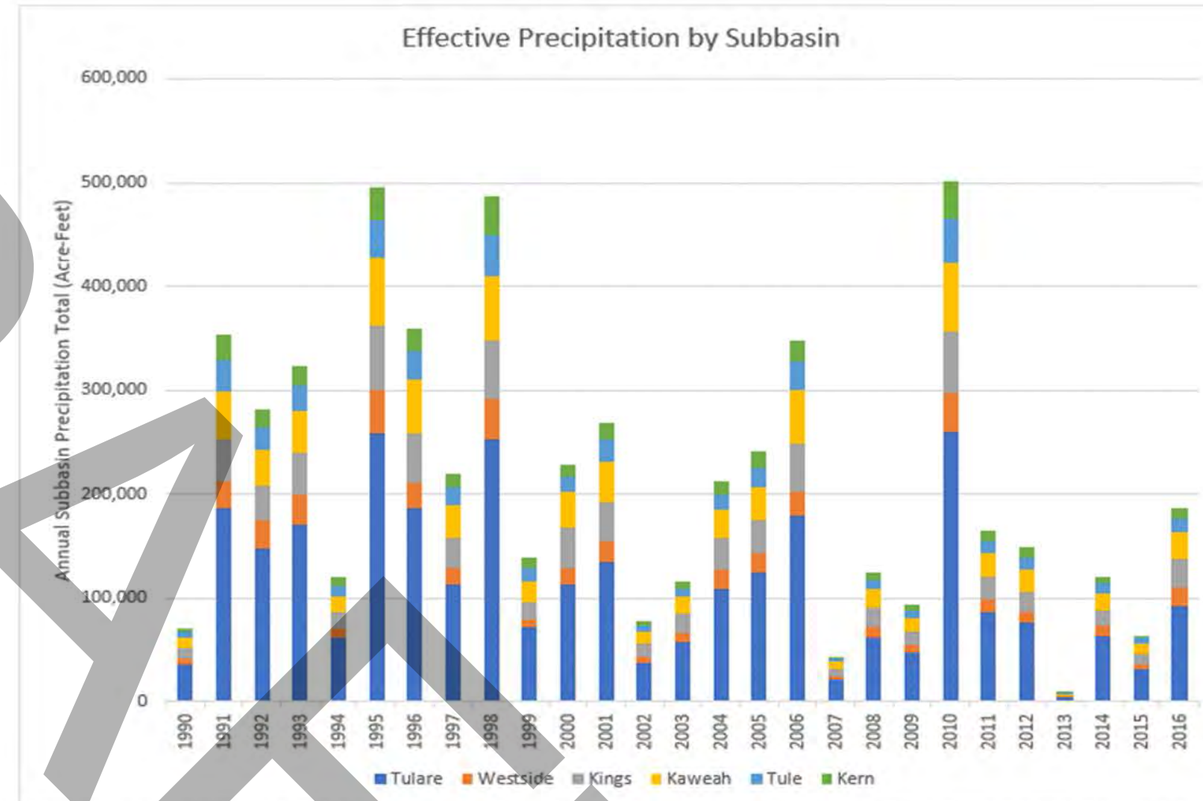
Modified from:
United Nations Food and Agricultre Organization (FAO)
FAO 56, Chapter 3 Table 6
Precipitation (P) and Effective Precipitation (Pe) in mm/month

Precipitation Versus Effective Precipitation
Tulare Lake Subbasin SGMA Model
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-14**

ANNUAL EFFECTIVE PRECIPITATION (ACRE-FEET)

Date	Tulare	Westside	Kings	Kaweah	Tule	Kern	Total
1990	35,788	5,208	10,921	10,176	4,812	3,714	70,619
1991	187,134	25,313	40,273	46,723	29,809	23,715	352,967
1992	148,073	27,645	33,148	33,386	21,388	17,350	280,990
1993	170,267	29,369	40,873	40,049	23,350	19,250	323,158
1994	61,232	8,593	15,645	16,141	10,127	8,240	119,978
1995	259,175	41,208	62,347	64,874	37,212	30,391	495,207
1996	186,149	24,278	48,754	51,487	27,483	21,442	359,593
1997	113,642	15,748	28,680	30,918	17,369	13,352	219,710
1998	252,323	38,854	56,898	60,724	41,542	36,341	486,681
1999	71,917	7,632	16,648	20,114	13,016	10,619	139,945
2000	113,113	16,314	38,555	34,058	15,532	11,155	228,726
2001	134,333	20,616	37,779	38,654	20,766	17,000	269,148
2002	37,068	5,535	12,943	11,666	5,956	4,445	77,613
2003	57,809	8,545	17,995	17,097	8,207	6,806	116,460
2004	109,787	18,411	29,462	28,012	14,496	12,064	212,232
2005	124,268	19,089	31,607	31,363	18,469	16,100	240,896
2006	179,592	23,246	45,635	51,807	27,290	19,450	347,021
2007	20,953	2,745	7,604	7,072	3,259	1,764	43,397
2008	61,111	11,105	18,873	18,211	9,119	6,389	124,809
2009	47,768	7,417	12,492	13,028	6,456	5,711	92,872
2010	260,214	37,095	58,830	65,701	43,440	35,754	501,035
2011	86,495	12,603	22,107	21,802	12,693	9,244	164,943
2012	75,839	10,048	19,758	21,768	12,555	8,764	148,732
2013	4,721	561	939	1,214	1,153	735	9,322
2014	63,051	9,701	14,375	17,224	9,896	6,761	121,008
2015	30,969	4,190	10,169	11,275	5,114	1,900	63,617
2016	92,375	18,143	27,302	25,956	12,925	10,086	186,788
min	4,721	561	939	1,214	1,153	735	9,322
max	260,214	41,208	62,347	65,701	43,440	36,341	501,035
mean	110,562	16,638	28,171	29,278	16,794	13,279	214,721



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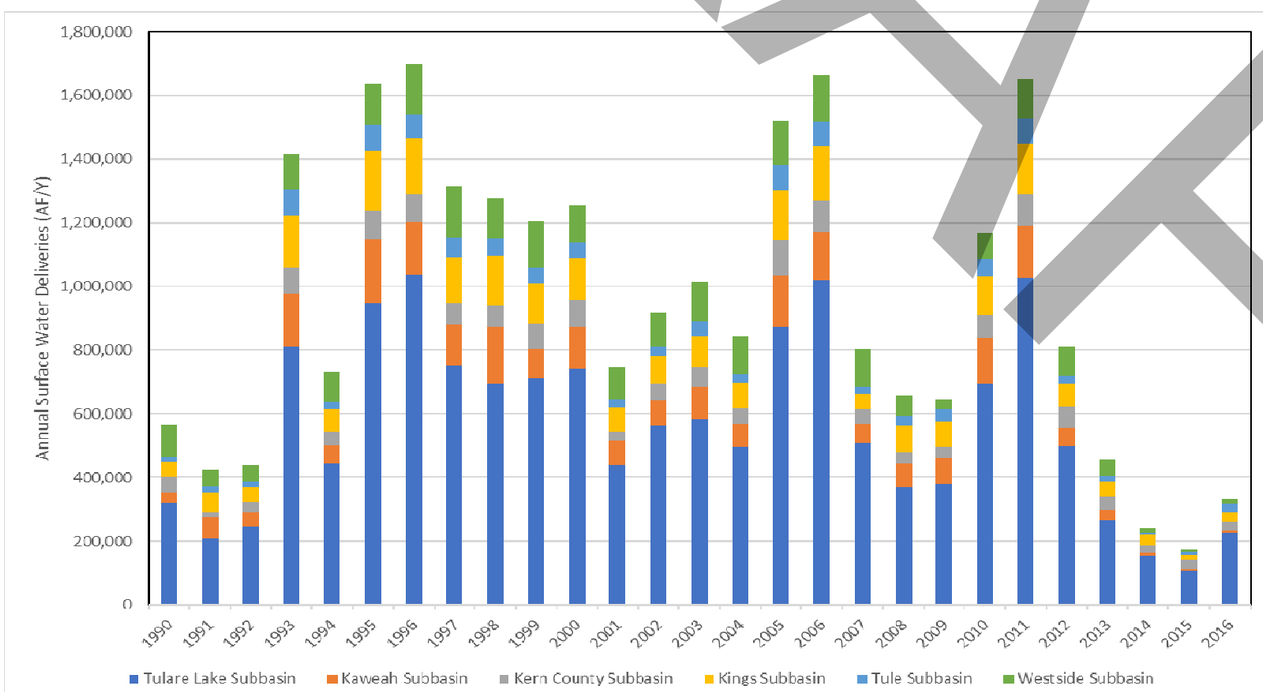
Estimated Annual Effective Precipitation by Subbasin

Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-15**

Annual Surface Water Deliveries (Acre-Feet / Year)

Date	Tulare Lake Subbasin	Kaweah Subbasin	Kern County Subbasin	Kings Subbasin	Tule Subbasin	Westside Subbasin	Total Model Domain
1990	319,638	34,691	46,977	47,706	14,494	101,753	565,259
1991	209,115	66,976	16,670	60,707	20,365	50,314	424,147
1992	244,988	48,175	29,248	47,266	18,257	51,537	439,472
1993	810,344	165,910	83,835	160,515	85,065	109,771	1,415,439
1994	443,205	56,606	44,535	69,284	22,852	94,931	731,414
1995	947,855	199,690	91,209	186,720	82,330	127,670	1,635,474
1996	1,036,790	163,574	87,848	177,280	75,768	155,283	1,696,544
1997	748,244	131,645	68,613	142,094	63,303	162,313	1,316,212
1998	693,058	179,630	69,486	153,596	54,029	127,191	1,276,990
1999	712,379	90,346	82,217	123,948	49,408	147,138	1,205,436
2000	740,630	131,085	85,279	129,655	53,811	114,126	1,254,586
2001	437,390	75,793	31,430	73,740	27,230	100,268	745,851
2002	563,492	79,353	51,035	87,765	28,672	107,362	917,680
2003	582,626	100,822	63,030	96,972	46,562	125,166	1,015,176
2004	495,419	71,381	49,475	80,158	28,180	120,407	845,020
2005	872,486	161,327	109,892	158,076	78,061	139,083	1,518,926
2006	1,019,418	150,216	100,573	170,799	74,941	147,368	1,663,316
2007	508,584	60,204	44,265	51,185	21,408	118,138	803,785
2008	370,440	74,103	34,343	83,836	29,913	64,483	657,118
2009	378,849	81,144	34,414	79,124	39,295	33,190	646,016
2010	693,453	145,197	71,837	120,646	54,005	81,772	1,166,909
2011	1,025,466	165,643	97,315	159,548	78,345	125,949	1,652,265
2012	498,360	56,953	65,646	72,022	26,220	90,518	809,719
2013	264,069	33,712	41,542	46,333	17,950	51,684	455,291
2014	154,035	8,482	24,232	31,689	7,799	15,092	241,330
2015	107,068	7,140	24,818	18,233	7,799	9,836	174,894
2016	227,433	8,482	24,232	31,689	24,908	15,092	331,837
1990-2016 Average	**559,438**	**94,381**	**58,296**	**98,540**	**41,888**	**95,831**	**948,374**
1998-2010 Average	**620,633**	**107,739**	**63,637**	**108,423**	**45,039**	**109,669**	**1,055,139**



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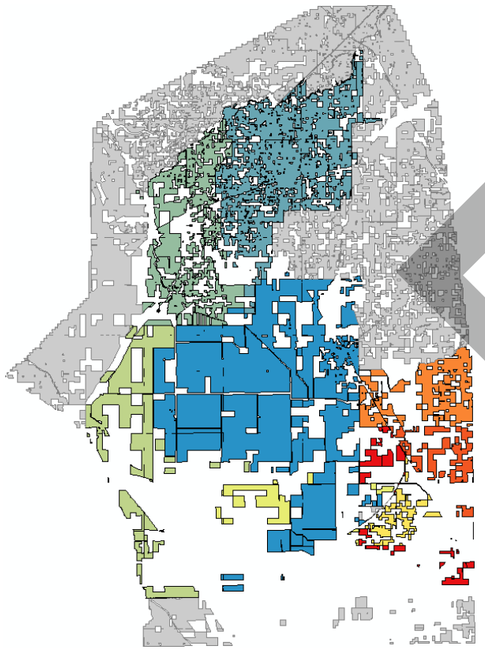
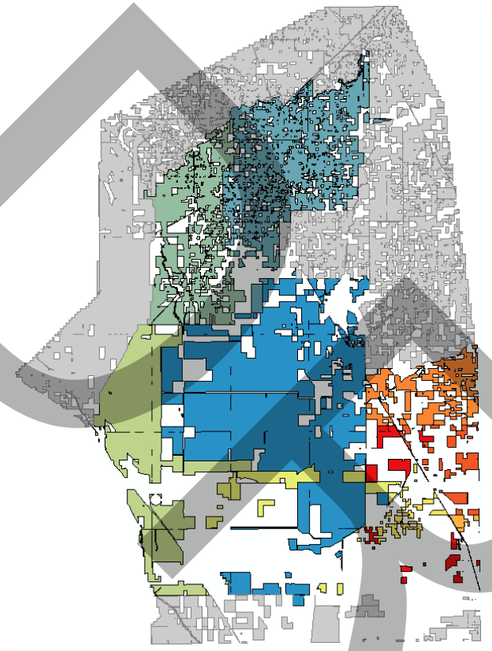
Estimated Annual Surface Water Diversions by Subbasin

Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

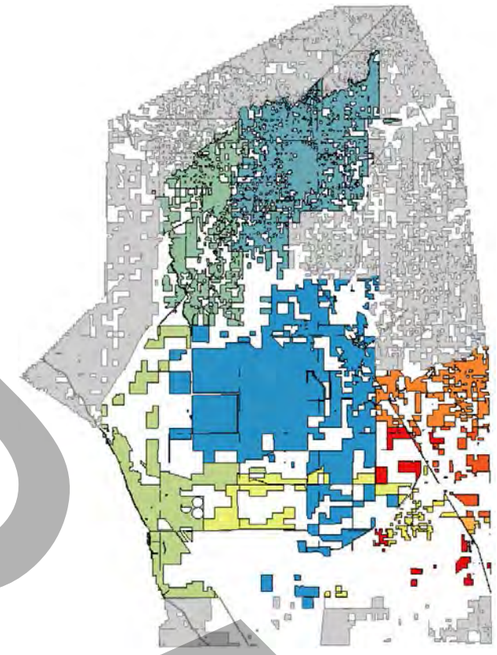
By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-16**



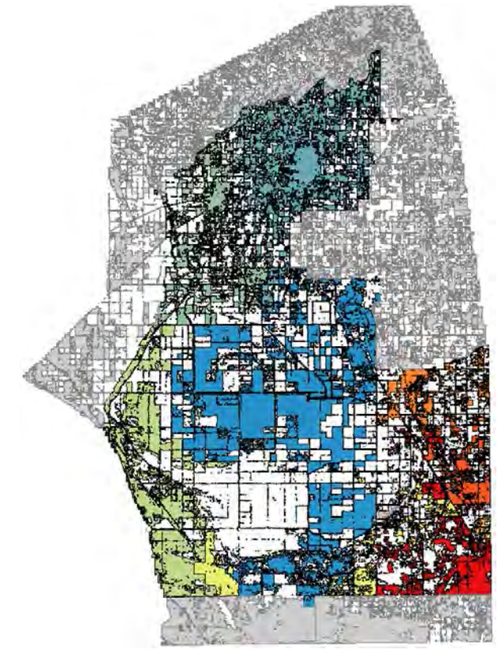
1990-1995



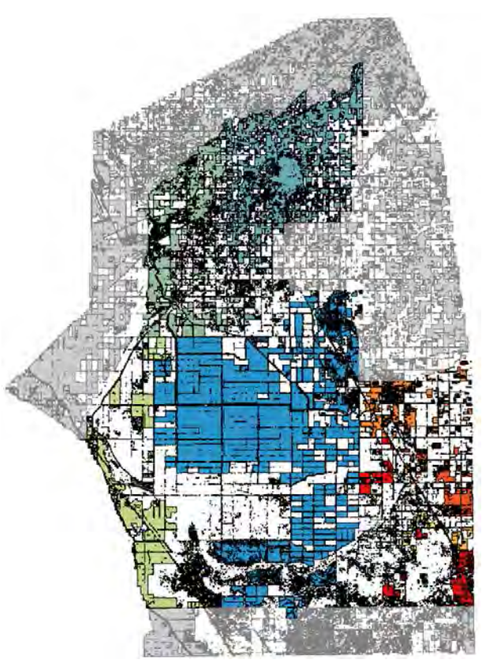
1996-1998



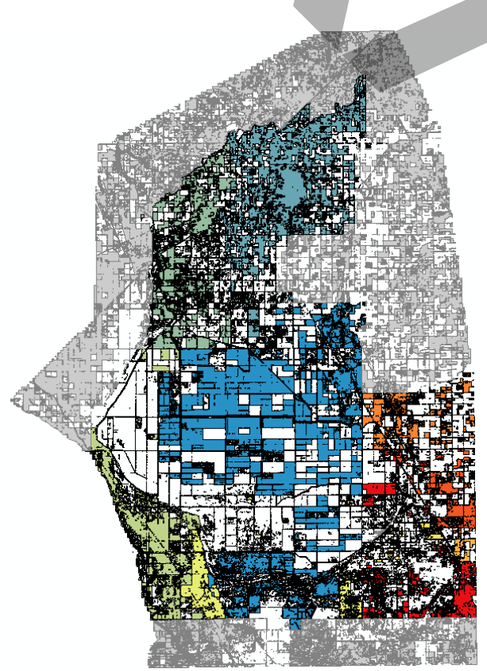
1999-2006



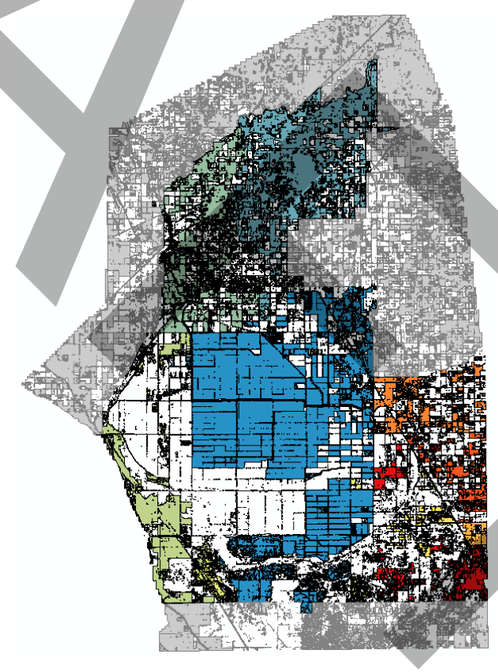
2009



2012



2014



2016

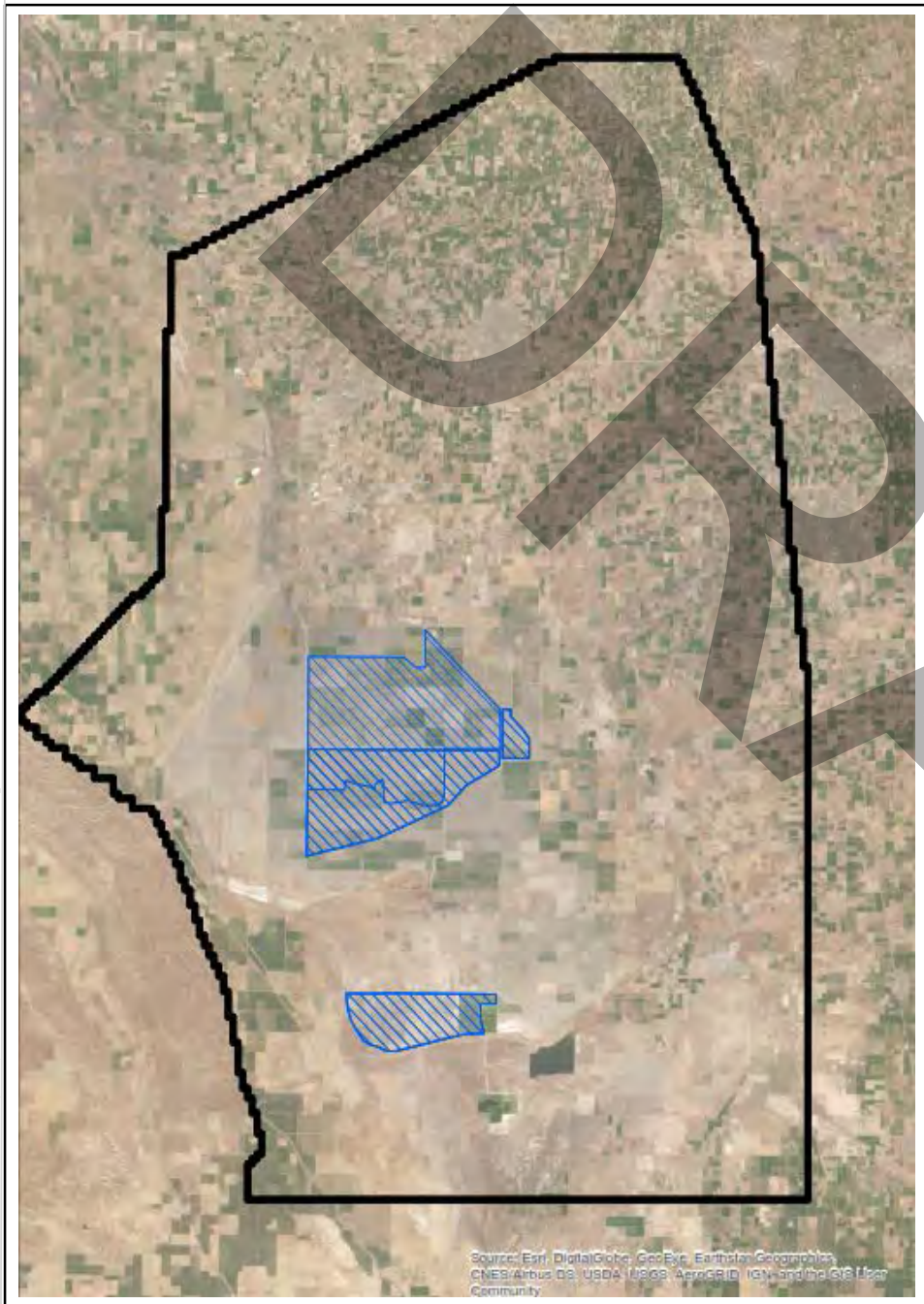
- Kaweah Subbasin, Greater Kaweah GSA
- Kaweah Subbasin, Mid-Kaweah GSA
- Kern County Subbasin, Kern Groundwater Authority GSA
- Kern County Subbasin, Semitropic
- Kings Subbasin, Central Kings GSA
- Kings Subbasin, Kings River East GSA
- Kings Subbasin, North Fork Kings GSA
- Kings Subbasin, South Kings GSA
- Tulare Lake Subbasin, Alpaugh GSA
- Tulare Lake Subbasin, El Rico GSA
- Tulare Lake Subbasin, Mid-Kings River GSA
- Tulare Lake Subbasin, South Fork Kings GSA
- Tulare Lake Subbasin, Southwest Kings GSA
- Tulare Lake Subbasin, Tri-County Water Authority GSA
- Tule Subbasin, Alpaugh GSA
- Tule Subbasin, Delano-Earlmart Irrigation District GSA
- Tule Subbasin, Lower Tule River ID GSA
- Tule Subbasin, Pixley ID GSA
- Tule Subbasin, Tri-County Water Authority GSA
- Westside Subbasin, Westlands Water District

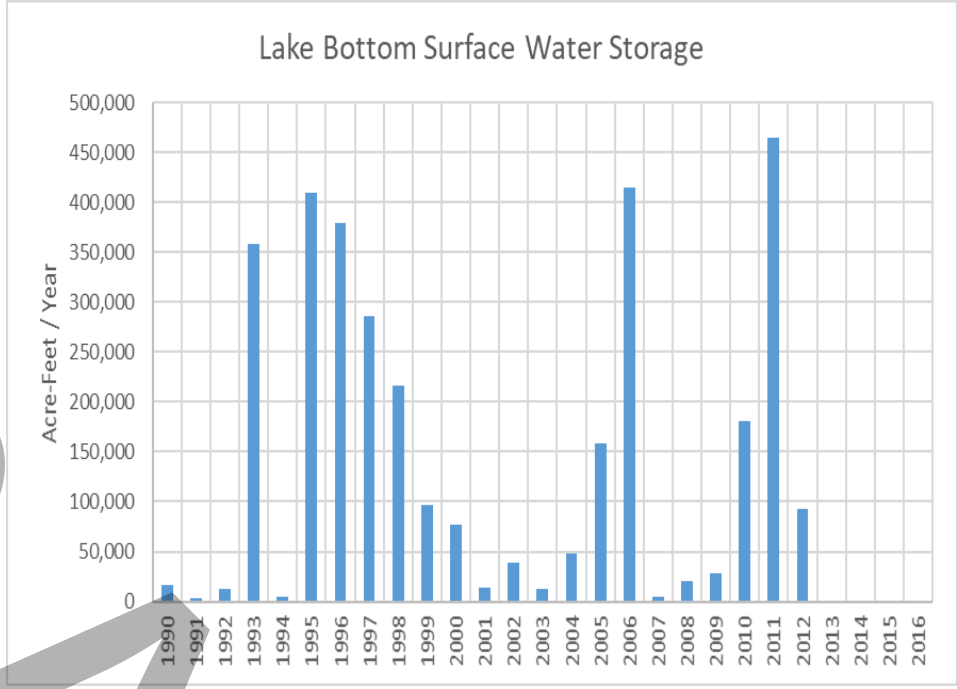
Location of Surface Water Delivery Areas by Subbasin

Tulare Lake Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 08/30/2019	Project No.: FR18161220
wood.		Figure **D2-17**

Source: I:\FR18s\FR18161220 Tulare Lake GSP\Model\Decoupled\ReportTables_070119\Calibration\SWD_Calibration_Final_070219.xlsx





Explanation

Study Area

Surface Water Ponds

Location of Surface Water Storage Areas and Annual Lake Bottom Storage

Tulare Lake Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 08/30/2019	Project No.: FR18161220
wood.		Figure **D2-18**

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Source: I:\FR18\FR18161220 Tulare Lake GSP\Model\Decoupled\ReportTables_070119\Calibration\SWD_Calibration_Final_070219.xlsx

Date	Pond 1 (AF/Y)	Pond 2 (AF/Y)	Pond 3 (AF/Y)	Pond 4 (AF/Y)	Pond 5 (AF/Y)	Pond 6 (AF/Y)	Pond 7 (AF/Y)	Pond 8 (AF/Y)	Pond 9 (AF/Y)	Total (AF/Y)
1990	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0
1994	10,700	12,840	0	0	0	0	0	0	0	23,540
1995	10,700	12,840	0	0	0	0	0	0	0	23,540
1996	10,700	12,840	0	0	0	0	0	0	0	23,540
1997	10,700	12,840	0	0	0	0	0	0	0	23,540
1998	10,700	12,840	0	0	0	0	0	0	0	23,540
1999	0	0	0	0	0	0	0	0	0	0
2000	10,700	12,840	0	0	0	0	0	0	0	23,540
2001	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0
2003	10,700	12,840	0	0	0	0	0	0	0	23,540
2004	10,700	0	0	0	0	0	0	0	0	10,700
2005	10,700	12,840	14,980	14,980	0	0	0	0	0	53,500
2006	10,700	12,840	14,980	14,980	21,400	25,680	12,840	23,540	10,700	147,660
2007	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0
2009	10,700	0	0	0	0	0	0	0	0	10,700
2010	10,700	12,840	0	0	0	0	0	0	0	23,540
2011	10,700	12,840	14,980	14,980	21,400	25,680	12,840	23,540	10,700	147,660
2012	10,700	0	0	0	0	0	0	0	0	10,700
2013	0	0	0	0	0	0	0	0	0	0
2014	10,600	12,720	0	0	0	0	0	0	0	23,320
2015	10,700	12,840	0	0	0	0	0	0	0	23,540
2016	0	0	0	0	0	0	0	0	0	0
Total	171,100	166,800	44,940	44,940	42,800	51,360	25,680	47,080	21,400	616,100

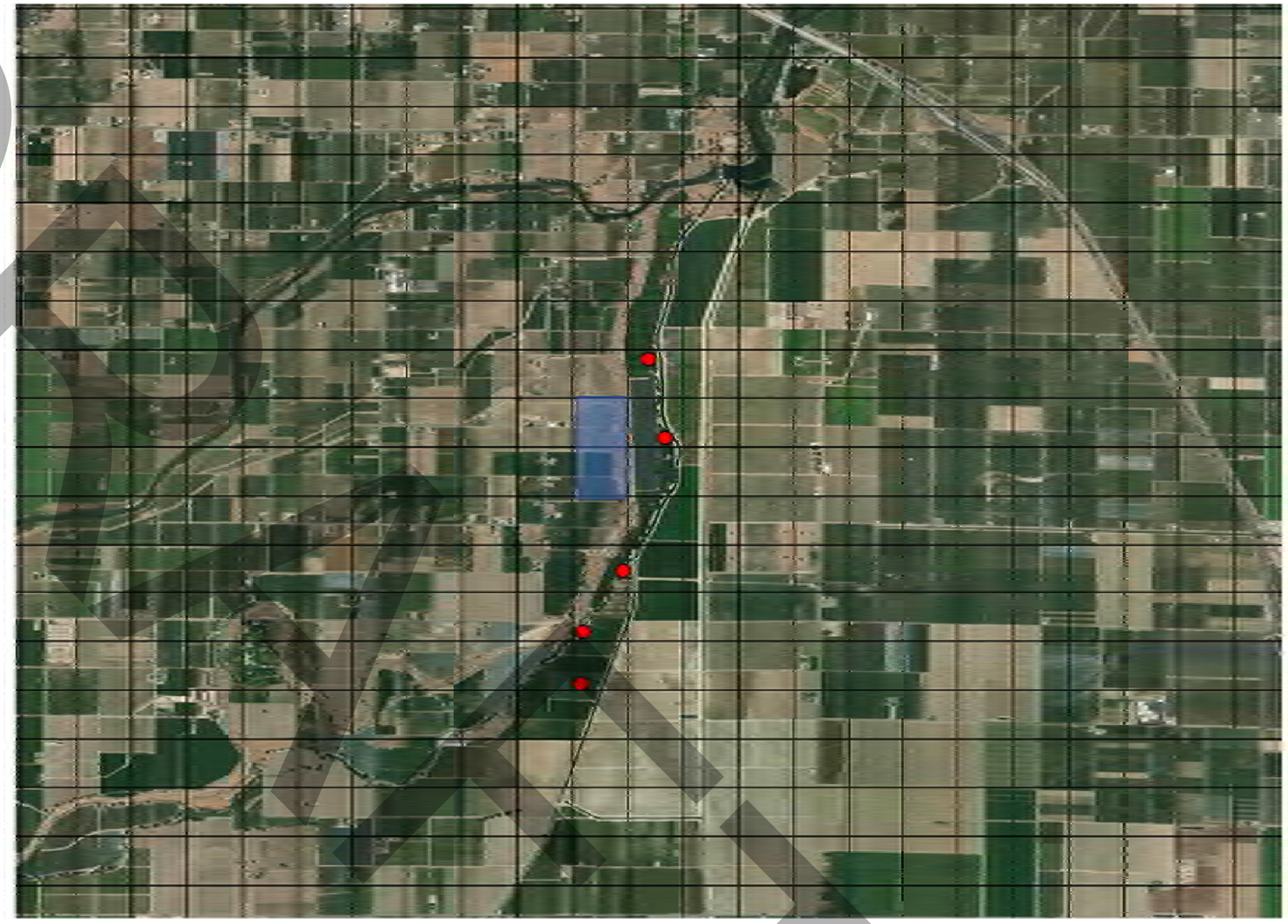
Estimated Annual Intentional Recharge - Corcoran Irrigation District

Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

By: dmb | Date: 07/30/19 | Project No.: FR18161220

Figure **D2-19**

Date	Cond 8 Recharge (AF/Y)	APEX Recharge (AF/Y)	APEX Recovery (AF/Y)	APEX Storage (AF/Y)
1990	1,021	--	--	--
1991	0	--	--	--
1992	0	--	--	--
1993	61	--	--	--
1994	0	--	--	--
1995	36,806	--	--	--
1996	8,541	--	--	--
1997	19,259	--	--	--
1998	37,879	--	--	--
1999	0	--	--	--
2000	0	--	--	--
2001	0	--	--	--
2002	0	225	0	225
2003	0	3,742	526	3,216
2004	0	0	912	-912
2005	5,442	10,994	0	10,994
2006	22,611	12,152	6,939	5,213
2007	0	3,630	6,319	-2,689
2008	0	2,792	5,435	-2,643
2009	0	9,514	7,677	1,837
2010	0	9,154	6,345	2,809
2011	32,441	10,292	0	10,292
2012	0	3,692	9,044	-5,352
2013	0	6,962	4,970	1,992
2014	0	441	298	143
2015	0	0	0	0
2016	42,672	0	0	0
Total	206,732	73,590	48,465	25,125

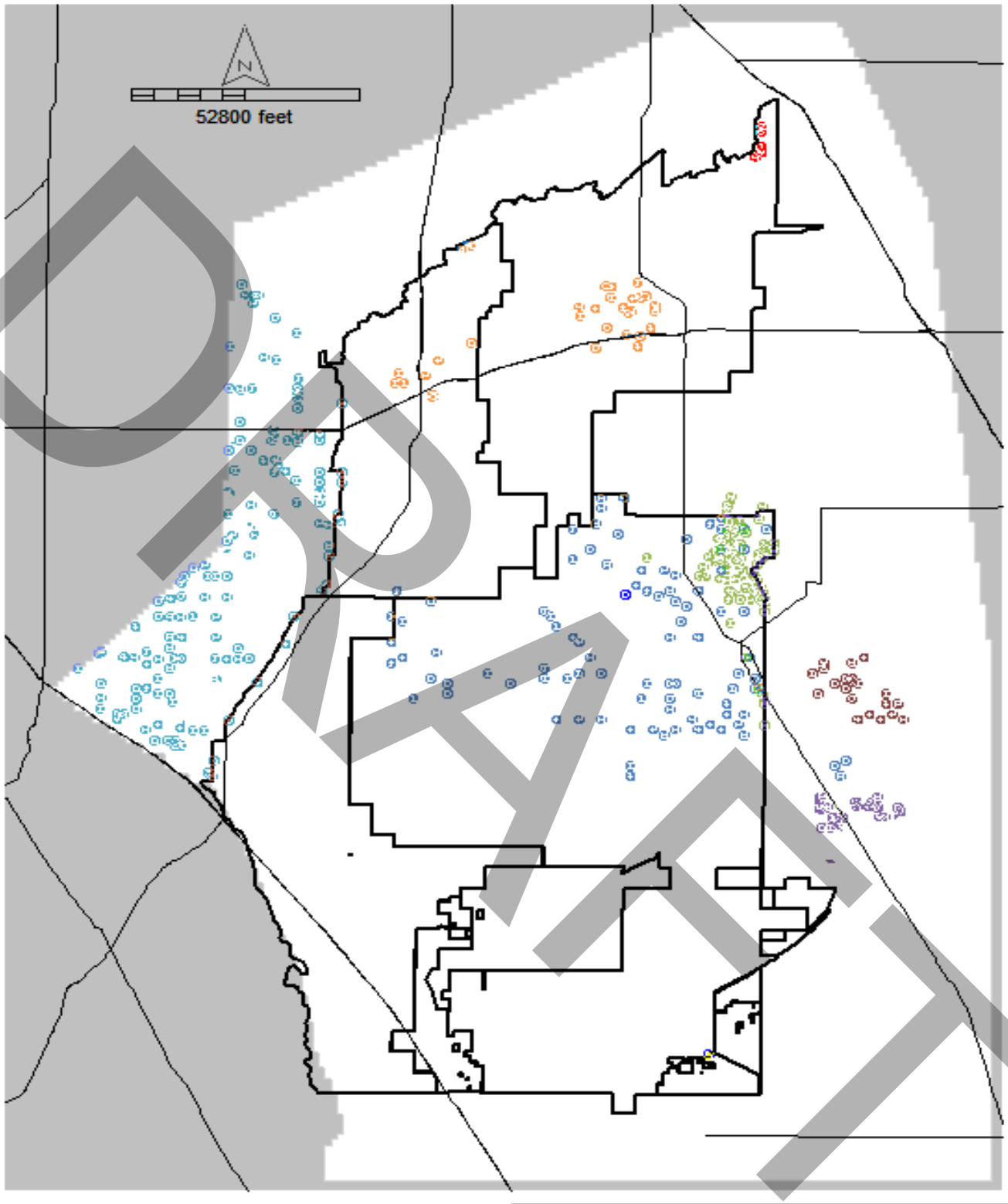


APEX Ranch Water Bank Recharge Pond
APEX Ranch Recover Well

Estimated Annual Intentional Recharge - Condition 8 and APEX Ranch
Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-20**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 2-21 Known Wells_9/7/2019



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- Apex Ranch
- Municipal
- Westlands WD
- Corcoran ID
- ElRico GSA
- Creighton Ranch
- Angiola Well Field

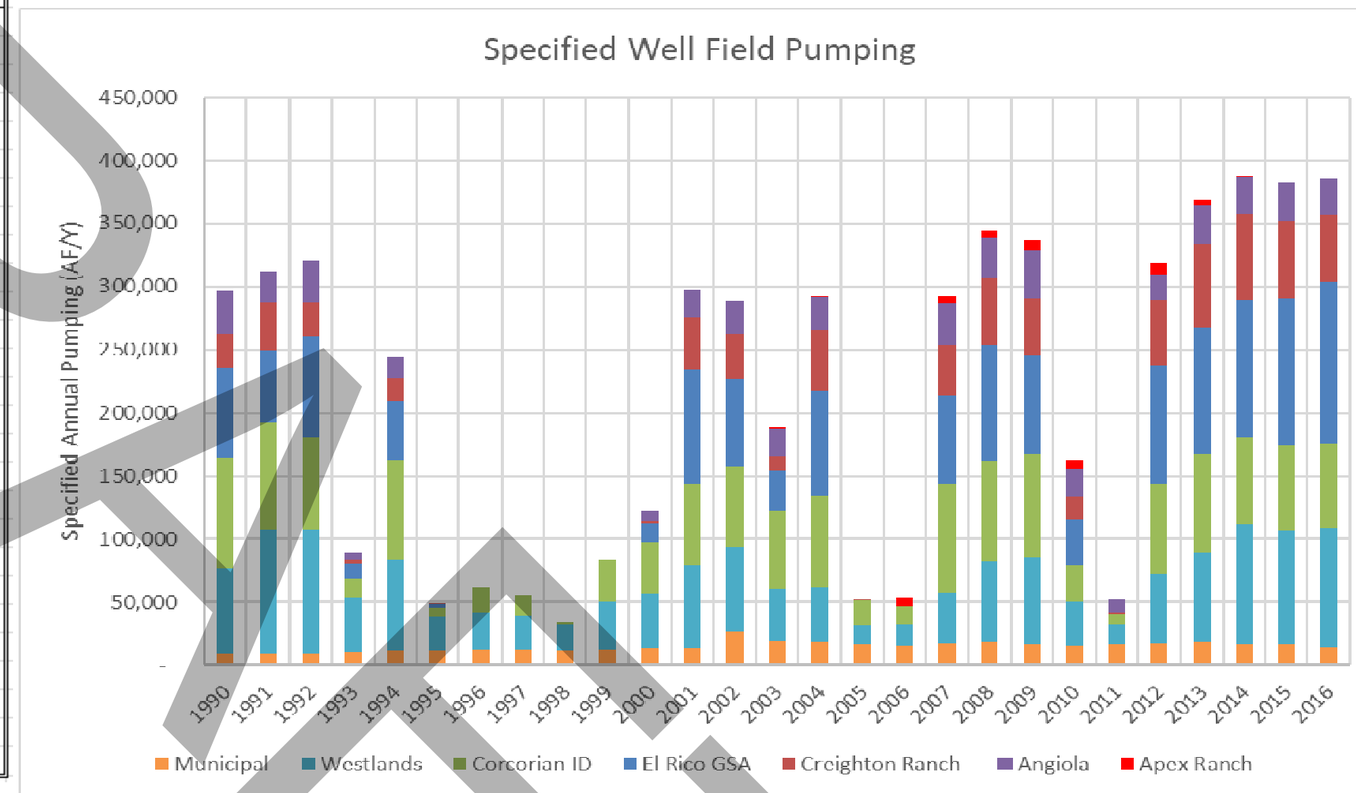
Location of Wells with Known Construction and Pumping

Tulare Lake Subbasin Groundwater Sustainabilty Plan

Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-21**

Date	El Rico GSA Well Field (AF/Y)	Creighton Ranch Well Field (AF/Y)	Corcorian ID Well Field (AF/Y)	Angiola Well Field (AF/Y)	Westlands Well Field (AF/Y)	Municipal Well Fields (AF/Y)	Apex Ranch Well Field (AF/Y)
1990	70,716	27,222	87,977	34,500	67,131	9,370	--
1991	57,509	38,484	84,438	23,396	98,656	9,109	--
1992	80,012	27,255	72,348	33,494	98,344	9,666	--
1993	11,395	4,035	14,248	5,956	44,056	10,208	--
1994	48,043	17,986	78,297	16,389	72,674	10,928	--
1995	2,897	905	7,145	-	27,589	10,775	--
1996	-	-	20,261	-	28,516	12,719	--
1997	-	-	15,586	-	27,000	12,775	--
1998	-	-	2,484	-	20,988	11,555	--
1999	-	-	33,406	-	37,185	13,087	--
2000	14,910	2,849	40,672	6,784	43,392	13,421	--
2001	89,799	41,120	64,353	23,244	65,947	13,895	--
2002	68,933	35,843	64,736	26,537	66,530	26,701	-
2003	32,420	10,856	62,246	22,429	40,841	19,349	526
2004	82,875	47,511	74,007	26,805	42,115	18,777	912
2005	-	468	20,138	662	14,744	16,536	-
2006	-	72	14,034	141	16,526	15,822	6,939
2007	69,863	40,266	85,434	32,894	40,373	17,221	6,319
2008	92,269	52,980	79,362	32,502	63,519	18,432	5,435
2009	78,097	45,292	81,493	37,798	69,904	16,354	7,677
2010	36,129	17,740	29,669	22,568	34,895	15,271	6,345
2011	606	314	7,328	11,336	15,509	17,042	-
2012	95,154	52,325	70,008	19,388	55,298	17,467	9,044
2013	100,275	66,005	78,175	30,528	70,940	18,411	4,970
2014	108,976	68,726	69,880	27,695	94,077	16,930	298
2015	116,254	61,050	67,982	30,220	90,723	16,146	-
2016	126,886	53,113	67,982	29,047	93,853	14,555	-



Annual Specified Well Field Pumping
Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

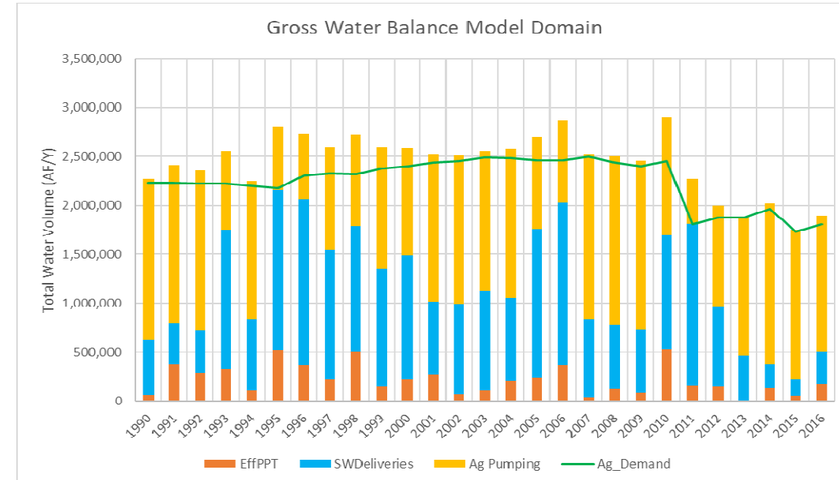
By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-22**

Annual Crop Demand (AF/Y)

Date	TLSB	Westside	Kings	Kaweah	Tule	Kern	Total
1990	899,240	291,990	330,754	424,556	197,637	87,217	2,231,393
1991	899,228	288,262	330,740	424,556	197,637	87,217	2,227,639
1992	900,123	284,489	331,041	424,998	197,921	87,318	2,225,890
1993	899,203	283,147	330,725	424,556	197,637	87,217	2,222,484
1994	898,828	263,495	330,725	424,556	197,637	87,217	2,202,456
1995	898,741	243,070	330,667	424,556	197,637	87,217	2,181,887
1996	981,073	257,687	293,933	406,852	254,257	107,481	2,301,283
1997	984,097	268,823	302,459	408,439	253,933	108,406	2,326,158
1998	987,935	243,239	311,161	410,462	254,000	109,483	2,316,281
1999	1,061,135	263,950	318,152	415,430	253,992	63,054	2,375,713
2000	1,078,160	258,530	325,943	418,470	254,108	66,574	2,401,785
2001	1,087,722	283,910	327,199	419,045	253,769	69,132	2,440,778
2002	1,098,452	277,743	328,684	420,081	253,820	71,790	2,450,569
2003	1,109,292	299,919	330,155	421,117	253,870	74,447	2,488,801
2004	1,111,553	289,665	330,466	422,104	254,310	75,582	2,483,679
2005	1,111,314	268,262	330,265	422,163	253,971	76,507	2,462,481
2006	1,112,413	261,146	330,192	422,685	254,021	77,537	2,457,995
2007	1,072,540	280,336	259,385	387,633	290,933	205,928	2,496,756
2008	1,003,256	273,945	258,252	421,390	296,194	186,808	2,439,846
2009	1,010,832	305,821	257,703	336,797	250,674	237,356	2,399,183
2010	993,478	278,025	283,228	346,870	301,120	247,643	2,450,365
2011	763,367	257,795	220,309	346,680	152,303	67,393	1,807,847
2012	737,036	292,444	228,697	361,650	182,653	73,426	1,875,904
2013	742,087	318,593	204,094	346,907	166,566	96,210	1,874,457
2014	699,296	365,392	240,781	343,552	193,931	120,344	1,963,297
2015	565,302	370,658	224,933	318,118	170,463	83,566	1,733,039
2016	644,432	371,623	242,684	317,784	152,776	80,645	1,809,944
Min	565,302	243,070	204,094	317,784	152,303	63,054	1,733,039
Max	1,112,413	371,623	331,041	424,998	301,120	247,643	2,496,756
Average	938,894	286,739	293,827	394,889	227,325	104,545	2,246,219

Annual Effective Precipitation (AF/Y)

Date	TLSB	Westside	Kings	Kaweah	Tule	Kern	Total
1990	29,405	4,356	10,571	10,710	6,158	3,378	64,578
1991	180,980	23,696	43,506	58,523	43,824	25,090	375,618
1992	140,617	25,747	34,660	39,891	29,881	17,221	288,017
1993	162,888	27,929	43,774	47,801	32,889	19,601	334,881
1994	52,536	6,178	15,150	16,848	12,552	7,556	110,820
1995	250,925	38,885	67,395	79,934	54,531	31,235	522,906
1996	174,776	21,996	51,123	60,728	38,800	21,295	368,718
1997	107,517	14,345	30,451	37,794	24,545	13,159	227,811
1998	240,579	36,457	60,584	74,457	59,943	38,198	510,218
1999	68,182	6,722	17,041	24,055	18,757	11,289	146,045
2000	103,955	14,037	40,679	39,454	22,138	11,059	231,322
2001	123,150	18,280	39,669	45,921	28,891	17,090	273,000
2002	31,822	4,352	12,745	12,481	7,903	3,892	73,193
2003	49,979	7,232	18,152	18,990	10,354	6,297	111,004
2004	103,157	16,951	30,992	31,847	20,164	11,894	215,006
2005	114,753	16,872	32,494	35,885	26,120	16,203	242,327
2006	172,452	21,719	48,407	63,678	40,362	20,039	366,658
2007	17,918	1,951	7,530	7,458	4,054	1,557	40,467
2008	56,121	9,882	19,155	21,093	13,332	6,202	125,785
2009	43,150	5,775	12,341	14,359	8,685	5,374	89,685
2010	249,164	34,595	62,810	81,240	63,405	37,584	528,797
2011	79,487	10,920	22,296	23,662	16,837	8,898	162,100
2012	69,600	8,881	20,233	25,412	17,114	8,734	149,973
2013	3,659	329	534	1,181	1,067	610	7,380
2014	65,032	10,759	18,394	21,619	13,090	6,177	135,070
2015	24,694	3,291	9,581	11,207	6,009	1,641	56,423
2016	82,029	15,780	27,714	28,407	16,148	9,245	179,324
Min	3,659	329	534	1,181	1,067	610	7,380
Max	250,925	38,885	67,395	81,240	63,405	38,198	528,797
Average	103,649	15,108	29,555	34,616	23,613	13,353	219,894

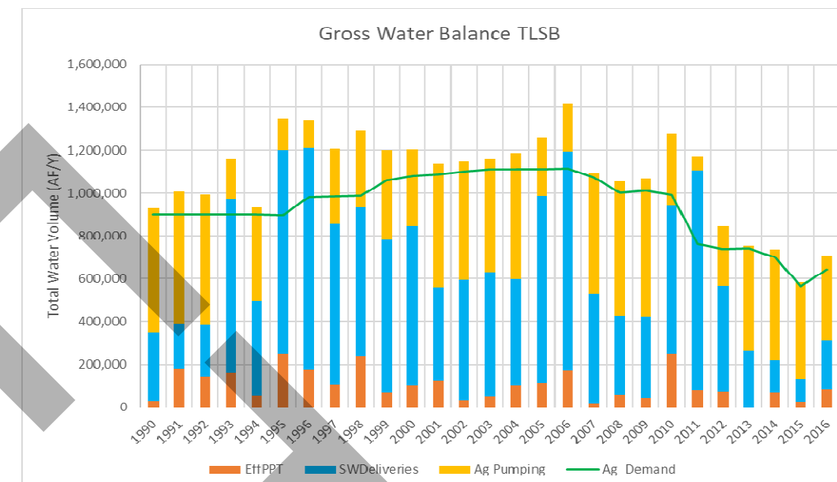


Annual Surface Water Deliveries (AF/Y)

Date	TLSB	Westside	Kings	Kaweah	Tule	Kern	Total
1990	319,622	101,619	47,787	34,733	14,511	46,975	565,248
1991	209,114	50,258	60,710	67,030	20,368	16,662	424,142
1992	245,057	51,466	47,261	48,204	18,265	29,256	439,510
1993	810,186	109,501	160,461	166,035	85,071	83,829	1,415,083
1994	443,296	94,821	69,354	56,681	22,866	44,530	731,548
1995	947,603	127,445	186,724	199,827	82,318	91,195	1,635,112
1996	1,036,884	155,077	177,251	163,768	75,817	87,846	1,696,643
1997	748,165	162,214	142,109	131,813	63,410	68,603	1,316,314
1998	692,922	127,058	153,528	179,774	54,049	69,486	1,276,818
1999	712,547	147,012	123,972	90,454	49,410	82,217	1,205,613
2000	740,656	114,048	129,646	131,211	53,836	85,257	1,254,654
2001	437,423	100,121	73,831	75,856	27,236	31,432	745,899
2002	563,569	107,249	87,814	79,437	28,684	51,013	917,765
2003	582,522	124,958	97,015	100,930	46,590	63,012	1,015,028
2004	495,274	120,232	80,250	71,463	28,189	49,469	844,876
2005	872,404	138,809	158,051	161,487	78,104	109,872	1,518,728
2006	1,019,905	147,160	170,835	150,345	74,983	100,583	1,663,811
2007	508,650	117,825	51,461	60,221	21,430	44,262	803,848
2008	370,464	64,289	83,880	74,197	29,911	34,341	657,082
2009	378,883	33,075	79,099	81,233	39,292	34,417	645,999
2010	693,443	81,618	120,617	145,326	54,007	71,839	1,166,851
2011	1,025,257	125,783	159,489	165,812	78,345	97,317	1,652,002
2012	498,353	90,342	72,089	57,021	26,222	65,649	809,676
2013	264,123	51,613	46,339	33,756	17,953	41,540	455,323
2014	154,032	15,048	31,675	8,517	7,799	24,232	241,303
2015	107,075	9,806	18,240	7,154	7,800	24,819	174,894
2016	227,464	15,061	31,676	8,505	24,909	24,233	331,849
Min	107,075	9,806	18,240	7,154	7,799	16,662	174,894
Max	1,036,884	162,214	186,724	199,827	85,071	109,872	1,696,643
Average	559,441	95,685	98,562	94,474	41,903	58,292	948,356

Annual Agricultiral Pumping Demand (AF/Y)

Date	TLSB	Westside	Kings	Kaweah	Tule	Kern	Total
1990	-579,392	-195,799	-272,396	-379,112	-176,967	-39,942	-1,643,609
1991	-615,666	-222,310	-242,280	-318,638	-152,734	-61,823	-1,613,451
1992	-607,207	-208,105	-259,434	-346,623	-160,538	-49,825	-1,631,733
1993	-187,308	-154,976	-144,086	-225,620	-94,747	-6,143	-812,880
1994	-436,029	-171,666	-246,221	-351,027	-162,219	-41,433	-1,408,595
1995	-150,552	-102,203	-113,599	-186,946	-90,057	-5,868	-649,226
1996	-130,756	-99,815	-84,209	-193,876	-148,813	-18,141	-675,611
1997	-350,459	-101,456	-143,164	-250,772	-173,732	-35,410	-1,054,993
1998	-358,649	-102,743	-118,762	-178,673	-161,117	-24,136	-944,080
1999	-417,727	-124,535	-187,294	-311,034	-197,720	-3,573	-1,241,883
2000	-357,361	-134,681	-172,312	-255,632	-179,770	-2,783	-1,102,539
2001	-576,351	-173,153	-220,655	-300,149	-198,745	-31,323	-1,500,376
2002	-555,067	-166,143	-228,125	-328,163	-217,233	-18,837	-1,513,568
2003	-526,923	-176,010	-217,125	-301,198	-196,926	-15,963	-1,434,146
2004	-589,313	-163,325	-224,170	-318,793	-205,957	-23,283	-1,524,841
2005	-275,238	-122,473	-145,391	-229,861	-156,859	0	-929,822
2006	-226,208	-102,677	-125,002	-226,671	-148,841	0	-829,400
2007	-567,188	-164,309	-200,395	-319,955	-265,449	-161,474	-1,678,768
2008	-626,693	-199,774	-161,109	-328,079	-254,174	-147,314	-1,717,143
2009	-646,999	-266,971	-166,263	-241,204	-202,960	-197,565	-1,721,963
2010	-335,748	-177,174	-134,351	-167,950	-222,543	-163,075	-1,200,841
2011	-64,909	-122,418	-49,664	-157,206	-58,470	-3,196	-455,862
2012	-278,297	-195,547	-137,844	-279,216	-139,563	-10,738	-1,041,205
2013	-484,432	-266,652	-157,220	-311,970	-147,545	-54,061	-1,421,880
2014	-516,434	-339,585	-196,445	-318,910	-178,068	-92,636	-1,642,079
2015	-452,095	-357,561	-197,893	-299,757	-156,654	-57,106	-1,521,066
2016	-395,523	-342,629	-191,188	-285,739	-117,426	-51,828	-1,384,333
Min	-646,999	-357,561	-272,396	-379,112	-265,449	-197,565	-1,721,963
Max	-64,909	-99,815	-49,664	-157,206	-58,470	0	-455,862
Average	-418,834	-183,507	-175,430	-274,547	-169,105	-48,795	-1,270,218

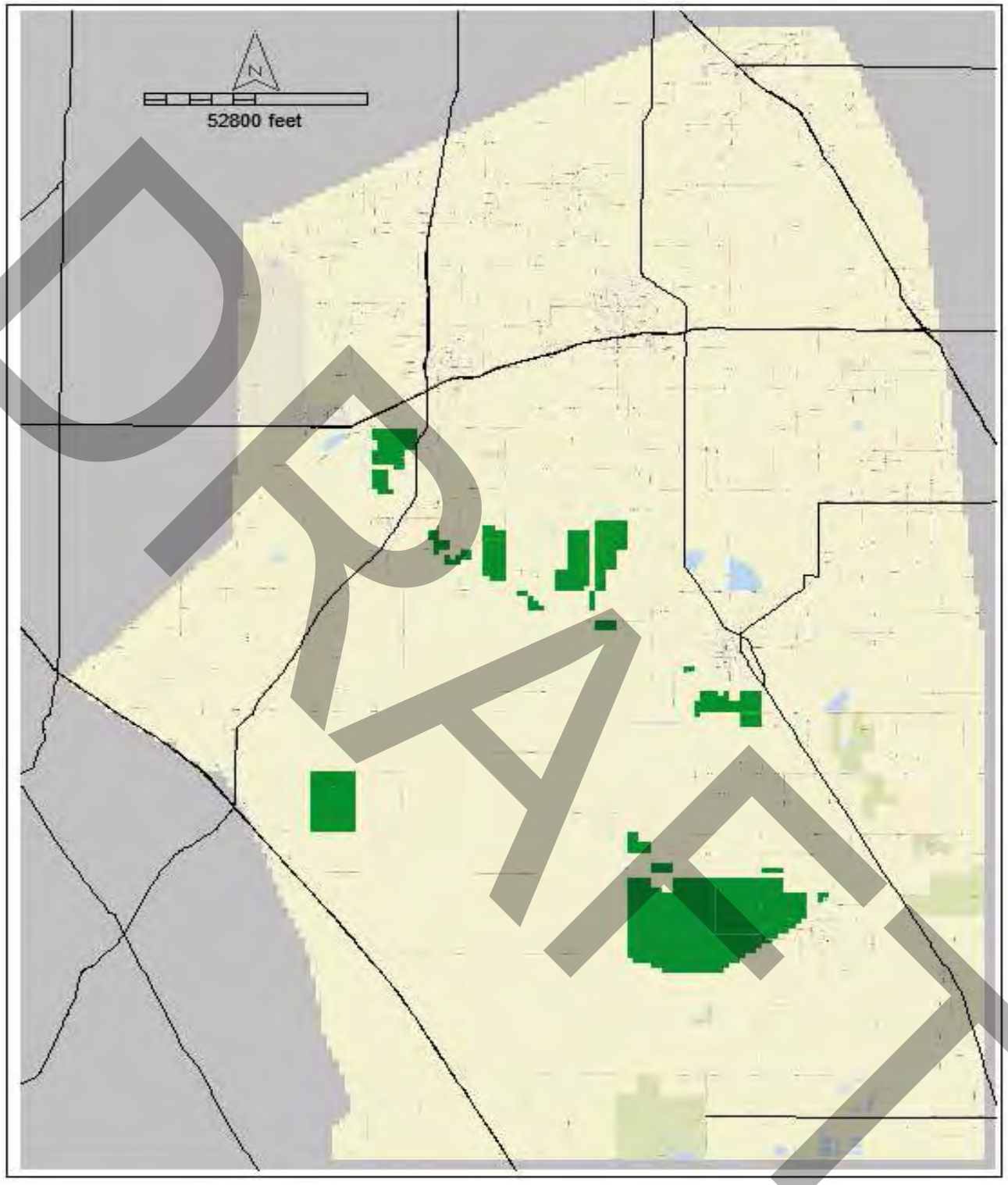


Gross Annual Water Balance

Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-23**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 2-24 Ag Drains_9/7/2019



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Legend

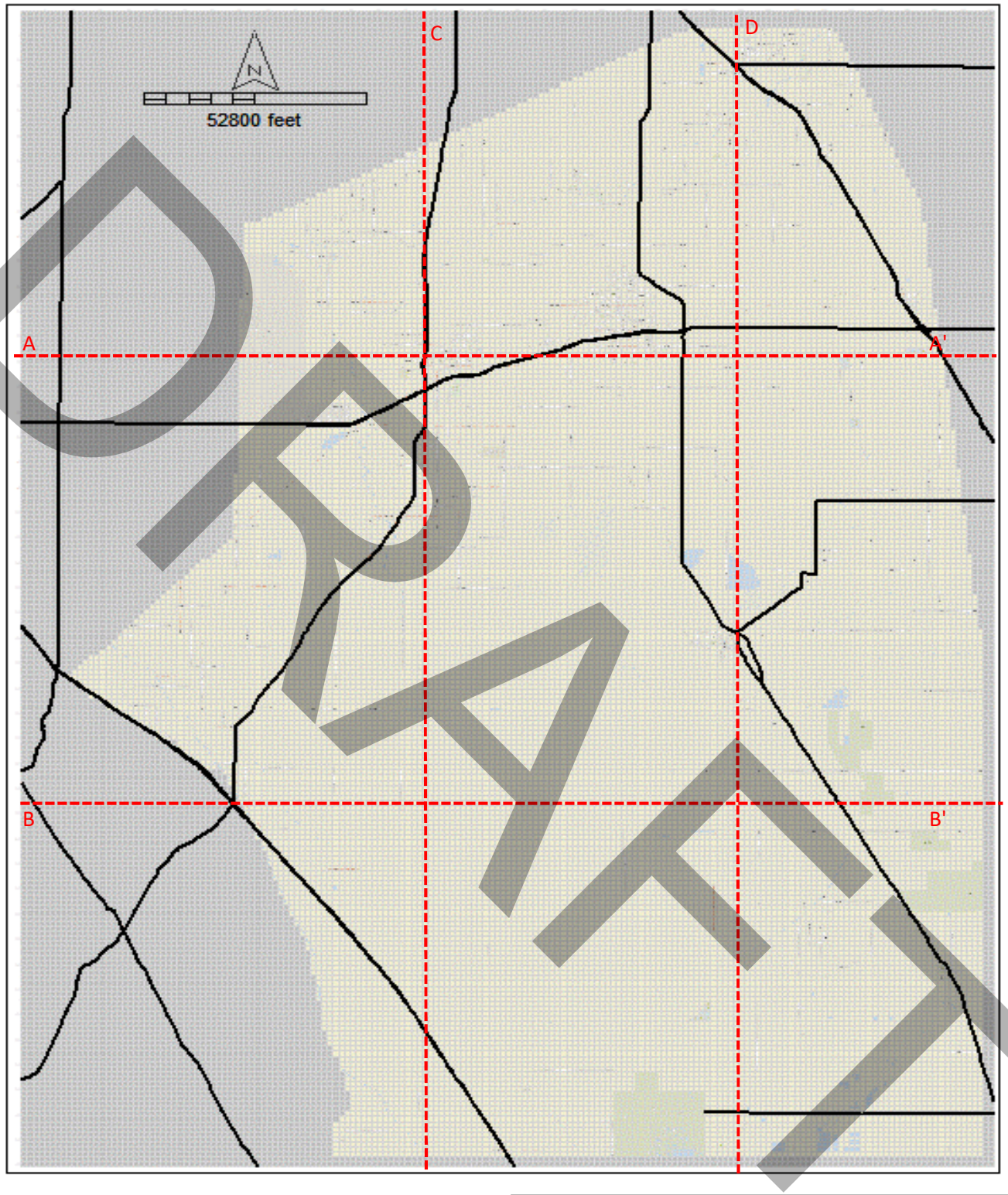
Model Area

Sub-Surface Drains

Approximate Location of Sub-Surface Drainage Systems

Tulare Lake Subbasin Groundwater Sustainabilty Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D2-24**



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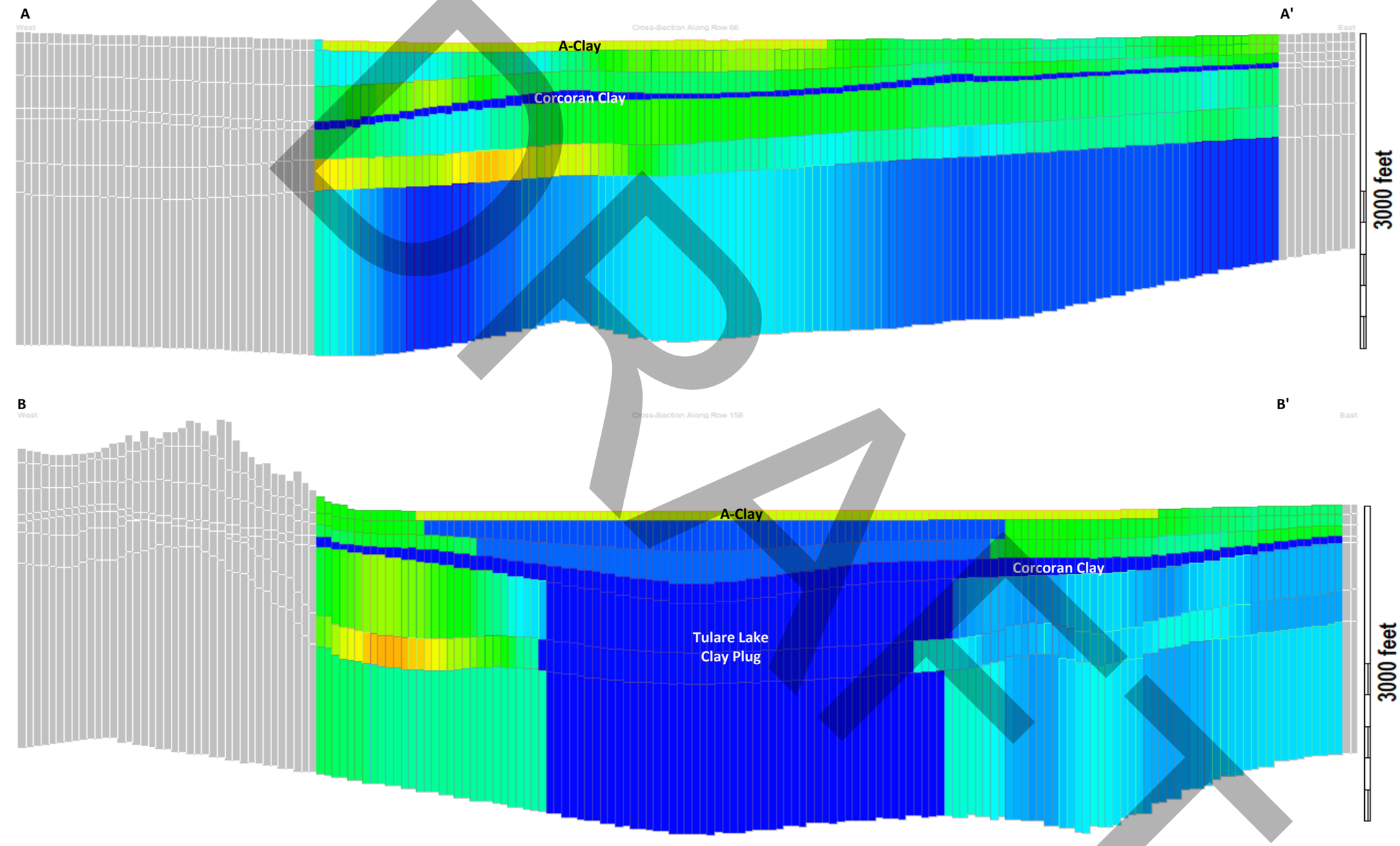
Legend

- Cross Section
- Major Roads
- No Flow

Tulare Lake Subbasin Hydrologic Model Domaind and Grid

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-1**



Vertical Exaggeration 20 X

Hydraulic Conductivity in Feet per day (ft/d)

0.01 5 10 15 20 25 30 35 40

Model Layers and East-West Cross-Sections A-A' and B-B'

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-2**

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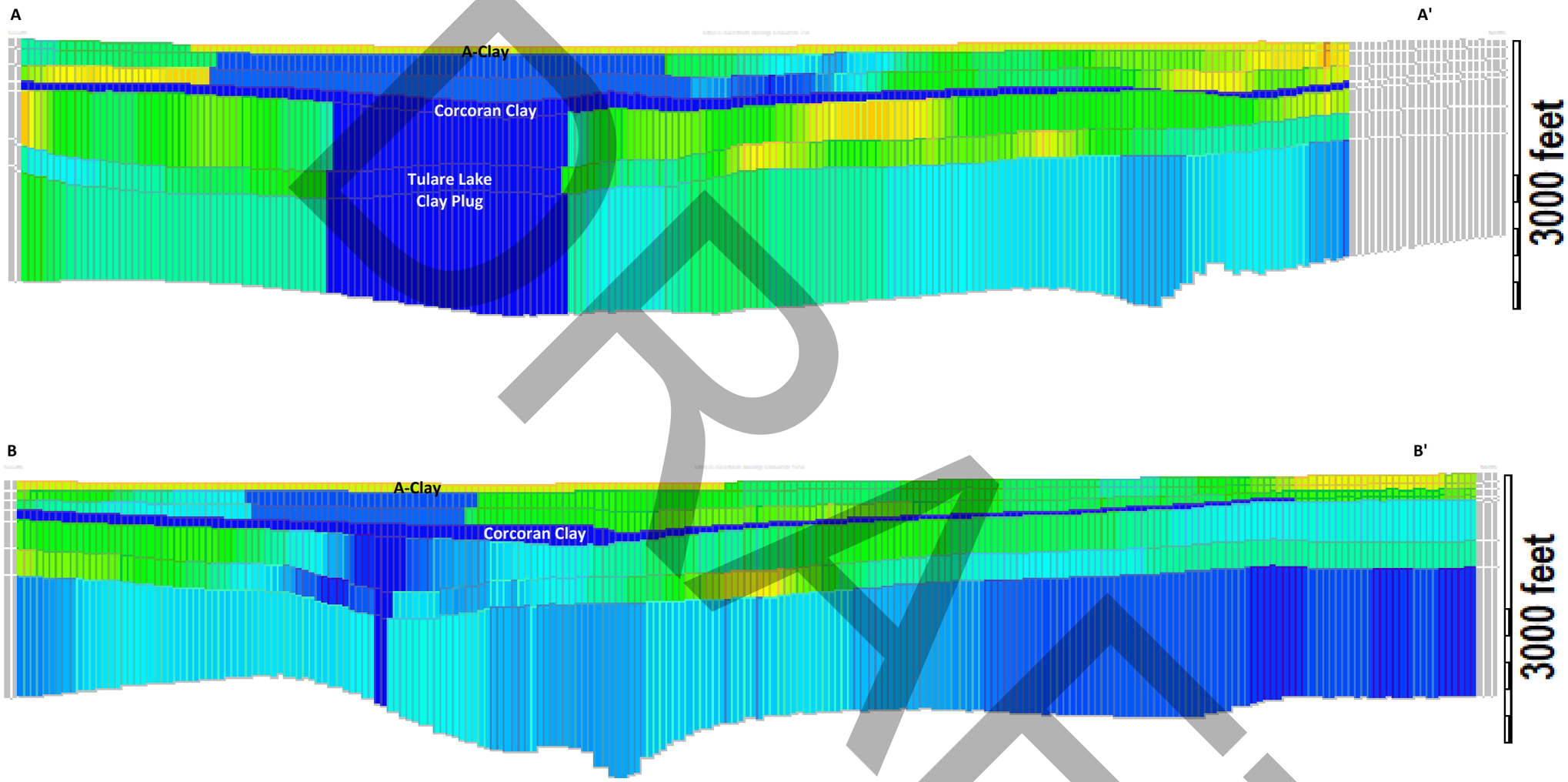
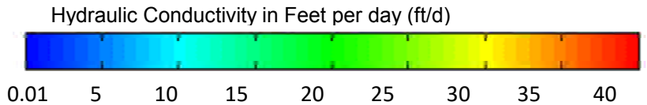


Vertical Exaggeration 20 X

Hydraulic Conductivity in Feet per day (ft/d)



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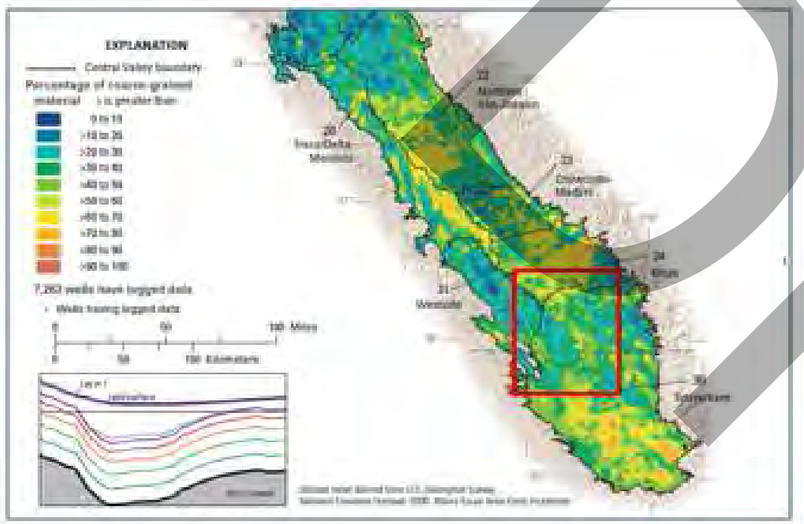
Model Layers and North-South Cross-Sections C-C' and D-D'

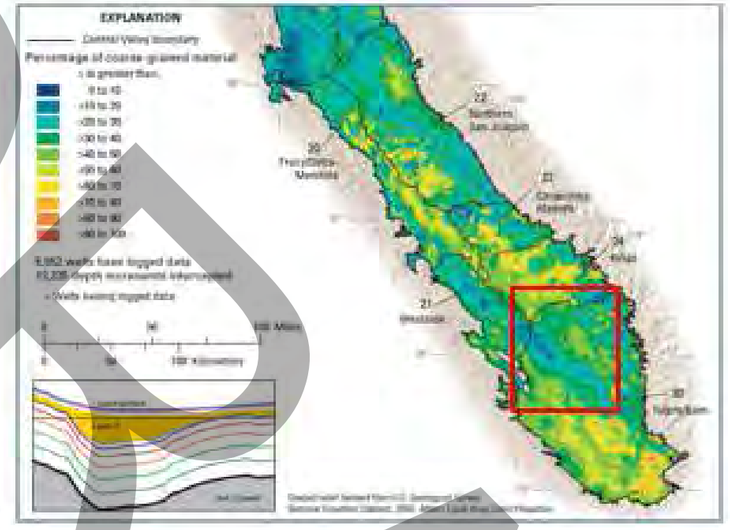
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-3**

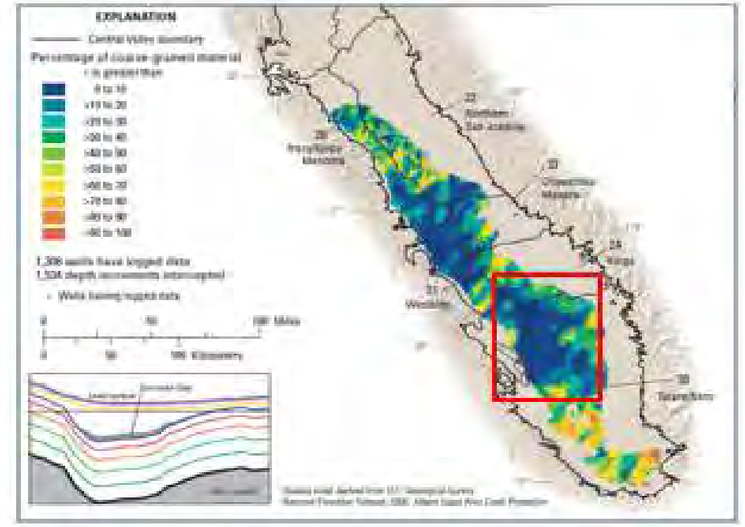
a. 0 - 50 foot depth interval



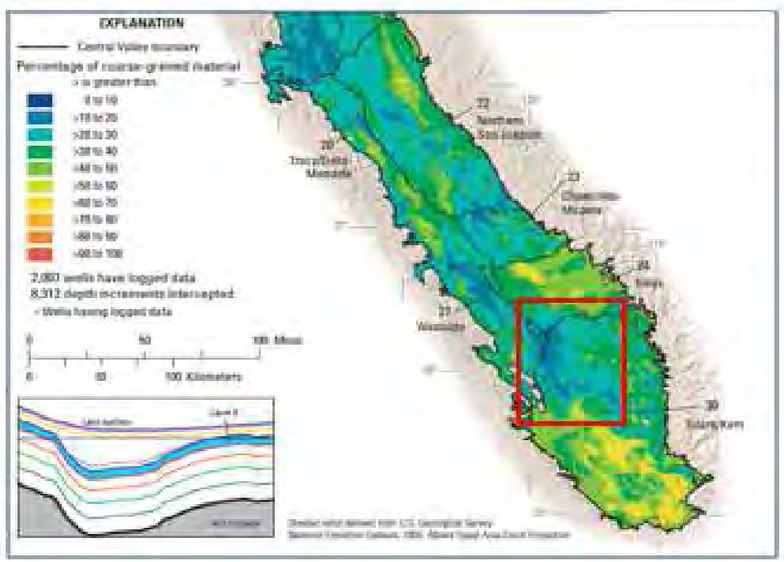
b. 50 - 200 foot depth interval



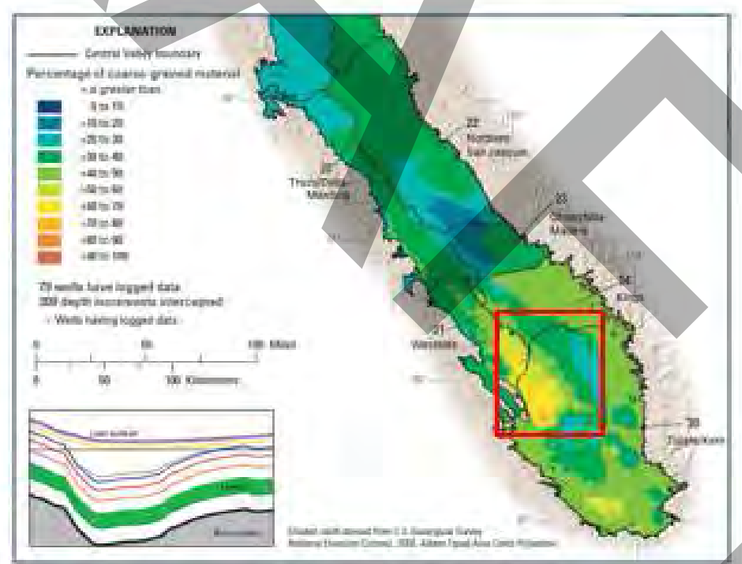
c. Corcoran Clay Depth interval



d. 100 foot depth interval immediately below Corcoran Clay



e. 200 foot depth interval from 400 to 700 feet bgs



Tulare Lake Subbasin Hydrologic Model study area

* adapted from Fig. A12, USGS Prof. Paper 1766

Kriged Distribution of Coarse Fraction For San Joaquin Valley Basin-Fill Sediments at Five Depth Intervals

Tulare Lake Subbasin SGMA Model

Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-4**

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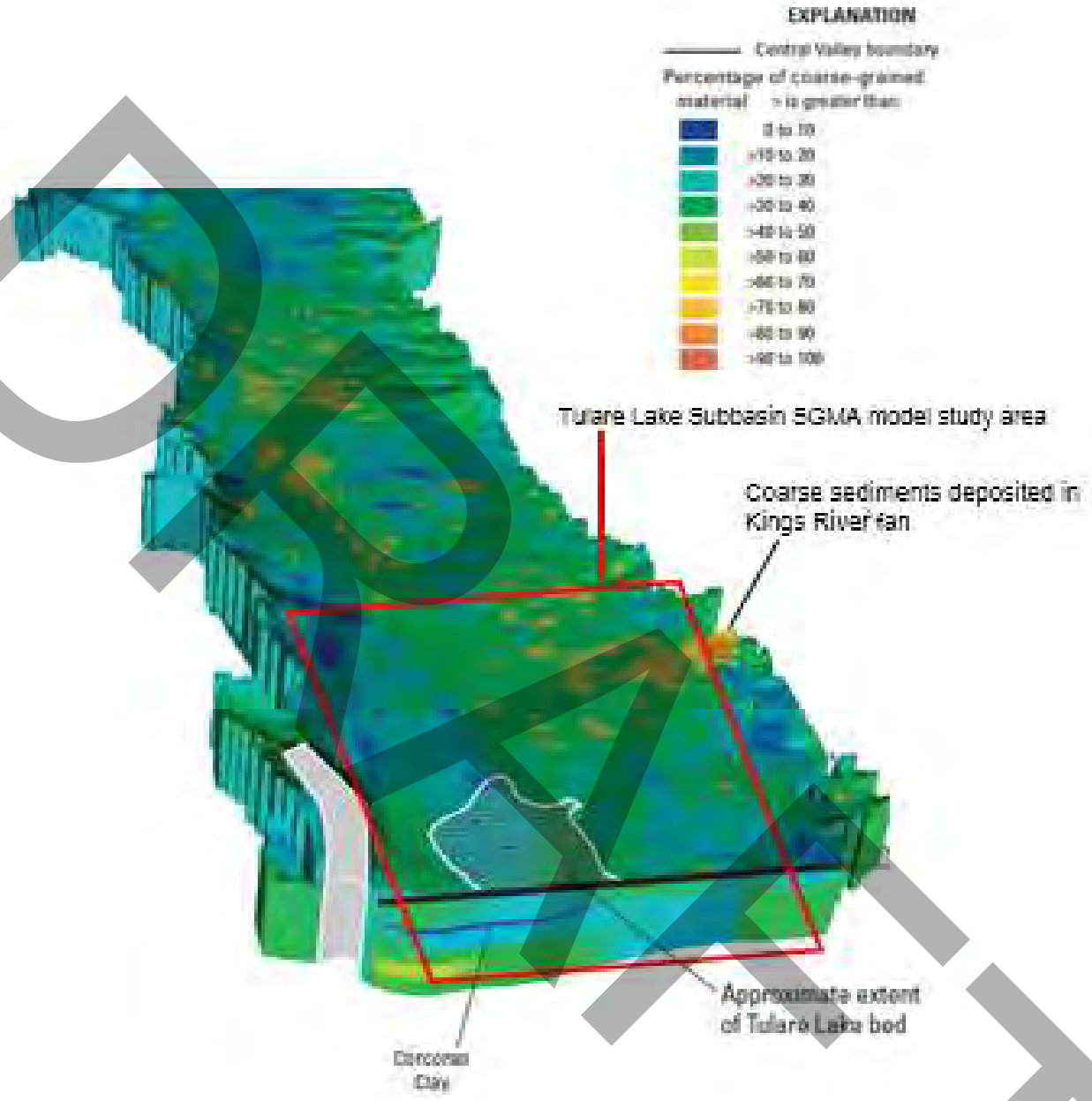

Adapted from Fig. A19, USGS Prof. Paper 1766

3D Oblique Image of San Joaquin Valley Coarse Fraction Percentage Estimated by USGS Sediment Texture Study

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-5**

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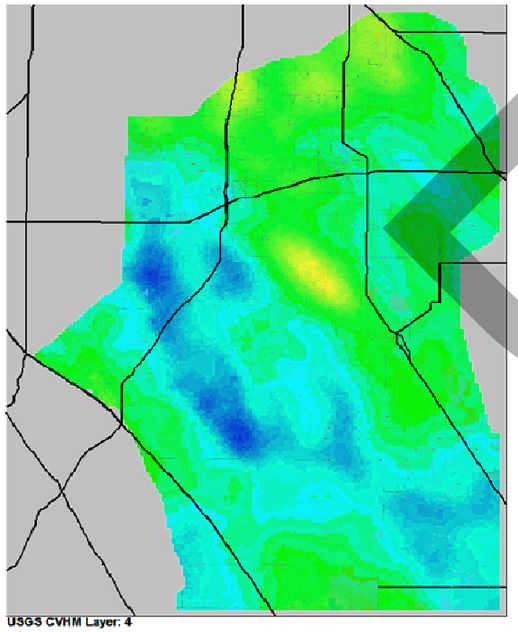

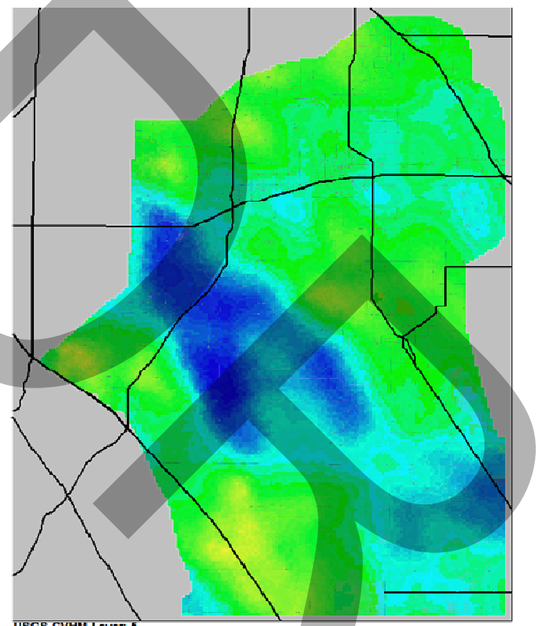

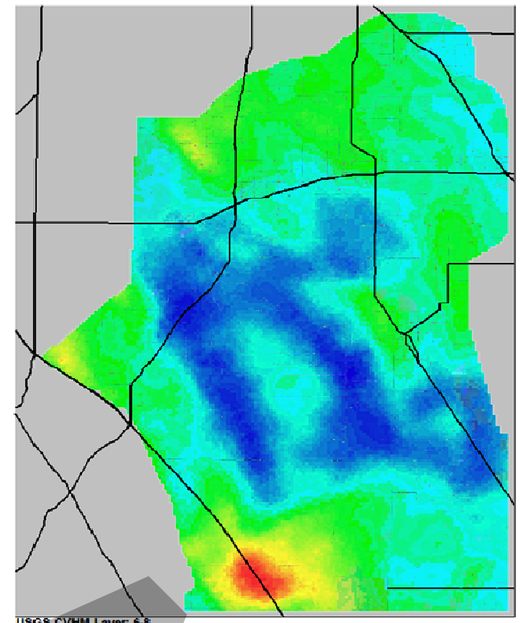

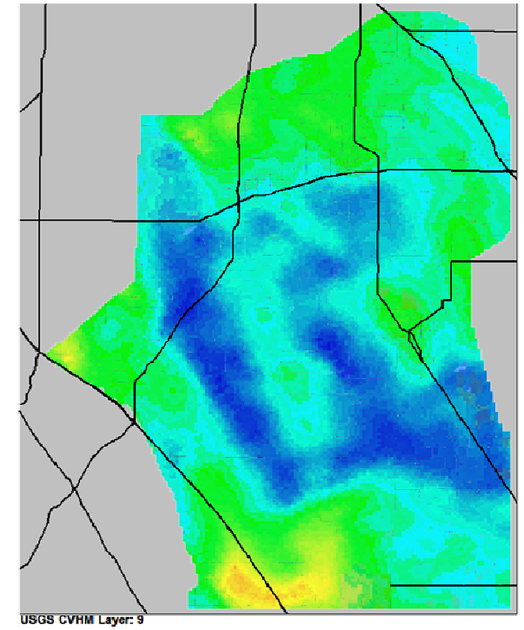

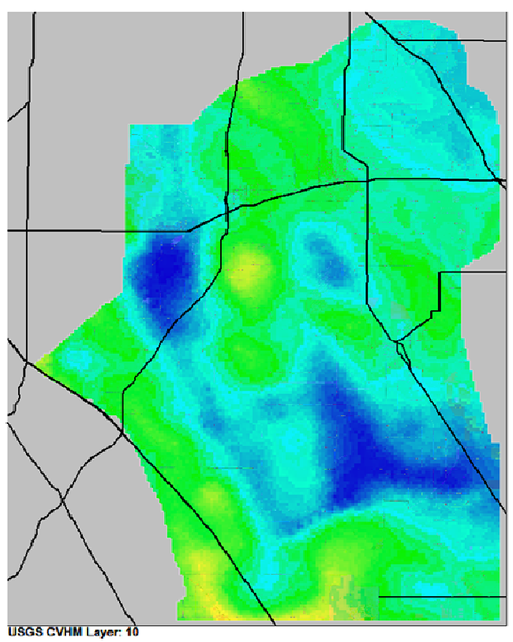

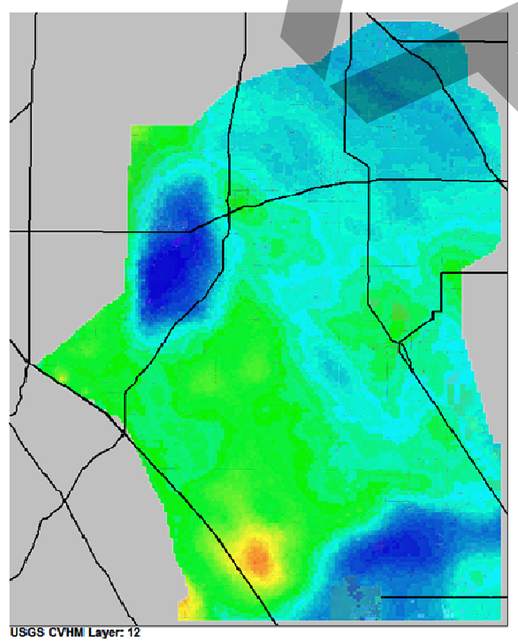

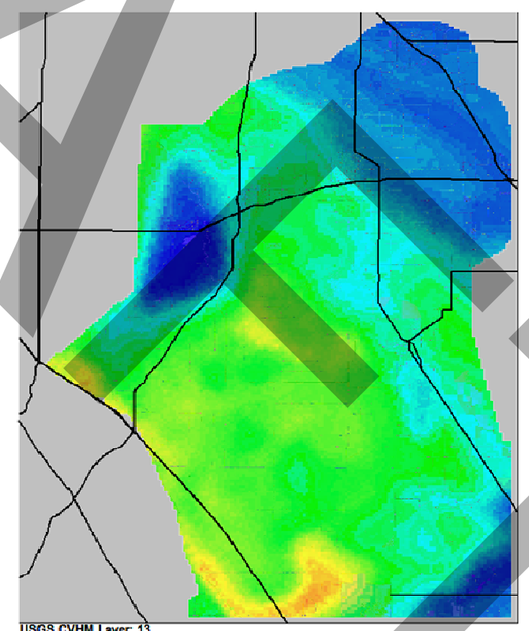

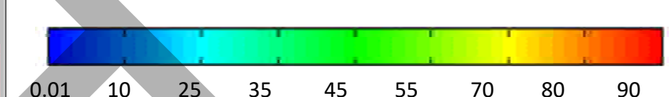

USGS CVHM Hydraulic Conductivity Distribution

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-6**

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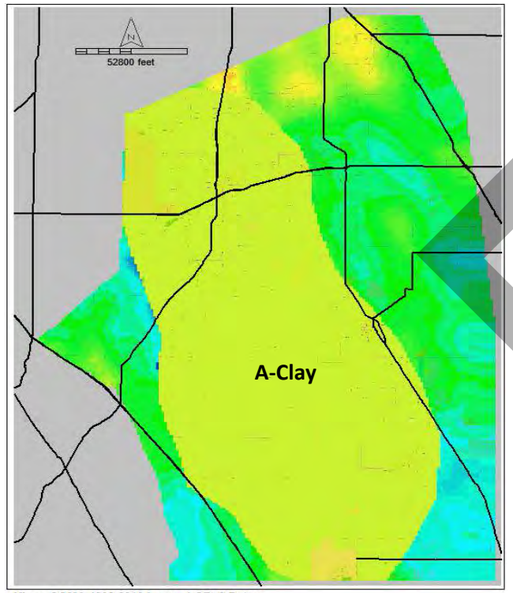

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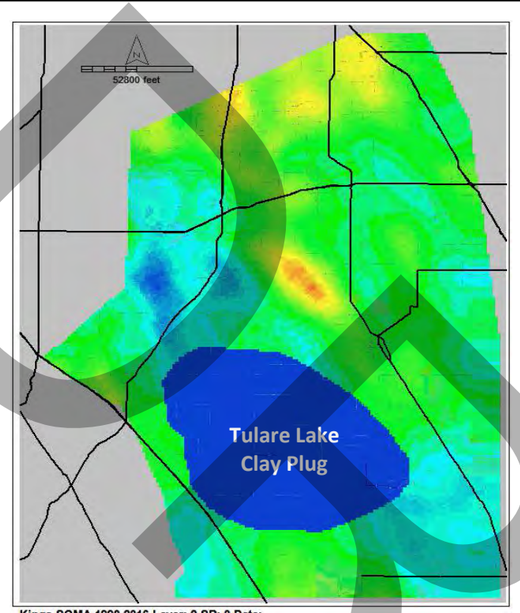

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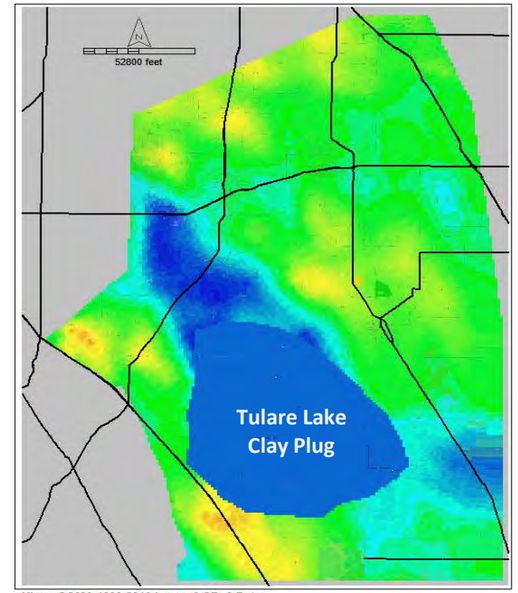

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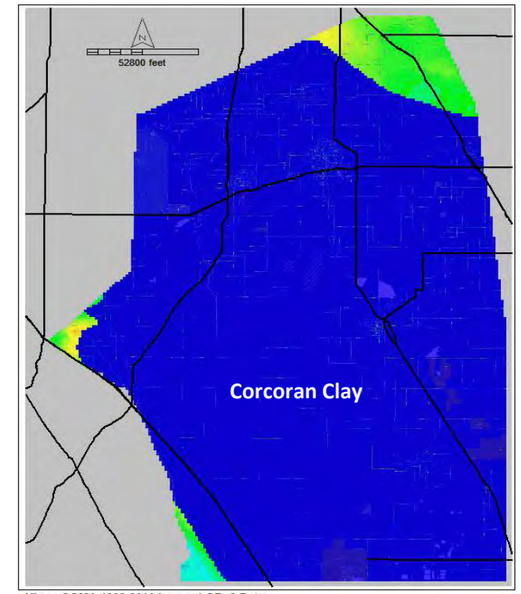

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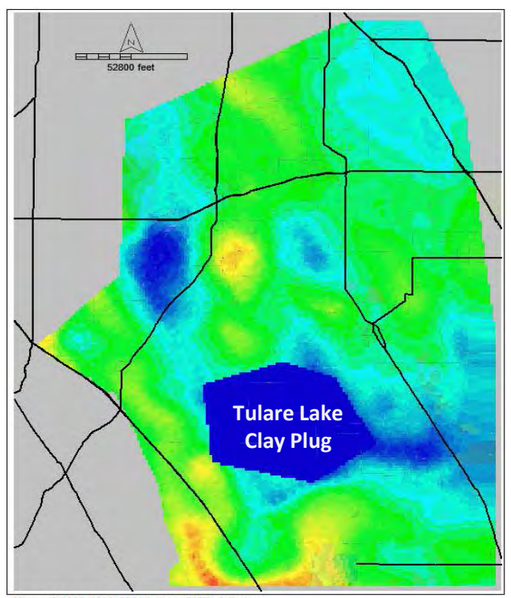

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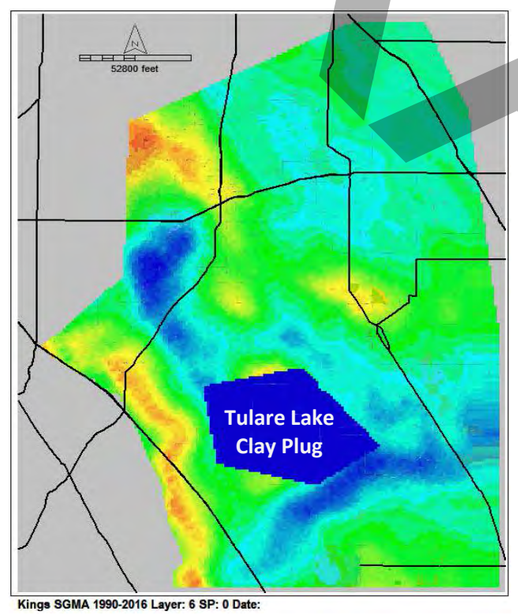

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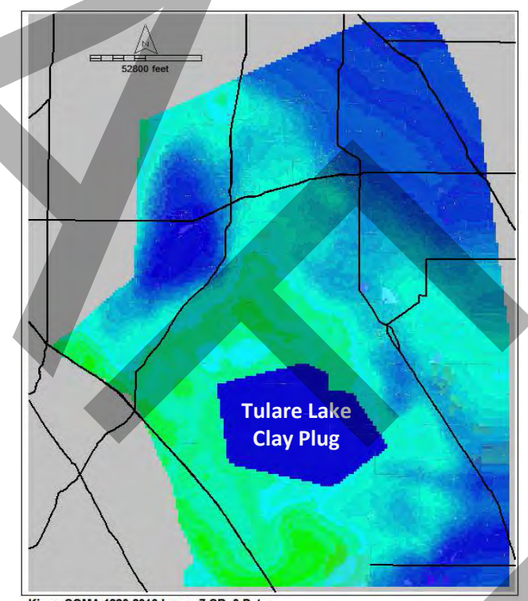

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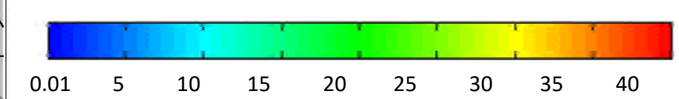
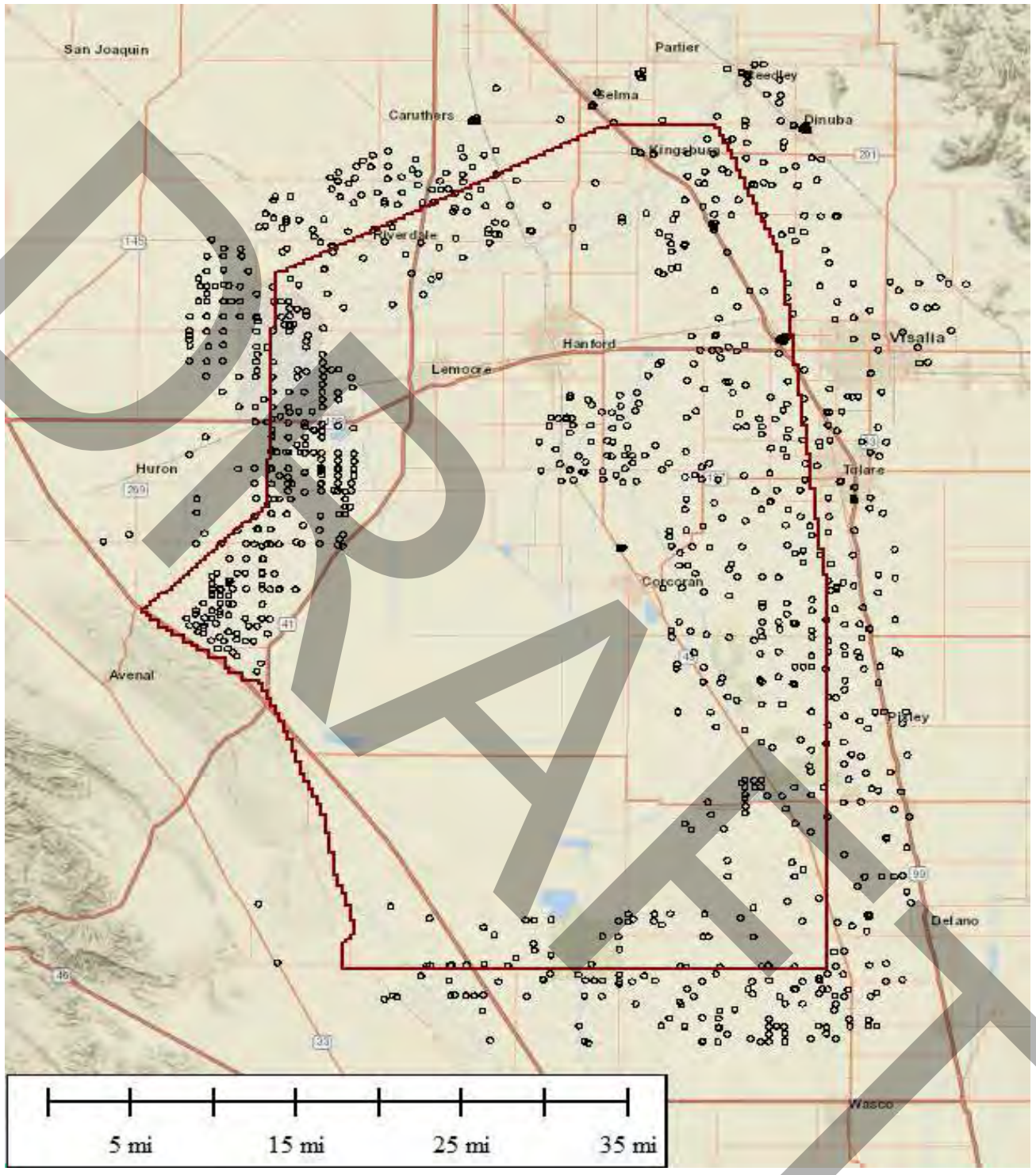


Calibrated Model Layer Hydraulic Conductivity Distribution

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-7**

草稿

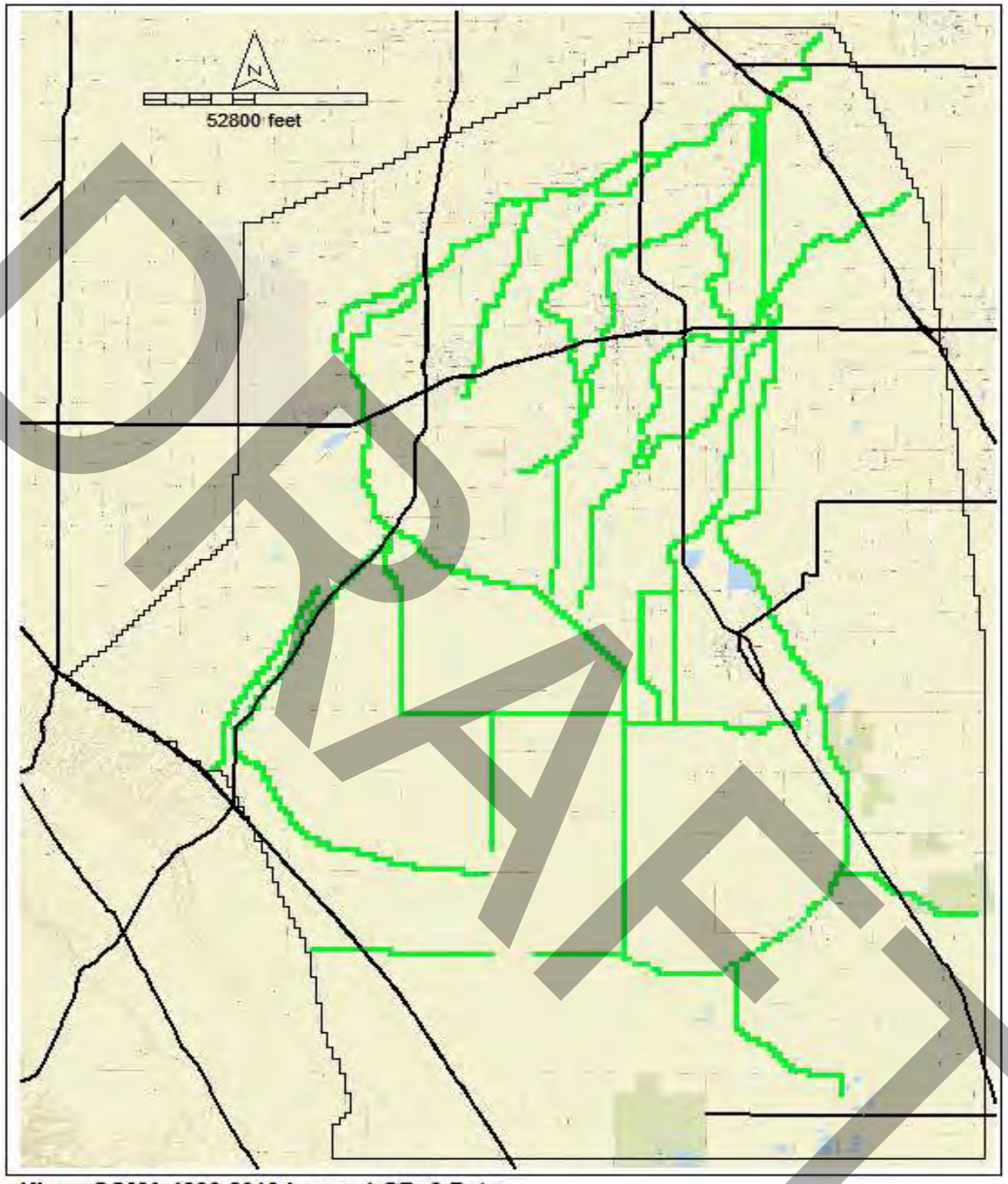


DRAFT

Location of Wells Evaluated for General Head Boundaries

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-8**



Kings SGMA 1990-2016 Layer: 1 SP: 0 Date:

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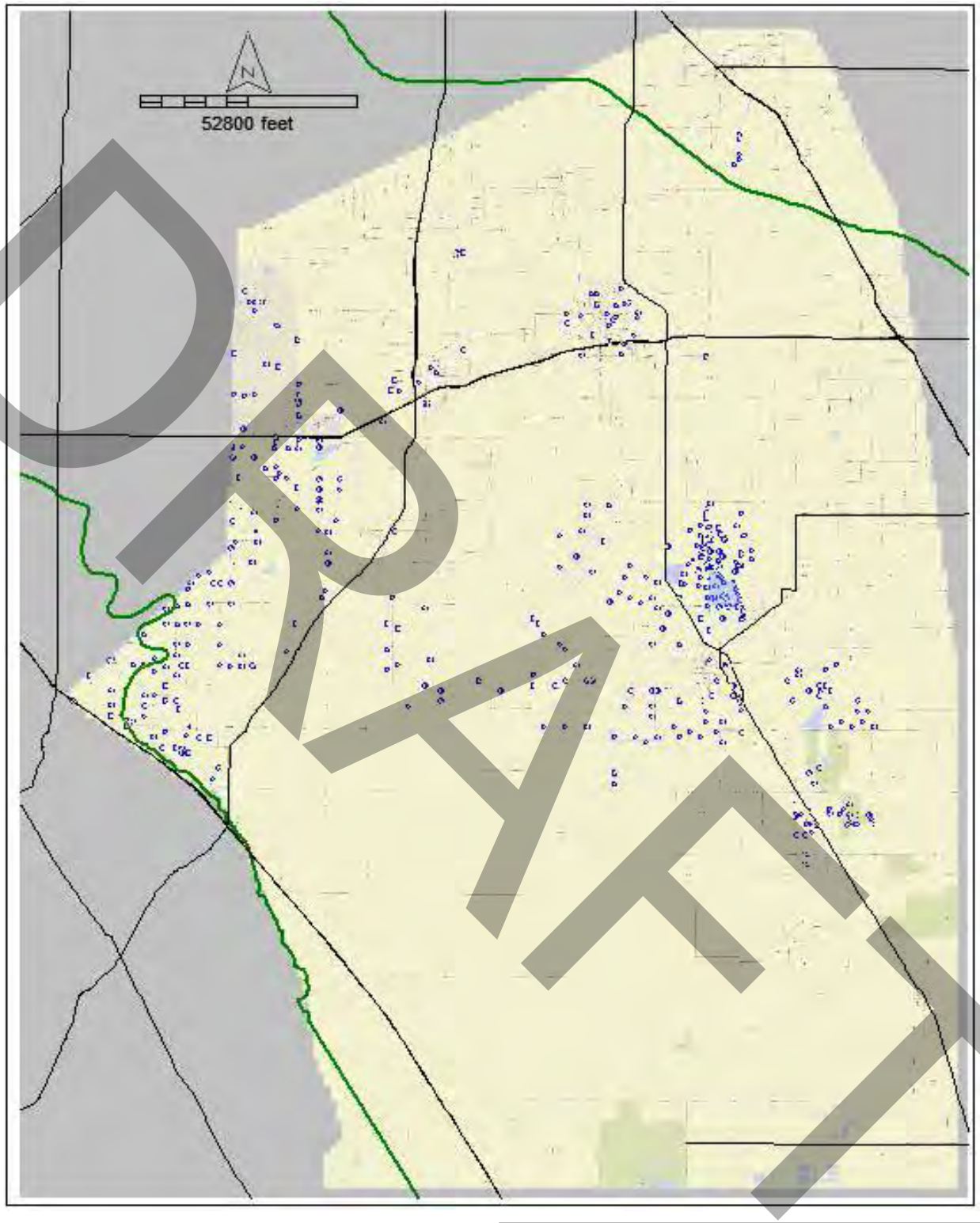
Location of Rivers, Streams, and Canals for River Boundaries

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-9**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 4-10 All Wells 9/7/2019



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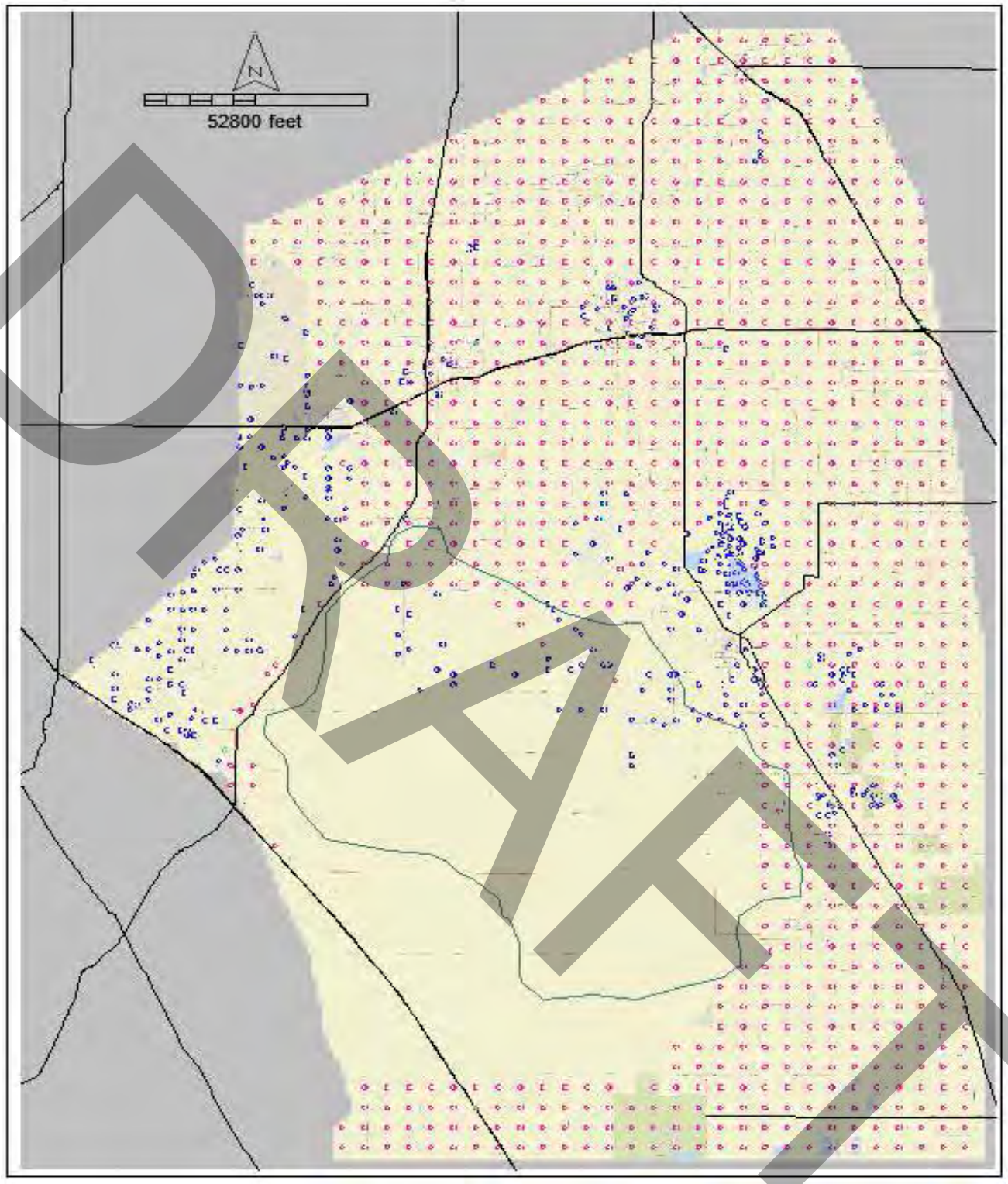
Location of Pumping Wells with Known Construction

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-10**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 4-11 All Wells 9/7/2019



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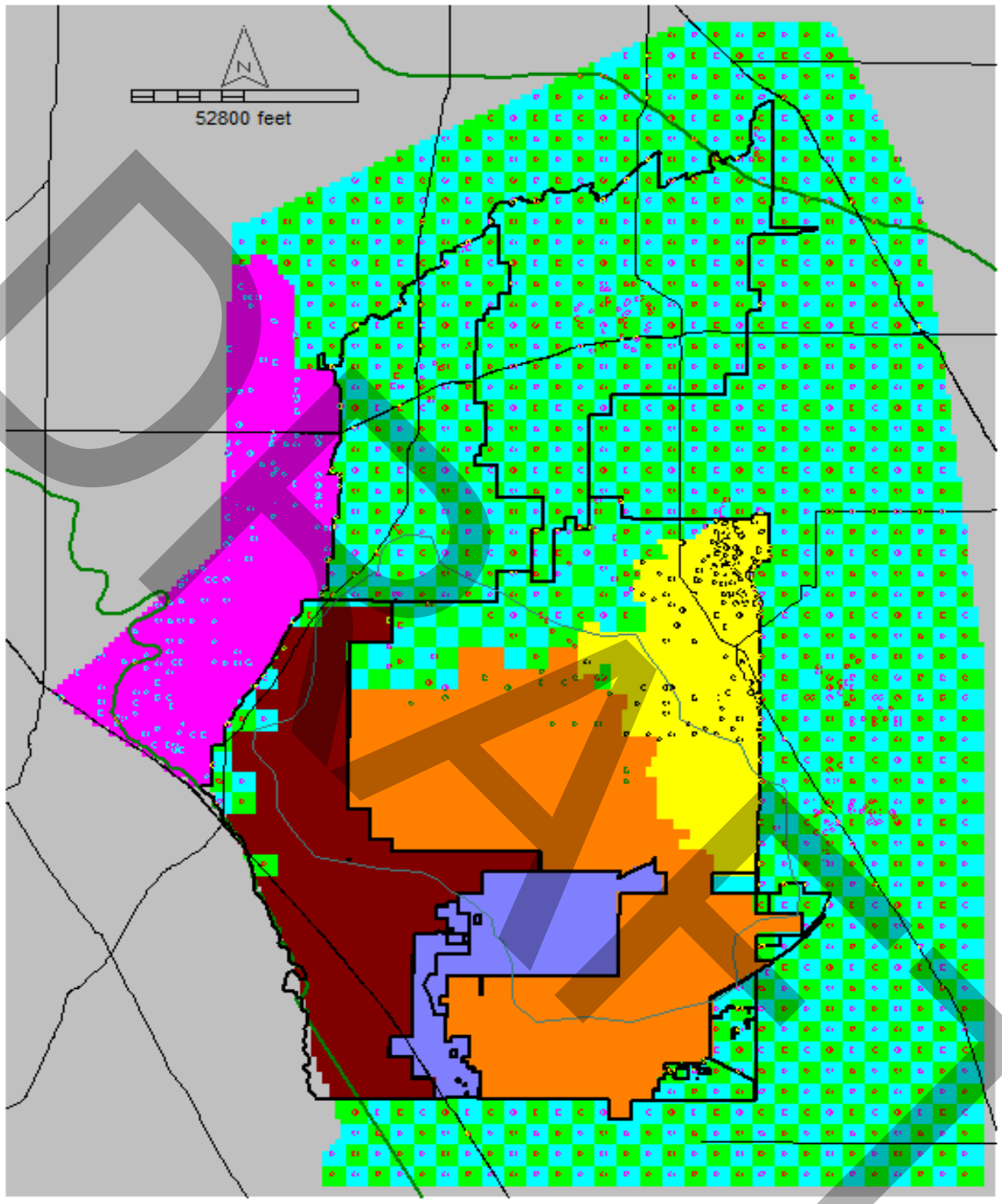
Location of Existing and Hypothetical Pumping Well within Model Domain

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-11**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 4-12 Ag Demand Areas (2)



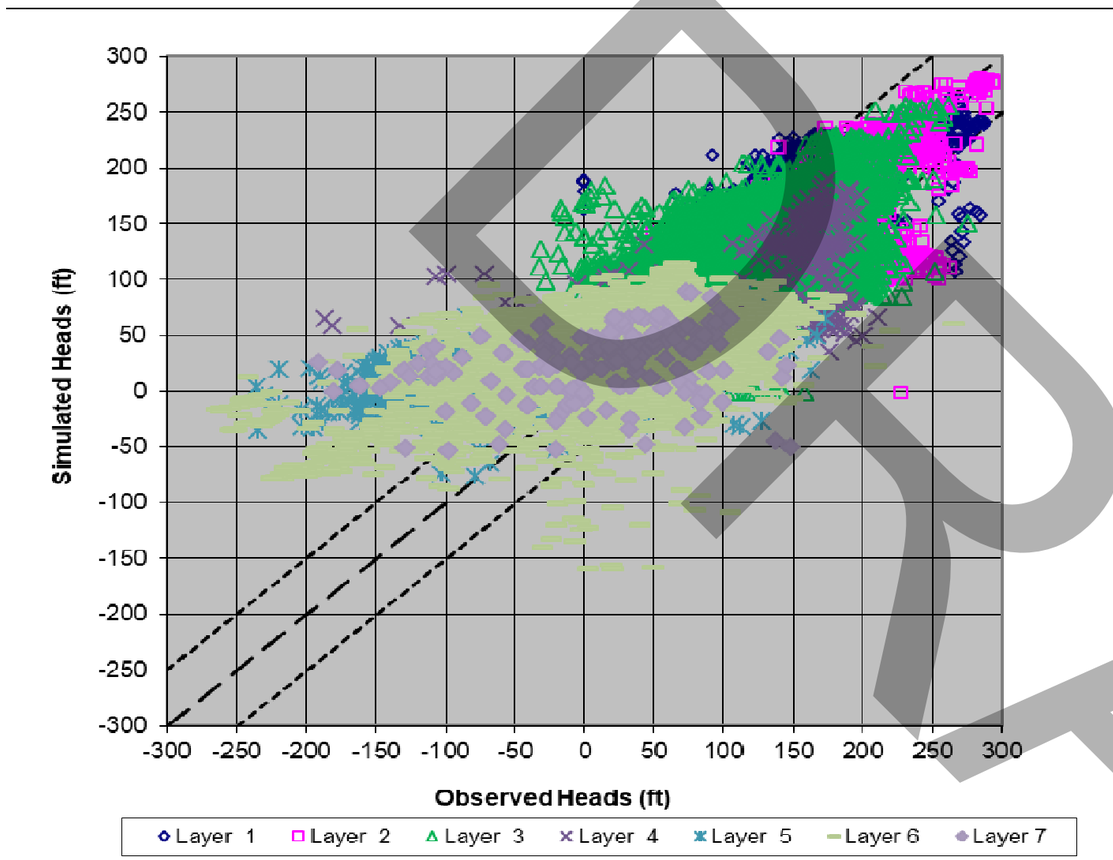
DRAFT

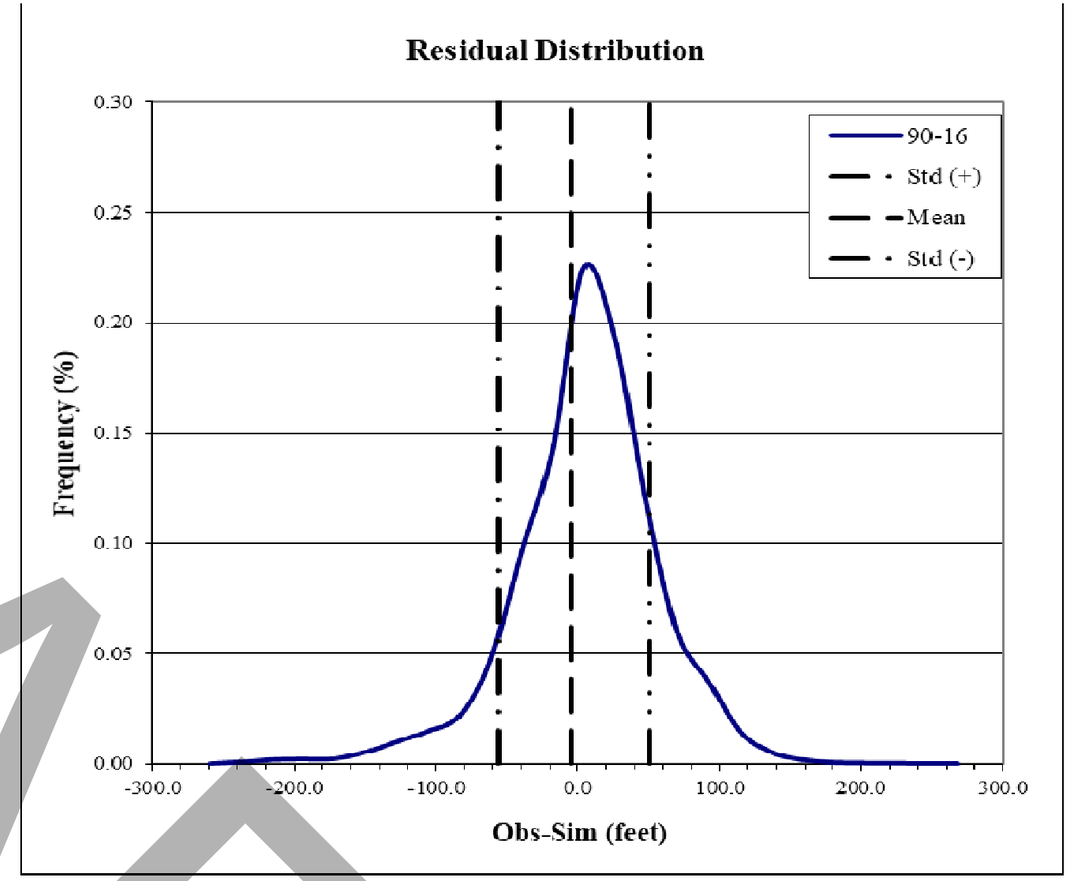
- Hypothetical Agricultural Well Service Area
- Hypothetical Agricultural Well Service Area
- Corcorain ID Service Area
- El Rico GSA Service Area
- Westlands Water District Service Area
- SouthWest Kings GSA Service Area
- Tri County Water Authority Service Area

Location of Hypothetical Irrigation Well Service Areas within Model Domain

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D4-12**





Statistics	Layer 1 - 7		Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Residual Mean	-4.92	ft	-8.74	184.88	-1.03	25.28	-35.16	-11.79	-11.95
Absolute Residual Mean	37.07	ft	26.56	38.88	30.49	36.70	64.18	49.74	45.95
Residual Std. Deviation	50.71	ft	35.14	45.07	39.71	54.58	75.90	63.57	64.23
Sum of Squares	43144818	ft^2	1752750	45881443	12883829	1335232	5744194	18659445	840886
RMS Error	50.95	ft	35.14	45.07	39.71	54.58	75.90	63.57	64.23
Min. Residual	-255.01	ft	-179.12	-1.00	-180.86	-252.29	-240.16	-255.01	-217.70
Max. Residual	213.32	ft	159.68	279.99	143.95	151.42	154.12	213.32	197.77
Number of Observations	16621		1337.00	1267.00	8166.00	369.00	821.00	4464.00	197.00
Range in Observations	575.33	ft	338.80	280.99	324.81	403.71	394.27	468.33	415.47
Scaled Residual Std. Deviation	0.088		0.10	0.16	0.12	0.14	0.19	0.14	0.15
Scaled Absolute Residual Mean	0.064		0.08	0.14	0.09	0.09	0.16	0.11	0.11
Scaled RMS Error	0.089		0.10	0.16	0.12	0.14	0.19	0.14	0.15
Scaled Residual Mean	-0.009		-0.03	0.66	0.00	0.06	-0.09	-0.03	-0.03
Correlation Coef.	82%		66%	65%	74%	77%	92%	81%	83%

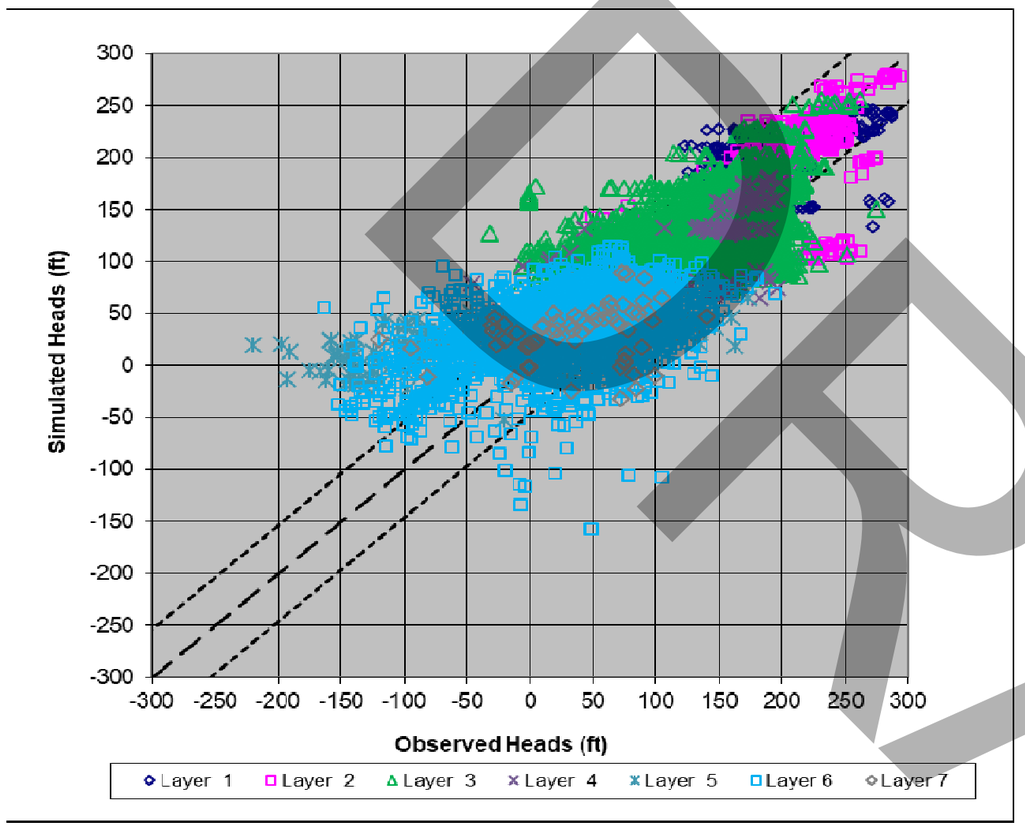
Calibrated Model Layer Hydraulic Conductivity Distribution

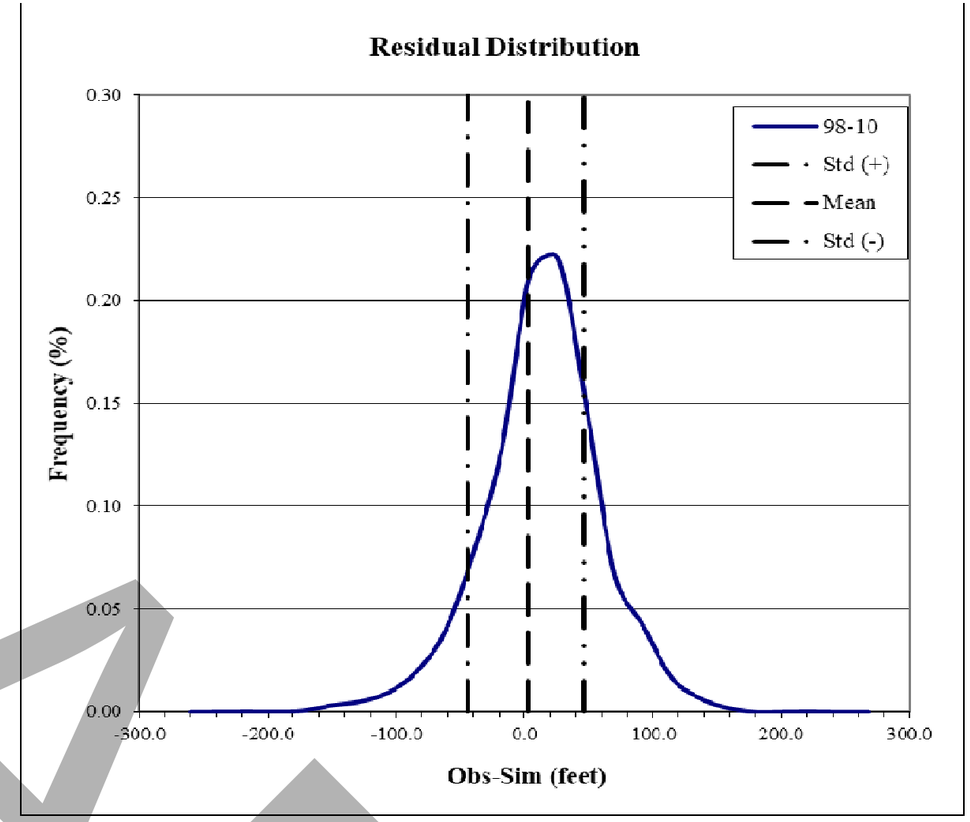
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb | Date: 07/30/19 | Project No.: FR18161220

Figure **D5-1a**

DRAFT





Statistics	Layer 1 - 7		Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Residual Mean	2.58	ft	-2.31	185.34	5.66	20.83	-26.48	-1.57	4.97
Absolute Residual Mean	34.77	ft	23.91	40.62	29.67	28.02	61.82	44.62	35.32
Residual Std. Deviation	46.21	ft	32.15	47.33	38.56	40.80	73.62	55.31	48.37
Sum of Squares	15054199	ft^2	564186	19100563	5394252	318952	2007497	5703199	160791
RMS Error	46.28	ft	32.15	47.33	38.56	40.80	73.62	55.31	48.37
Min. Residual	-239.89	ft	-89.06	-1.00	-167.88	-124.93	-239.89	-219.30	-145.43
Max. Residual	213.32	ft	138.34	279.99	143.95	121.27	144.40	213.32	108.62
Number of Observations	7028		543.00	522.00	3552.00	152.00	328.00	1863.00	68.00
Range in Observations	545.16	ft	227.40	280.99	311.83	246.20	384.29	432.62	254.06
Scaled Residual Std. Deviation	0.085		0.14	0.17	0.12	0.17	0.19	0.13	0.19
Scaled Absolute Residual Mean	0.064		0.11	0.14	0.10	0.11	0.16	0.10	0.14
Scaled RMS Error	0.085		0.14	0.17	0.12	0.17	0.19	0.13	0.19
Scaled Residual Mean	0.005		-0.01	0.66	0.02	0.08	-0.07	0.00	0.02
Correlation Coefficient	82%		58%	62%	77%	67%	91%	79%	78%

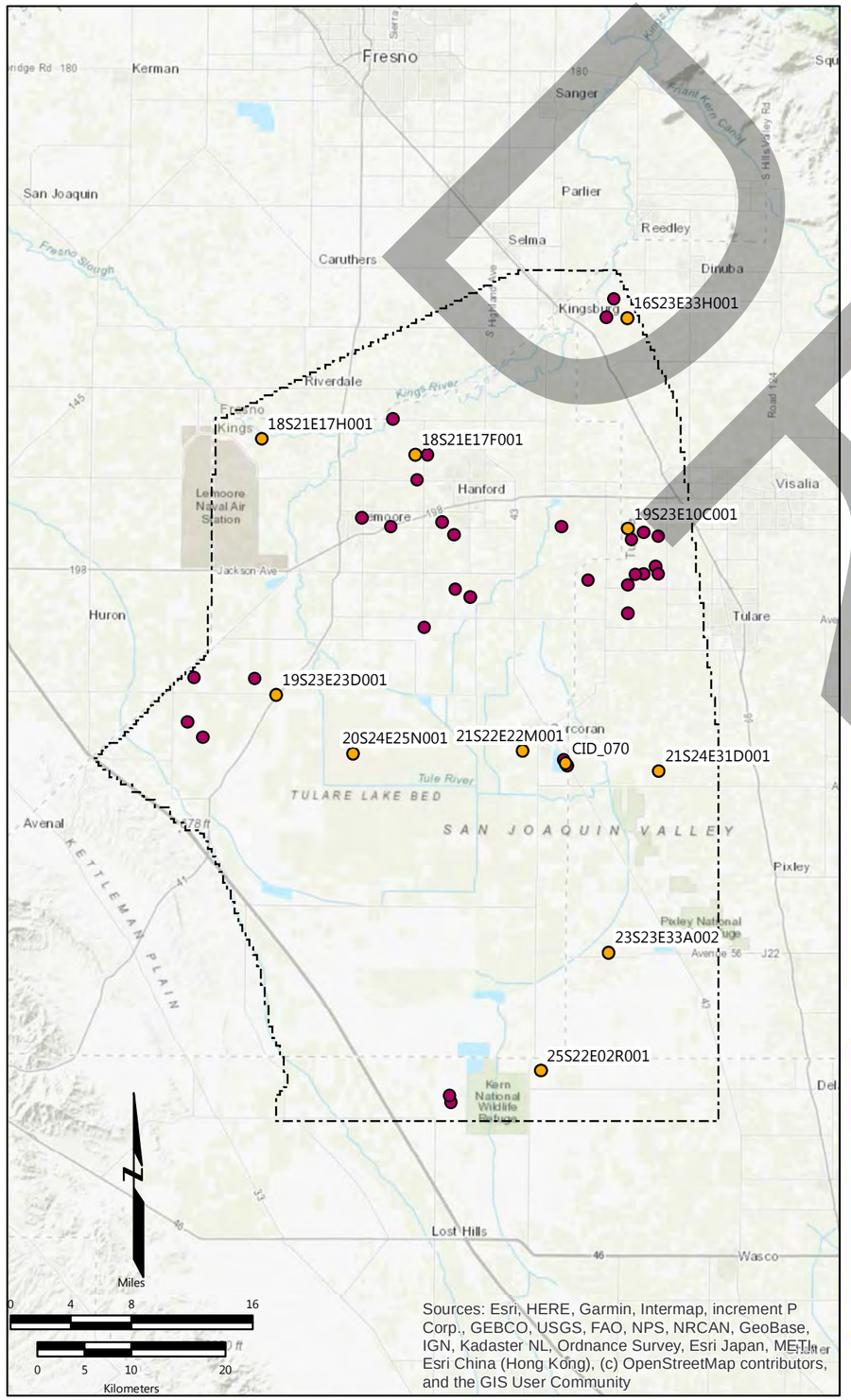
1998 - 2010 Calibration Statistics and Scattergram

Tulare Lake Subbasin SGMA Model
Kings County, California

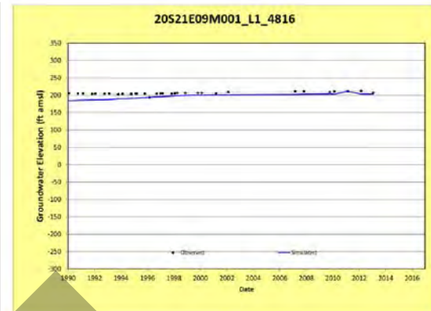
By: dmb | Date: 07/30/19 | Project No.: FR18161220

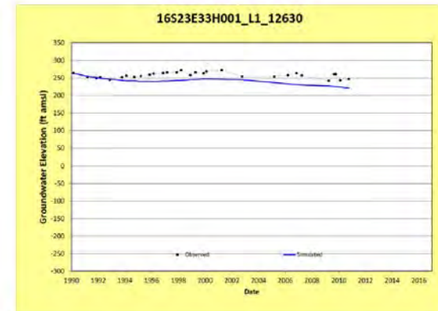
Figure **D5-1b**

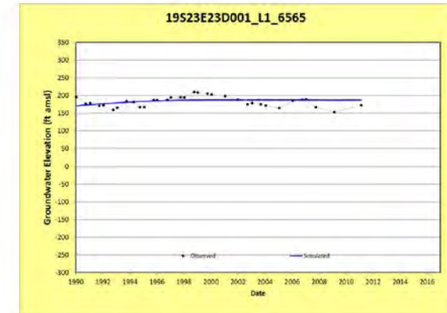
DRAFT

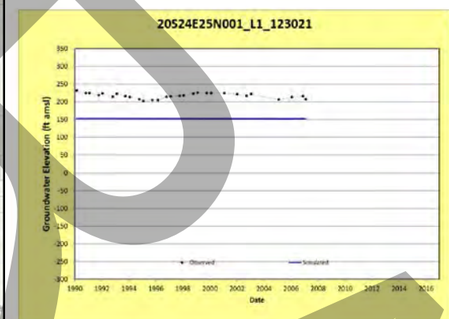


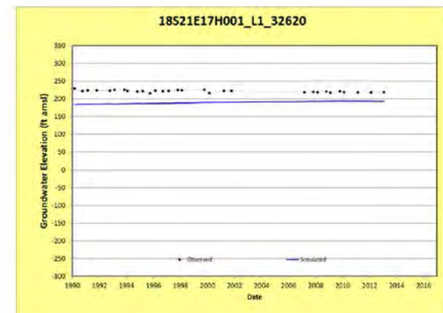
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

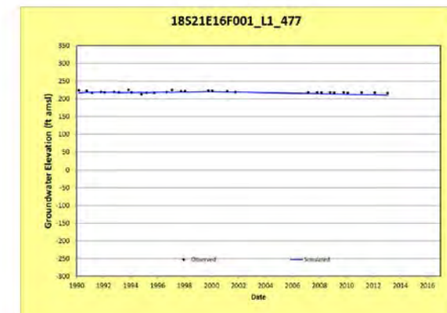


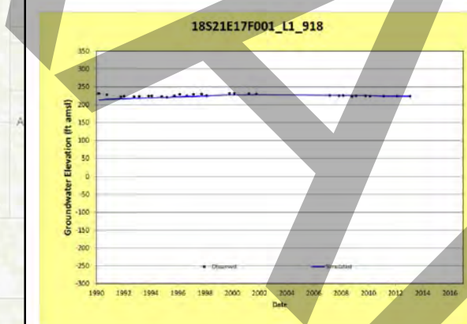


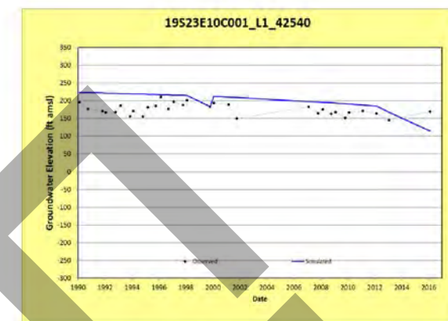


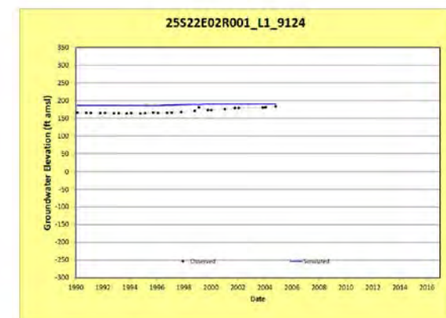


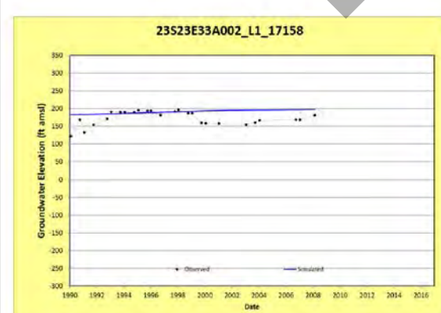


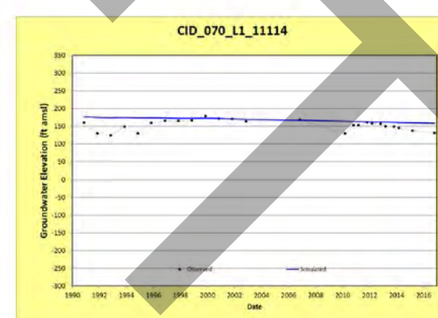












Explanation

- Target well with hydrograph shown
- Target well
- Study Area

Well ID — Layer — RMS

CID-070-4-11114

Layer 1 Observed and Simulated Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2a**

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Date: 9/9/2019 Printed by: elizabeth.chapman
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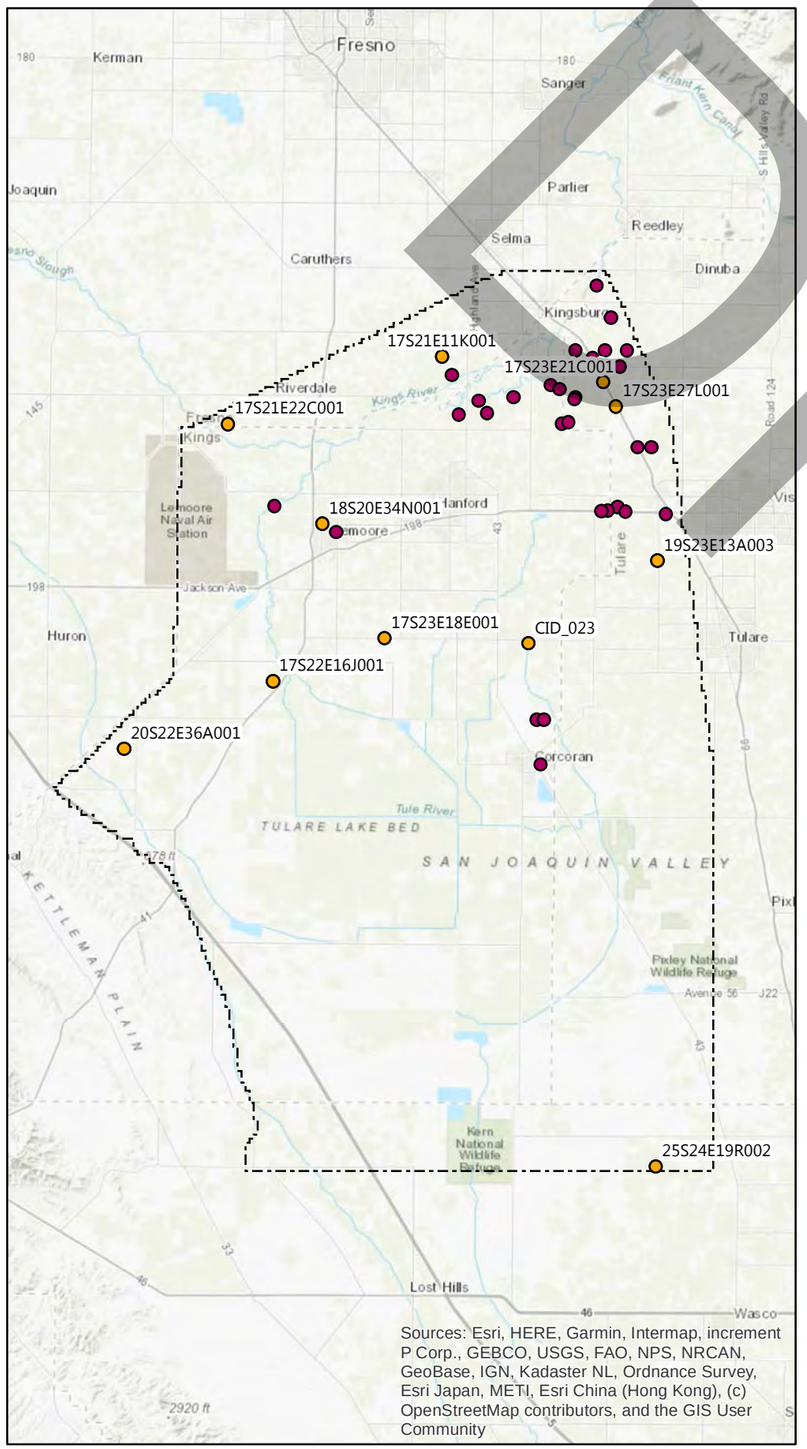
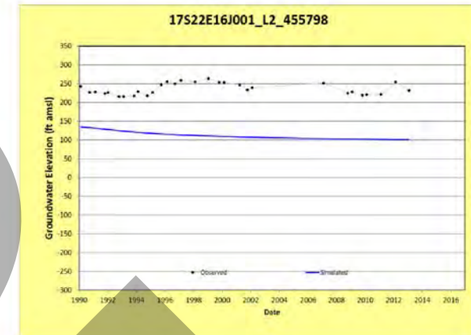
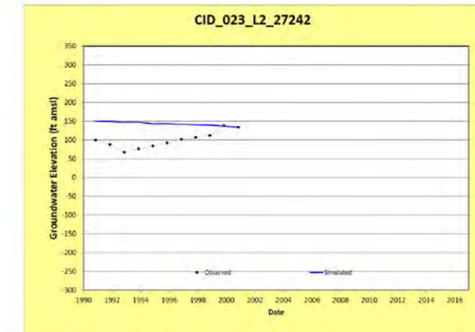
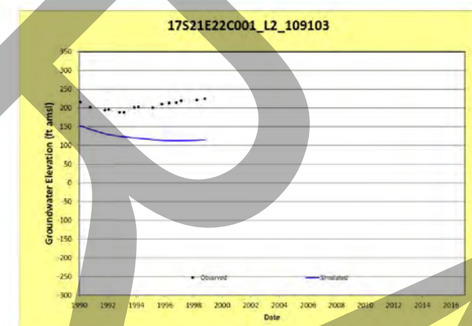
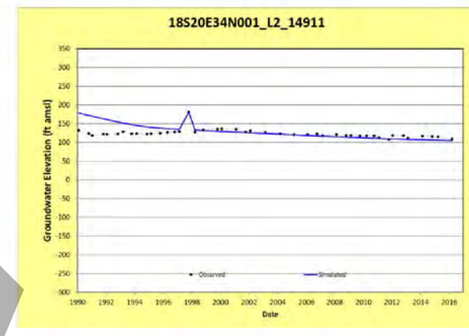


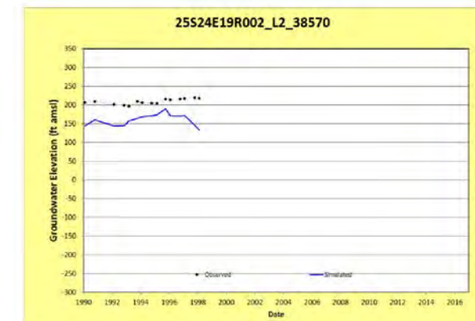
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

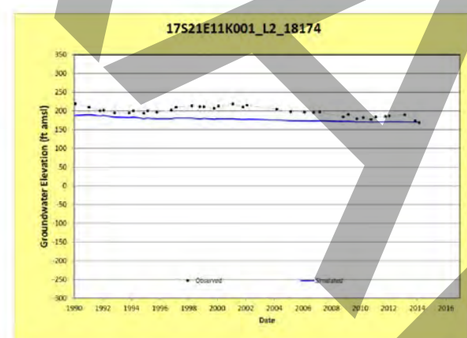


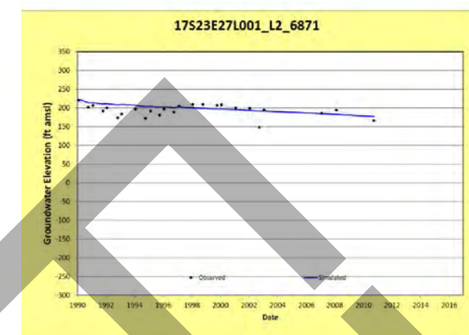


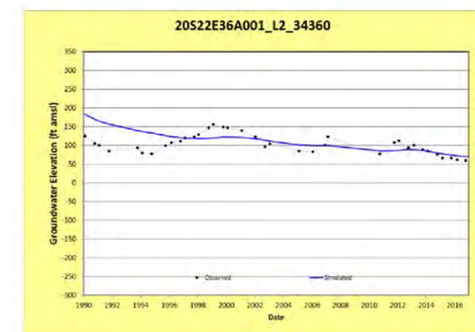


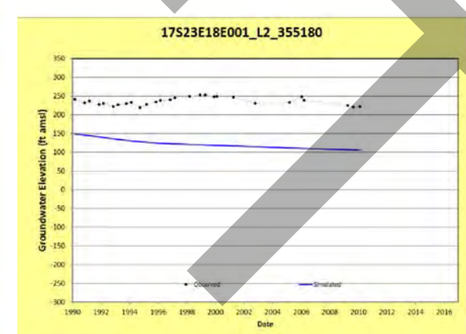












Explanation

- Target wells with hydrograph shown
- Target well
- Study Area

Well ID — Layer — RMS

CID-070-4-11114

Layer 2 Observed and Simulated Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2b**

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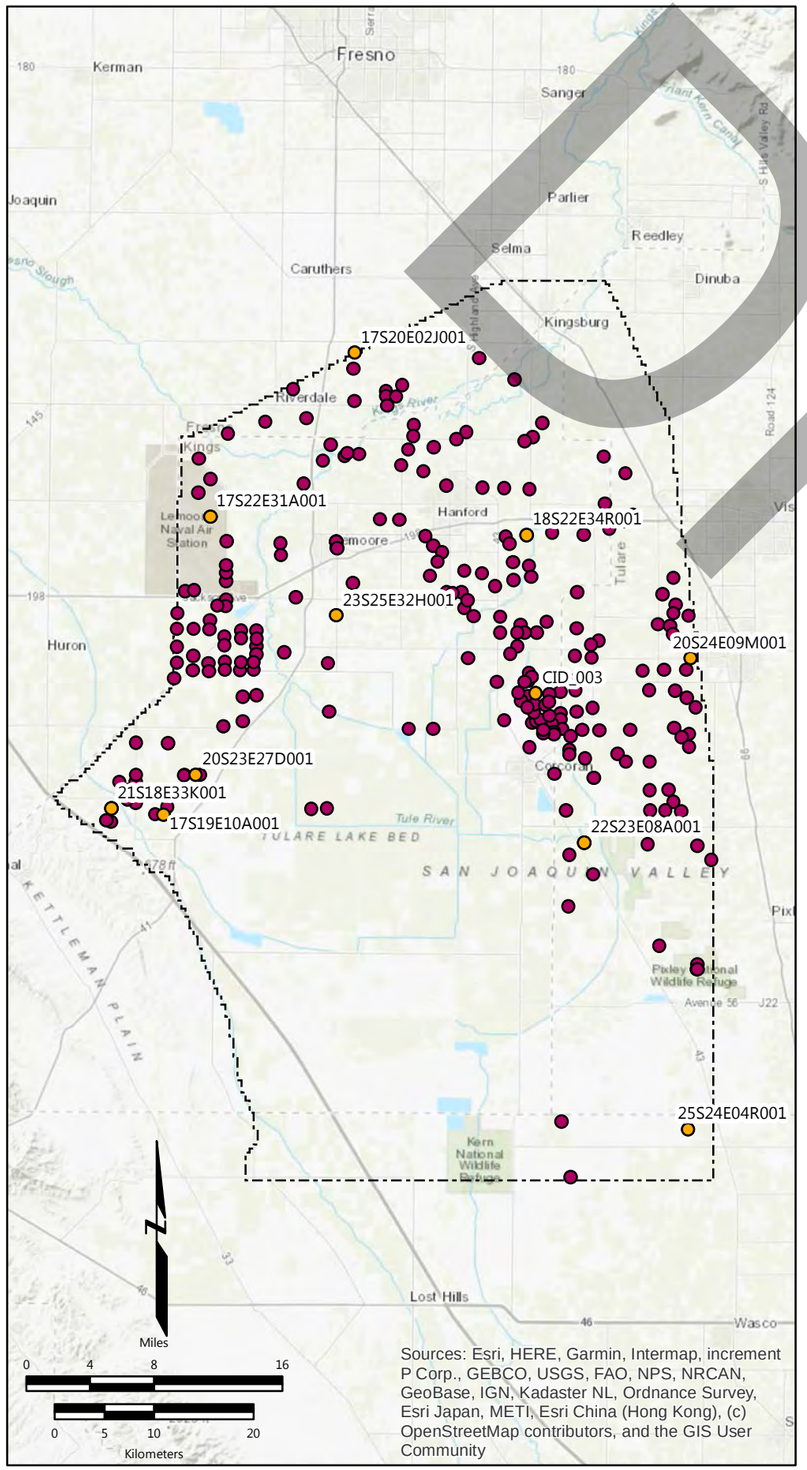
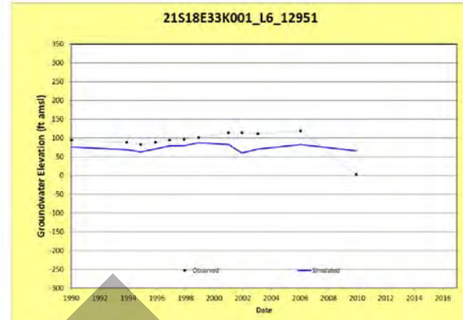
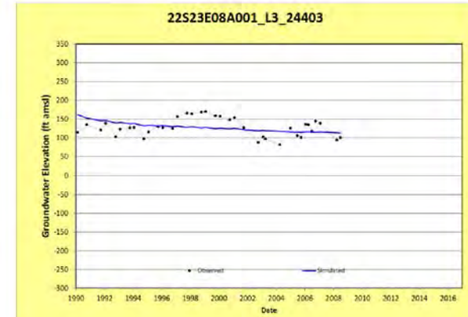
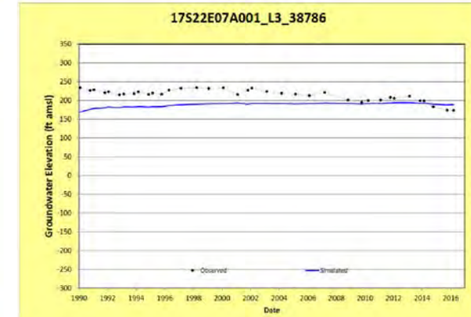
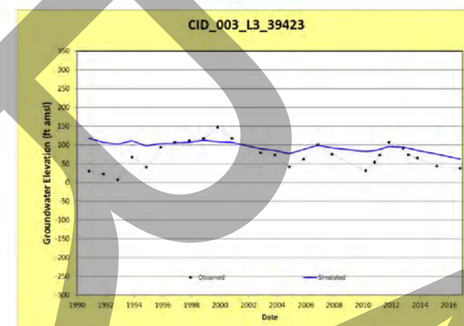


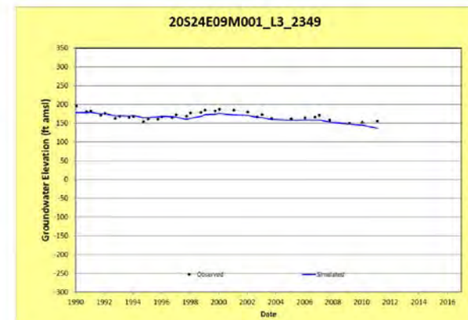
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

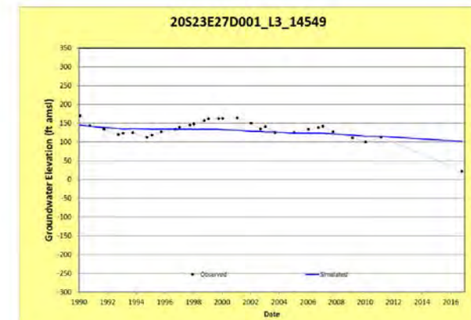


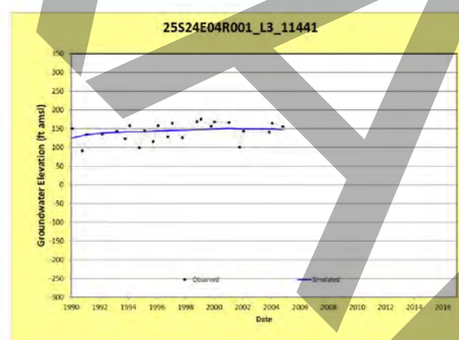


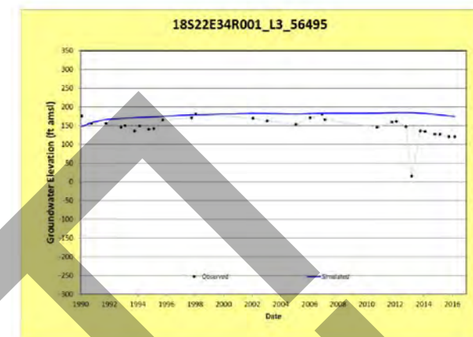


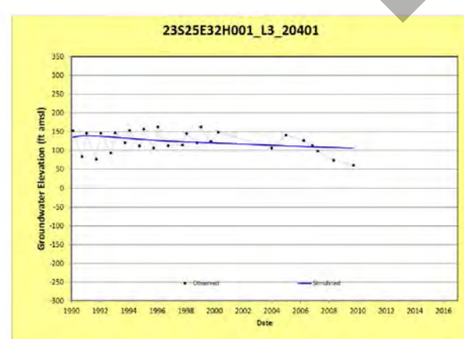


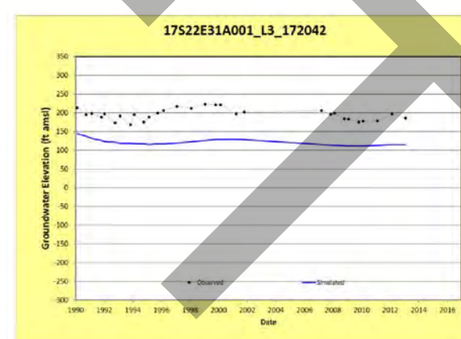












Explanation

- Target wells with hydrograph shown
- Target well
- Study Area

Well ID — Layer — RMS

CID-070-4-11114

Layer 3 Observed and Simulated Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2c**

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Date: 9/9/2019 Printed by: elizabeth.chapman
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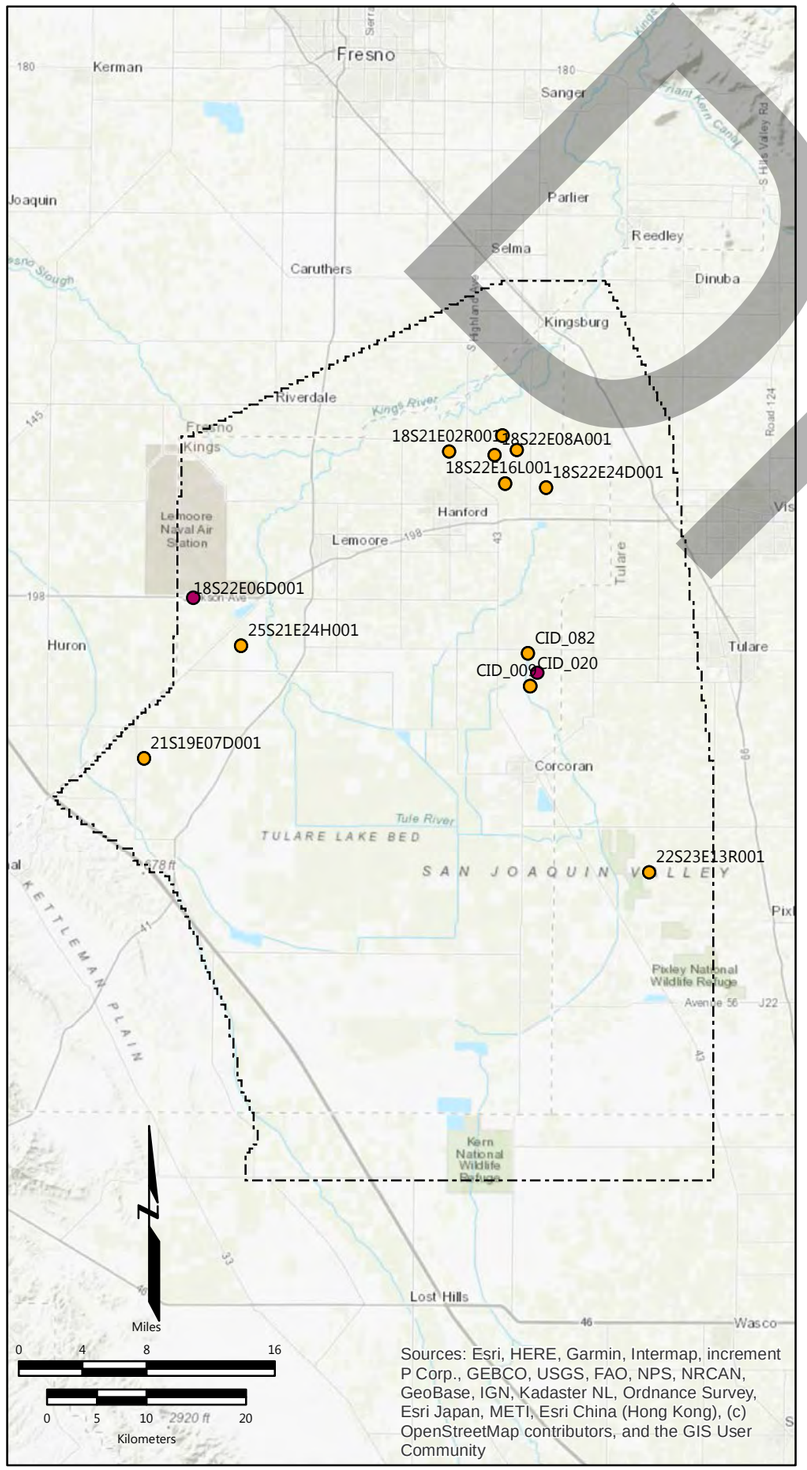

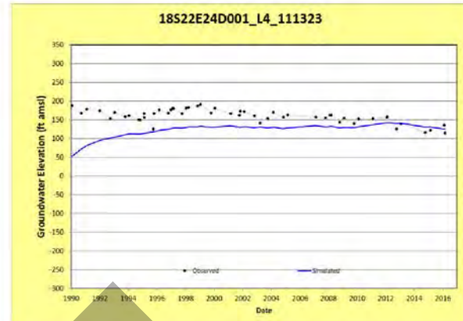

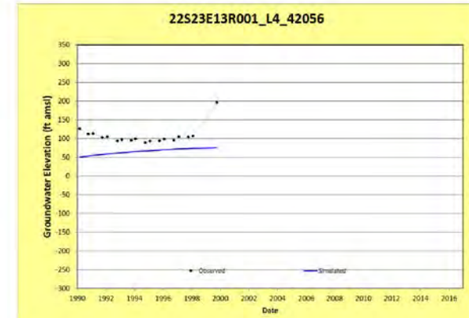

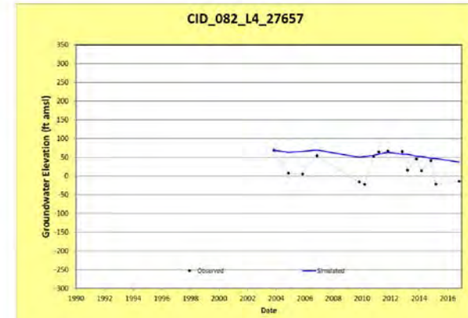

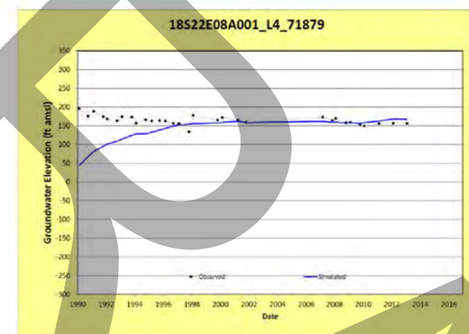

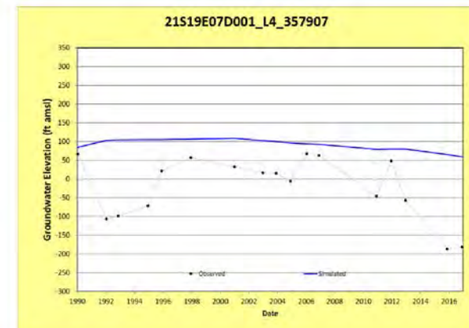

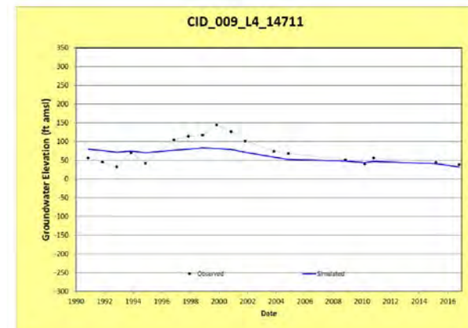

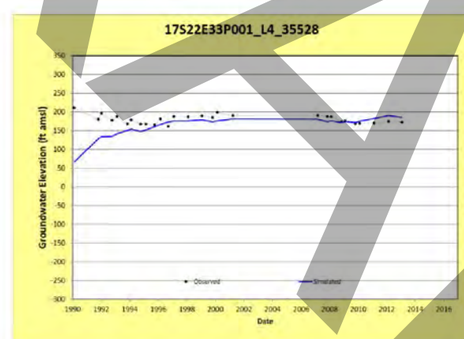

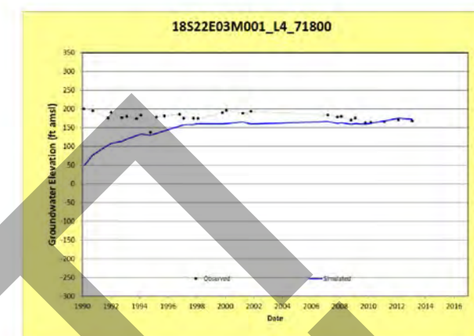

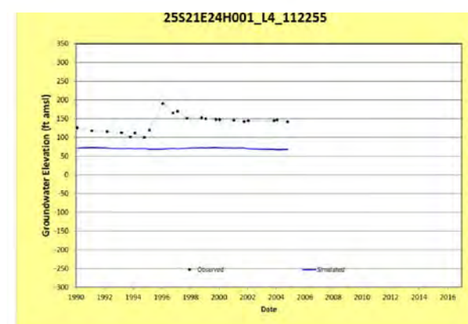

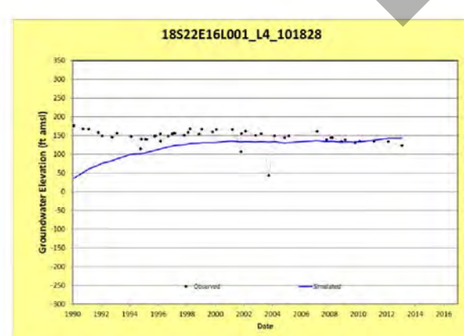

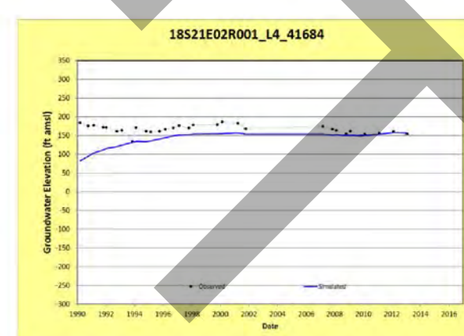

Explanation

- Target well with hydrograph shown
- Target well
- Study Area

Well ID — Layer — RMS

CID-070-4-11114

Layer 4 Observed and Simulated Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2d**

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Date: 9/9/2019 Printed by: elizabeth.chapman
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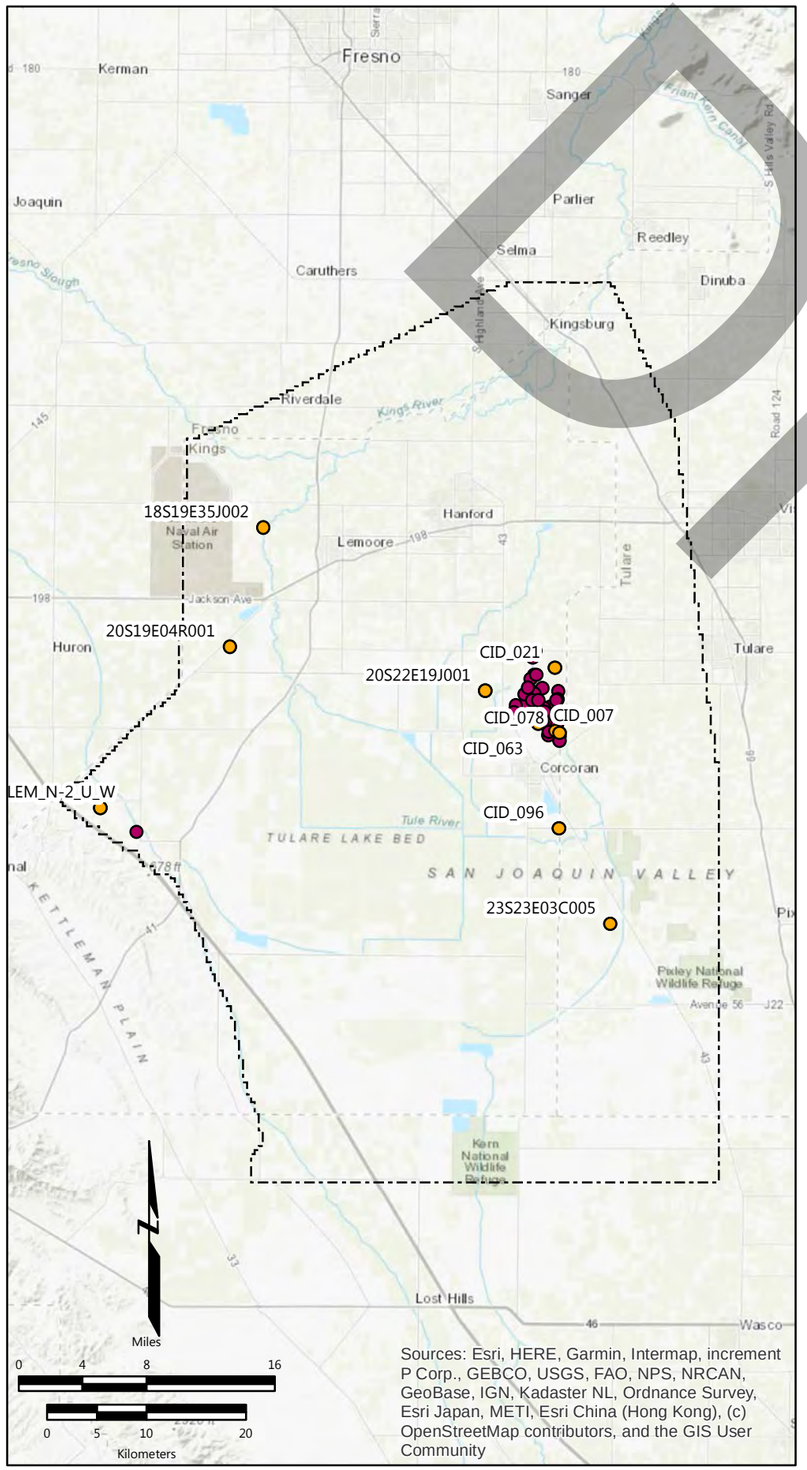

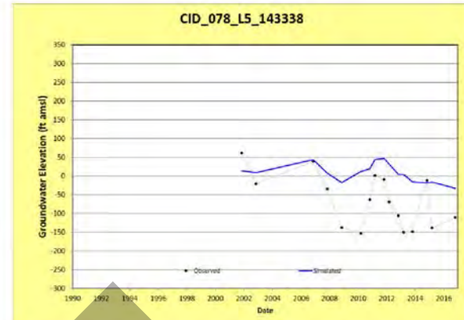

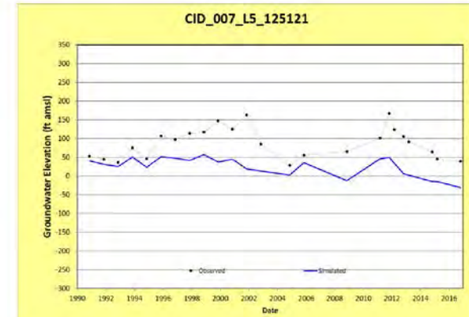

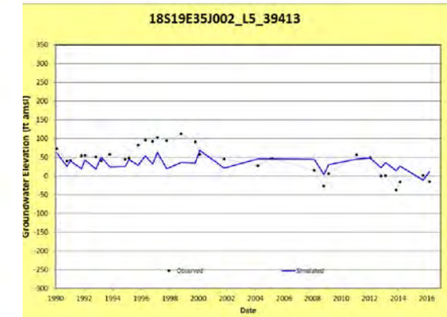

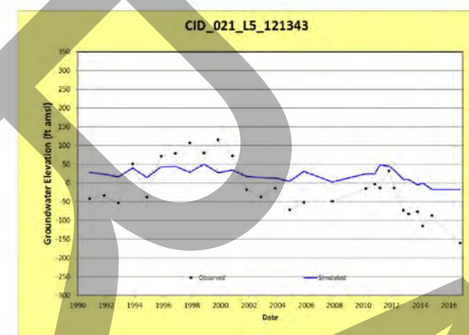

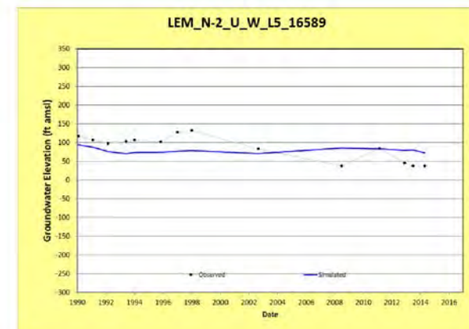

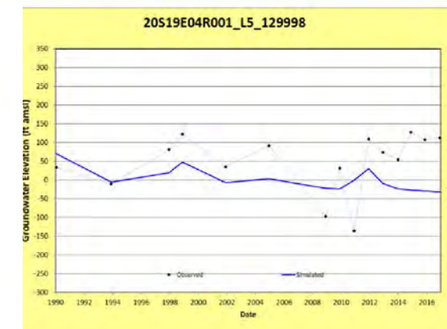

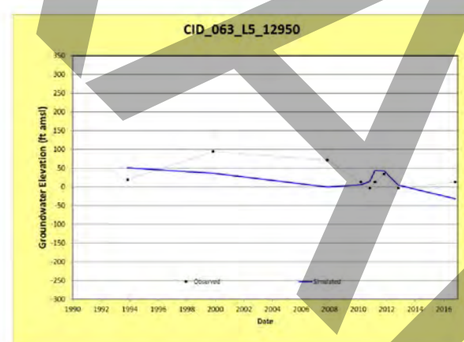

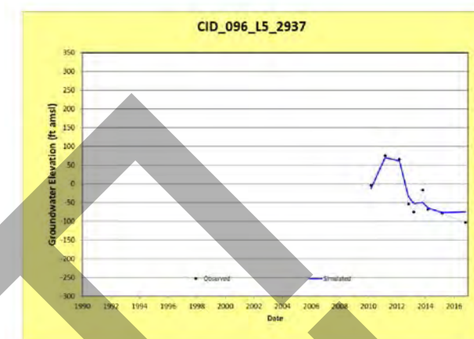

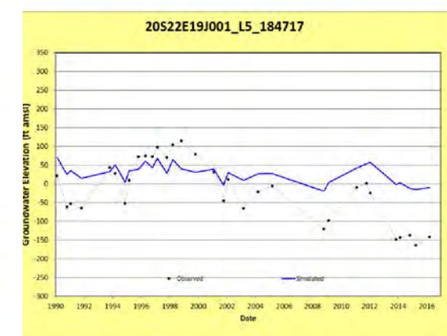

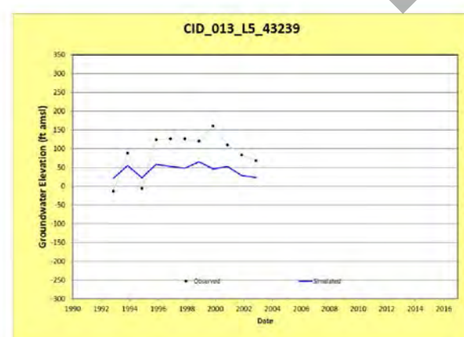

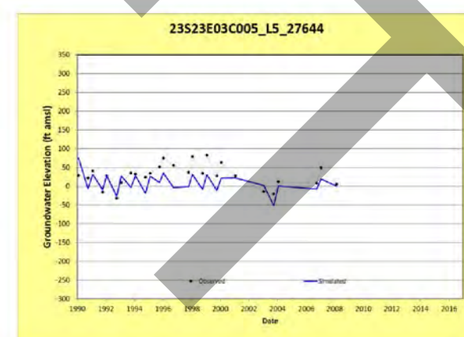

Explanation

- Target well with hydrograph shown
- Target well
- Study Area

Well ID — Layer — RMS

CID-070-4-11114

Layer 5 Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2e**

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Date: 9/9/2019 Printed by: elizabeth.chapman
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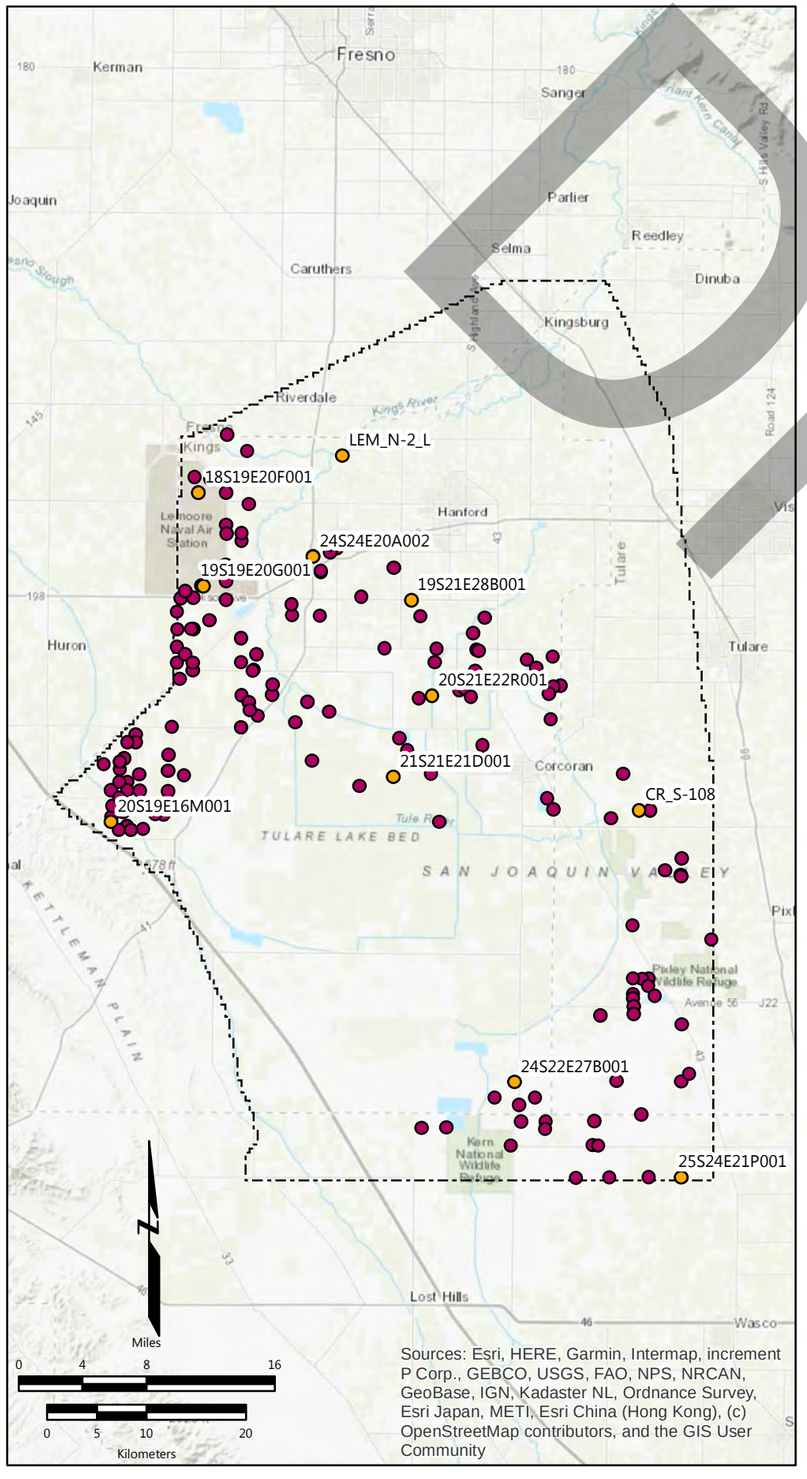

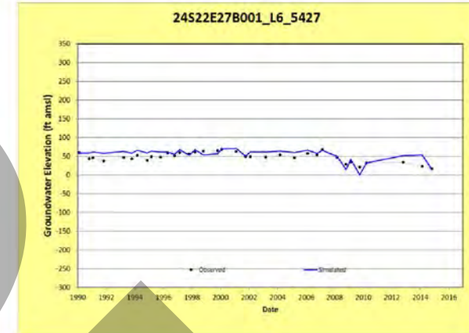

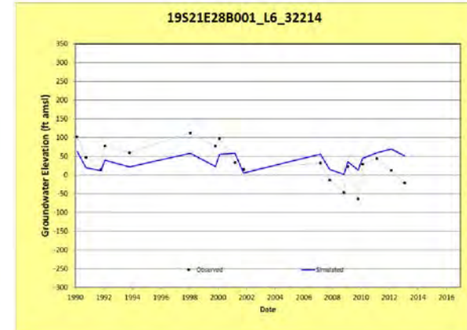

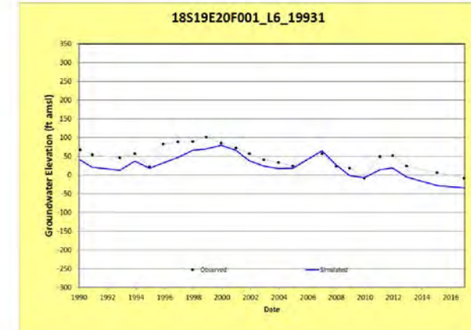

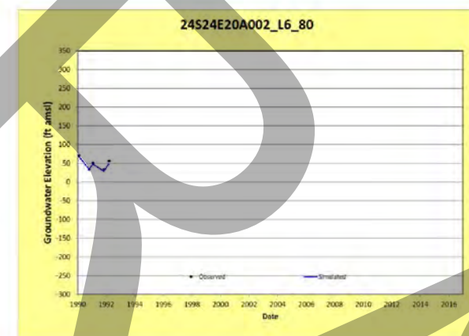

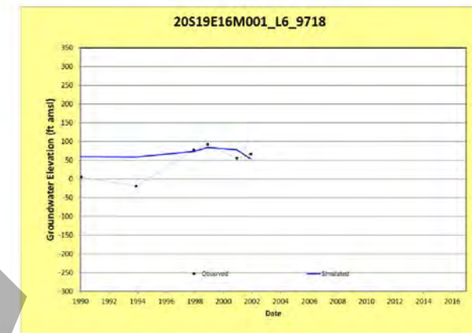

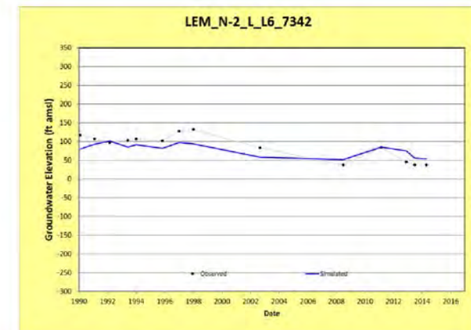

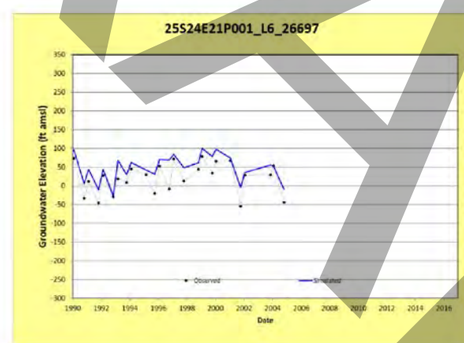

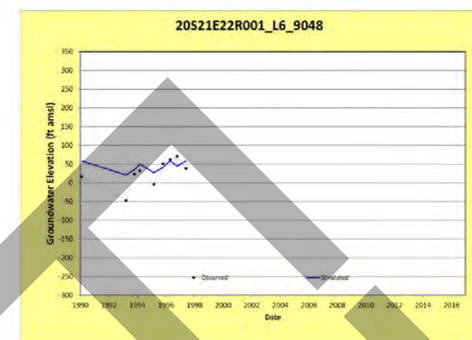

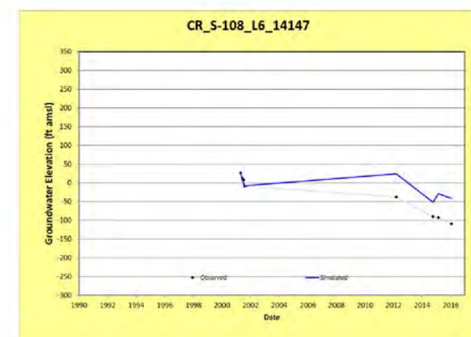

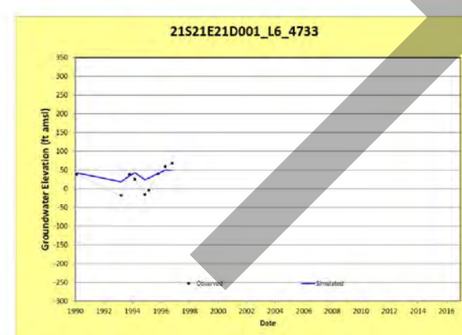

Explanation

- Target wells with hydrograph shown
- Target well
- Study Area

Well ID — Layer — RMS

CID-070-4-11114

Layer 6 Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2f**

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Date: 9/9/2019 Printed by: elizabeth.chapman
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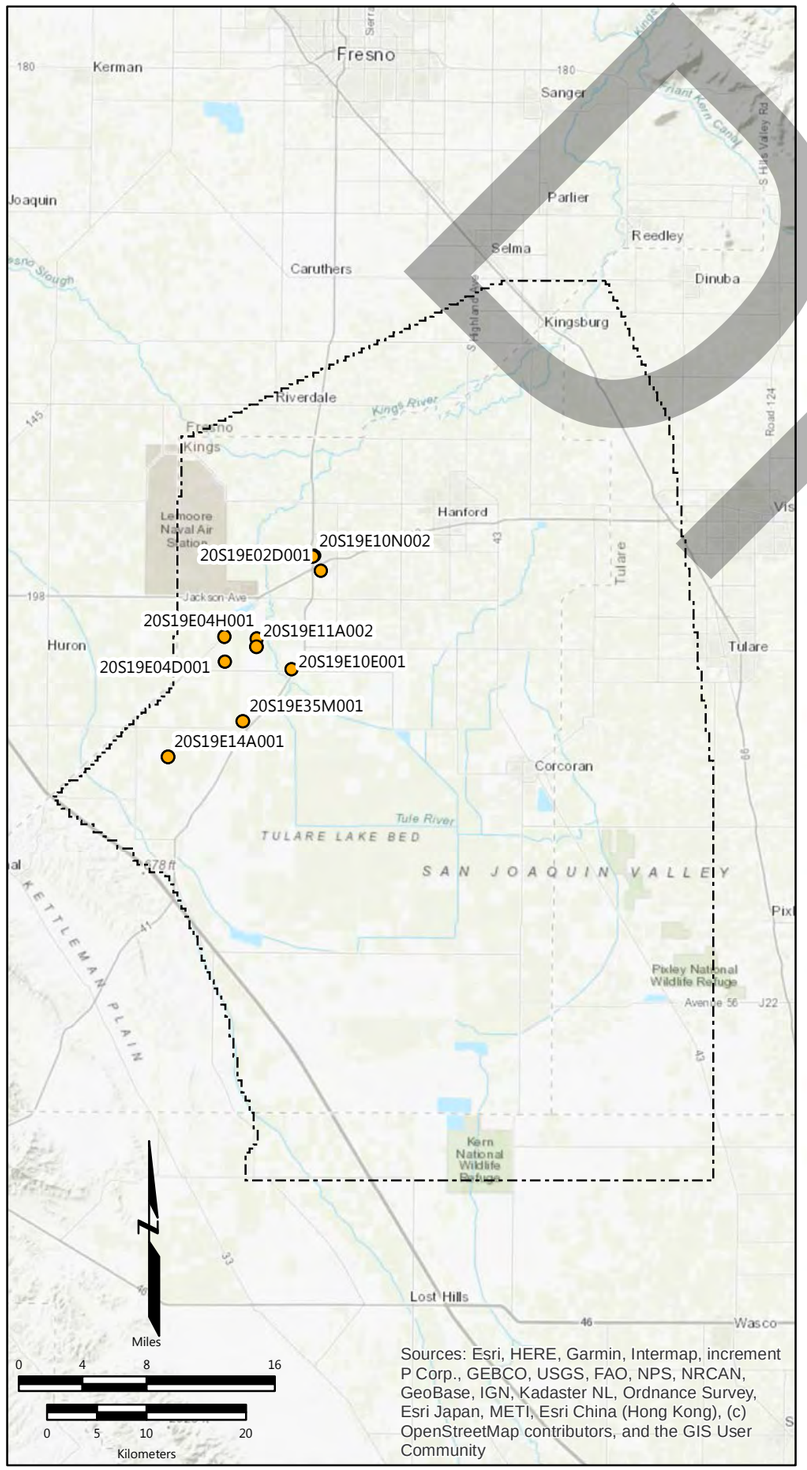
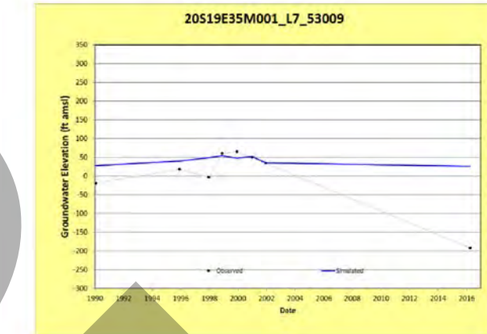
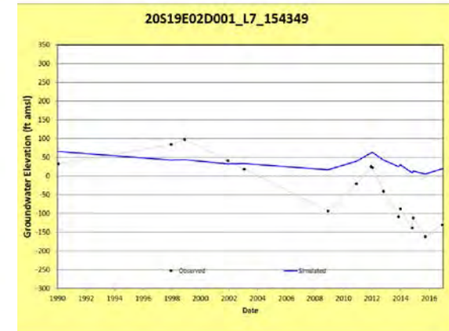
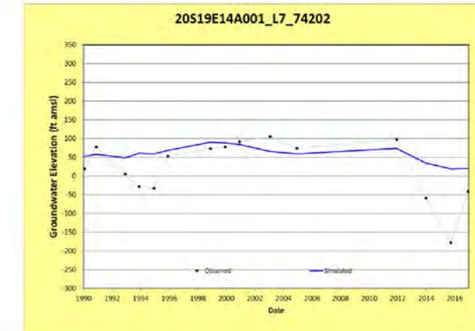
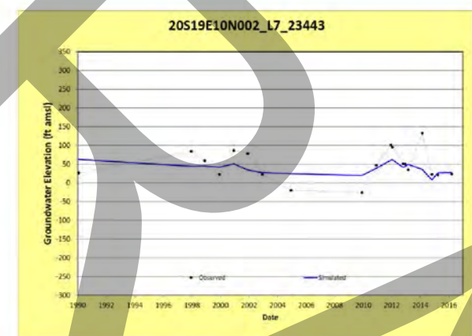


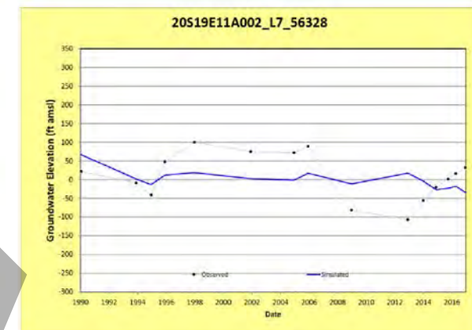
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

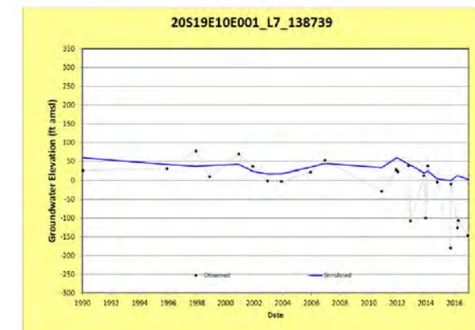


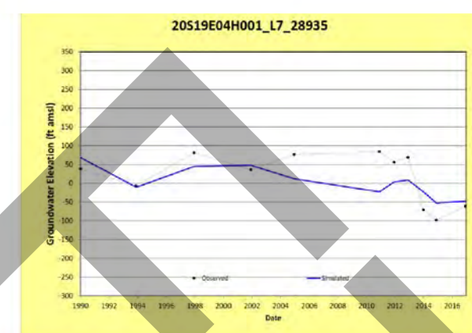


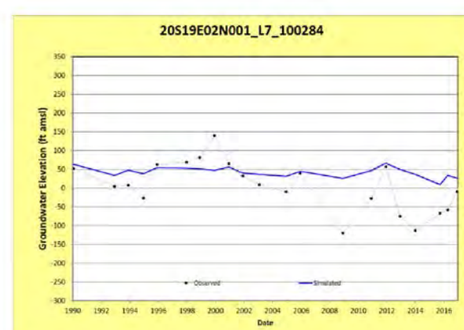


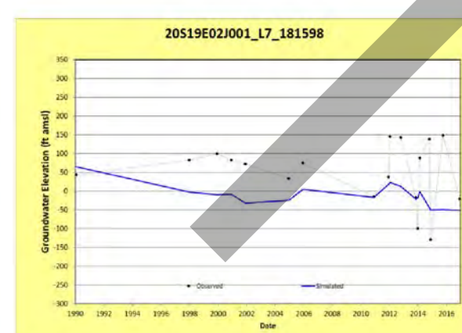












Explanation

- Target well with hydrograph shown
- Target well
- Study Area

Well ID Layer RMS

CID-070-4-11114

Layer 7 Hydrographs

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: EMC	Date: 9/9/2019	Project No.: FR18161220
		Figure **D5-2g**

DRAFT

Date: 9/9/2019 Printed by: elizabeth.chapman
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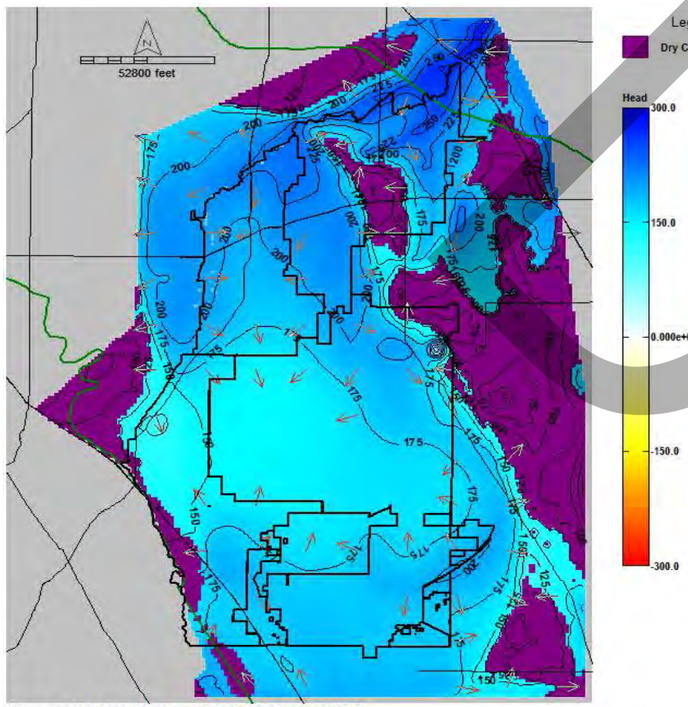
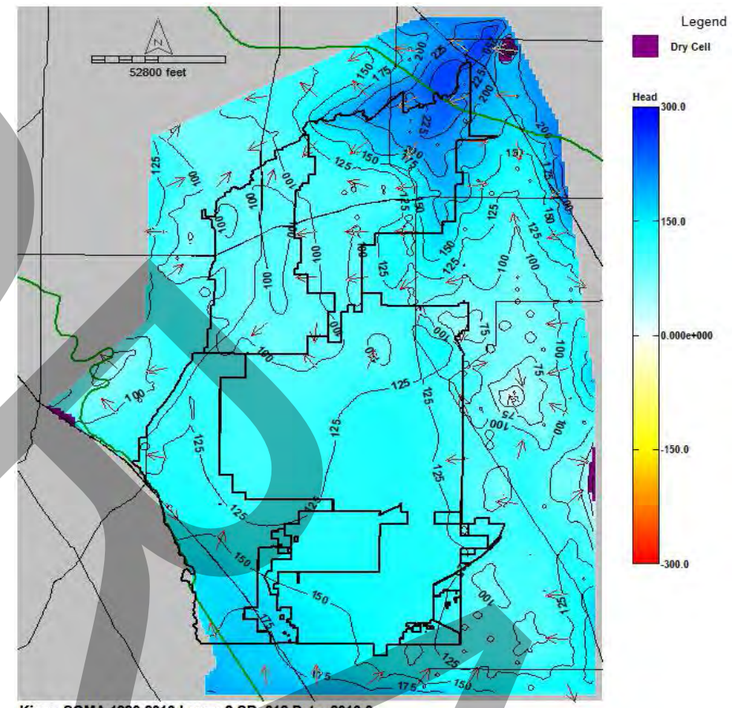
N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 5-3 Calib PotentiometricMap 9/7/2019



Kings SGMA 1990-2016 Layer: 1 SP: 312 Date: 2016.0



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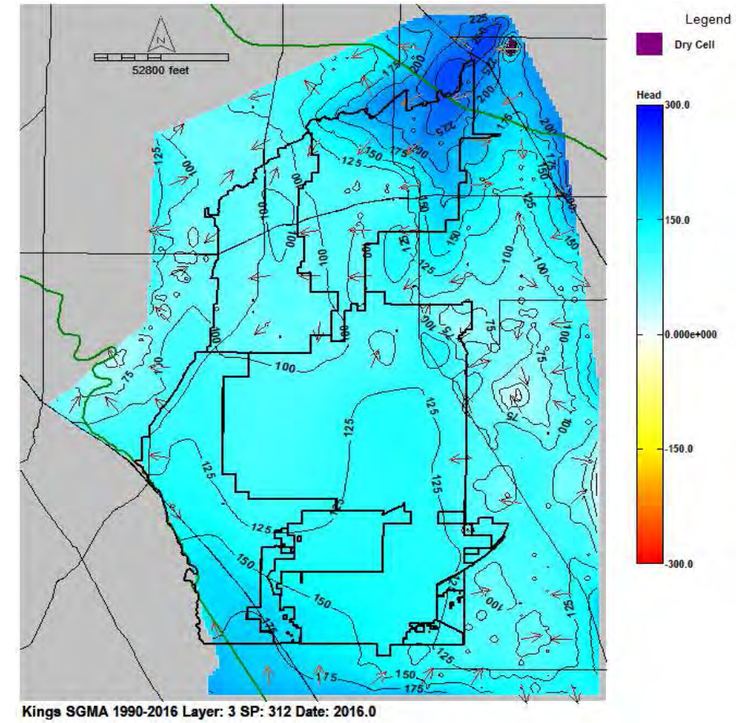

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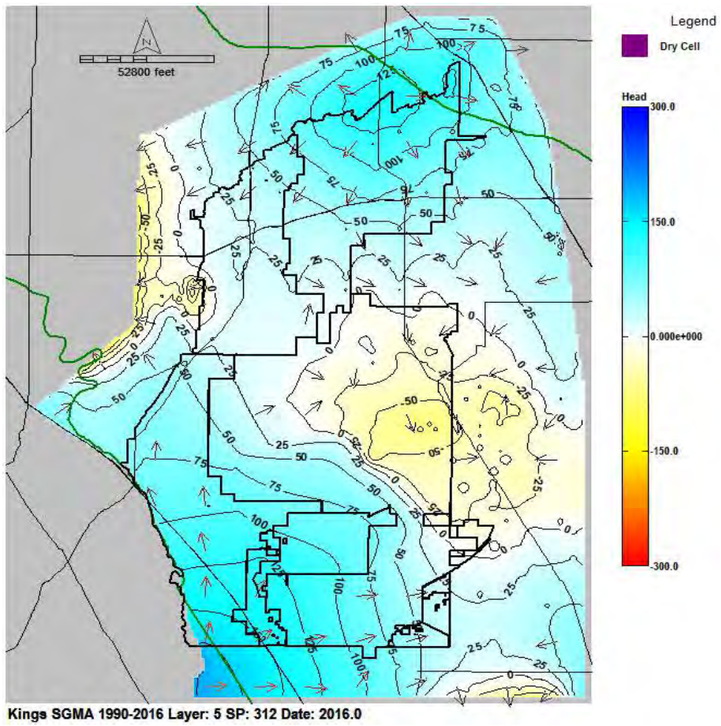

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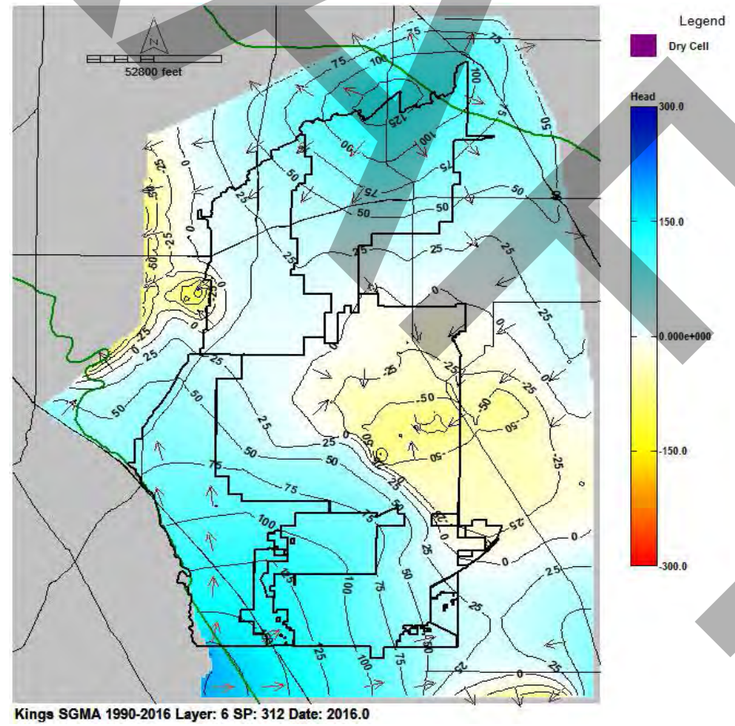

Kings SGMA 1990-2016 Layer: 6 SP: 312 Date: 2016.0

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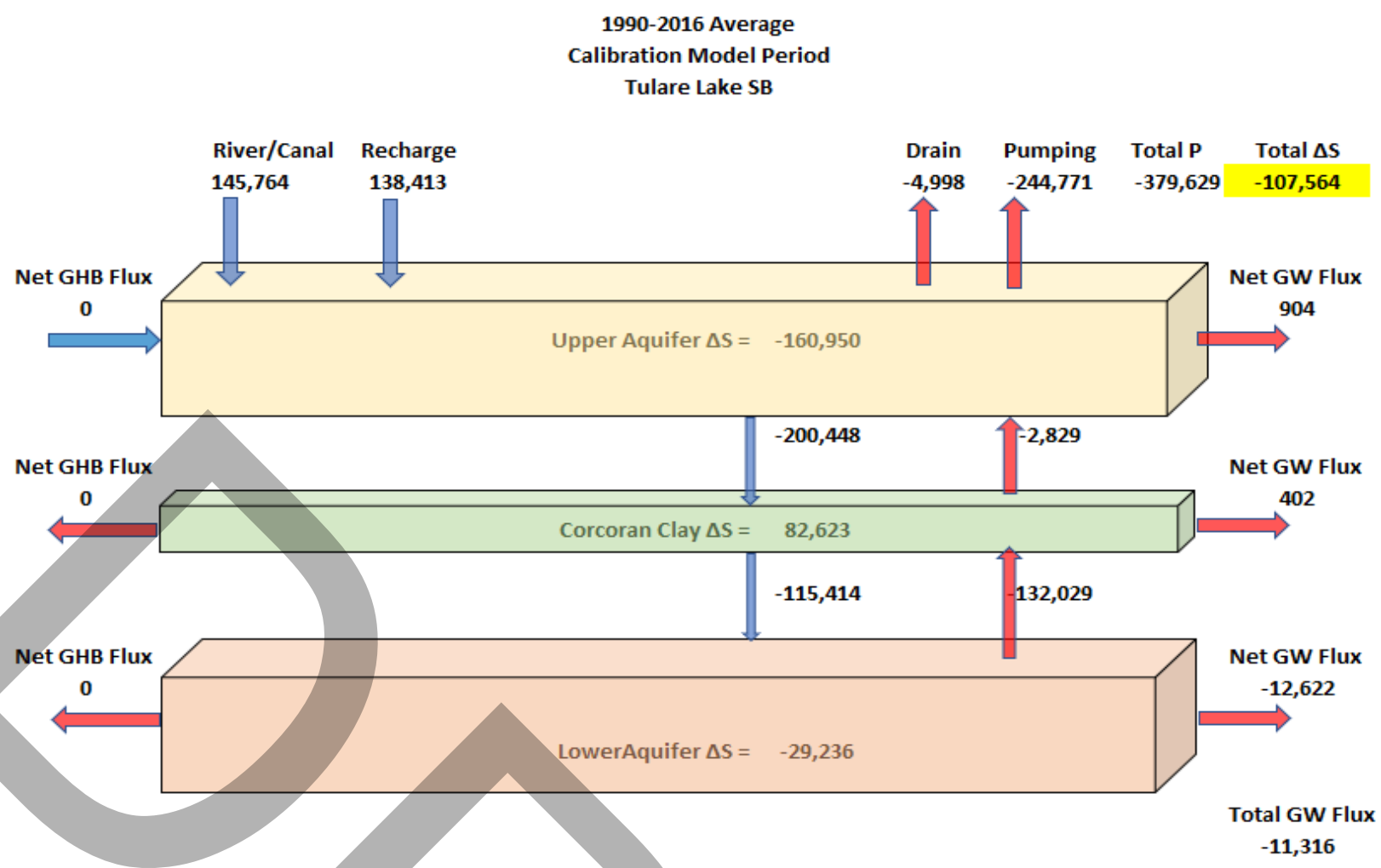
Simulated December 2015 Groundwater Elevations and Groundwater Flow Vectors

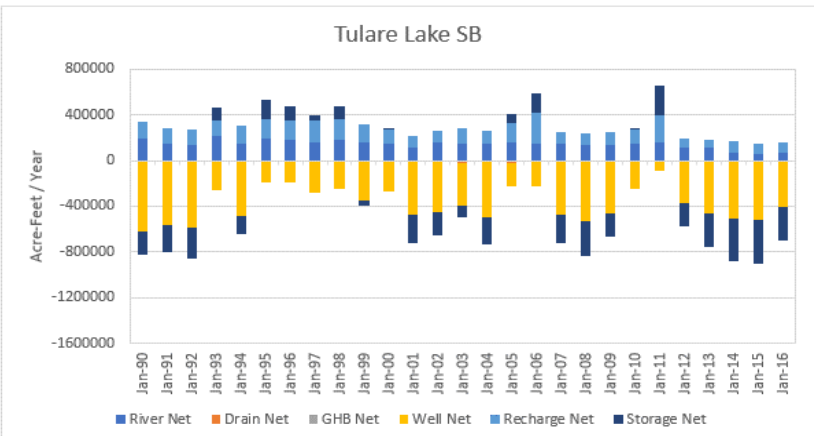
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

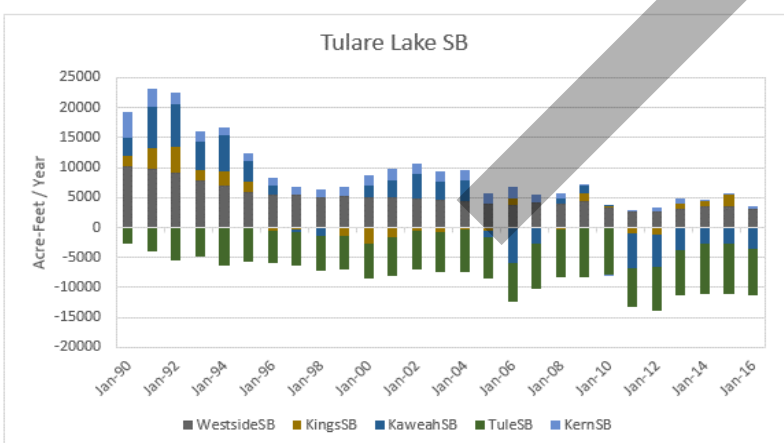
By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-3**

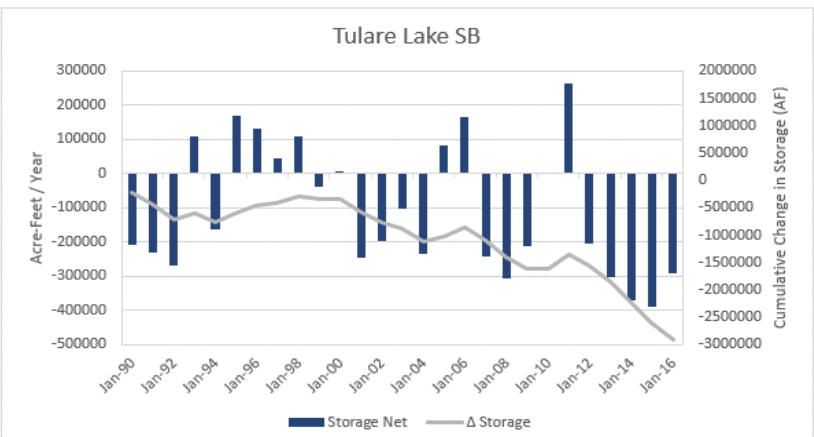


1990-2016 Calibration Period

Tulare Lake SB	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total	TSLB Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-90	194902	0	0	-622063	145263	0	-207975	16590	10308	1747	2972	-2610	4174	16590	-207975
Dec-91	153076	0	0	-569460	131326	0	-230138	19055	9774	3470	6980	-4047	2878	19055	-438114
Dec-92	141618	0	0	-585961	133709	0	-267450	17124	9172	4379	7054	-5494	2013	17124	-705563
Dec-93	219832	0	0	-253509	138043	0	110473	11154	7938	1623	4728	-4816	1681	11154	-595091
Dec-94	147197	-39	0	-481871	160540	0	-160754	10290	7100	2334	5920	-6438	1374	10290	-755845
Dec-95	191766	-46	0	-189978	175890	0	171249	6753	5986	1659	3521	-5718	1305	6753	-584596
Dec-96	178335	-125	0	-187972	169256	0	133404	2438	5587	-515	1333	-5315	1348	2438	-451191
Dec-97	165277	-614	0	-281070	186883	0	46706	442	5425	-406	-413	-5457	1294	442	-404485
Dec-98	182330	-2300	0	-244981	186206	0	110869	-820	4997	-29	-1350	-5718	1280	-820	-293616
Dec-99	163206	-7772	0	-345245	159447	0	-37133	-248	5191	-1464	12	-5551	1565	-248	-330749
Dec-00	152386	-13279	0	-262416	126350	0	5806	236	4998	-2665	1943	-5902	1863	236	-324942
Dec-01	117714	-8160	0	-466327	104350	0	-245844	1663	5004	-1579	2881	-6544	1901	1663	-570786
Dec-02	155580	-10105	0	-445039	111387	0	-194824	3693	4850	-617	4083	-6444	1820	3693	-765610
Dec-03	149854	-18982	0	-371253	133719	0	-102503	1974	4566	-704	3031	-6724	1804	1974	-868113
Dec-04	144459	-4473	0	-488683	116513	0	-235435	2258	4478	-250	3418	-7168	1781	2258	-1103549
Dec-05	164656	-16565	0	-212435	163578	0	82468	-2581	4051	-443	-1164	-6789	1764	-2581	-1021080
Dec-06	153278	-10801	0	-218055	266977	0	166031	-5735	3719	1171	-5861	-6590	1826	-5735	-855049
Dec-07	145836	-8417	0	-470691	110333	0	-241740	-4603	4110	71	-2676	-7494	1386	-4603	-1096789
Dec-08	132276	-2714	0	-522583	105345	0	-305547	-2590	4062	-227	772	-7989	792	-2590	-1402336
Dec-09	137211	-15197	0	-442966	112593	0	-211108	-1109	4468	1243	1363	-8242	58	-1109	-1613444
Dec-10	152568	-2272	0	-243075	124218	0	87	-4516	3412	186	46	-7880	-281	-4516	-1613357
Dec-11	161477	-2244	0	-87112	236976	0	264424	-10476	2661	-900	-5809	-6620	191	-10476	-1348933
Dec-12	114920	-3438	0	-367720	84221	0	-202591	-10541	2690	-1214	-5292	-7382	658	-10541	-1551524
Dec-13	109981	-3095	0	-456669	76531	0	-302107	-6456	3058	993	-3783	-7492	768	-6456	-1853631
Dec-14	74071	-2035	0	-508737	102208	0	-368910	-6329	3571	897	-2787	-8246	236	-6329	-2222541
Dec-15	59946	-1859	0	-513031	86484	0	-389608	-5519	3534	1948	-2737	-8441	177	-5519	-2612149
Dec-16	71882	-415	0	-411078	88793	0	-292080	-7729	3222	-140	-3384	-7747	320	-7729	-2904230
1990-2016 Average	145764	-4998	0	-379629	138413	0	-107564	904	5109	391	548	-6476	1332	904	--
2010-2016 Average	106406	-2194	0	-369631	114204	0	-184398	-7367	3164	253	-3392	-7687	295	-7367	--
1998-2010 Average	150104	-9311	0	-364134	140078	0	-92990	-952	4454	-408	500	-6849	1351	-952	--







Groundwater Mass Balance
Tulare Lake Subbasin
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-4**

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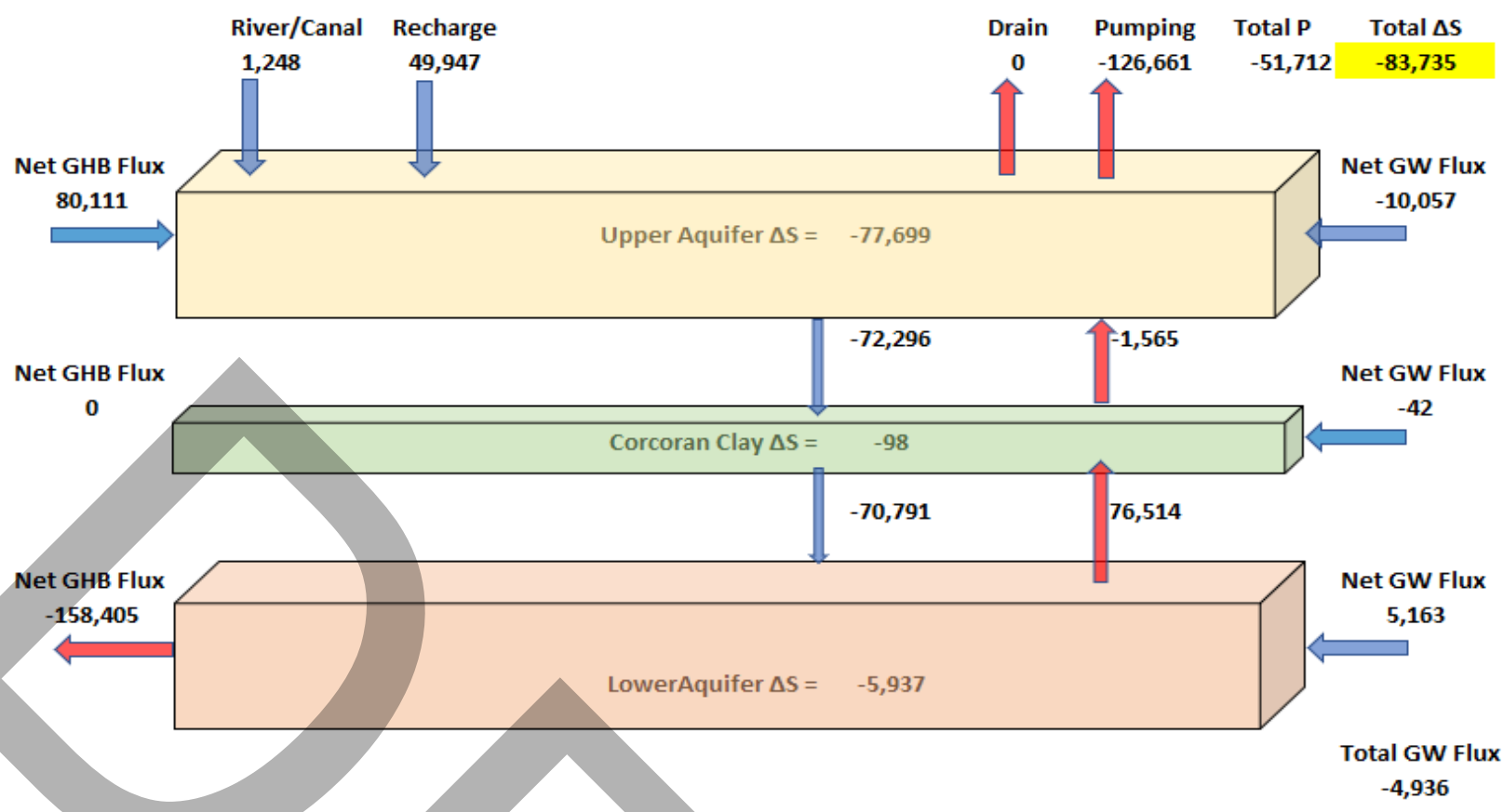
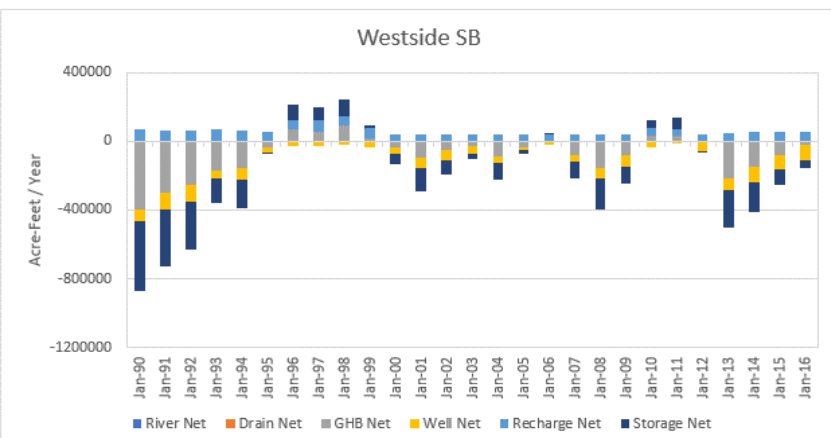
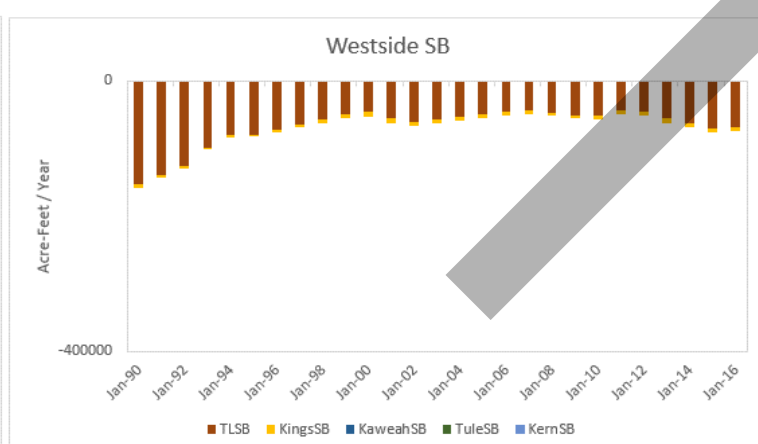
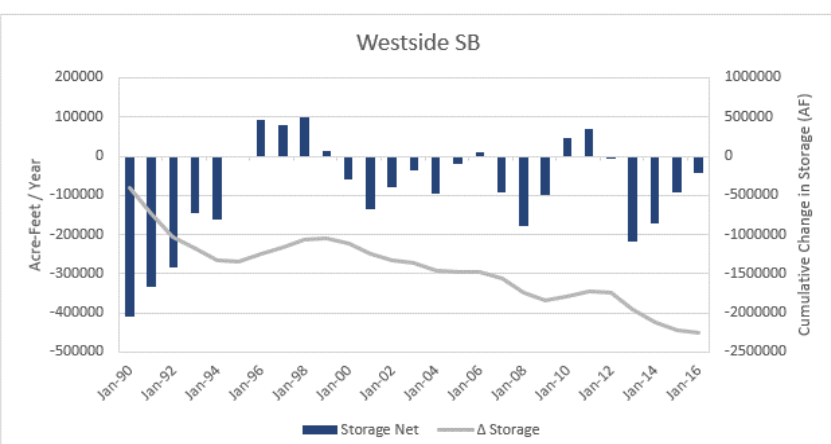


1990-2016 Calibration Period

Westside SB	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total	Westside Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-90	1315	0	-396816	-65480	71730	0	-408972	-153003	158667	-5663	0	0	0	153003	-408972
Dec-91	1317	0	-301297	-94527	65593	0	-333621	-139326	142956	-3630	0	0	0	139326	-742593
Dec-92	1299	0	-255631	-93440	64072	0	-285004	-125840	128433	-2593	0	0	0	125840	-1027597
Dec-93	1278	0	-170793	-42748	67141	0	-146277	-98728	100863	-2134	0	0	0	98728	-1173874
Dec-94	1268	0	-152975	-69963	61675	0	-162259	-80105	82579	-2474	0	0	0	80105	-1336133
Dec-95	1265	0	-36632	-26765	56748	0	-3099	-78571	80913	-2342	0	0	0	78571	-1339232
Dec-96	1265	0	67498	-27836	56985	0	92197	-72690	75776	-3086	0	0	0	72690	-1247035
Dec-97	1262	0	54795	-26106	64480	0	77675	-64427	68539	-4112	0	0	0	64427	-1169360
Dec-98	1265	0	90014	-20684	52993	0	99538	-56838	61688	-4850	0	0	0	56838	-1069822
Dec-99	1265	0	16467	-35646	64192	0	14711	-48535	54382	-5847	0	0	0	48535	-1055111
Dec-00	1278	0	-30477	-42882	36632	0	-60018	-45819	52610	-6791	0	0	0	45819	-1115129
Dec-01	1285	0	-93424	-65102	39529	0	-134787	-55102	61406	-6304	0	0	0	55102	-1249917
Dec-02	1293	0	-47650	-64372	40099	0	-80803	-60790	66811	-6021	0	0	0	60790	-1330719
Dec-03	1299	0	-29244	-39318	43671	0	-37313	-56620	62306	-5686	0	0	0	56620	-1368032
Dec-04	1306	0	-86123	-39784	39826	0	-96968	-52243	57740	-5497	0	0	0	52243	-1465000
Dec-05	1308	0	-33855	-14930	37389	0	-19947	-49359	54573	-5214	0	0	0	49359	-1484946
Dec-06	1310	0	-62	-16591	37501	0	9504	-45256	50214	-4958	0	0	0	45256	-1475442
Dec-07	1312	0	-79160	-40372	40010	0	-92598	-43215	48106	-4891	0	0	0	43215	-1568040
Dec-08	1322	0	-156481	-62097	40211	0	-179769	-46254	51137	-4883	0	0	0	46254	-1747809
Dec-09	1322	0	-78624	-67825	43444	0	-97803	-50772	55588	-4816	0	0	0	50772	-1845612
Dec-10	1324	0	35737	-34288	38450	0	47387	-50789	55731	-4942	0	0	0	50789	-1798225
Dec-11	1326	0	34525	-15154	37827	0	68323	-43511	48959	-5448	0	0	0	43511	-1729902
Dec-12	1332	0	-3671	-54344	41816	0	-5418	-45296	51660	-6364	0	0	0	45296	-1735319
Dec-13	1330	0	-212532	-69382	48047	0	-219281	-55100	61810	-6709	0	0	0	55100	-1954601
Dec-14	1327	0	-149305	-91282	51750	0	-171229	-62092	68708	-6616	0	0	0	62092	-2125829
Dec-15	1214	0	-77050	-86923	53608	0	-92137	-69944	76239	-6295	0	0	0	69944	-2217966
Dec-16	0	0	-21179	-88385	53151	0	-42883	-68155	73591	-5437	0	0	0	68155	-2260850
1990-2016 Average	1248	0	-78294	-51712	49947	0	-83735	-67347	72296	-4948	0	0	0	67347	--
2010-2016 Average	1122	0	-56211	-62822	46379	0	-59320	-56412	62385	-5973	0	0	0	56412	--
1998-2010 Average	1299	0	-37914	-41838	42611	0	-48374	-50892	56330	-5438	0	0	0	50892	--







Groundwater Mass Balance
Westside Subbasin
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-5**

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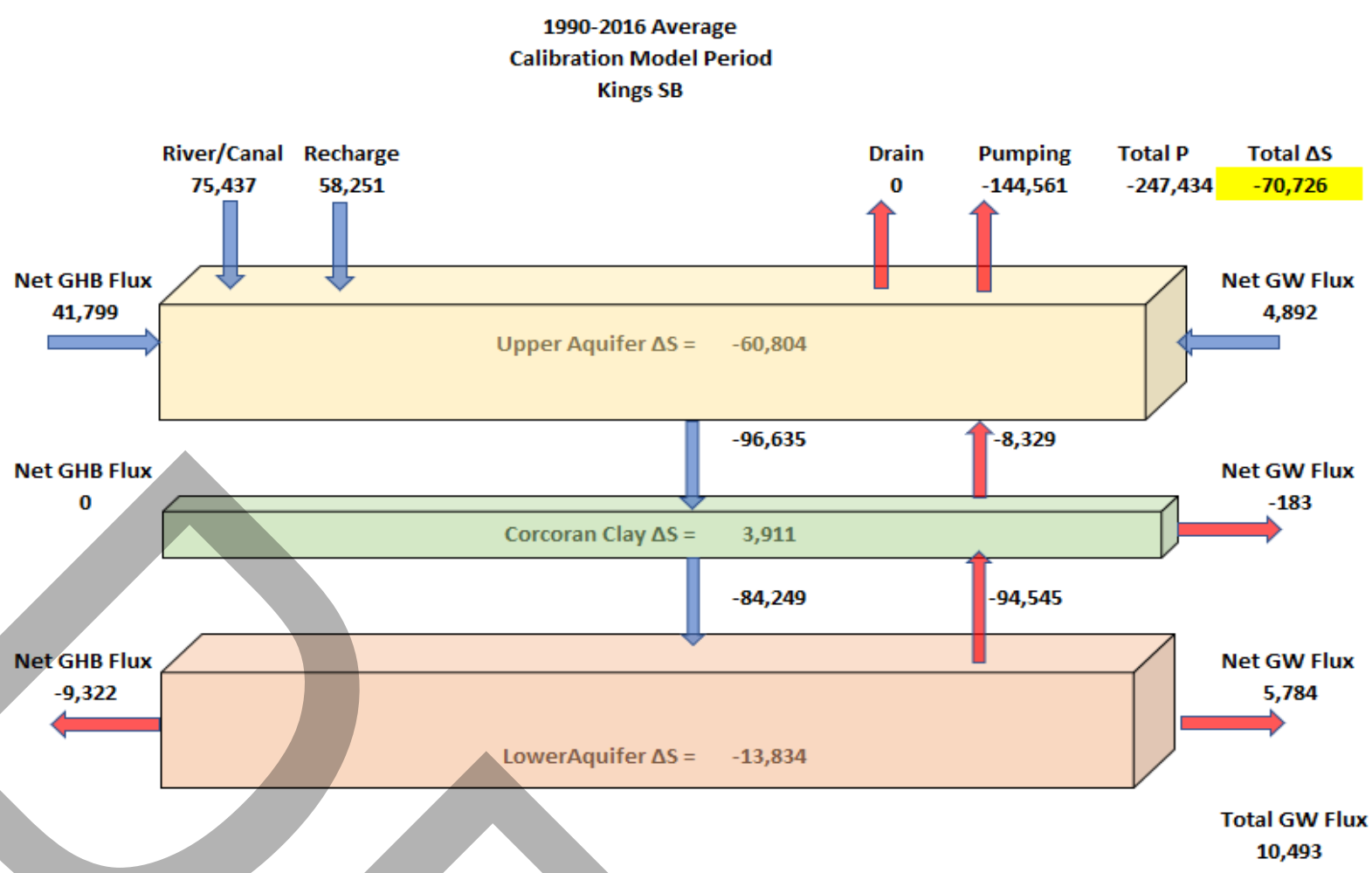
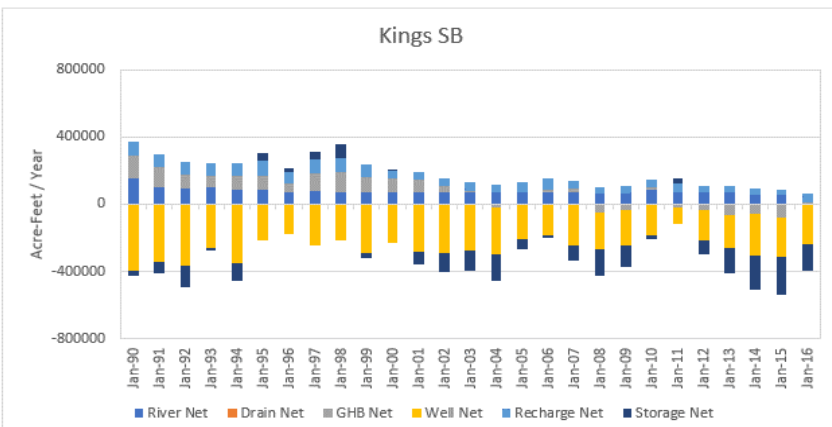
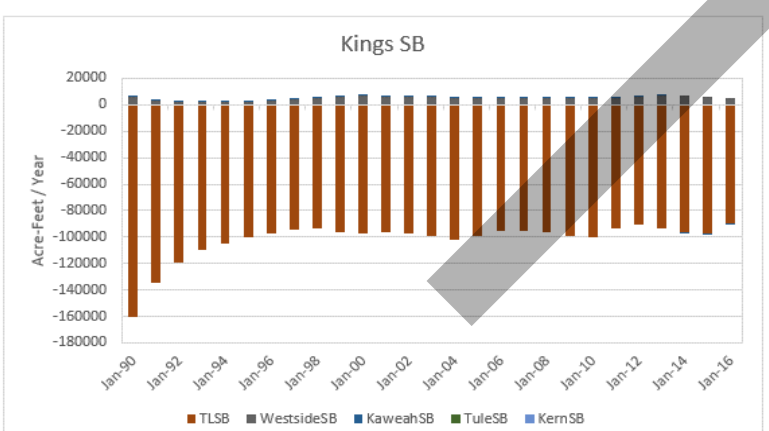
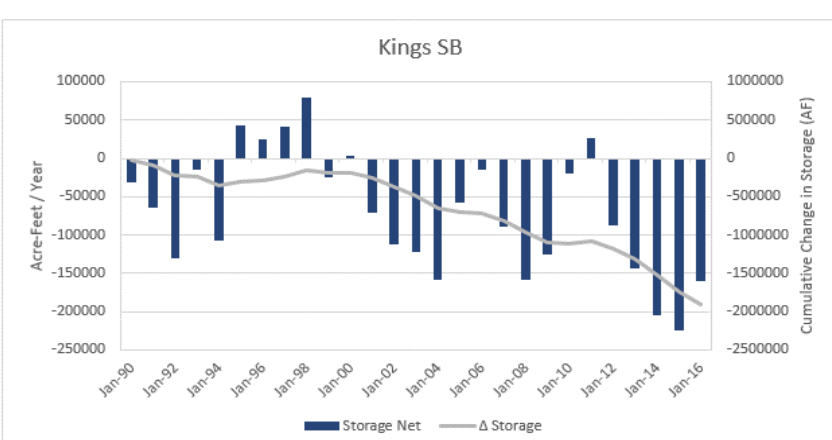


1990-2016 Calibration Period

Kings SB	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total	Kings Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-90	156383	0	136574	-395511	82203	0	-31101	-160697	5663	154598	436	0	0	160697	-31101
Dec-91	100262	0	123275	-345890	74870	0	-63783	-134943	3630	130944	370	0	0	134943	-94884
Dec-92	94997	0	80395	-363468	75679	0	-129616	-119327	2593	116389	344	0	0	119327	-224500
Dec-93	101796	0	66255	-259505	77864	0	-14511	-109261	2134	106777	350	0	0	109261	-239011
Dec-94	86022	0	82414	-350913	77561	0	-108062	-104854	2474	102043	336	0	0	104854	-347073
Dec-95	84373	0	85351	-216988	91298	0	42339	-100625	2342	97912	371	0	0	100625	-304734
Dec-96	72694	0	50941	-178123	68156	0	24125	-96908	3086	93377	446	0	0	96908	-280609
Dec-97	79105	0	109186	-242835	80201	0	40809	-94680	4112	90073	495	0	0	94680	-239800
Dec-98	71811	0	120064	-215200	85676	0	78557	-93749	4850	88370	529	0	0	93749	-161243
Dec-99	69687	0	94484	-293702	76924	0	-25400	-96601	5847	90277	477	0	0	96601	-186644
Dec-00	70854	0	87276	-228528	44764	0	3052	-97579	6791	90338	449	0	0	97579	-183592
Dec-01	69993	0	79584	-285613	45094	0	-71694	-95985	6304	89238	444	0	0	95985	-255286
Dec-02	71199	0	38349	-289417	47825	0	-111595	-97617	6021	91181	416	0	0	97617	-366881
Dec-03	73250	0	5978	-272164	50285	0	-122783	-99131	5686	93059	386	0	0	99131	-489665
Dec-04	75103	0	-16091	-280798	45178	0	-159014	-102147	5497	96300	350	0	0	102147	-648679
Dec-05	71386	0	-4531	-203908	58869	0	-57652	-99214	5214	93627	373	0	0	99214	-706331
Dec-06	69388	0	19339	-188648	67702	0	-14142	-94911	4958	89569	383	0	0	94911	-720473
Dec-07	70137	0	27471	-248425	41885	0	-89381	-95672	4891	90428	354	0	0	95672	-809854
Dec-08	61107	0	-49181	-220586	39886	0	-158621	-96508	4883	91217	408	0	0	96508	-968475
Dec-09	66256	0	-34123	-213518	45889	0	-126234	-98960	4816	93667	477	0	0	98960	-1094710
Dec-10	83045	0	15448	-186322	48669	0	-19496	-99794	4942	94313	540	0	0	99794	-1114206
Dec-11	73328	0	-18645	-100391	53855	0	26260	-93908	5448	87981	479	0	0	93908	-1087945
Dec-12	74808	0	-30871	-181573	35453	0	-87221	-90980	6364	84129	486	0	0	90980	-1175167
Dec-13	72659	0	-64183	-199997	37366	0	-144383	-93749	6709	86907	133	0	0	93749	-1319550
Dec-14	57945	0	-58065	-244356	34599	0	-204420	-96586	6616	90065	-95	0	0	96586	-1523969
Dec-15	57124	0	-77209	-238598	31760	0	-225024	-97724	6295	91726	-297	0	0	97724	-1748993
Dec-16	2075	0	7397	-235751	53256	0	-160621	-89701	5437	84644	-380	0	0	89701	-1909614
1990-2016 Average	75437	0	32477	-247434	58251	0	-70726	-101919	4948	96635	336	0	0	101919	--
2010-2016 Average	60141	0	-32304	-198141	42137	0	-116415	-94635	5973	88538	124	0	0	94635	--
1998-2010 Average	71017	0	29544	-240525	53742	0	-67262	-97528	5438	91660	430	0	0	97528	--







Groundwater Mass Balance
Kings Subbasin
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-6**

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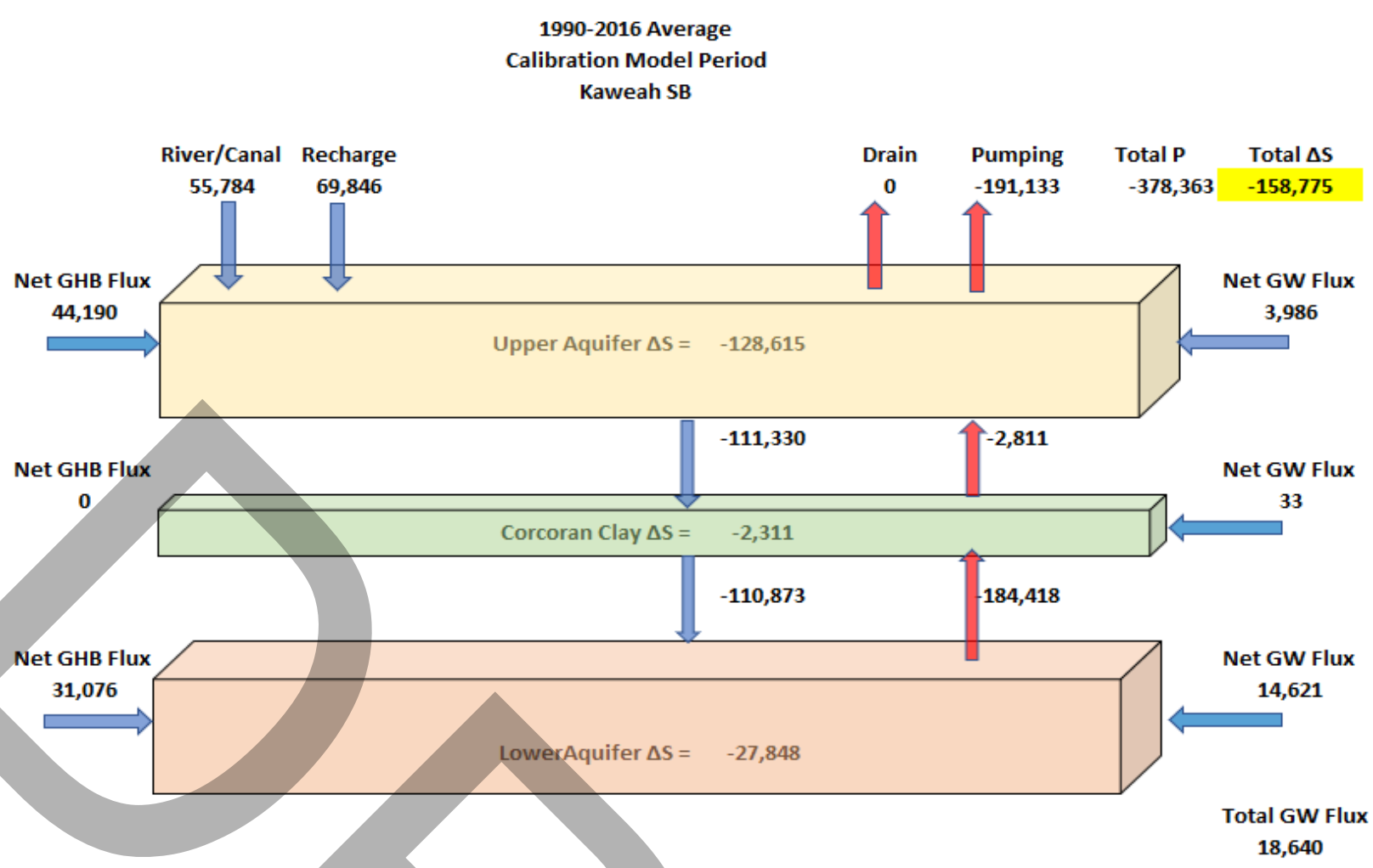
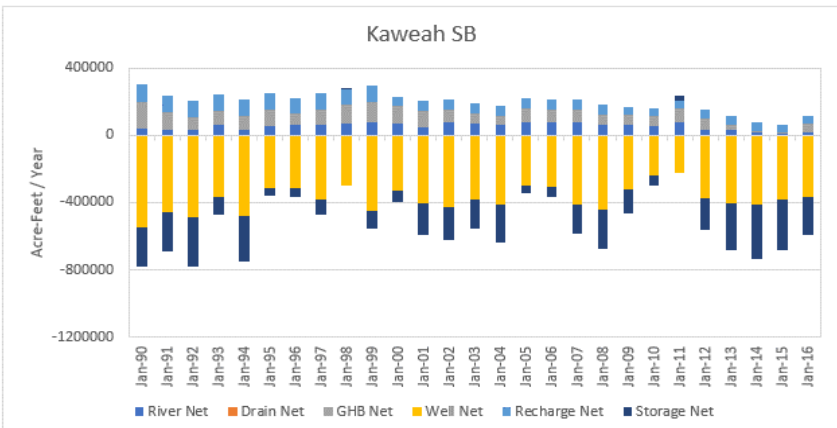
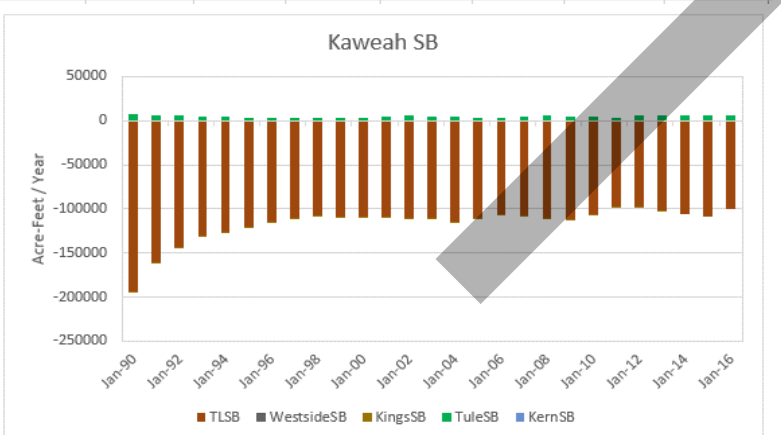
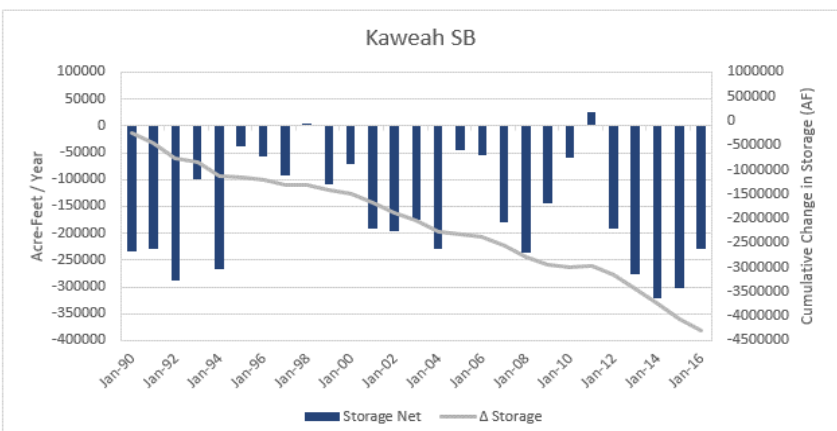


1990-2016 Calibration Period

Kaweah SB	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total	Kaweah Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-90	42496	0	158117	-545823	105264	0	-234717	-193827	0	-436	185987	8276	0	193827	-234717
Dec-91	36764	0	106304	-458094	95350	0	-229544	-159995	0	-370	153989	6376	0	159995	-464262
Dec-92	31169	0	77530	-489000	97575	0	-289243	-142709	0	-344	137131	5923	0	142709	-753505
Dec-93	65972	0	80611	-368502	100636	0	-99897	-130822	0	-350	126582	4590	0	130822	-853403
Dec-94	37121	0	78054	-482931	99914	0	-266542	-125694	0	-336	121977	4054	0	125694	-1119945
Dec-95	59767	0	96998	-317084	95426	0	-39019	-120626	0	-371	117470	3528	0	120626	-1158964
Dec-96	63692	0	66692	-309630	89196	0	-56636	-114993	0	-446	111980	3459	0	114993	-1215600
Dec-97	61613	0	92833	-378899	96149	0	-92376	-110733	0	-495	107755	3473	0	110733	-1307975
Dec-98	68918	0	117213	-300534	89825	0	4249	-107030	0	-529	104211	3348	0	107030	-1303726
Dec-99	80684	0	117497	-446338	100807	0	-109832	-108516	0	-477	105268	3725	0	108516	-1413558
Dec-00	70363	0	103731	-326853	58157	0	-71297	-108929	0	-449	105775	3603	0	108929	-1484855
Dec-01	48303	0	97509	-402646	58127	0	-190555	-108180	0	-444	103388	5236	0	108180	-1675410
Dec-02	76549	0	76513	-425588	61359	0	-196210	-109817	0	-416	104723	5510	0	109817	-1871620
Dec-03	73466	0	55695	-379970	59971	0	-175439	-110420	0	-386	106480	4327	0	110420	-2047060
Dec-04	63984	0	53848	-410793	58016	0	-229571	-113745	0	-350	108890	5206	0	113745	-2276631
Dec-05	81374	0	80871	-299268	58820	0	-46038	-110722	0	-373	107313	3782	0	110722	-2322669
Dec-06	78556	0	77885	-309391	58041	0	-54052	-105301	0	-383	102342	3343	0	105301	-2376721
Dec-07	79629	0	77583	-407803	55897	0	-178529	-107253	0	-354	102410	5197	0	107253	-2555250
Dec-08	64782	0	59796	-438838	61325	0	-235530	-110811	0	-408	105448	5772	0	110811	-2790780
Dec-09	63595	0	58061	-320695	47717	0	-143971	-111853	0	-477	107124	5206	0	111853	-2934751
Dec-10	59620	0	53355	-236786	47752	0	-60030	-106313	0	-540	102539	4315	0	106313	-2994780
Dec-11	79343	0	79144	-222371	49315	0	26397	-97325	0	-479	94181	3622	0	97325	-2968384
Dec-12	35742	0	67254	-372878	50784	0	-191724	-96609	0	-486	91485	5610	0	96609	-3160108
Dec-13	33329	0	28621	-404196	51844	0	-275701	-100975	0	-133	94850	6258	0	100975	-3435809
Dec-14	17069	0	11382	-414030	49068	0	-320008	-105983	0	95	99430	6458	0	105983	-3755817
Dec-15	11546	0	10636	-381789	45108	0	-301770	-109049	0	297	102618	6135	0	109049	-4057587
Dec-16	20724	0	48445	-365059	44388	0	-229342	-100122	0	380	94578	5164	0	100122	-4286929
1990-2016 Average	55784	0	75266	-378363	69846	0	-158775	-115865	0	-336	111330	4870	0	115865	--
2010-2016 Average	36768	0	42691	-342444	48323	0	-193168	-102340	0	-124	97097	5366	0	102340	--
1998-2010 Average	69986	0	79197	-361962	62755	0	-129754	-109145	0	-430	105070	4505	0	109145	--







Groundwater Mass Balance
Kaweah Subbasin
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-7**

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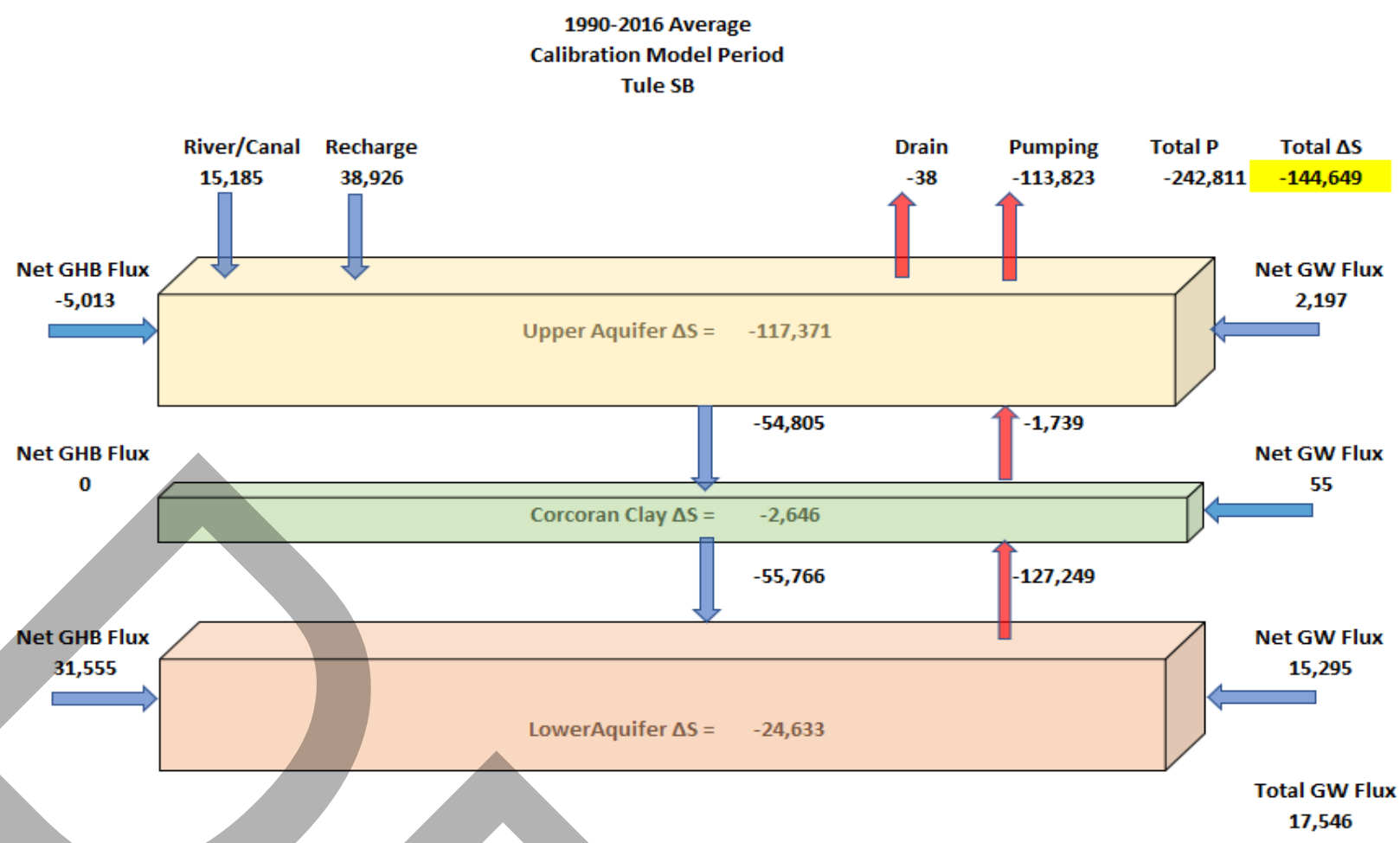
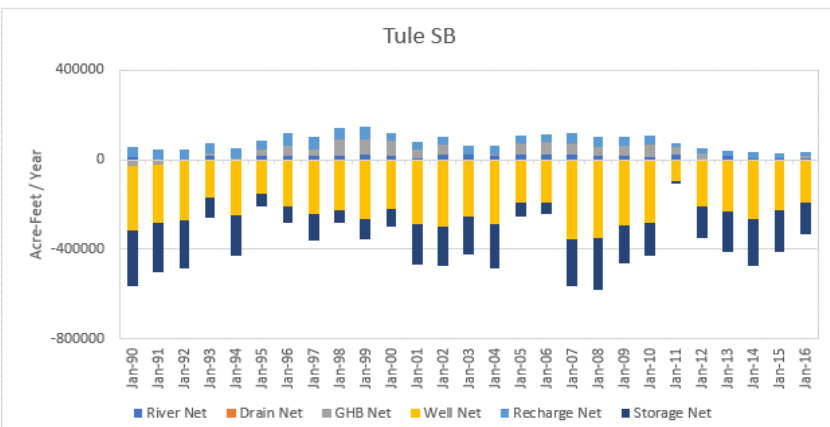
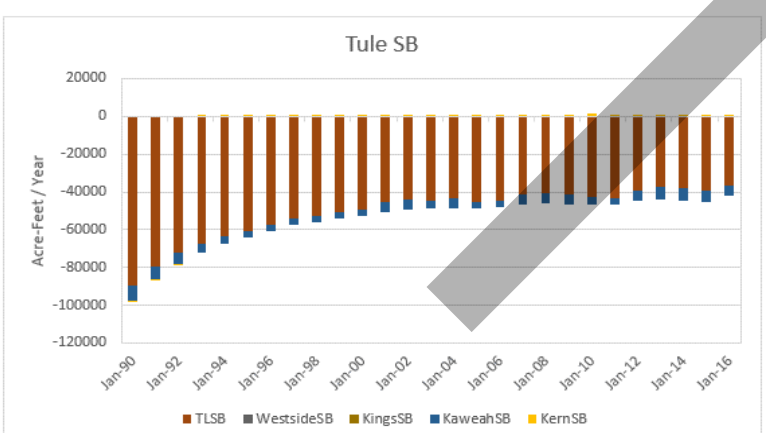
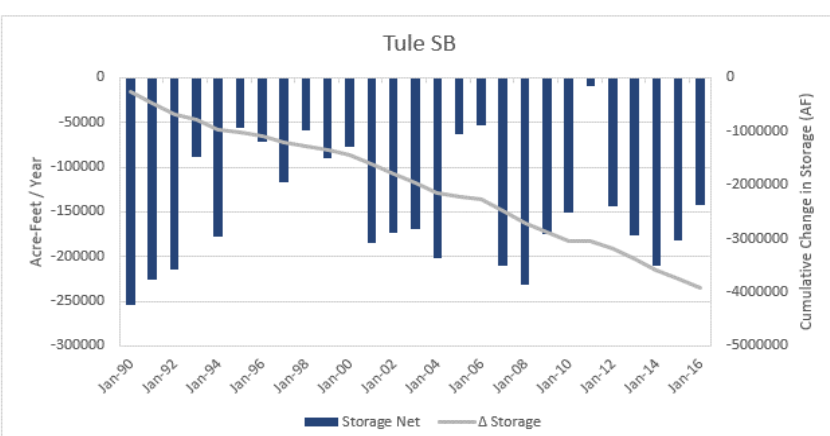


1990-2016 Calibration Period

Tule SB	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total	Tule Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-90	9672	0	-26336	-287628	47940	0	-253460	-89628	0	0	-8276	98267	-363	89628	-253460
Dec-91	3571	0	-19973	-260457	42405	0	-225138	-79728	0	0	-6376	86360	-256	79728	-478599
Dec-92	738	0	-5883	-264017	43818	0	-214575	-72312	0	0	-5923	78382	-147	72312	-693174
Dec-93	19790	0	7818	-170880	45472	0	-88581	-67753	0	0	-4590	72328	15	67753	-781755
Dec-94	229	0	7446	-248506	45240	0	-178271	-63266	0	0	-4054	67200	119	63266	-960026
Dec-95	16882	0	26394	-153616	43617	0	-56250	-60433	0	0	-3528	63754	207	60433	-1016276
Dec-96	19681	0	45357	-210687	55019	0	-71526	-57485	0	0	-3459	60557	387	57485	-1087802
Dec-97	18625	0	25461	-241775	59004	0	-117189	-54041	0	0	-3473	57020	494	54041	-1204991
Dec-98	20517	0	68719	-225444	53864	0	-58634	-52553	0	0	-3348	55387	514	52553	-1263624
Dec-99	25562	-53	64021	-266174	60878	0	-89384	-50636	0	0	-3725	53735	627	50636	-1353008
Dec-00	19710	-50	63561	-219170	34823	0	-77465	-49365	0	0	-3603	52308	660	49365	-1430473
Dec-01	7656	-21	40194	-286559	34968	0	-184525	-45405	0	0	-5236	49938	703	45405	-1614999
Dec-02	24624	-58	42494	-298807	36543	0	-172959	-44004	0	0	-5510	48831	682	44004	-1787958
Dec-03	22068	-106	2613	-255997	36142	0	-169082	-44422	0	0	-4327	48089	660	44422	-1957039
Dec-04	17250	-67	8953	-286521	34494	0	-201356	-43425	0	0	-5206	47970	661	43425	-2158396
Dec-05	24483	-127	49193	-191884	34954	0	-62863	-45084	0	0	-3782	48224	642	45084	-2221259
Dec-06	23019	-110	56279	-190267	34539	0	-53185	-44613	0	0	-3343	47316	640	44613	-2274444
Dec-07	23370	-174	52568	-355217	42274	0	-210028	-41324	0	0	-5197	45530	990	41324	-2484472
Dec-08	16126	-104	40986	-351711	43174	0	-230884	-40576	0	0	-5772	45256	1092	40576	-2715355
Dec-09	16800	-78	48084	-290795	35823	0	-174981	-41373	0	0	-5206	45410	1169	41373	-2890336
Dec-10	12933	-20	55712	-279413	41806	0	-151281	-42681	0	0	-4315	45760	1236	42681	-3041618
Dec-11	23865	-48	30953	-96917	21304	0	-9719	-43056	0	0	-3622	45808	871	43056	-3051337
Dec-12	2520	-4	24881	-207319	25348	0	-143073	-39049	0	0	-5610	43819	840	39049	-3194410
Dec-13	16283	0	1837	-233829	24657	0	-176559	-37534	0	0	-6258	42896	896	37534	-3370968
Dec-14	8619	0	-357	-265576	27597	0	-209605	-38260	0	0	-6458	43716	1001	38260	-3580574
Dec-15	6224	0	-629	-227495	24071	0	-182274	-39451	0	0	-6135	44697	889	39451	-3762848
Dec-16	9186	0	6274	-189225	21238	0	-142677	-36714	0	0	-5164	41166	712	36714	-3905525
1990-2016 Average	15185	-38	26541	-242811	38926	0	-144649	-50525	0	0	-4870	54805	590	50525	--
2010-2016 Average	11376	-10	16953	-214253	26575	0	-145027	-39535	0	0	-5366	43980	921	39535	--
1998-2010 Average	19548	-74	45644	-269074	40329	0	-141279	-45035	0	0	-4505	48750	790	45035	--







Groundwater Mass Balance
Tule Subbasin
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-8**

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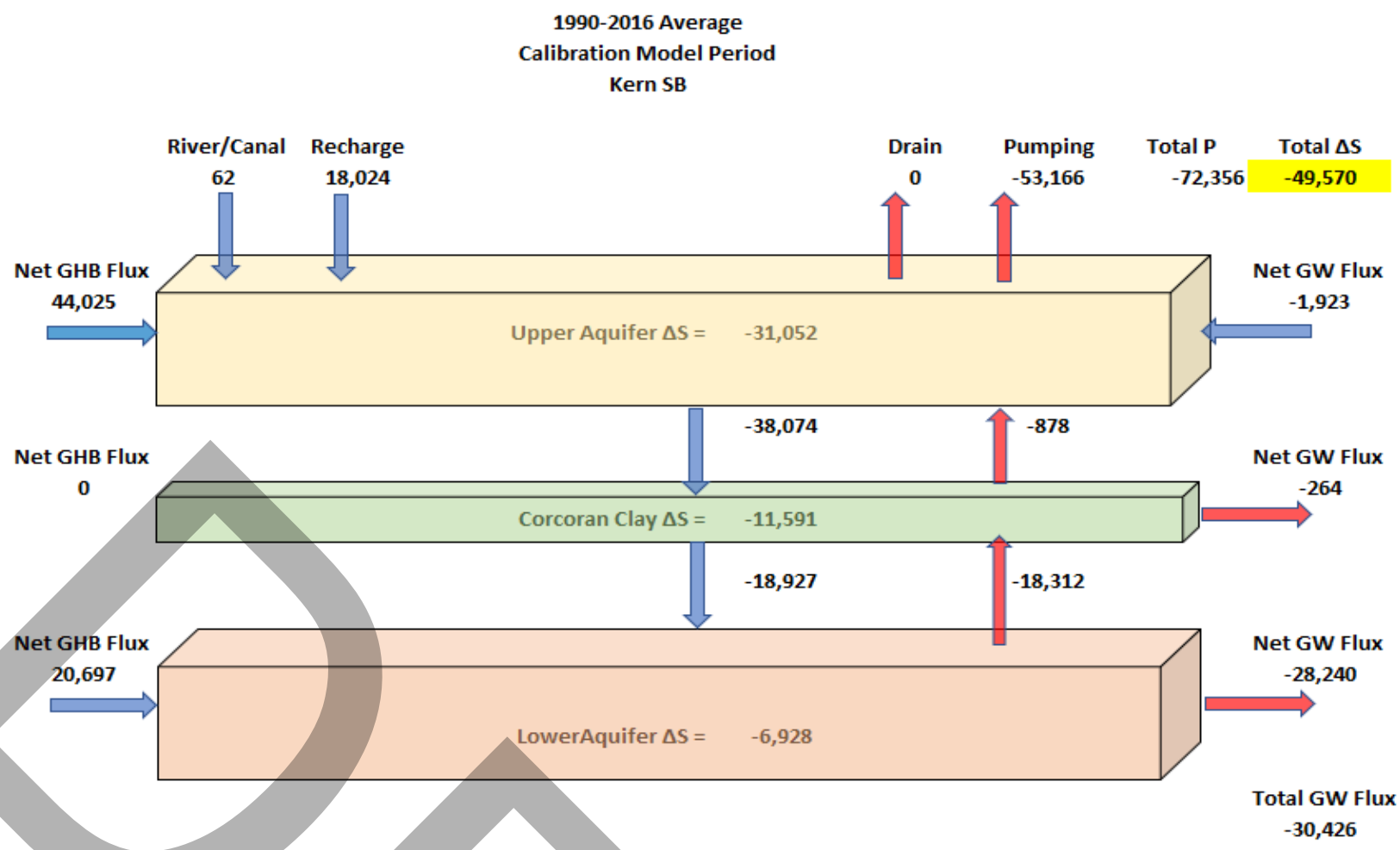
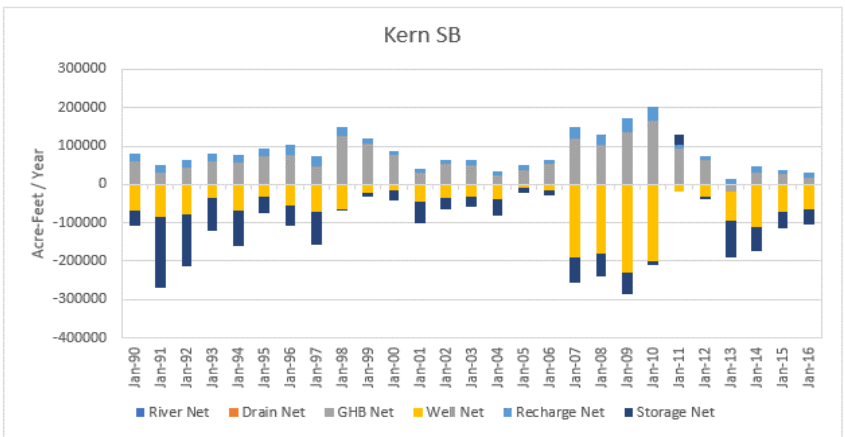
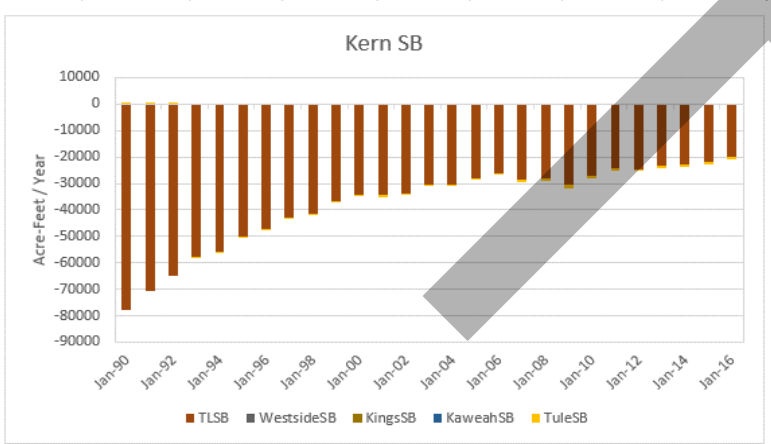
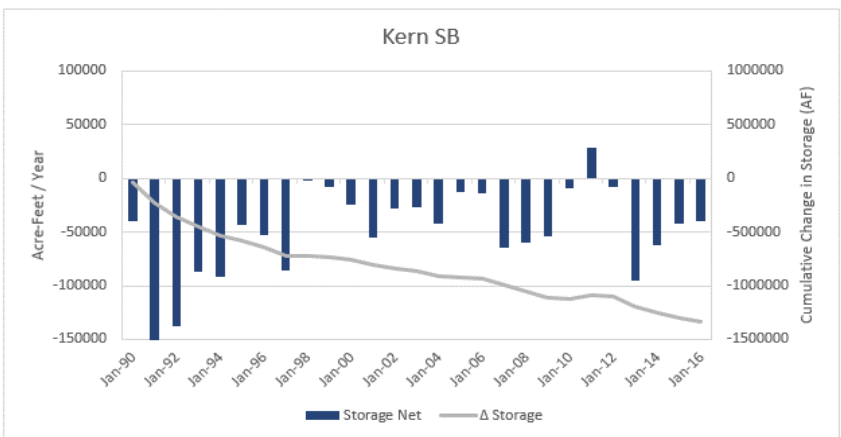


1990-2016 Calibration Period															
Kern SB	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern	Kern
	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-90	0	0	58953	-69307	21698	0	-40042	-77981	0	0	0	363	77618	77981	-40042
Dec-91	48	0	31263	-86147	19637	0	-182815	-70485	0	0	0	256	70230	70485	-222857
Dec-92	187	0	42832	-76580	20117	0	-137418	-65074	0	0	0	147	64927	65074	-360275
Dec-93	138	0	60158	-35842	20720	0	-86849	-57519	0	0	0	-15	57534	57519	-447124
Dec-94	48	0	57312	-69141	20680	0	-91555	-55726	0	0	0	-119	55845	55726	-538679
Dec-95	185	0	73539	-30379	20177	0	-43523	-49873	0	0	0	-207	50080	49873	-582202
Dec-96	187	0	78226	-56388	23865	0	-52831	-47245	0	0	0	-387	47632	47245	-635033
Dec-97	185	0	47995	-72148	25832	0	-85387	-43001	0	0	0	-494	43495	43001	-720420
Dec-98	138	0	125696	-66545	23577	0	-1848	-41376	0	0	0	-514	41890	41376	-722268
Dec-99	48	0	105100	-23400	15454	0	-7777	-36503	0	0	0	-627	37129	36503	-730045
Dec-00	139	0	75998	-16978	9236	0	-24696	-34076	0	0	0	-660	34735	34076	-754740
Dec-01	0	0	31177	-45688	9735	0	-54603	-34514	0	0	0	-703	35217	34514	-809343
Dec-02	0	0	52984	-36639	10536	0	-27804	-33696	0	0	0	-682	34378	33696	-837148
Dec-03	0	0	52127	-30832	10768	0	-26474	-30399	0	0	0	-660	31059	30399	-863622
Dec-04	48	0	23140	-38258	10424	0	-42110	-30276	0	0	0	-661	30936	30276	-905732
Dec-05	185	0	38499	-10056	10629	0	-12266	-27847	0	0	0	-642	28489	27847	-917998
Dec-06	138	0	53021	-14044	11096	0	-13975	-26140	0	0	0	-640	26780	26140	-931973
Dec-07	0	0	119111	-191159	30224	0	-64164	-28313	0	0	0	-990	29304	28313	-996137
Dec-08	0	0	102261	-179232	27840	0	-60115	-27900	0	0	0	-1092	28992	27900	-1056252
Dec-09	0	0	138051	-230965	34259	0	-54284	-30607	0	0	0	-1169	31777	30607	-1110536
Dec-10	0	0	167673	-200524	34788	0	-9102	-27029	0	0	0	-1236	28265	27029	-1119638
Dec-11	0	0	93282	-18958	9608	0	28038	-24274	0	0	0	-871	25145	24274	-1091599
Dec-12	0	0	62312	-31291	10267	0	-7716	-24487	0	0	0	-840	25327	24487	-1099316
Dec-13	0	0	-19044	-75081	14426	0	-94725	-23173	0	0	0	-896	24070	23173	-1194041
Dec-14	0	0	30678	-110989	17443	0	-62220	-22716	0	0	0	-1001	23718	22716	-1256261
Dec-15	0	0	26312	-71144	12159	0	-42483	-21816	0	0	0	-889	22704	21816	-1298744
Dec-16	0	0	18833	-65891	11450	0	-39651	-20013	0	0	0	-712	20725	20013	-1338395
1990-2016 Average	62	0	64722	-72356	18024	0	-49570	-37484	0	0	0	-590	38074	37484	--
2010-2016 Average	0	0	54292	-81983	15735	0	-32551	-23358	0	0	0	-921	24279	23358	--
1998-2010 Average	53	0	83449	-83409	18351	0	-30709	-31437	0	0	0	-790	32227	31437	--







Groundwater Mass Balance
Kern Subbasin
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-9**

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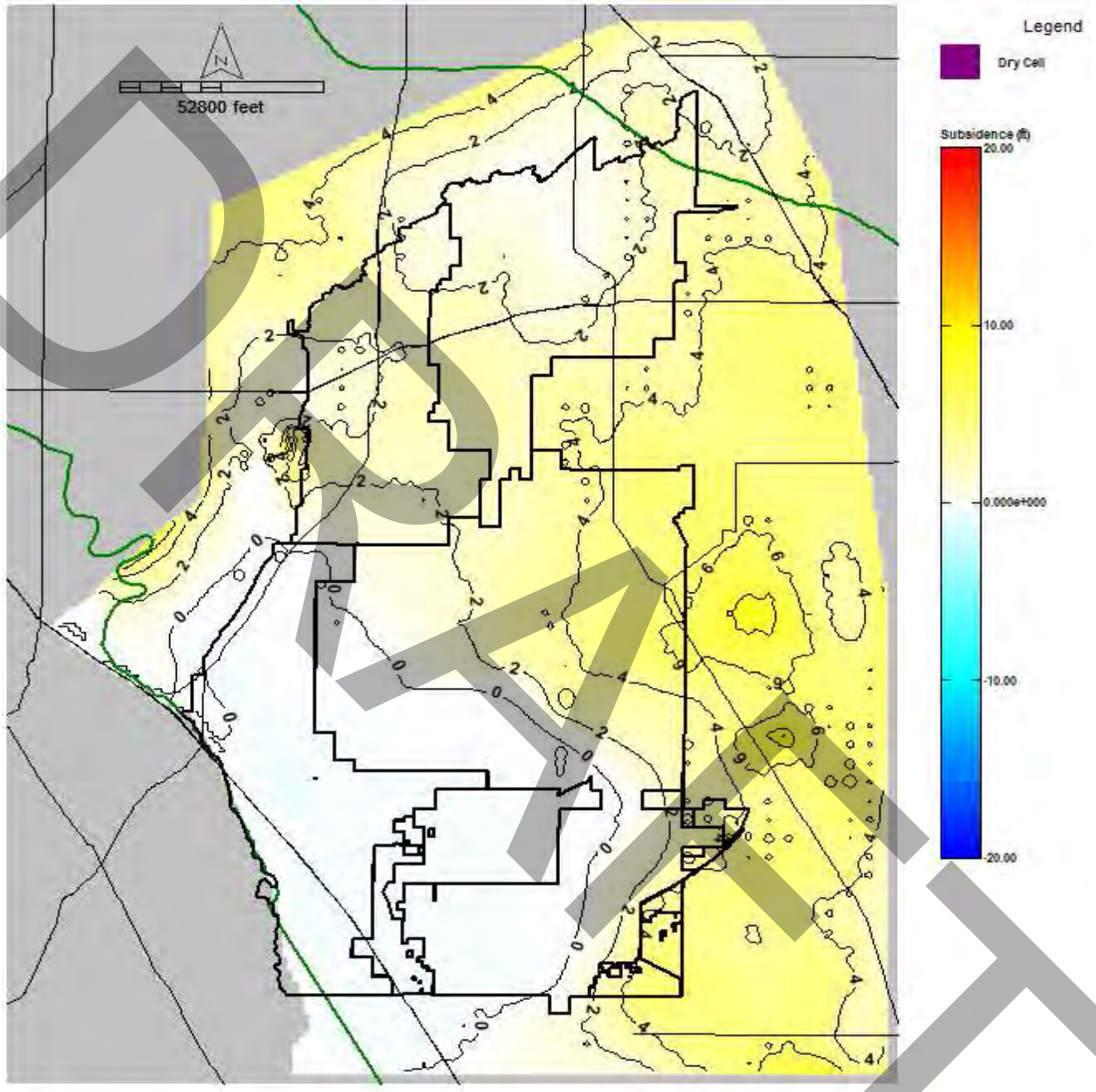

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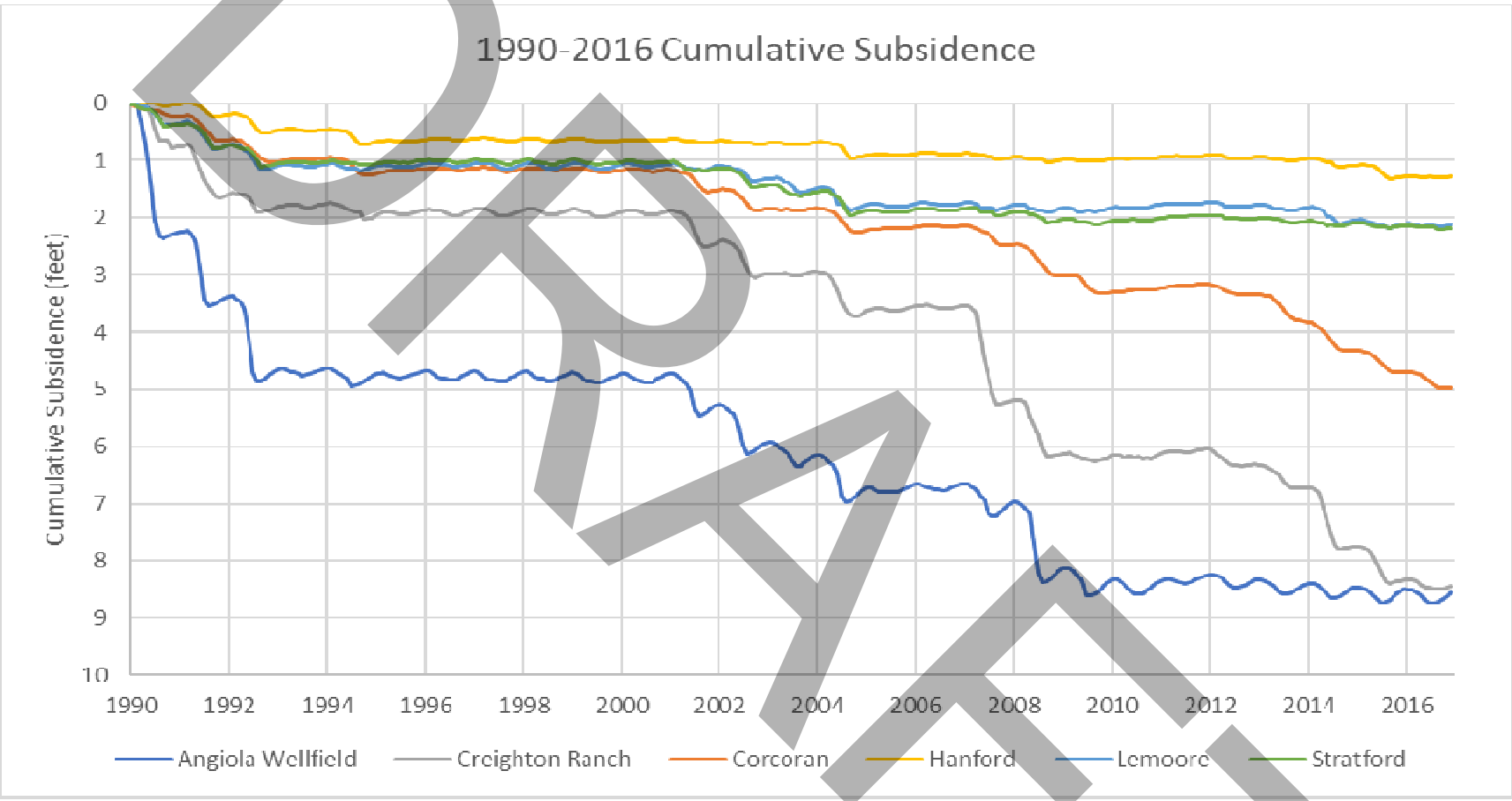
Simulated Subsidence 1990-2016

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-10**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 5-11 Sub Hydrographs 9/7/2019



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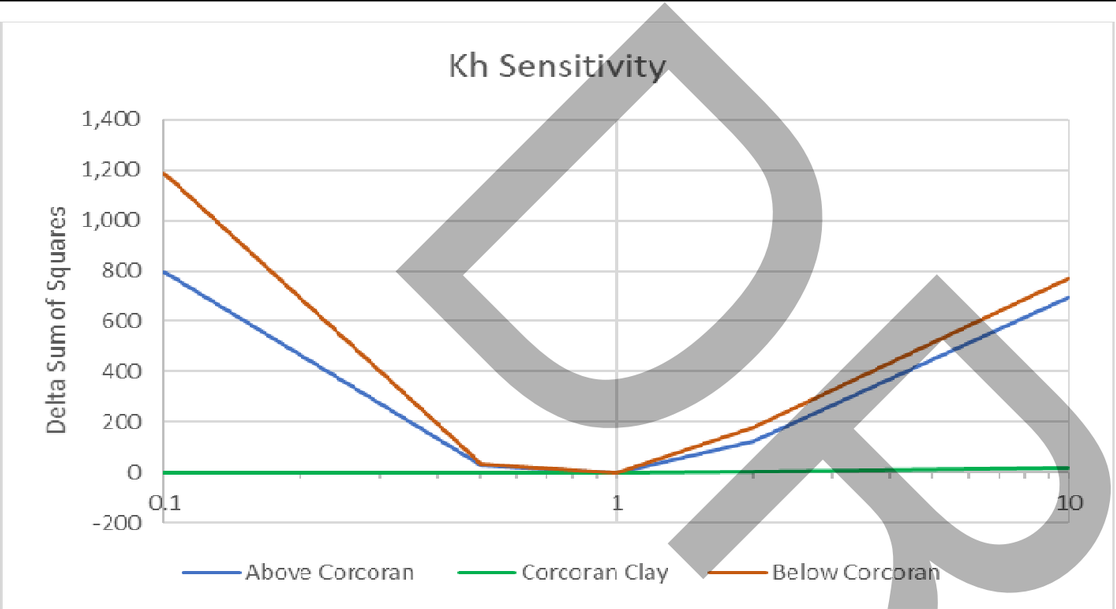
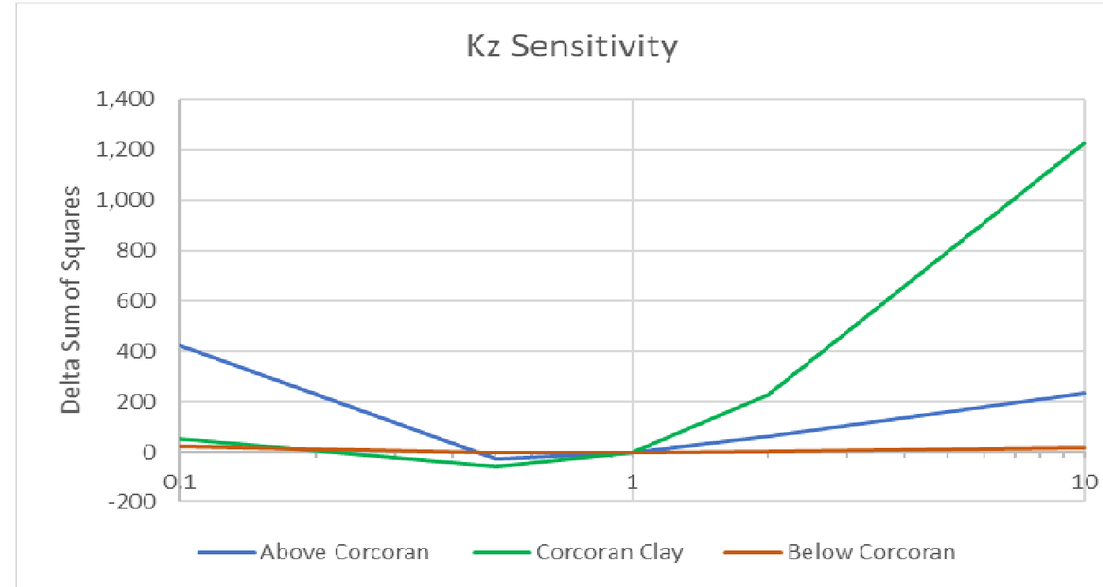
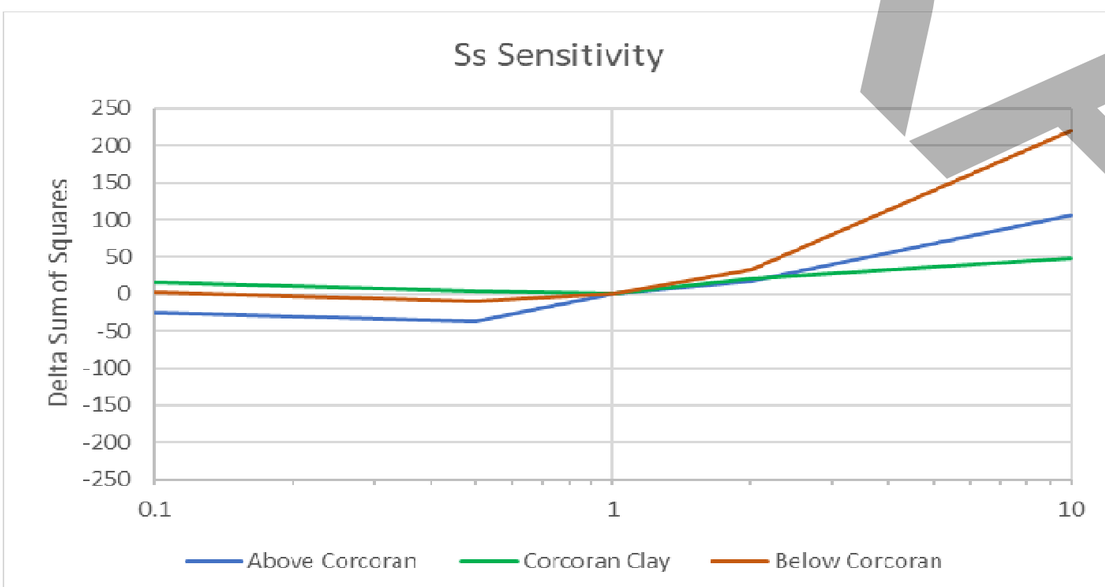
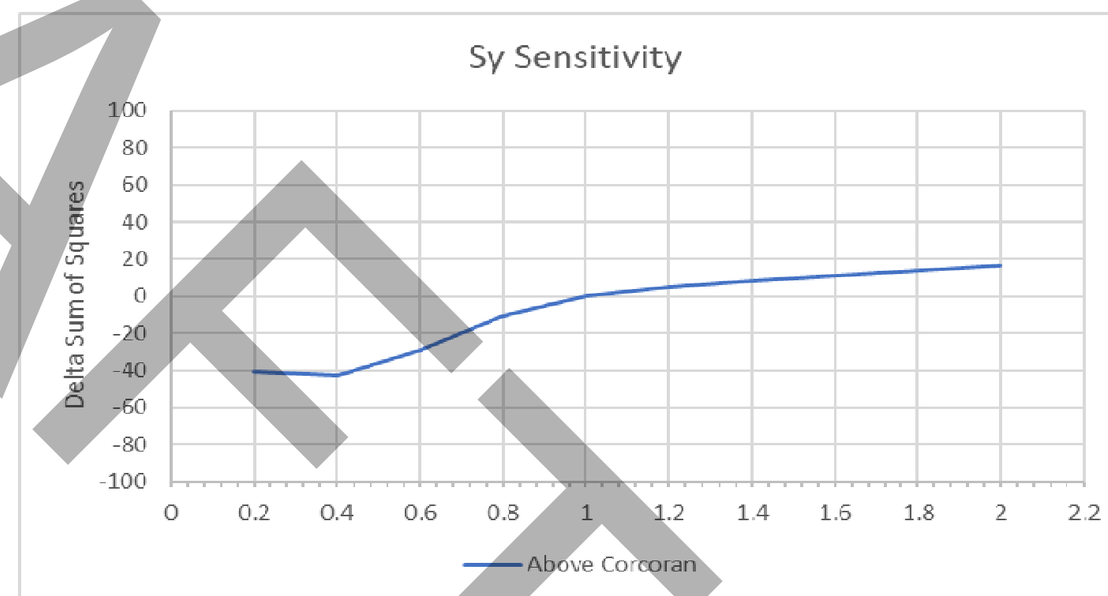
Simulated Cumulative Subsidence
Municipal and Agricultural Well Field
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D5-11**









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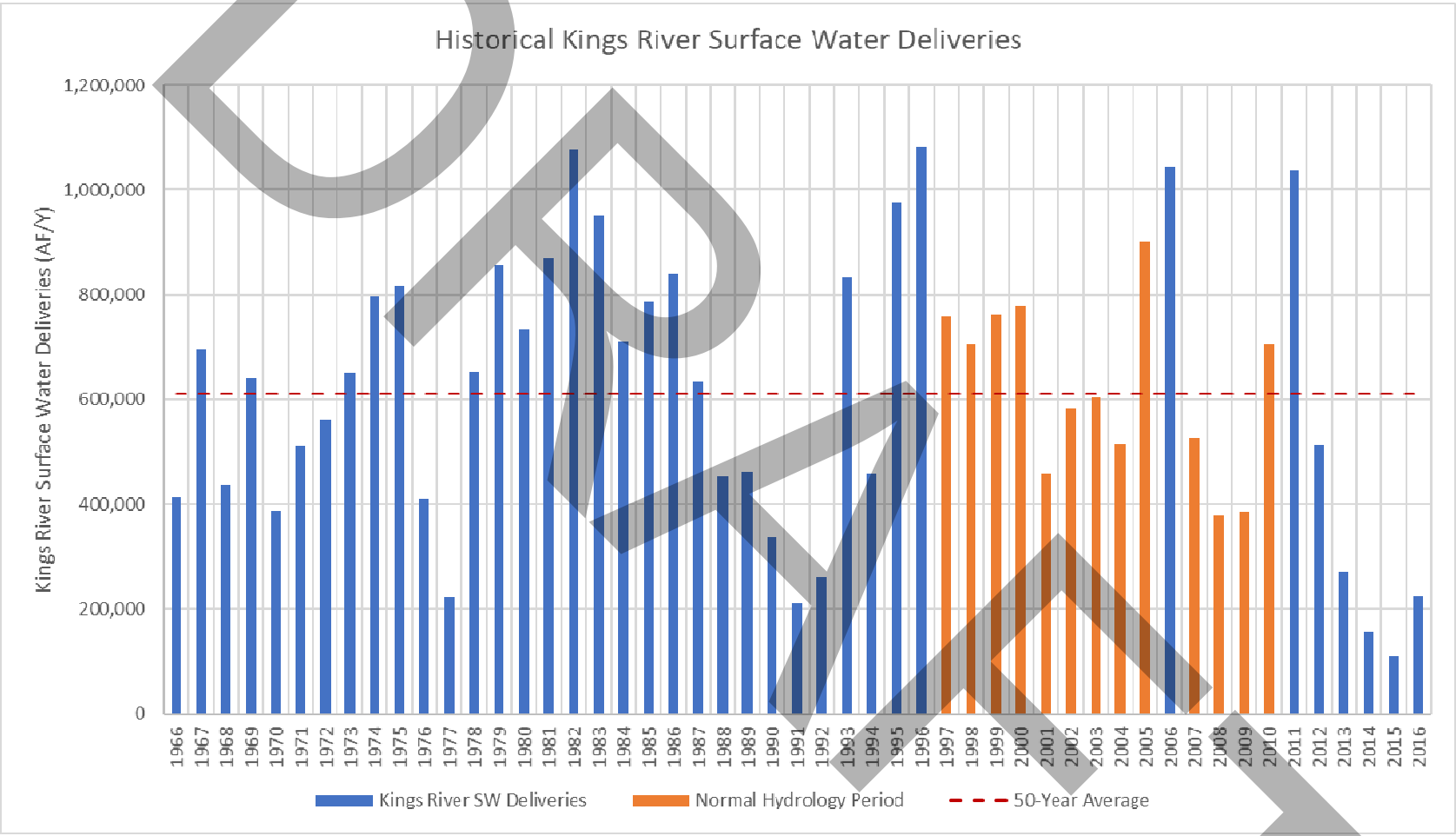
Model Hydraulic Parameter Sensitivity Analysis

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D6-1**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 7-1 Normal Kings Hydrol (2) 9/7/2019



Note: Normal Hydrology cycle included 1997 instead of 2006 to match the 50-year average

Historical Kings River Surface Water Deliveries with Normal Hydrology

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-1**

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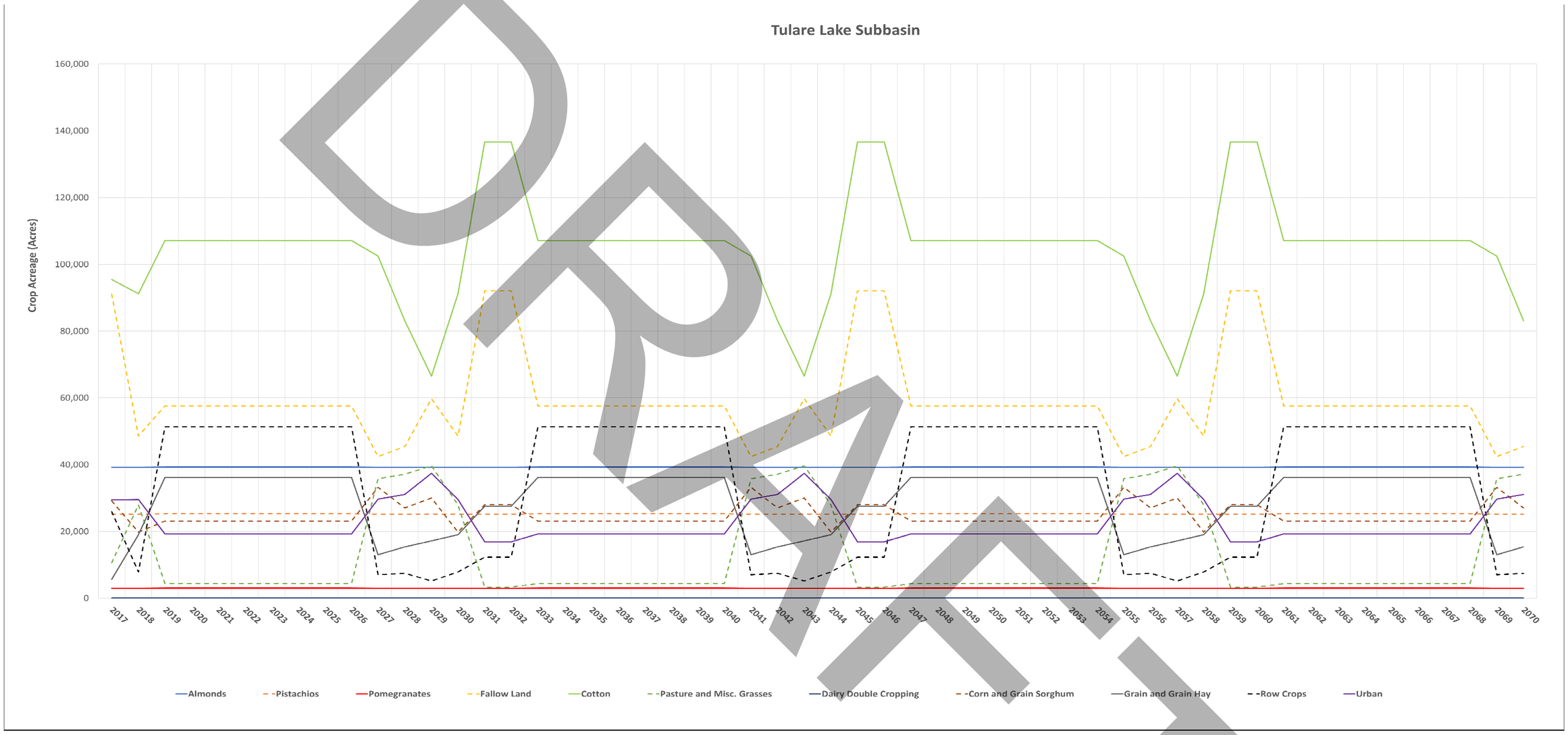

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2017-2070 Baseline Forecast Model
Crop Acreage
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-2**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 7-3 Forecast SWD CNRA 9/7/2019

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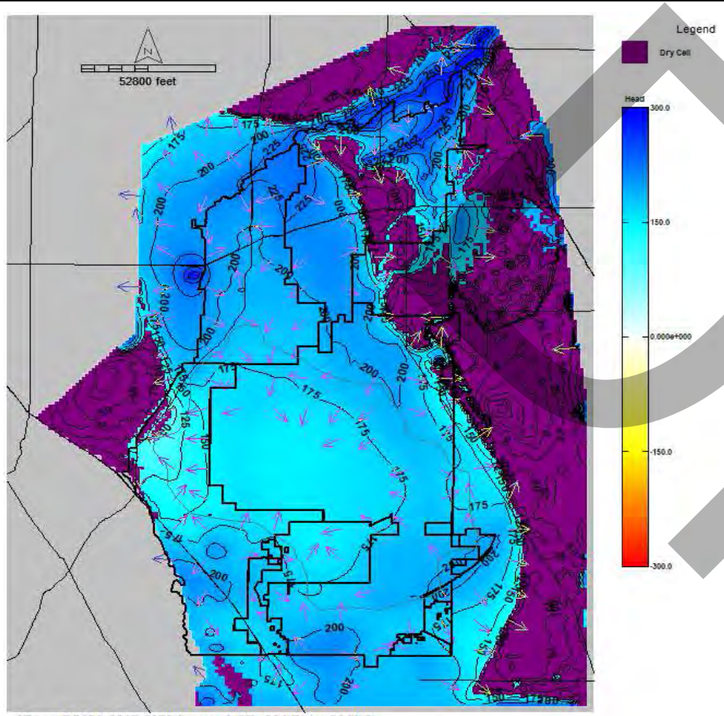
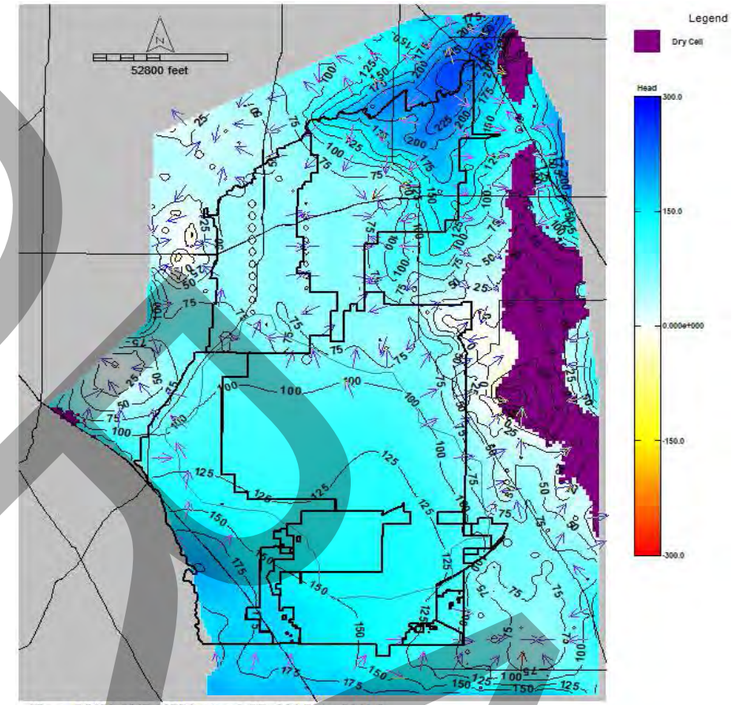
2017-2070 Baseline Forecast of Surface Water Deliveries with CNRA

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

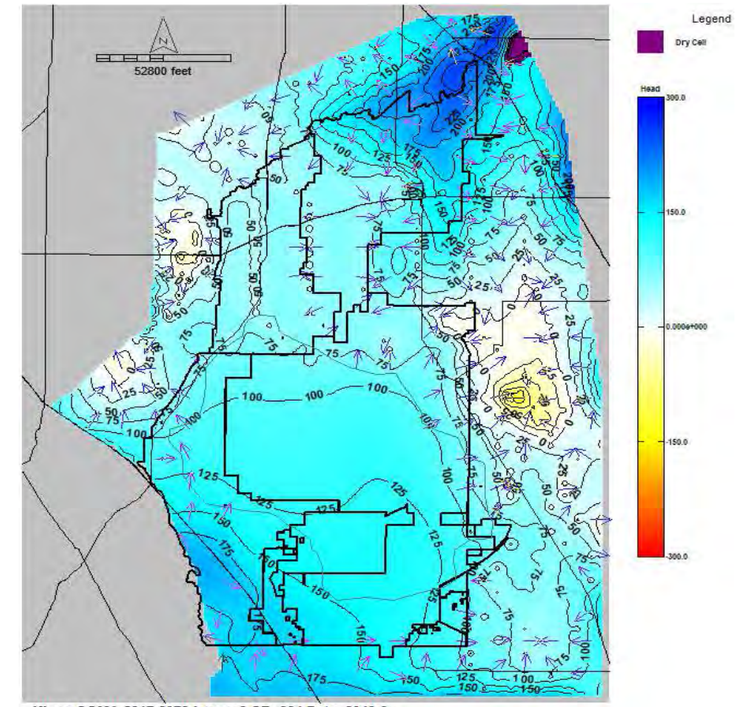
By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-3**



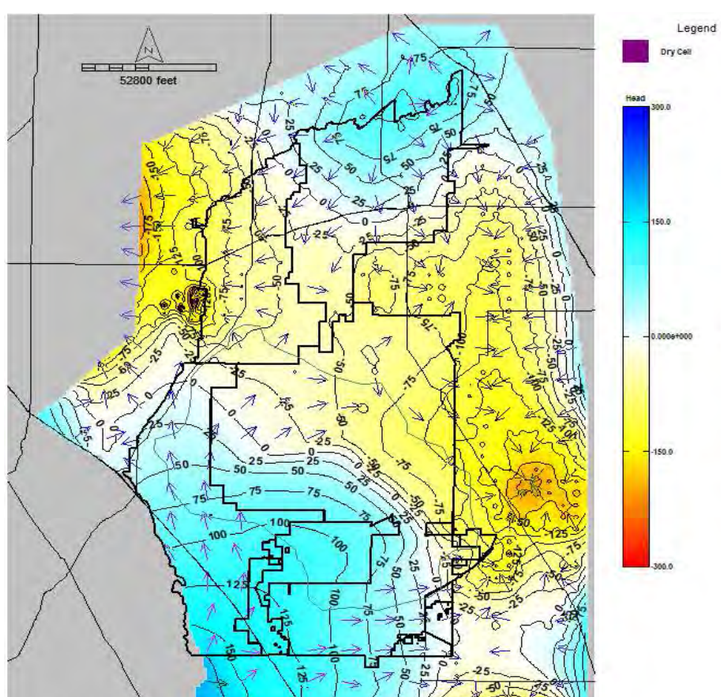
Kings SGMA 2017-2070 Layer: 1 SP: 284 Date: 2040.6



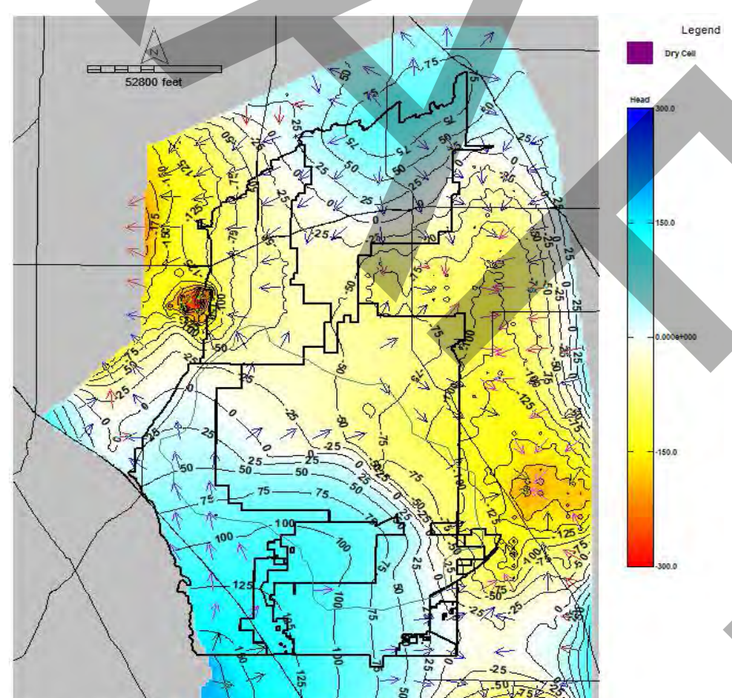
Kings SGMA 2017-2070 Layer: 2 SP: 284 Date: 2040.6



Kings SGMA 2017-2070 Layer: 3 SP: 284 Date: 2040.6



Kings SGMA 2017-2070 Layer: 5 SP: 284 Date: 2040.6



Kings SGMA 2017-2070 Layer: 6 SP: 284 Date: 2040.6

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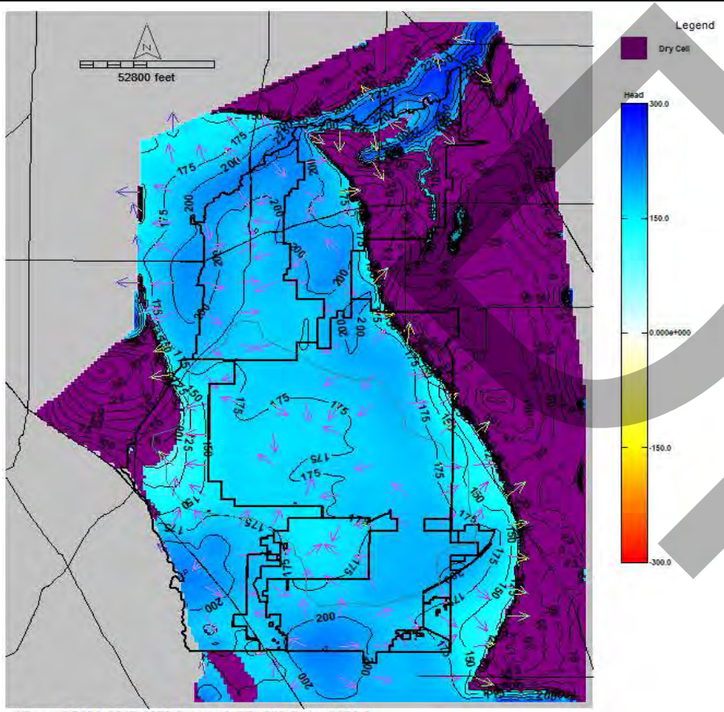
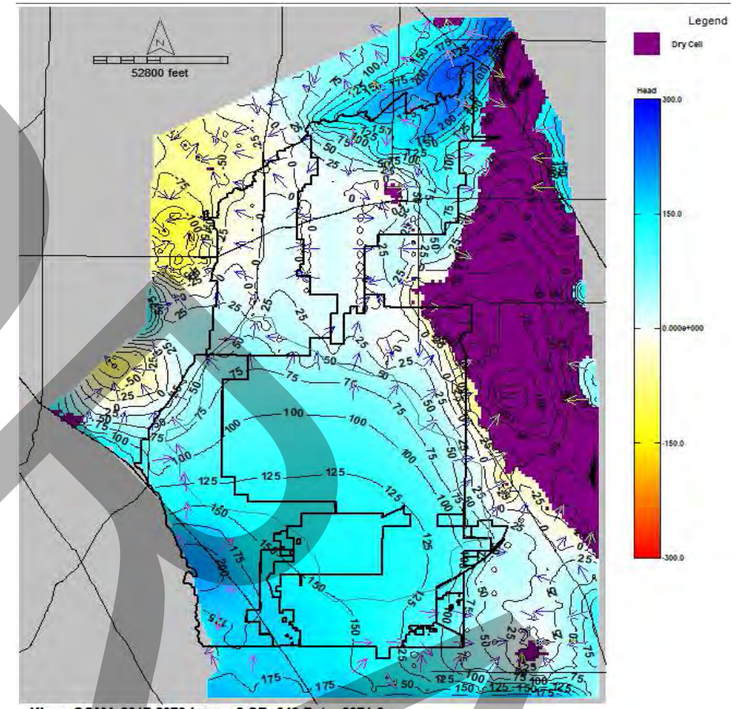
2040 Baseline Forecast Groundwater Elevations and Groundwater Flow Vectors

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

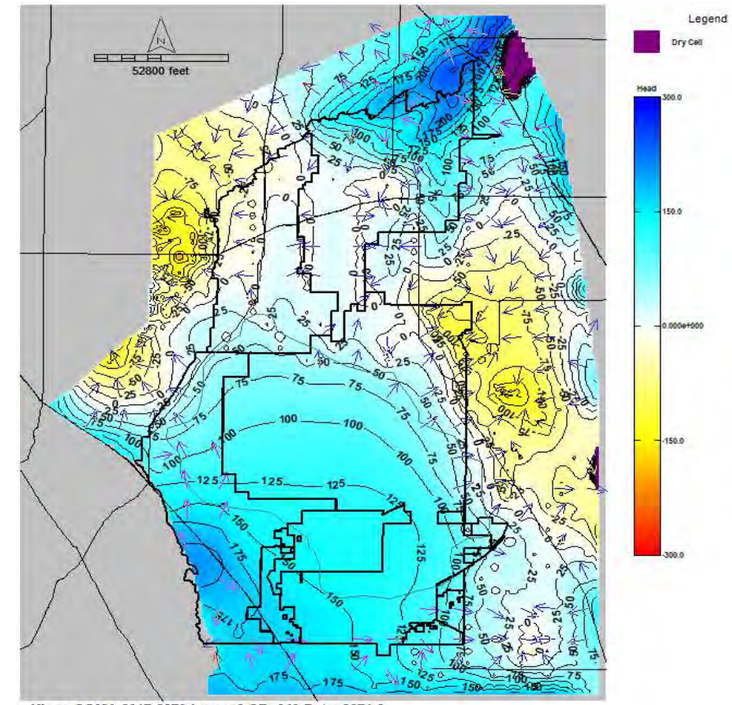
By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-4**



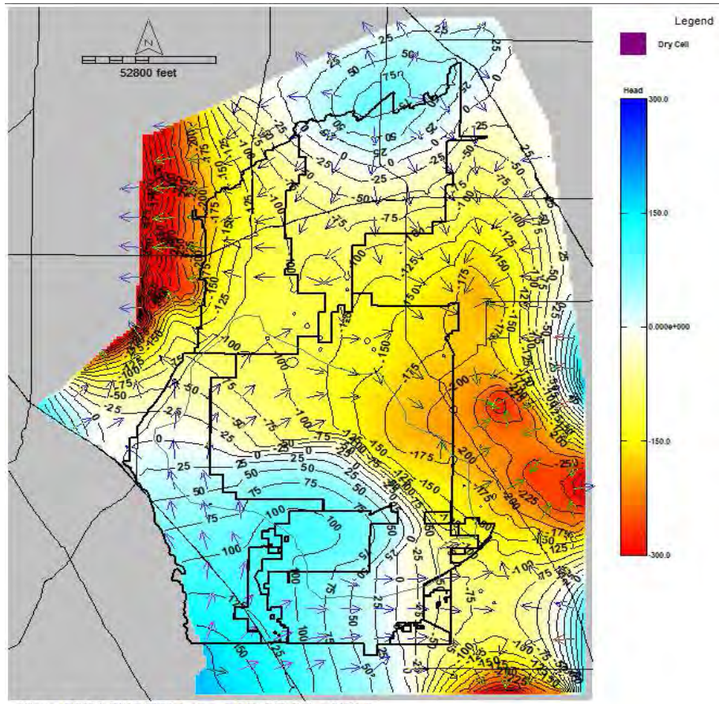
Kings SGMA 2017-2070 Layer: 1 SP: 649 Date: 2071.0



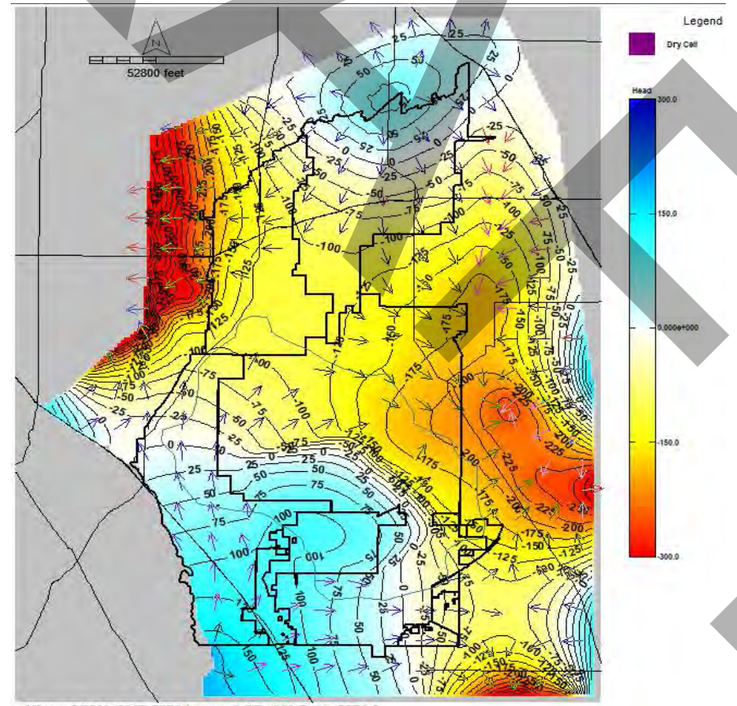
Kings SGMA 2017-2070 Layer: 2 SP: 649 Date: 2071.0



Kings SGMA 2017-2070 Layer: 3 SP: 649 Date: 2071.0



Kings SGMA 2017-2070 Layer: 5 SP: 649 Date: 2071.0



Kings SGMA 2017-2070 Layer: 6 SP: 649 Date: 2071.0

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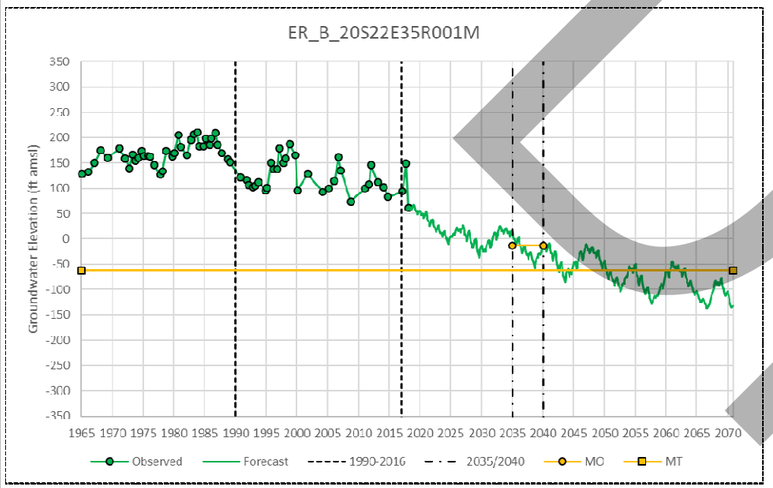
2070 Baseline Forecast Groundwater Elevations and Groundwater Flow Vectors

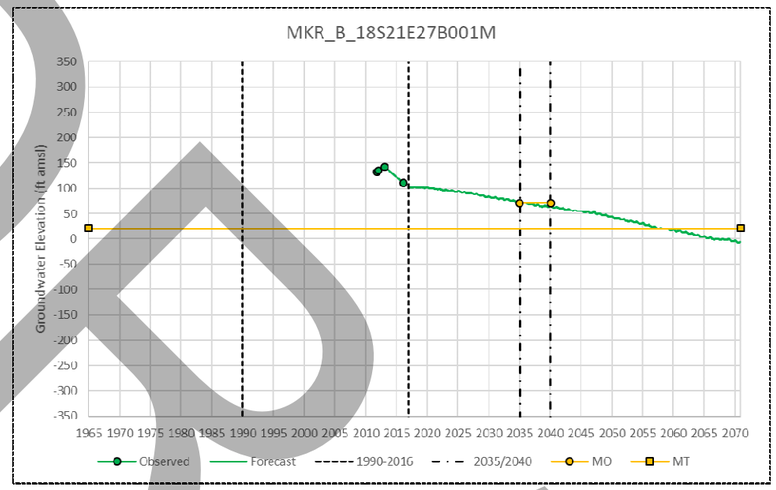
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-5**

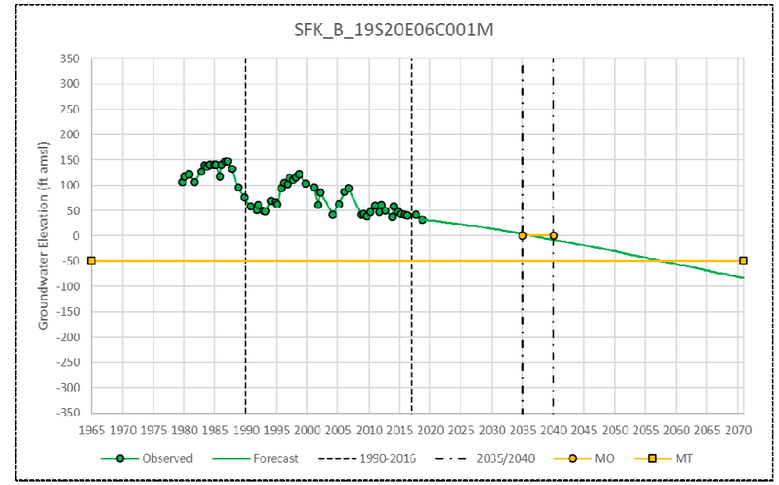
Below the Corcoran Clay



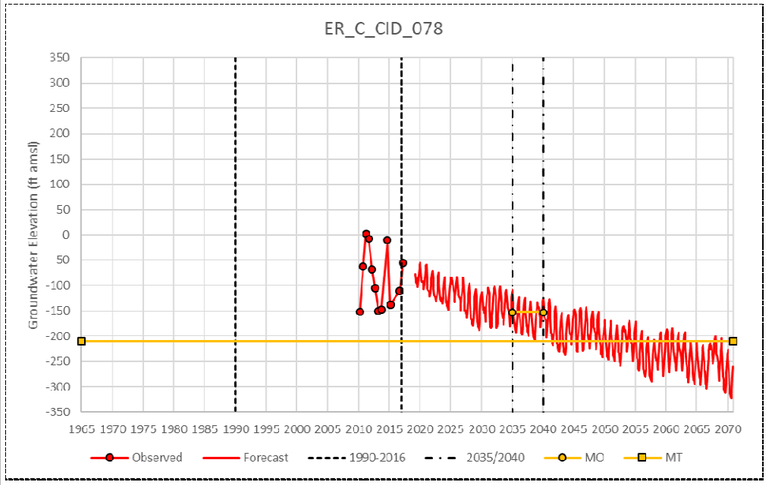
Corcoran

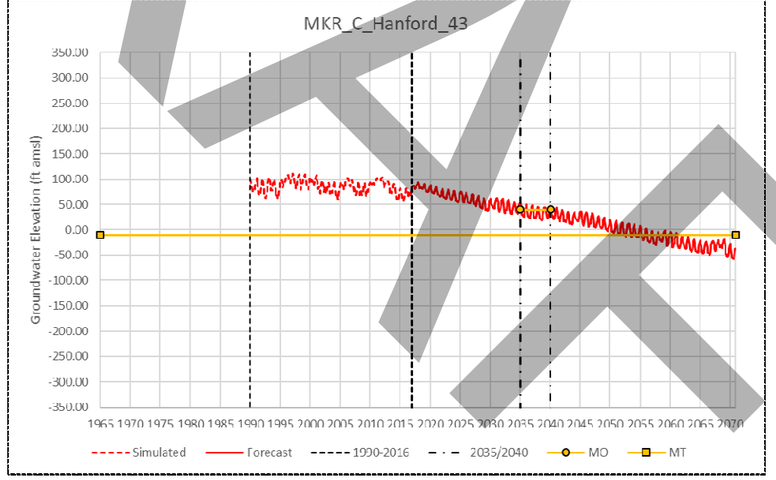


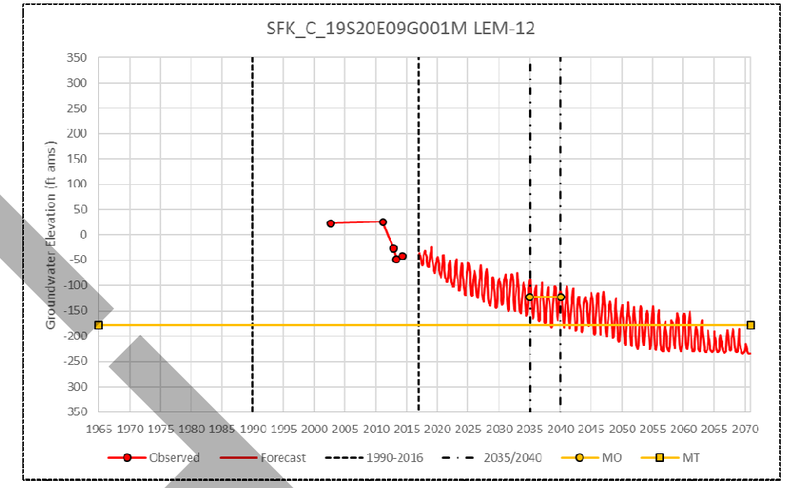
Hanford



Lemoore







Above the Corcoran Clay

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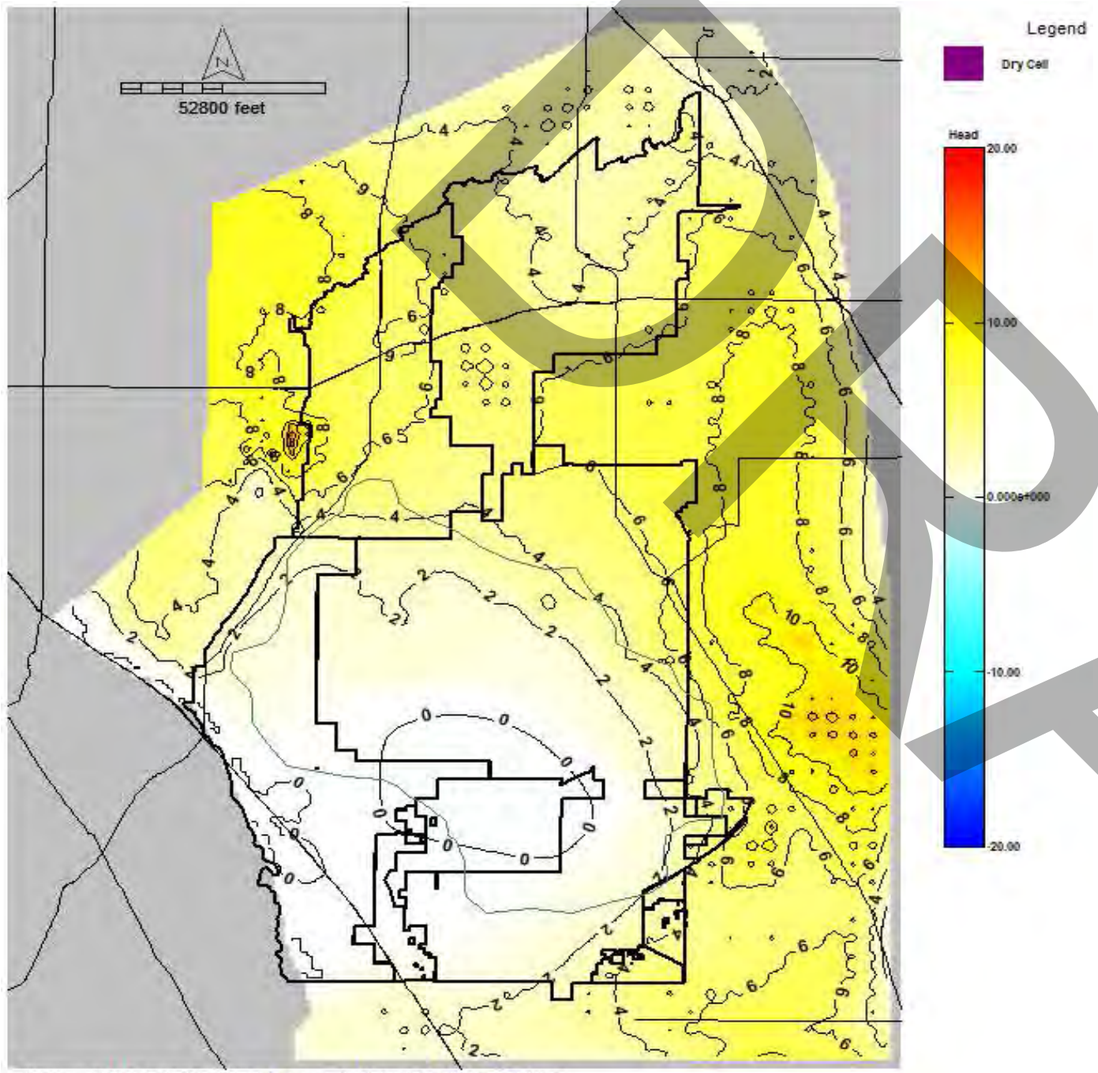
Baseline Forecast Hydrographs for Selected Compliance Wells

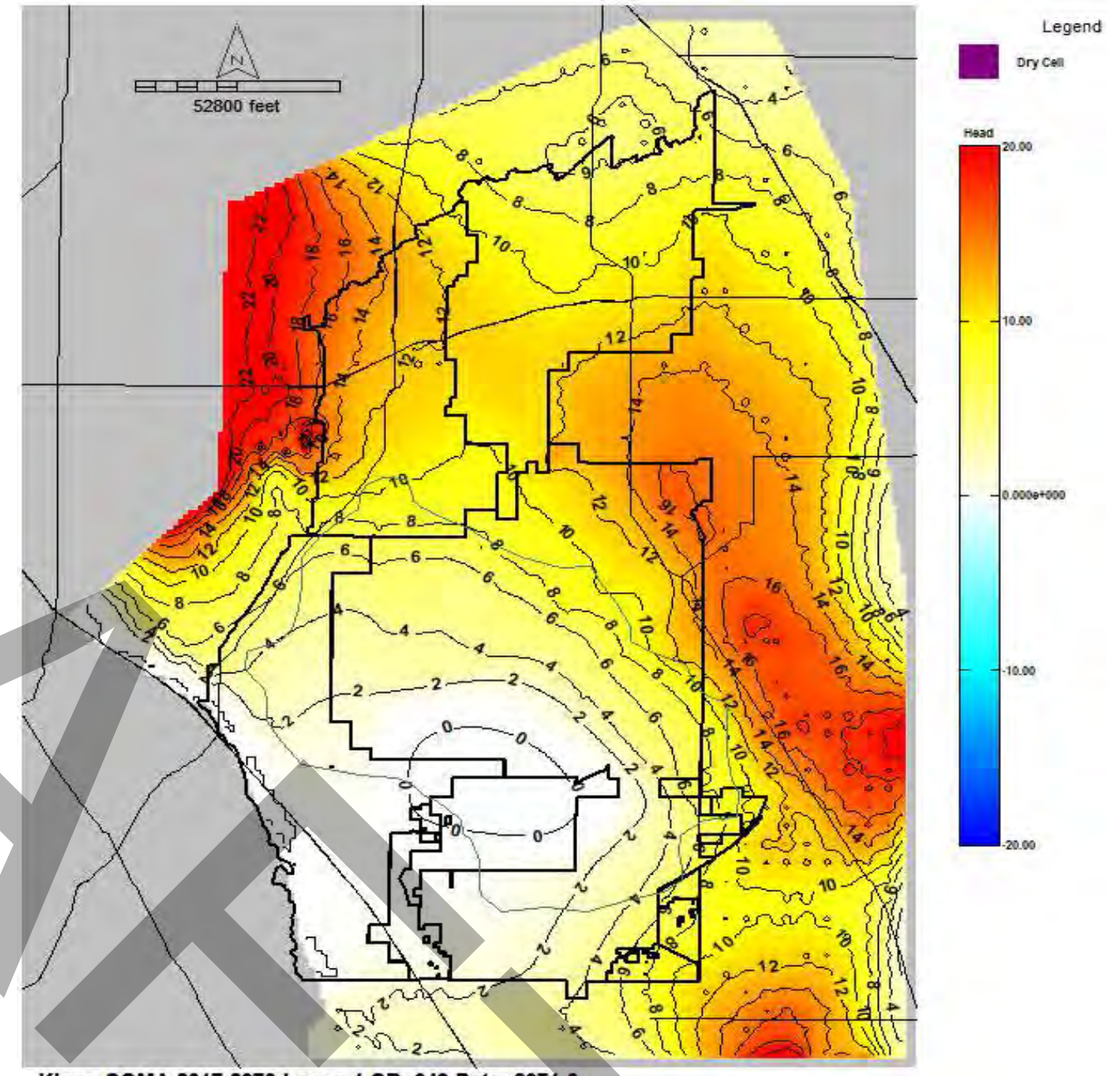
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-6**



Kings SGMA 2017-2070 Layer: 1 SP: 284 Date: 2040.6

2040



Kings SGMA 2017-2070 Layer: 1 SP: 649 Date: 2071.0

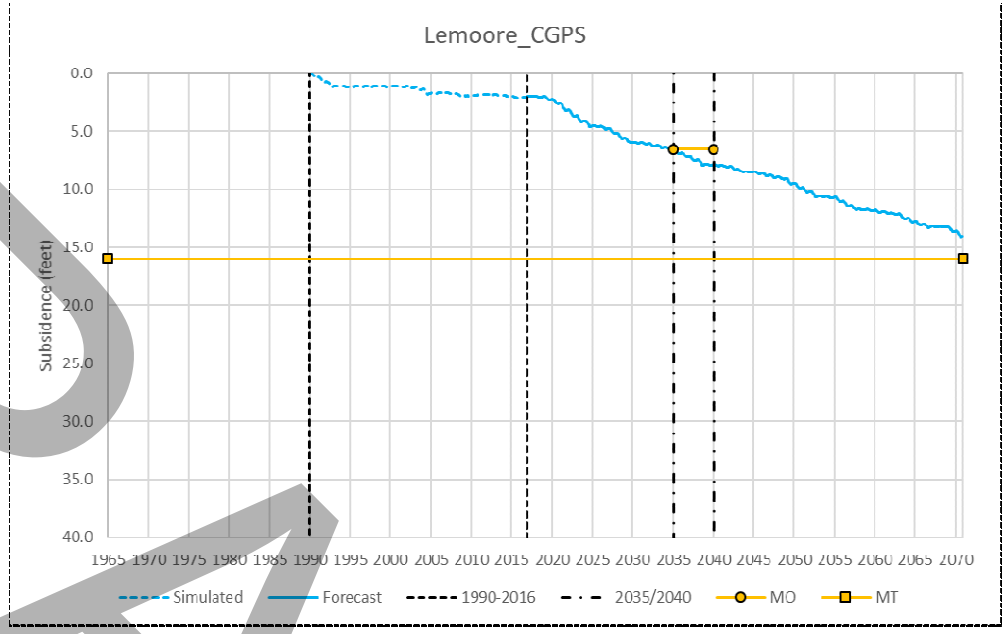
2070

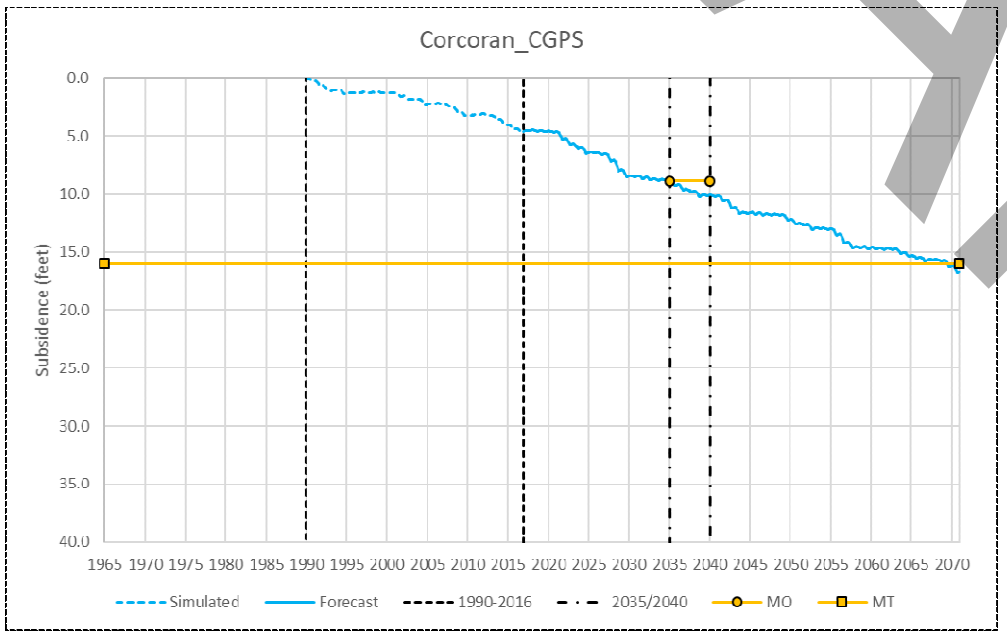
Baseline Forecast 2040 and 2070 Subsidence

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-7**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 7-8 BaselineSub Hydrogr (2) 9/7/2019





Baseline Forecast Cumulative Subsidence Compliance Monitoring Points

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-8**

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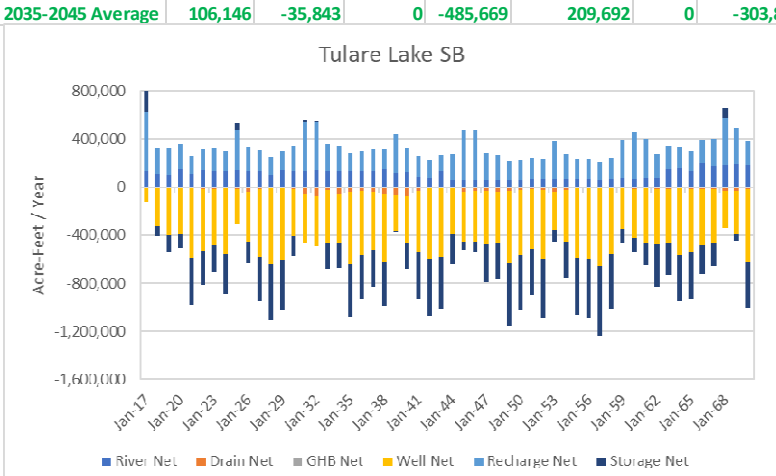
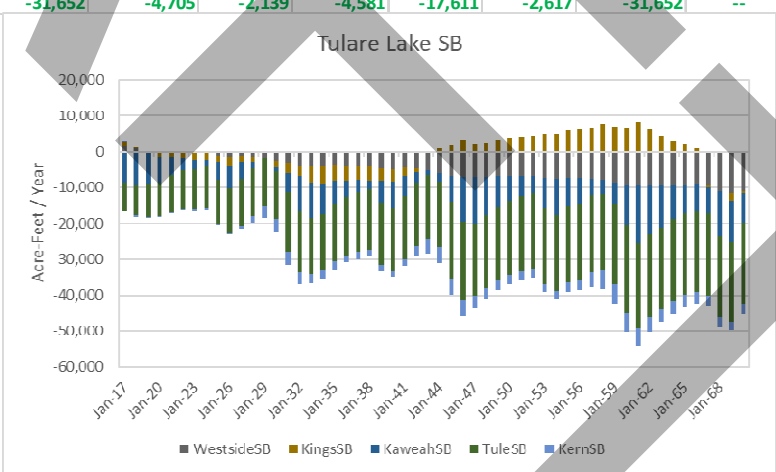
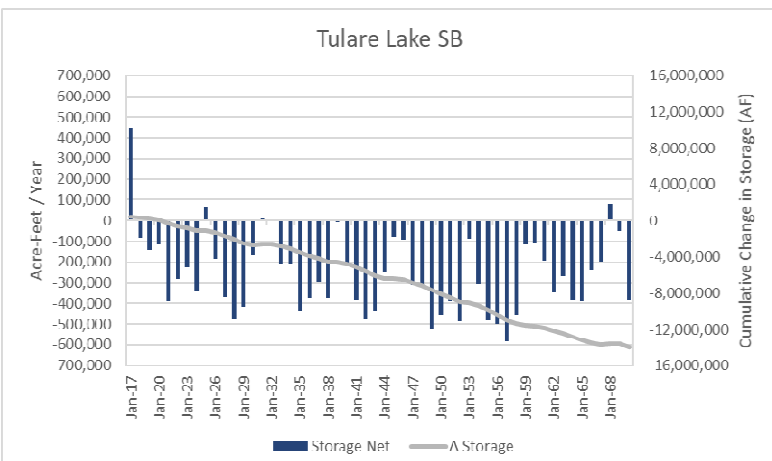
Non-Projects @ 100% Ag Demand with 75% RTFlow RCH

Tulare Lake SB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB
	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-17	132,178	-3,938	0	-118,599	498,648	0	445,939	-13,656	1,527	1,146	-8,547	-8,025	243	-13,656	445,939
Dec-18	102,766	-3,154	0	-323,254	217,547	0	-84,222	-16,888	854	515	-9,490	-8,402	-365	-16,888	361,717
Dec-19	97,508	-3,575	0	-399,953	225,197	0	-141,077	-18,461	51	-248	-8,571	-9,368	-325	-18,461	220,640
Dec-20	148,987	-7,233	0	-389,412	207,614	0	-112,276	-17,991	-114	-1,454	-6,953	-9,407	-63	-17,991	108,364
Dec-21	106,926	-10,464	0	-577,135	153,255	0	-391,643	-17,126	-111	-1,190	-5,038	-10,573	-212	-17,126	-283,279
Dec-22	140,951	-18,150	0	-511,535	173,282	0	-281,817	-16,372	-309	-1,460	-3,474	-10,750	-379	-16,372	-565,096
Dec-23	138,957	-14,931	0	-469,968	185,683	0	-228,080	-16,551	-378	-1,995	-2,656	-11,094	-428	-16,551	-793,176
Dec-24	130,269	-12,277	0	-544,811	166,182	0	-337,941	-16,376	-369	-2,104	-1,700	-11,768	-435	-16,376	-1,131,117
Dec-25	142,593	-19,824	0	-295,665	325,130	0	68,004	-20,483	-1,045	-1,851	-4,919	-12,313	-355	-20,483	-1,063,113
Dec-26	135,404	-35,817	0	-413,114	204,390	0	-182,294	-23,173	-1,257	-2,842	-6,214	-12,592	-268	-23,173	-1,245,407
Dec-27	129,052	-15,576	0	-567,178	171,364	0	-370,893	-21,399	-985	-2,097	-4,583	-12,984	-750	-21,399	-1,616,300
Dec-28	99,178	-13,034	0	-626,354	151,469	0	-473,618	-19,757	-1,261	-1,643	-1,725	-13,323	-1,805	-19,757	-2,089,918
Dec-29	145,661	-8,645	0	-598,284	147,280	0	-413,928	-18,406	-1,717	-61	-2	-13,332	-3,294	-18,406	-2,503,846
Dec-30	137,279	-16,891	0	-391,660	208,378	0	-168,045	-22,580	-2,675	-1,803	-855	-13,521	-3,727	-22,580	-2,671,891
Dec-31	126,801	-53,181	0	-412,372	421,193	0	11,876	-31,715	-3,341	-2,559	-5,223	-16,931	-3,661	-31,715	-2,660,015
Dec-32	139,713	-71,310	0	-420,509	410,681	0	6,173	-37,009	-3,876	-2,681	-9,962	-17,119	-3,371	-37,009	-2,653,841
Dec-33	138,637	-26,640	0	-446,692	222,492	0	-207,787	-36,723	-4,023	-4,495	-10,077	-15,495	-2,633	-36,723	-2,861,628
Dec-34	133,877	-50,610	0	-418,512	209,150	0	-210,502	-35,287	-3,897	-5,028	-8,541	-15,734	-2,085	-35,287	-3,072,130
Dec-35	125,837	-39,188	0	-600,724	157,842	0	-438,462	-32,777	-3,768	-4,289	-6,673	-16,035	-2,013	-32,777	-3,510,593
Dec-36	125,415	-31,058	0	-534,293	166,971	0	-373,317	-30,894	-3,992	-4,159	-4,524	-16,251	-1,968	-30,894	-3,883,909
Dec-37	134,523	-35,888	0	-490,745	183,009	0	-298,967	-29,826	-3,972	-3,940	-3,436	-16,630	-1,848	-29,826	-4,182,877
Dec-38	152,417	-56,616	0	-560,204	163,719	0	-374,382	-29,040	-3,902	-4,095	-2,503	-16,766	-1,774	-29,040	-4,557,258
Dec-39	115,951	-61,410	0	-302,568	322,067	0	-8,981	-33,257	-4,571	-3,412	-6,251	-17,389	-1,634	-33,257	-4,566,240
Dec-40	117,776	-73,244	0	-394,234	208,495	0	-215,628	-34,807	-4,820	-3,516	-7,553	-17,442	-1,476	-34,807	-4,781,867
Dec-41	87,846	-31,993	0	-513,939	171,885	0	-384,827	-31,814	-4,481	-2,295	-5,589	-17,661	-1,789	-31,814	-5,166,695
Dec-42	69,391	-11,387	0	-581,872	151,634	0	-480,359	-29,083	-4,724	-928	-2,817	-17,847	-2,766	-29,083	-5,647,054
Dec-43	125,480	-8,727	0	-571,569	143,779	0	-436,558	-28,328	-5,074	211	-1,300	-17,940	-4,224	-28,328	-6,083,612
Dec-44	57,887	-5,863	0	-381,269	214,594	0	-253,259	-30,233	-5,903	1,026	-2,331	-18,314	-4,711	-30,233	-6,336,871
Dec-45	55,080	-38,895	0	-410,938	422,619	0	-77,222	-38,118	-6,554	1,869	-7,410	-21,441	-4,584	-38,118	-6,414,093
Dec-46	55,936	-31,376	0	-420,409	412,011	0	-93,176	-42,538	-7,081	3,151	-12,527	-21,840	-4,241	-42,538	-6,507,269
Dec-47	54,979	-33,033	0	-448,826	222,729	0	-310,223	-41,490	-7,177	2,171	-12,993	-20,003	-3,489	-41,490	-6,817,491
Dec-48	56,363	-36,094	0	-422,501	209,068	0	-306,382	-38,772	-7,040	2,360	-10,855	-20,328	-2,910	-38,772	-7,123,874
Dec-49	56,403	-28,498	0	-601,937	158,631	0	-521,083	-35,510	-6,815	3,085	-8,533	-20,475	-2,772	-35,510	-7,644,957
Dec-50	57,311	-25,667	0	-540,868	168,201	0	-457,732	-33,361	-6,990	3,511	-6,619	-20,610	-2,652	-33,361	-8,102,689
Dec-51	61,797	-14,129	0	-499,597	183,840	0	-390,099	-31,815	-6,895	3,942	-5,590	-20,780	-2,492	-31,815	-8,492,788
Dec-52	61,793	-22,782	0	-575,557	164,933	0	-487,834	-30,580	-6,825	4,402	-4,690	-21,069	-2,399	-30,580	-8,980,622
Dec-53	61,452	-39,381	0	-321,434	322,838	0	-89,439	-34,088	-7,463	5,131	-8,404	-21,146	-2,206	-34,088	-9,070,062
Dec-54	61,702	-24,629	0	-424,336	209,428	0	-308,137	-35,948	-7,641	5,064	-10,052	-21,306	-2,013	-35,948	-9,378,199
Dec-55	61,240	-10,665	0	-575,198	172,200	0	-484,403	-33,127	-7,289	5,906	-7,841	-21,466	-2,438	-33,127	-9,862,602
Dec-56	63,245	-4,934	0	-588,599	166,234	0	-498,547	-32,347	-7,296	6,207	-7,008	-21,509	-2,742	-32,347	-10,361,149
Dec-57	58,936	-5,379	0	-646,962	146,256	0	-584,370	-30,795	-7,533	6,777	-4,622	-21,508	-3,909	-30,795	-10,945,519
Dec-58	63,472	-1,248	0	-559,290	182,300	0	-458,823	-30,895	-7,896	7,642	-3,729	-21,474	-5,439	-30,895	-11,404,341
Dec-59	69,306	-3,397	0	-348,316	322,292	0	-116,547	-35,522	-8,612	7,037	-5,835	-22,466	-5,647	-35,522	-11,520,888
Dec-60	65,350	-15,037	0	-411,082	391,392	0	-109,102	-43,417	-9,241	6,821	-11,338	-24,428	-5,231	-43,417	-11,629,990
Dec-61	68,681	-7,875	0	-450,856	337,484	0	-190,649	-45,890	-9,662	8,197	-15,875	-23,803	-4,746	-45,890	-11,820,640
Dec-62	67,658	-15,297	0	-462,353	202,220	0	-348,064	-43,891	-9,578	6,299	-13,663	-23,043	-3,907	-43,891	-12,168,703
Dec-63	151,494	-19,094	0	-450,681	191,521	0	-266,720	-42,976	-9,350	4,436	-11,802	-22,834	-3,427	-42,976	-12,435,424
Dec-64	164,238	-10,446	0	-554,686	164,706	0	-386,365	-42,257	-9,274	2,849	-9,437	-22,930	-3,464	-42,257	-12,821,788
Dec-65	129,195	-15,126	0	-528,149	162,461	0	-390,905	-41,079	-9,300	2,126	-7,707	-22,963	-3,235	-41,079	-13,212,693
Dec-66	202,821	-13,706	0	-472,060	187,556	0	-240,802	-41,291	-9,140	1,005	-7,343	-22,773	-3,040	-41,291	-13,453,495
Dec-67	178,899	-19,117	0	-442,028	227,904	0	-196,730	-42,910	-9,305	-787	-7,024	-22,918	-2,875	-42,910	-13,650,225
Dec-68	184,093	-33,854	0	-308,537	395,552	0	79,234	-48,757	-11,096	10	-12,493	-22,714	-2,464	-48,757	-13,570,991
Dec-69	192,675	-33,811	0	-357,592	299,952	0	-51,097	-49,775	-11,370	-2,260	-11,635	-22,154	-2,356	-49,775	-13,622,088
Dec-70	188,434	-17,682	0	-598,218	190,087	0	-383,336	-45,142	-10,996	-510	-8,460	-22,313	-2,863	-45,142	-14,005,424
2017-2070 Average	109,848	-23,366	0	-468,101	229,580	0	-259,360	-31,895	-5,288	726	-6,944	-17,876	-2,512	-31,895	--
2040-2050 Average	72,223	-29,525	0	-480,760	225,786	0	-321,495	-34,914	-6,060	968	-7,139	-19,446	-3,238	-34,914	--
2035-2045 Average	106,146	-35,843	0	-485,669	209,692	0	-303,815	-31,652	-4,705	-2,139	-4,581	-17,611	-2,617	-31,652	--





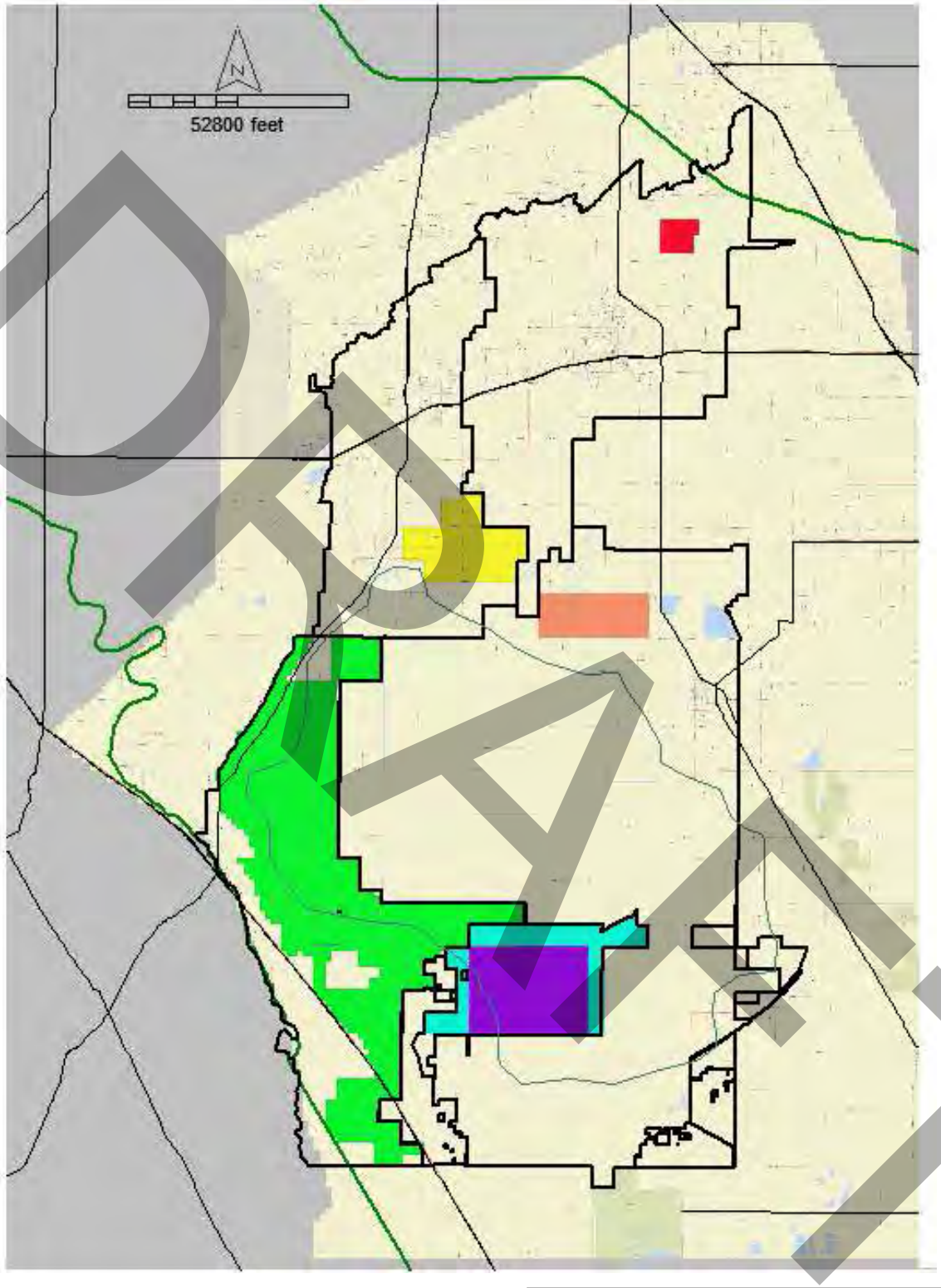


Baseline Forecast Groundwater Mass Balance Tulare Lake Subbasin

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-9**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\Wood Figure TemplatesFig 7-10 Project Locations (2)



DRAFT

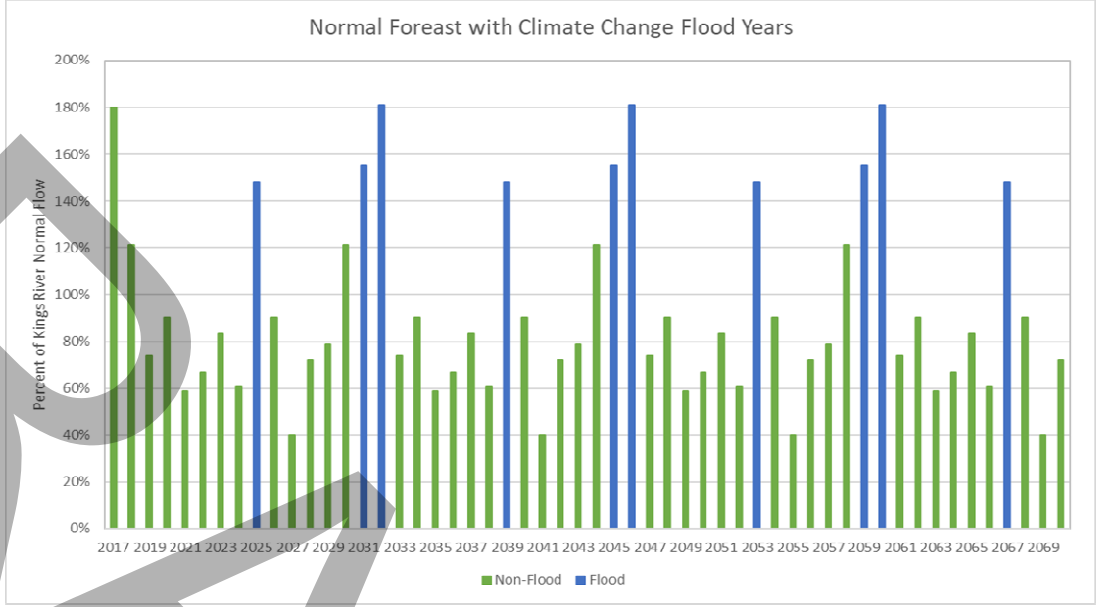
- Mid Kings Intentional Recharge Basins
- El Rico Intermittal Surface Water Storage Ponds
- South Fork Kings Surface Water Storage Ponds
- TCWA Surface Water Storage Ponds
- Southwest Kings Land Fallowing
- TCWA Land Fallowing

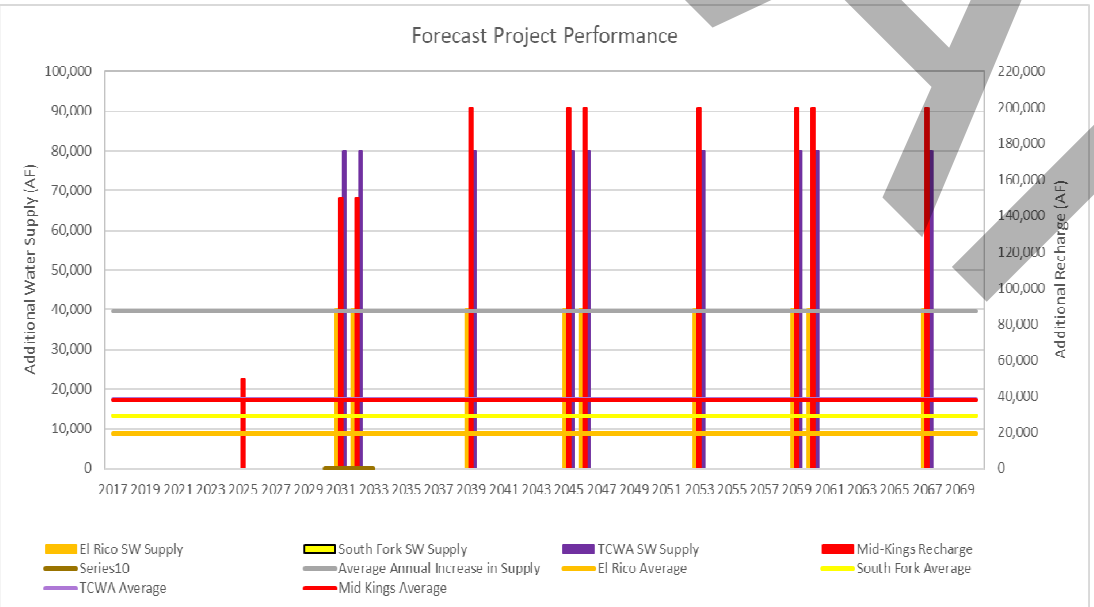
Forecast Project Areas

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-10**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\DRAFT_TLSB_SGMA_GWModel_Figures_v2Fig 7-11 Project Yields 9/7/2019





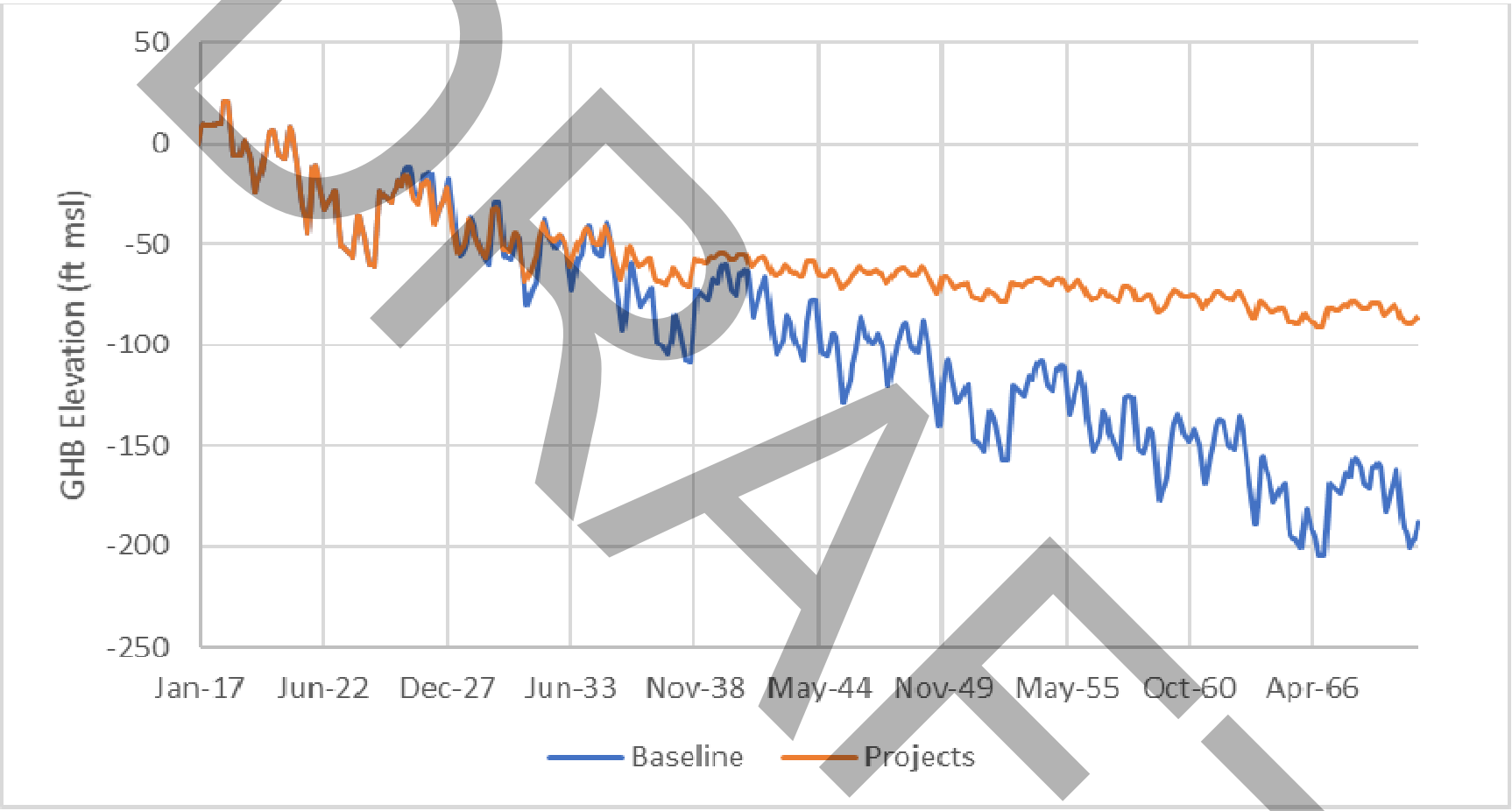
Project Forecast Flood Years and Project Performance

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-11**

DRAFT

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\DRAFT_TLSB_SGMA_GWModel_Figures_v2Fig 7-12 Project GHBs 9/7/2019

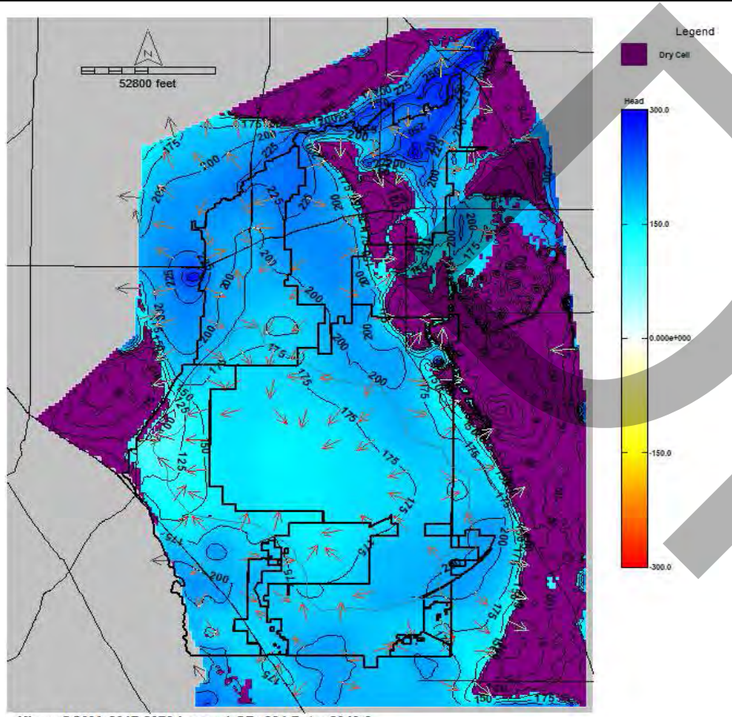


DRAFT

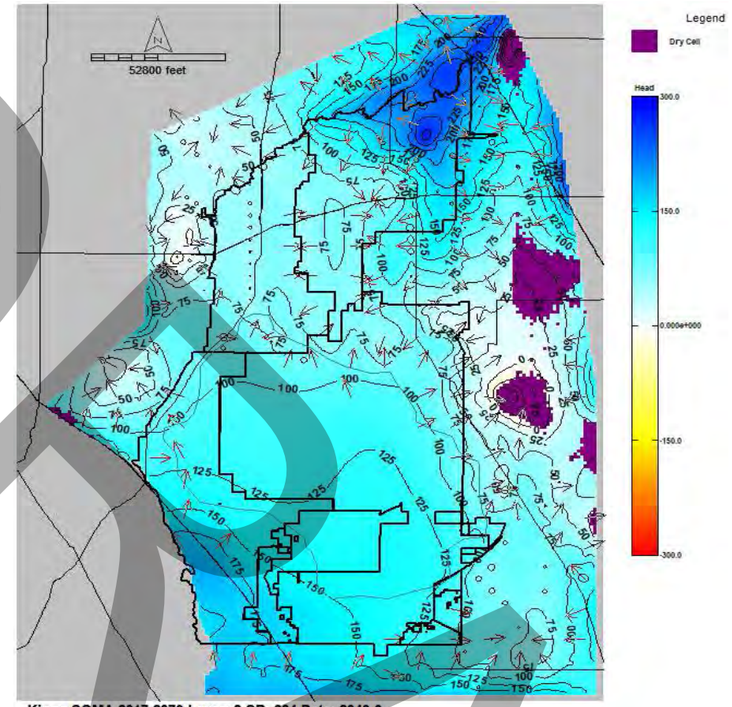
Project vs. Baseline GHB Example

Tulare Lake Subbasin Groundwater Sustainbility Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-12**



Kings SGMA 2017-2070 Layer: 1 SP: 284 Date: 2040.6



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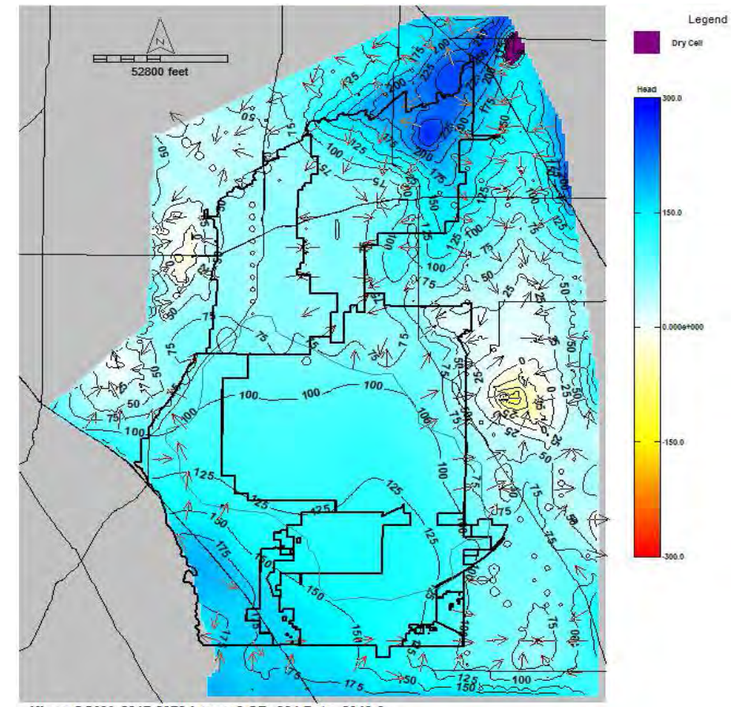

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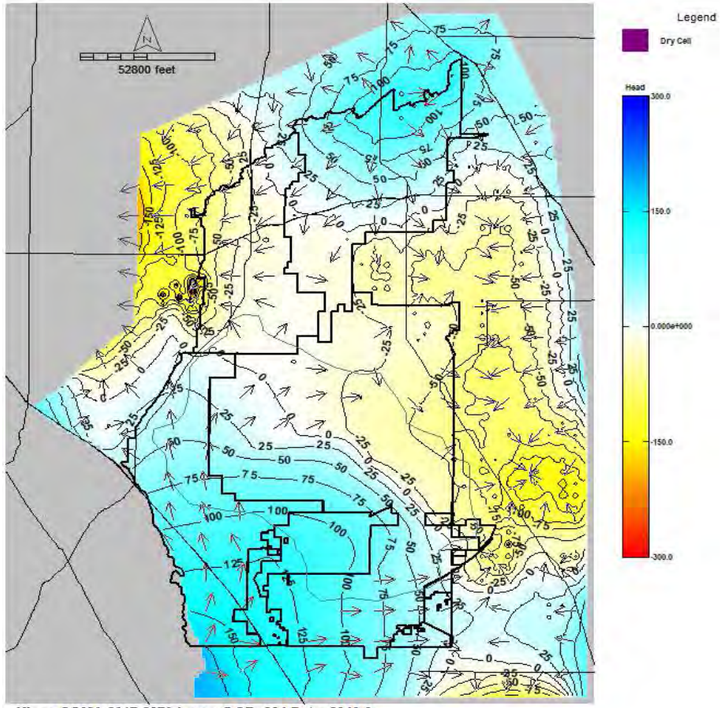

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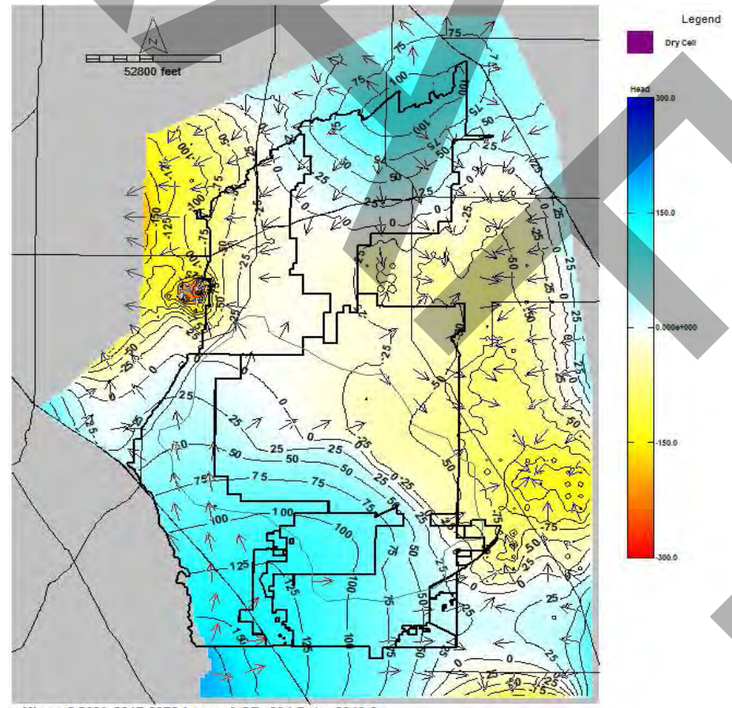


Kings SGMA 2017-2070 Layer: 6 SP: 284 Date: 2040.6

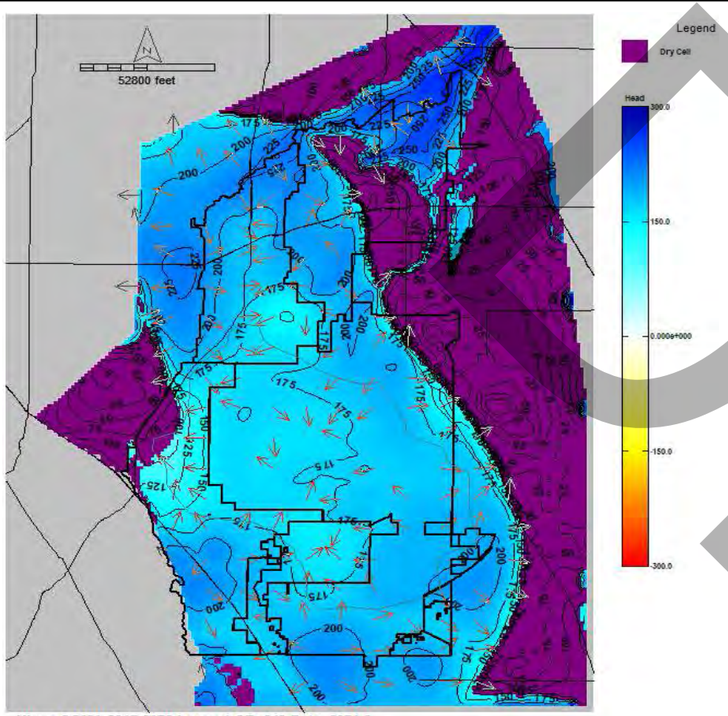
DRAFT

2040 Project Forecast Groundwater Elevations and Groundwater Flow Vectors

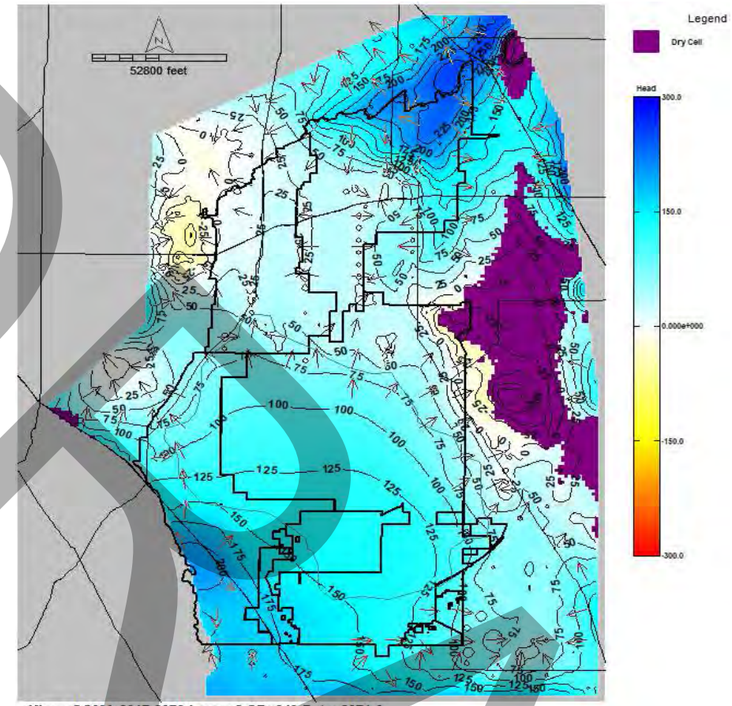
Tulare Lake Subbasin Groundwater Sustainbility Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-13**

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\DRAFT_TLSB_SGMA_GWModel_Figures_v2Fig 7-14 2070 Project Potentios 9/7/2019



Kings SGMA 2017-2070 Layer: 1 SP: 649 Date: 2071.0



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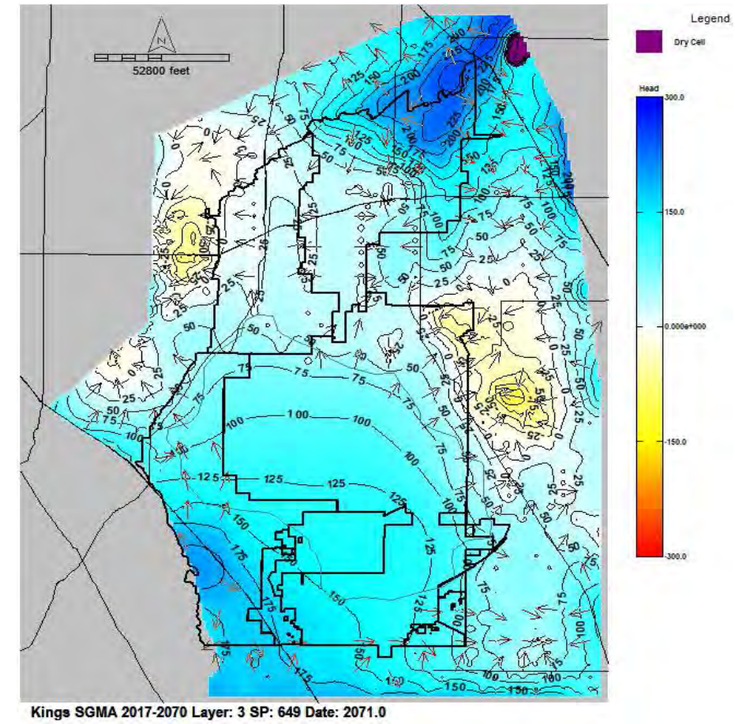

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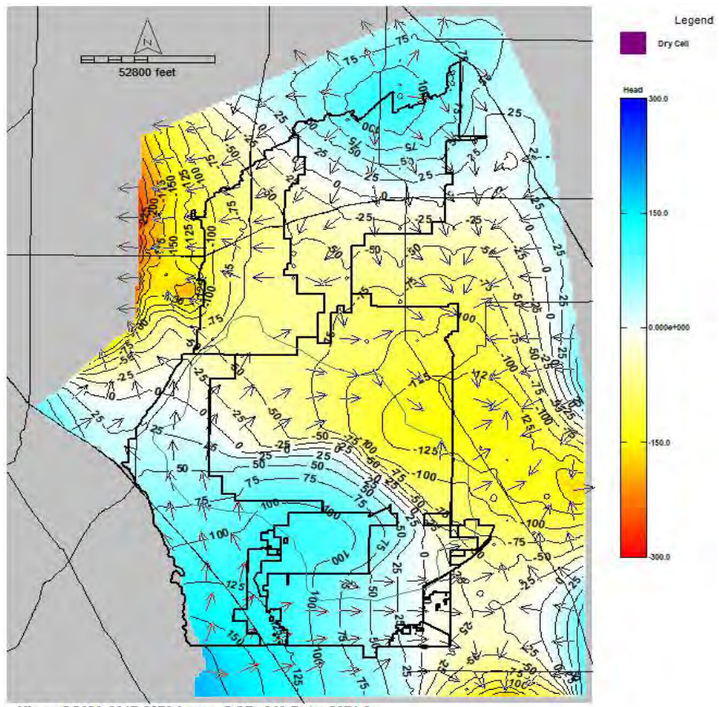

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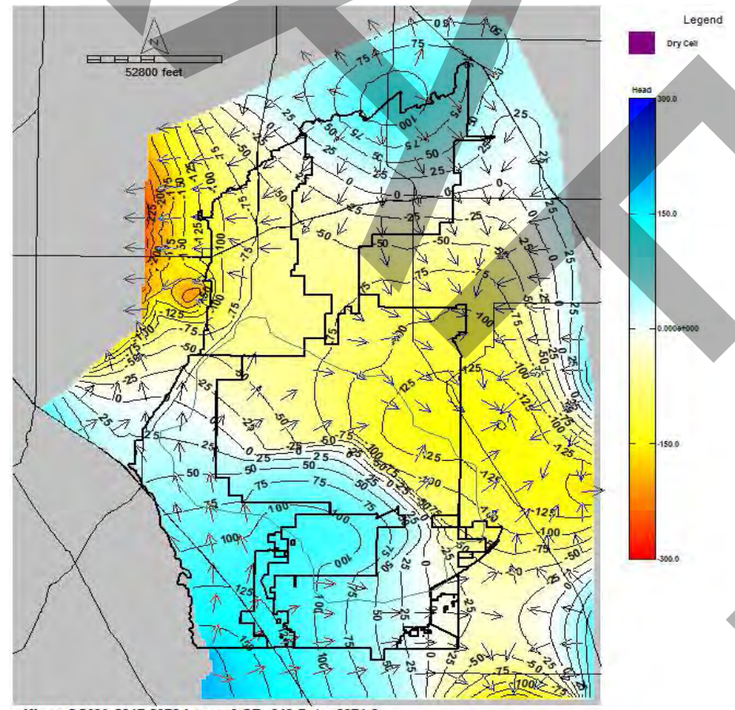


Kings SGMA 2017-2070 Layer: 6 SP: 649 Date: 2071.0

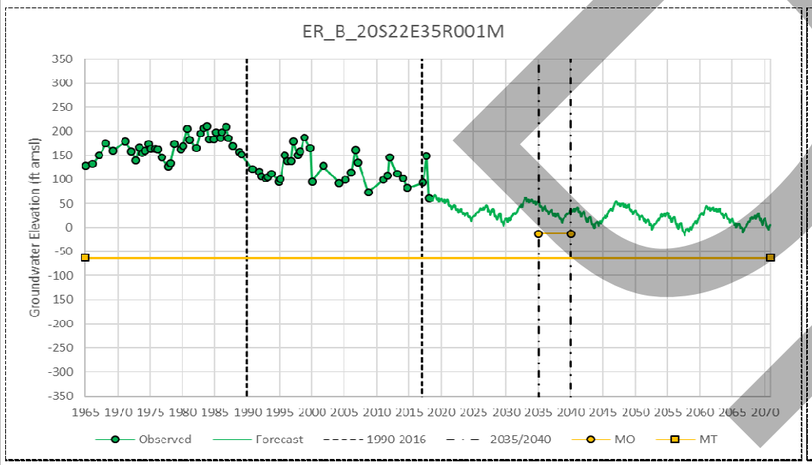
DRAFT

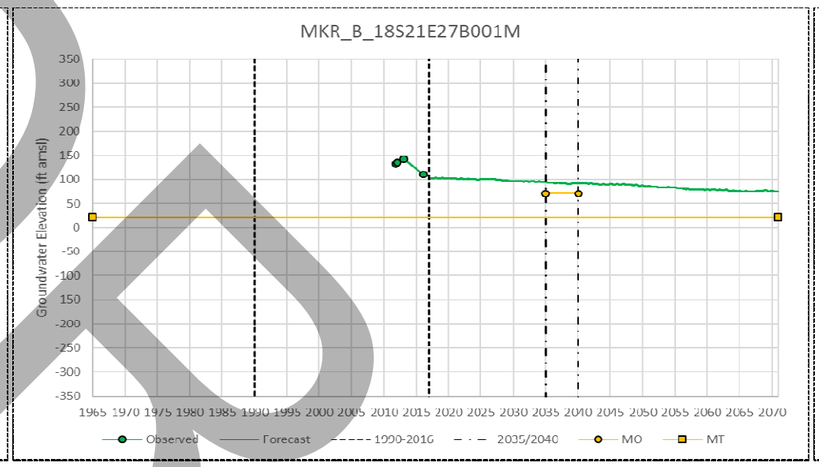
2070 Project Forecast Groundwater Elevations and Groundwater Flow Vectors

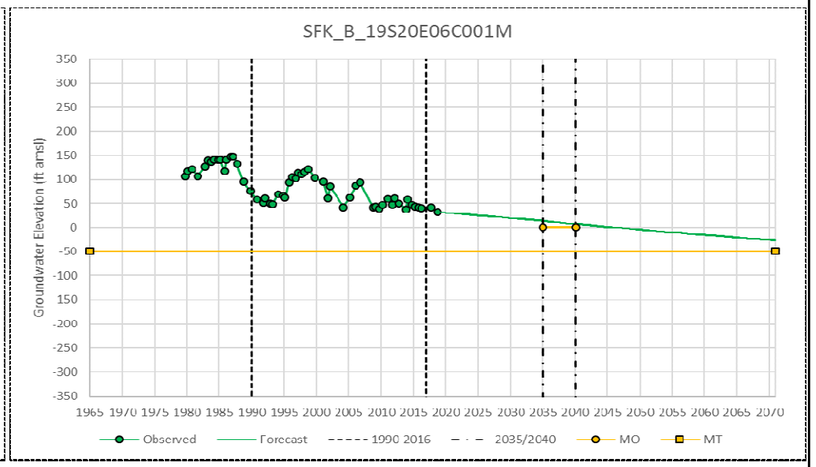
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-14**

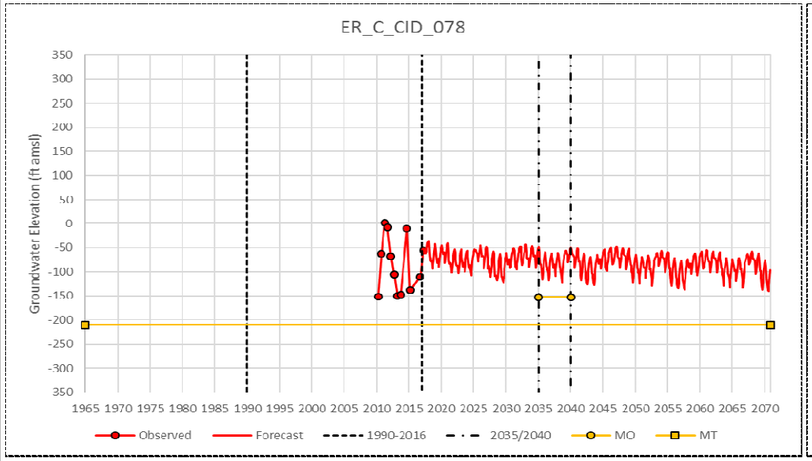
Below the Corcoran Clay

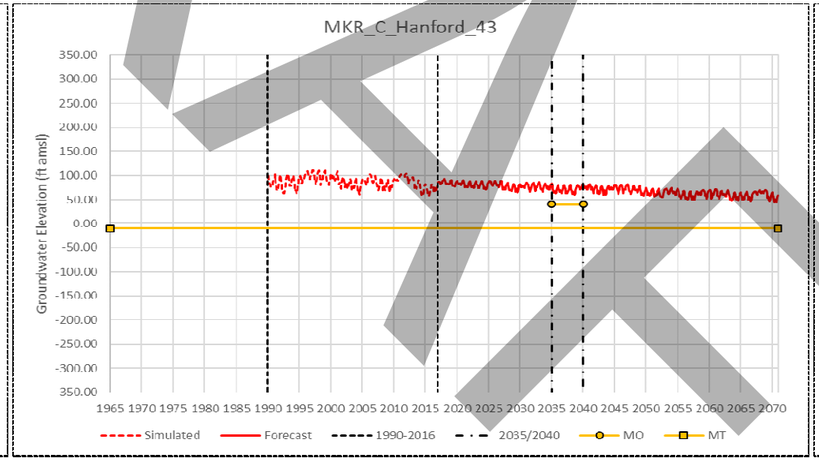


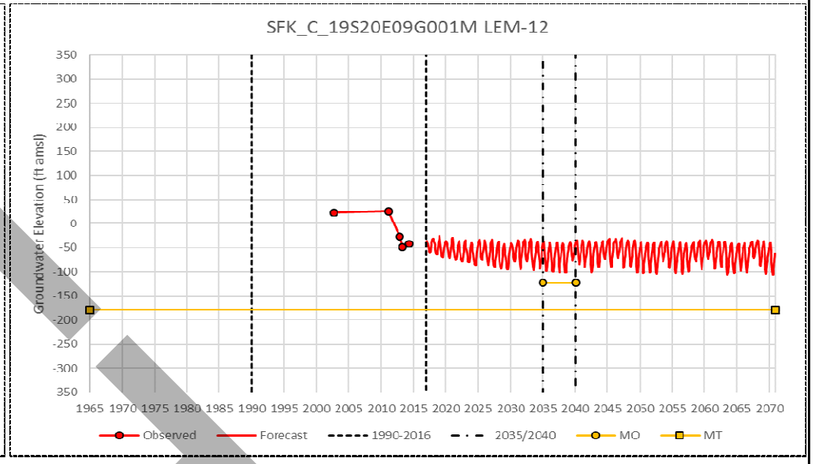




Corcoran **Hanford** **Lemoore**







Above the Corcoran Clay

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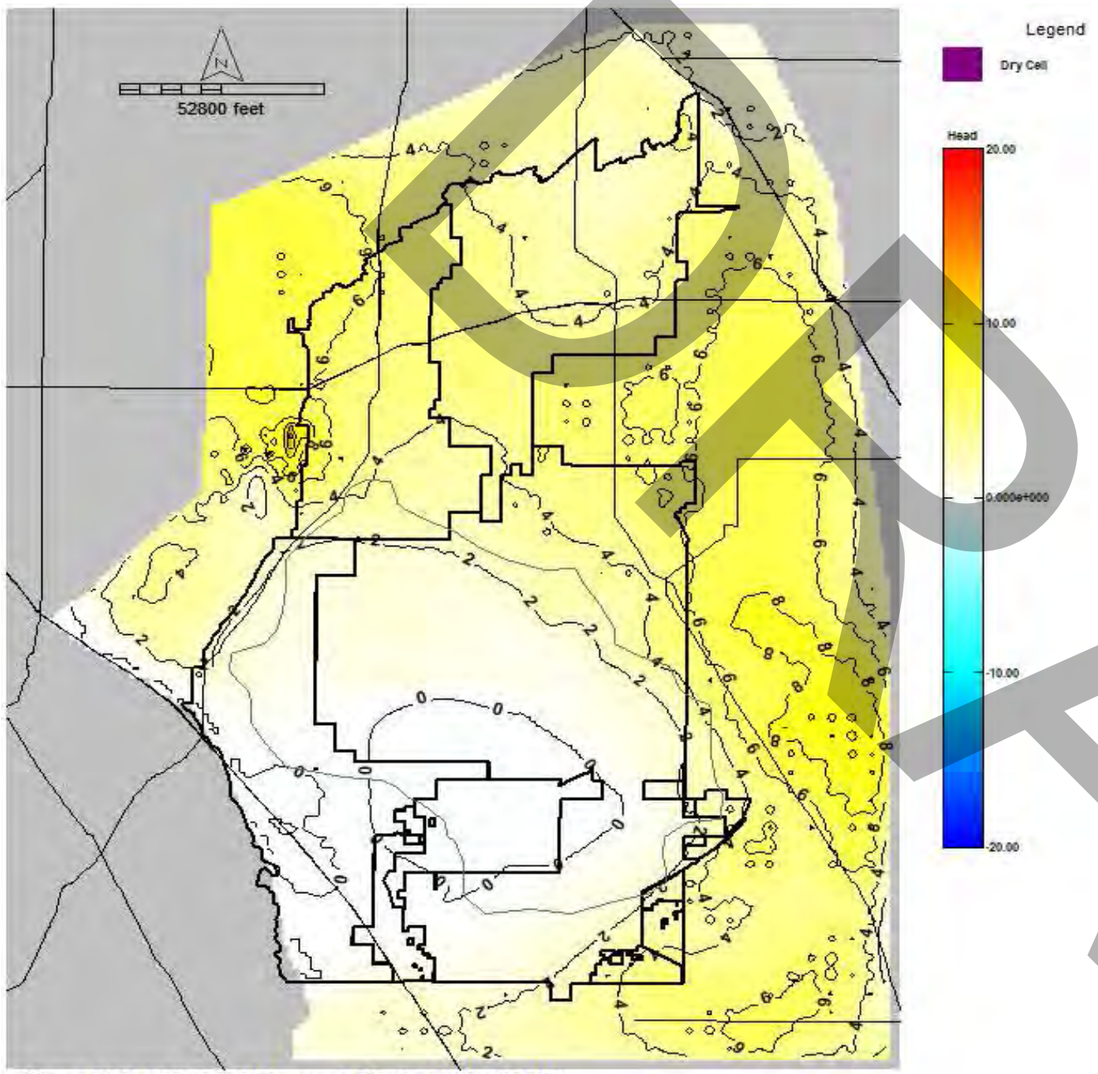
Project Forecast Hydrographs for Selected Compliance Wells

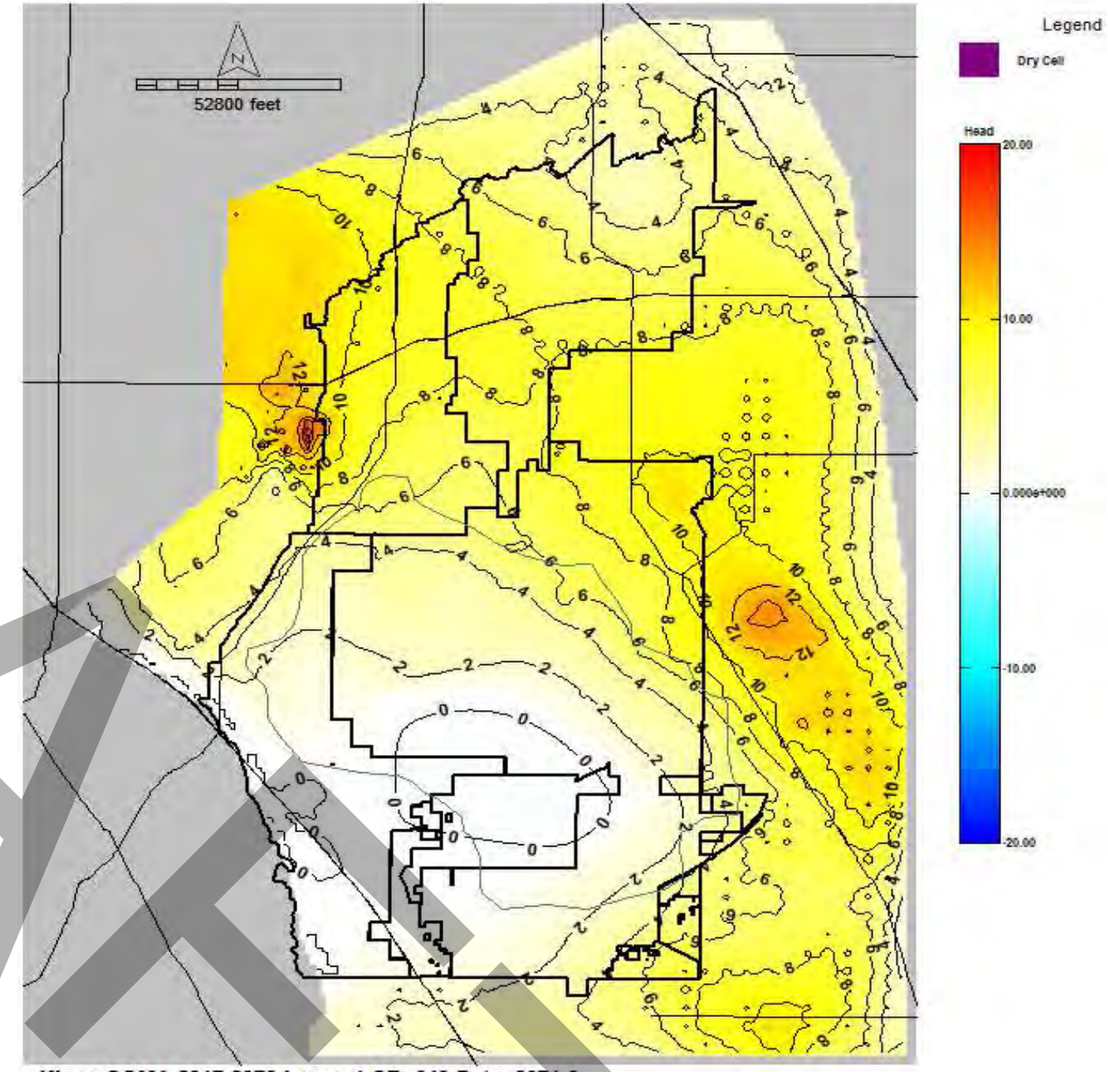
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-15**



Kings SGMA 2017-2070 Layer: 1 SP: 284 Date: 2040.6

2040



Kings SGMA 2017-2070 Layer: 1 SP: 649 Date: 2071.0

2070

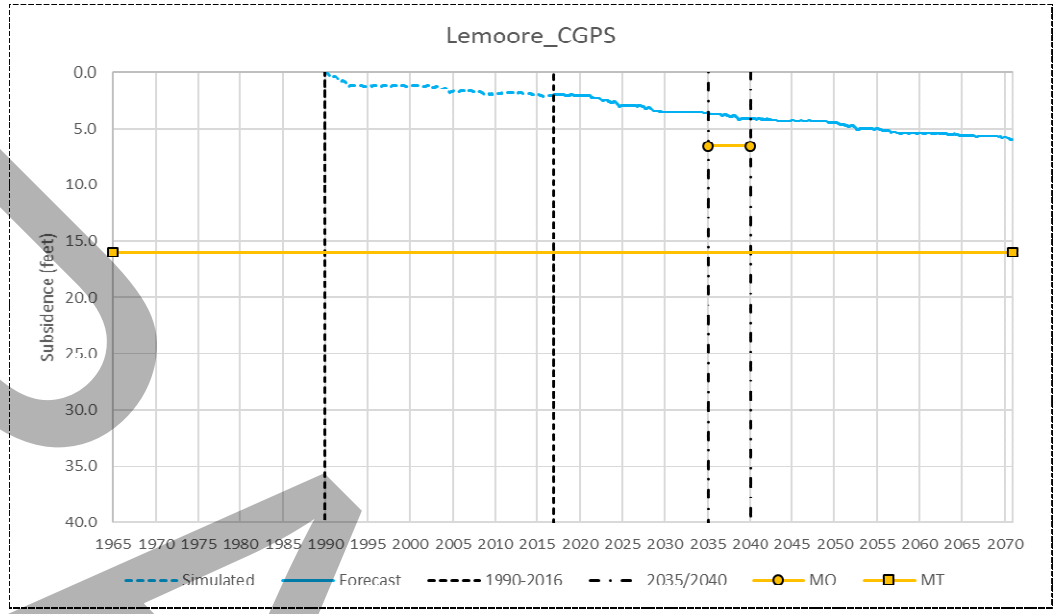
Project Forecast 2040 and 2070 Subsidence

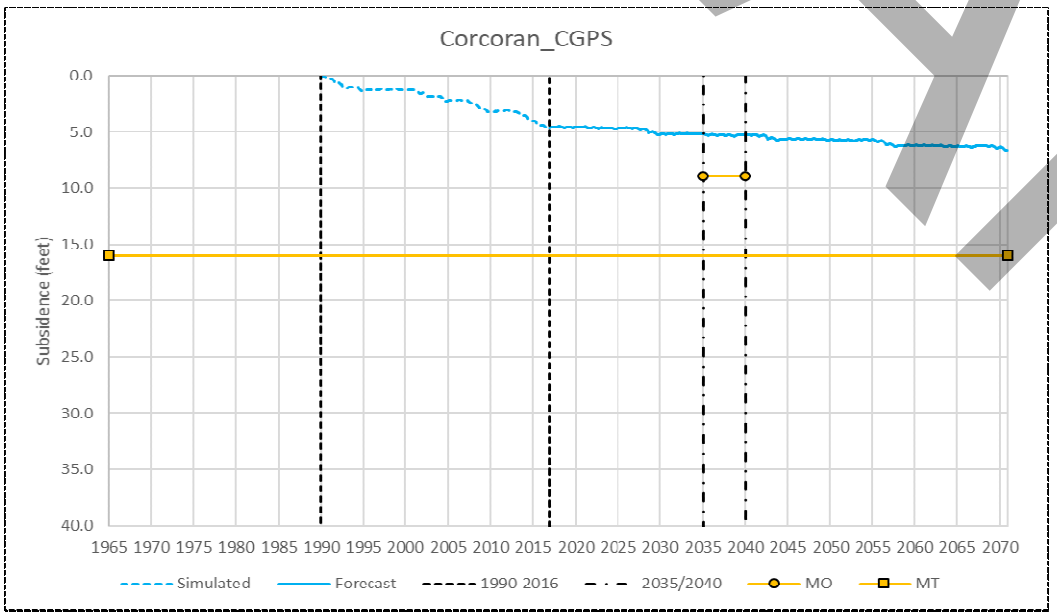
Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-16**

DRAFT

N:_FR_projects\FR18s\FR18161220\temp\DBean_Hydro_\DRAFT_TLSB_SGMA_GWModel_Figures_v2Fig 7-17 Project Sub Hydros 9/7/2019





Project Forecast Cumulative Subsidence Compliance Monitoring Points

Tulare Lake Subbasin Groundwater Sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **7-17**

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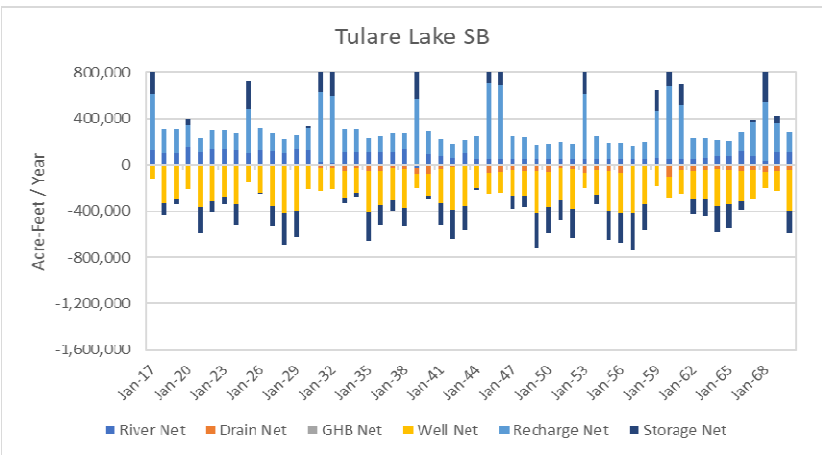
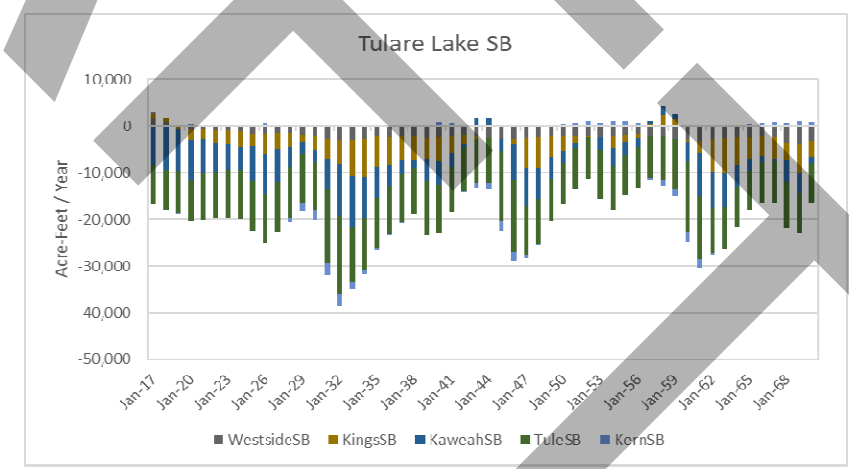
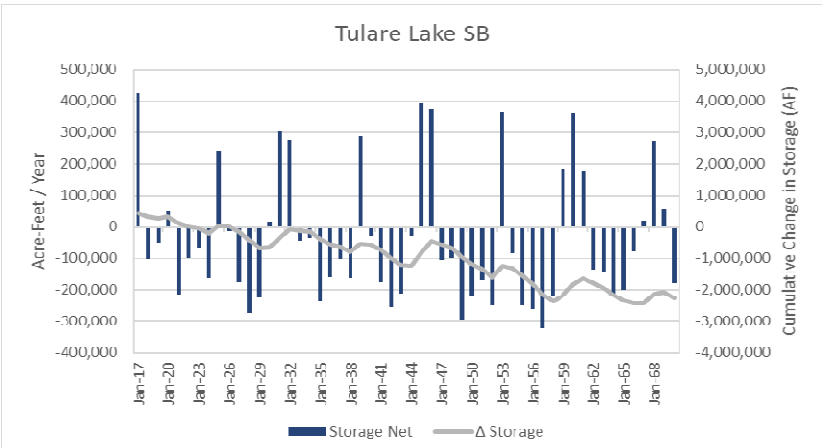
All SB Projects @ 73% Overdraft, 75% Declining Ag Demand with 75% DeepRTFlow

Tulare Lake SB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB	TSLB
	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total
AF/Y								HSU 2 Net	HSU 3 Net	HSU 4 Net	HSU 5 Net	HSU 6 Net	HSU 7 Net	Inter-Basin	Cumulative
Year	River Net	Drain Net	GHB Net	Well Net	Recharge Net	ET Net	Storage Net	TLSB	WestsideSB	KingsSB	KaweahSB	TuleSB	KernSB	Flow	Δ Storage
Dec-17	132,766	-3,116	0	-118,131	479,621	0	427,730	-13,742	1,462	1,159	-8,565	-8,094	297	-13,742	427,730
Dec-18	103,536	-4,071	0	-322,792	197,177	0	-102,754	-16,254	739	1,027	-9,467	-8,444	-108	-16,254	324,977
Dec-19	99,202	-5,121	0	-287,661	201,500	0	-51,718	-18,755	-54	-491	-8,994	-9,201	-15	-18,755	273,259
Dec-20	151,578	-3,158	0	-211,996	194,223	0	51,093	-20,084	-579	-2,538	-8,278	-9,018	328	-20,084	324,352
Dec-21	109,251	-4,655	0	-365,626	121,000	0	-213,950	-19,915	-545	-2,359	-7,179	-10,062	231	-19,915	110,402
Dec-22	143,666	-7,295	0	-305,144	149,747	0	-100,610	-19,742	-904	-2,790	-6,094	-10,002	48	-19,742	9,792
Dec-23	141,250	-8,002	0	-273,346	156,114	0	-64,468	-19,627	-926	-3,067	-5,521	-10,124	10	-19,627	-54,677
Dec-24	132,264	-5,769	0	-342,198	140,892	0	-162,233	-19,853	-1,119	-3,412	-4,831	-10,554	63	-19,853	-216,910
Dec-25	106,161	-9,375	0	-140,962	374,446	0	241,634	-22,143	-1,528	-2,872	-7,288	-10,673	219	-22,143	24,724
Dec-26	131,213	-13,729	0	-224,911	189,501	0	-13,015	-24,537	-1,581	-4,467	-8,456	-10,538	505	-24,537	11,708
Dec-27	125,871	-10,218	0	-349,605	147,301	0	-176,704	-22,509	-1,359	-3,586	-6,969	-10,732	136	-22,509	-164,995
Dec-28	96,233	-3,539	0	-410,961	127,221	0	-274,954	-20,449	-1,476	-3,039	-4,398	-10,815	-720	-20,449	-439,949
Dec-29	141,562	-6,340	0	-388,566	117,726	0	-226,381	-18,379	-1,861	-1,474	-2,676	-10,602	-1,767	-18,379	-666,330
Dec-30	132,322	-7,820	0	-204,658	193,508	0	16,497	-20,098	-2,360	-2,776	-2,681	-10,324	-1,957	-20,098	-649,832
Dec-31	23,586	-30,061	0	-198,552	604,877	0	300,993	-31,893	-2,880	-4,239	-6,448	-15,904	-2,421	-31,893	-348,840
Dec-32	11,924	-31,376	0	-184,417	585,113	0	274,030	-38,594	-3,074	-5,128	-11,086	-16,756	-2,550	-38,594	-74,810
Dec-33	111,045	-54,276	0	-232,101	203,776	0	-43,313	-34,939	-3,053	-7,574	-10,909	-11,871	-1,532	-34,939	-118,123
Dec-34	115,385	-28,852	0	-216,318	195,995	0	-35,729	-31,719	-2,905	-7,943	-8,885	-11,207	-778	-31,719	-153,852
Dec-35	110,103	-49,820	0	-364,467	122,256	0	-236,780	-26,519	-2,414	-6,387	-6,700	-10,589	-429	-26,519	-390,632
Dec-36	111,198	-48,735	0	-303,508	141,444	0	-159,500	-23,402	-2,463	-5,878	-4,623	-10,209	-228	-23,402	-550,132
Dec-37	119,996	-29,752	0	-271,947	150,260	0	-103,550	-20,579	-2,236	-4,974	-3,119	-10,237	-13	-20,579	-653,682
Dec-38	137,564	-35,200	0	-335,734	136,148	0	-162,211	-18,666	-2,140	-5,020	-1,838	-9,915	248	-18,666	-815,893
Dec-39	-27,562	-49,519	0	-127,278	567,442	0	288,677	-23,293	-2,692	-4,370	-4,613	-11,781	162	-23,293	-527,216
Dec-40	86,085	-70,316	0	-195,941	201,113	0	-27,660	-22,396	-2,437	-5,231	-5,111	-10,307	689	-22,396	-554,876
Dec-41	71,344	-38,554	0	-300,023	151,760	0	-176,880	-17,883	-1,933	-3,829	-3,187	-9,591	656	-17,883	-731,756
Dec-42	57,003	-23,903	0	-363,483	128,716	0	-254,034	-14,177	-1,705	-2,314	-497	-9,476	-185	-14,177	-985,790
Dec-43	102,492	-6,321	0	-349,698	114,545	0	-212,466	-11,697	-2,133	-660	1,668	-9,414	-1,159	-11,697	-1,198,256
Dec-44	47,695	-6,369	0	-188,661	204,910	0	-28,220	-11,841	-2,677	160	1,575	-9,484	-1,416	-11,841	-1,226,476
Dec-45	43,713	-61,830	0	-189,857	662,472	0	394,772	-22,335	-2,930	-31	-2,353	-15,117	-1,904	-22,335	-831,704
Dec-46	43,422	-57,999	0	-184,639	644,277	0	374,498	-28,951	-2,907	-1,033	-7,525	-15,499	-1,987	-28,951	-457,206
Dec-47	41,640	-40,026	0	-232,640	205,947	0	-105,047	-28,290	-2,756	-6,272	-8,112	-10,282	-869	-28,290	-562,253
Dec-48	42,794	-50,771	0	-217,146	195,932	0	-101,779	-25,200	-2,562	-6,480	-6,531	-9,620	-7	-25,200	-664,032
Dec-49	42,884	-51,179	0	-365,236	123,390	0	-298,196	-20,062	-2,170	-4,359	-4,730	-9,091	288	-20,062	-962,228
Dec-50	43,654	-58,714	0	-307,781	142,236	0	-221,468	-16,340	-2,282	-2,910	-2,782	-8,802	436	-16,340	-1,183,696
Dec-51	47,153	-26,011	0	-277,770	150,737	0	-171,419	-12,947	-2,028	-1,491	-1,152	-8,895	619	-12,947	-1,355,115
Dec-52	47,226	-32,562	0	-346,575	136,828	0	-249,052	-10,074	-1,935	-618	301	-8,675	853	-10,074	-1,604,167
Dec-53	44,983	-66,373	0	-135,681	568,487	0	365,089	-15,049	-2,495	-67	-2,523	-10,619	656	-15,049	-1,239,078
Dec-54	45,110	-45,521	0	-213,904	198,551	0	-85,573	-16,685	-2,332	-2,429	-3,906	-9,227	1,209	-16,685	-1,324,651
Dec-55	44,524	-51,630	0	-341,157	148,548	0	-250,564	-13,983	-1,867	-1,610	-2,585	-8,837	917	-13,983	-1,575,215
Dec-56	46,203	-62,622	0	-353,492	143,385	0	-259,063	-12,806	-1,652	-1,020	-1,842	-8,899	607	-12,806	-1,834,278
Dec-57	43,380	-12,901	0	-405,002	116,856	0	-323,257	-10,161	-1,966	385	794	-9,017	-357	-10,161	-2,157,535
Dec-58	46,733	-3,152	0	-340,691	156,125	0	-219,924	-8,573	-2,407	2,142	2,204	-9,053	-1,459	-8,573	-2,377,459
Dec-59	49,120	-13,681	0	-167,388	411,890	0	186,014	-12,756	-2,869	1,535	846	-10,679	-1,590	-12,756	-2,191,445
Dec-60	44,436	-101,045	0	-185,922	632,994	0	360,348	-24,806	-3,127	-258	-4,366	-15,030	-2,024	-24,806	-1,831,097
Dec-61	44,851	-43,372	0	-209,205	469,152	0	178,652	-30,374	-3,176	-2,632	-9,244	-13,481	-1,842	-30,374	-1,652,445
Dec-62	44,571	-49,260	0	-242,442	184,831	0	-135,729	-27,560	-2,843	-6,857	-7,996	-9,359	-505	-27,560	-1,788,174
Dec-63	51,589	-45,979	0	-248,071	173,613	0	-145,518	-26,076	-2,717	-7,499	-7,096	-8,977	212	-26,076	-1,933,692
Dec-64	75,543	-34,688	0	-325,733	136,447	0	-221,685	-21,438	-2,502	-5,890	-4,724	-8,566	244	-21,438	-2,155,377
Dec-65	71,587	-41,825	0	-304,685	133,496	0	-200,855	-17,722	-2,531	-4,345	-2,788	-8,453	394	-17,722	-2,356,232
Dec-66	124,214	-47,946	0	-261,669	157,410	0	-78,227	-15,694	-2,298	-3,958	-1,589	-8,450	601	-15,694	-2,434,458
Dec-67	76,544	-44,215	0	-249,091	296,151	0	19,472	-15,463	-2,452	-4,563	-673	-8,583	808	-15,463	-2,414,986
Dec-68	26,907	-55,533	0	-143,742	515,110	0	273,484	-21,229	-3,793	-3,392	-4,866	-9,824	646	-21,229	-2,141,503
Dec-69	109,471	-48,912	0	-179,393	252,473	0	56,163	-21,881	-3,934	-6,229	-4,155	-8,719	1,156	-21,881	-2,085,340
Dec-70	121,288	-44,794	0	-361,471	160,658	0	-178,213	-15,772	-3,292	-3,152	-1,573	-8,572	818	-15,772	-2,263,553
2017-2070 Average	79,412	-33,107	0	-266,094	248,451	0	-41,918	-20,295	-2,123	-3,095	-4,521	-10,301	-255	-20,295	--
2040-2050 Average	56,611	-42,362	0	-263,191	252,300	0	-59,680	-19,925	-2,408	-2,996	-3,417	-10,608	-496	-19,925	--
2035-2045 Average	**78,148**	**-38,211**	**0**	**-271,872**	**234,643**	**0**	**-61,623**	**-19,344**	**-2,342**	**-3,503**	**-2,618**	**-10,556**	**-325**	**-19,344**	**--**







Project Forecast Groundwater Mass Balance Tulare Lake Sub Basin

Tulare Lake Subbasin Groundwater sustainability Plan
Kings County, California

By: dmb	Date: 07/30/19	Project No.: FR18161220
		Figure **D7-18**

DRAFT

Appendix D1
Annualized Land Use and Crop Acreage

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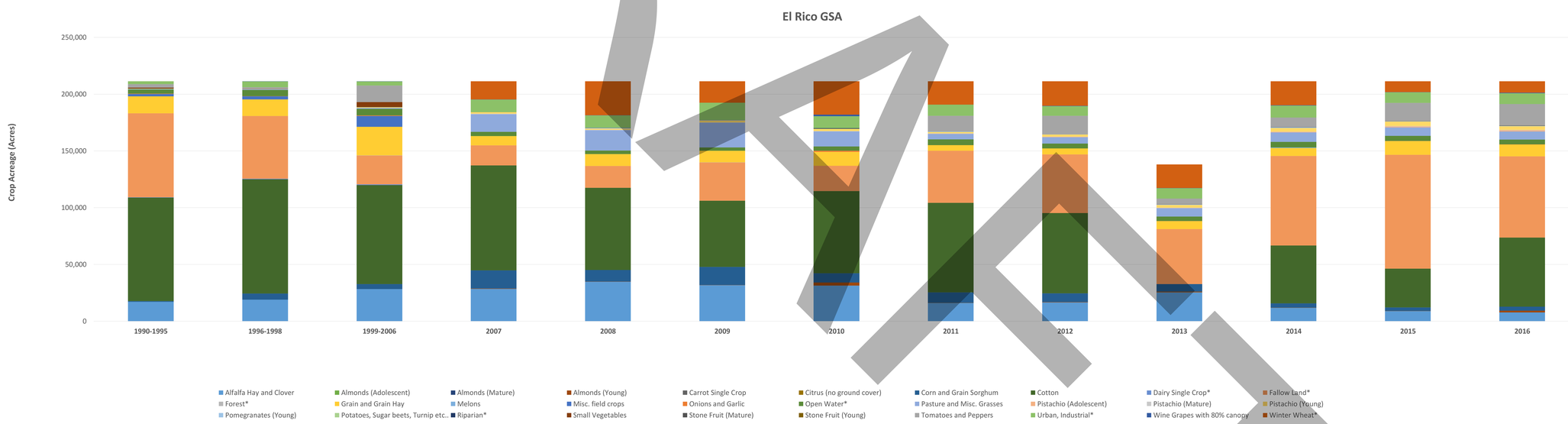
APPENDIX D1-1

Sum of Crop Acreage (Acres) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
El Rico GSA													
Alfalfa Hay and Clover	17062	18882	28224	28550	34759	31625	31388	16035	16646	25428	11801	8919	7682
Almonds (Adolescent)	0	0	0	0	0	0	0	2	1	1	8	2	4
Almonds (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Almonds (Young)	0	0	0	258	180	197	2669	238	259	636	208	246	1546
Carrot Single Crop	0	0	0	0	0	0	0	6	2	0	0	0	4
Citrus (no ground cover)	0	0	0	0	0	0	0	5	0	2	0	1	1
Corn and Grain Sorghum	782	5521	4532	16009	10213	16088	8204	9059	7686	6589	3771	2958	3518
Cotton	91026	100576	87075	92487	72329	58241	72345	78989	70591	0	50987	34147	60879
Dairy Single Crop*	386	493	718	0	0	0	0	0	0	0	0	0	0
Fallow Land*	73850	55208	25343	17545	19197	33697	22362	45881	51731	48511	78767	100327	71667
Forest*	0	12	156	0	3	36	1	0	0	0	0	0	0
Grain and Grain Hay	15048	14737	25257	8152	10582	10260	12219	4876	5254	7028	7005	12142	10308
Melons	0	0	0	0	0	0	0	1	6	1	491	3	63
Misc. field crops	2012	2737	9414	0	2	0	0	0	0	0	0	0	0
Onions and Garlic	253	165	606	0	0	0	1031	26	59	28	43	82	62
Open Water*	3550	5363	5676	3742	3038	2939	3748	5020	4152	4064	4826	4456	4232
Pasture and Misc. Grasses	444	682	902	15534	17925	21653	13233	4887	5745	7242	8473	7506	7212
Pistachio (Adolescent)	0	0	0	0	0	0	0	168	188	225	433	732	931
Pistachio (Mature)	0	0	0	519	494	348	294	286	281	260	259	414	386
Pistachio (Young)	0	92	612	1286	1030	1613	2066	1148	1837	2468	3146	3862	3324
Pomegranates (Young)	0	0	0	3	518	237	24	460	92	425	541	324	292
Potatoes, Sugar beets, Turnip etc..	465	0	0	5	0	0	0	1	0	1	0	1	1
Riparian*	0	0	260	11	59	93	386	20	14	54	83	92	101
Small Vegetables	807	298	4282	0	0	2	58	14	18	67	64	5	73
Stone Fruit (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	0	0	2	13	64	3	4	123	1	2	57	60
Tomatoes and Peppers	3069	1361	14625	5	1	67	0	13774	16185	4920	8549	16040	18943
Urban, Industrial*	2645	5070	3531	11025	10872	15246	10536	9841	8535	9304	10539	9274	9570
Wine Grapes with 80% canopy	0	196	130	160	142	18	1400	89	407	36	215	186	377
Winter Wheat*	0	0	0	16033	29951	18879	29323	20451	21465	20757	21059	9497	10032
El Rico GSA Irrigated Crop Acreage	**130966**	**145246**	**175658**	**162969**	**148189**	**140412**	**144935**	**130069**	**125380**	**128584**	**95998**	**87624**	**115666**
El Rico GSA Total Crop Acreage	**211398**	**211393**	**211342**	**211325**	**211311**	**211301**	**211291**	**211282**	**211278**	**211273**	**211272**	**211270**	**211268**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



APPENDIX D1-2

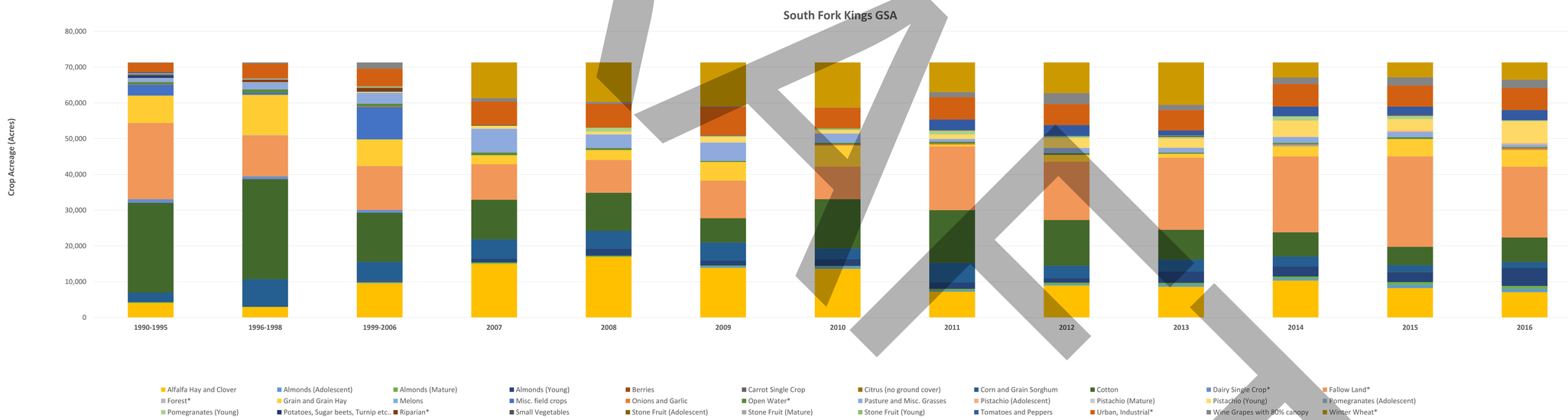
Sum of Crop Acreage (Acres) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mid-Kings River GSA													
Alfalfa Hay and Clover	13077	8955	11390	17127	17455	19907	17997	11349	11422	11310	11841	10814	8641
Almonds (Adolescent)	0	0	2646	0	0	3787	4400	2615	3312	5048	4677	5026	4221
Almonds (Mature)	6279	4955	4272	8040	7115	6086	5356	6765	7410	7851	9051	10582	10643
Almonds (Young)	0	3000	4011	10240	15571	8903	9640	9566	9308	11916	12070	12231	10961
Berries	0	0	0	0	0	0	0	0	1	2	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	1	2	0	2	0	4
Citrus (no ground cover)	0	0	21	0	10	9	4	110	27	89	30	17	4
Corn and Grain Sorghum	10777	24410	19454	17506	16434	12857	11789	18456	17872	17415	16054	13966	12211
Cotton	32138	21479	15330	2895	2617	4746	7523	7128	4136	2391	4027	3536	4295
Dairy Single Crop*	2278	2624	2666	0	0	0	0	0	0	0	0	0	0
Fallow Land*	9607	8651	7329	4456	3877	3288	3992	13754	14408	12757	11022	10897	11563
Forest*	93	163	71	2	0	7	1	0	0	1	0	0	0
Grain and Grain Hay	1658	2181	3123	2539	1275	2690	2058	498	1815	2657	1915	2558	1776
Melons	151	56	27	0	0	0	0	1	3	4	0	0	13
Misc. field crops	2574	1297	3410	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	58	0	0	0	0	1	20	36	71	4	61	7	118
Open Water*	457	209	560	246	228	121	274	280	177	103	122	203	212
Pasture and Misc. Grasses	860	1881	1360	8942	12009	4550	2646	1272	1468	1001	1177	750	595
Pistachio (Adolescent)	0	0	0	0	0	0	0	2	14	41	112	244	227
Pistachio (Mature)	99	78	74	244	95	46	27	25	17	16	14	14	19
Pistachio (Young)	0	137	452	1302	1386	2477	3444	3198	2521	3410	5367	6919	6844
Pomegranates (Young)	0	0	0	1	21	5	5	114	50	254	220	26	74
Potatoes, Sugar beets, Turnip etc..	0	1	0	2	0	2	0	0	0	0	0	0	1
Riparian*	0	20	20	178	18	20	4	66	9	29	69	10	38
Small Vegetables	336	348	236	15	1	2	98	99	64	102	87	29	92
Stone Fruit (Adolescent)	0	0	1183	0	0	3	60	100	124	69	46	191	166
Stone Fruit (Mature)	6217	4597	3662	793	345	29	7	3	23	41	23	27	39
Stone Fruit (Young)	0	1504	2816	342	1126	953	2187	1008	485	1549	1150	1093	612
Tomatoes and Peppers	589	132	48	1	0	35	0	2108	1412	788	603	763	1651
Urban, Industrial*	7209	7934	10796	11097	11599	13542	10655	11296	10679	10709	11395	11219	11192
Wine Grapes with 80% canopy	2868	2713	2368	2768	1506	1180	778	2768	3935	2023	2241	1448	7218
Winter Wheat*	0	0	0	8574	4606	12043	14313	4658	6509	5691	3894	4696	3835
Mid-Kings River GSA Irrigated Crop	**77681**	**77725**	**75883**	**72754**	**76968**	**68269**	**68042**	**67222**	**65492**	**67981**	**70768**	**70242**	**70424**
Mid-Kings River GSA Total Crop Acre	**97326**	**97326**	**97325**	**97307**	**97296**	**97289**	**97282**	**97276**	**97273**	**97272**	**97269**	**97267**	**97265**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year

APPENDIX D1-3

Sum of Crop Acreage (Acres) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
South Fork Kings GSA													
Alfalfa Hay and Clover	4030	2892	9546	14989	16927	13848	13603	7183	8911	8561	10328	8208	7048
Almonds (Adolescent)	0	0	172	0	0	431	605	301	272	538	469	857	905
Almonds (Mature)	213	143	135	383	332	259	221	507	522	584	651	818	829
Almonds (Young)	0	188	322	1113	1972	1328	1916	1794	1231	3147	2833	2825	5066
Berries	0	0	0	0	0	0	0	0	0	0	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	1	0	2	0	2	7
Citrus (no ground cover)	0	0	5	0	0	0	0	4	1	5	0	1	1
Corn and Grain Sorghum	2721	7461	5363	5344	4974	5058	2951	5499	3523	3375	2758	1893	1639
Cotton	25101	27984	13748	11091	10661	6816	13753	14685	12783	8294	6759	5136	6829
Dairy Single Crop*	998	761	781	0	0	0	0	0	0	0	0	0	0
Fallow Land*	21306	11422	12200	9929	9182	10491	9125	17821	16304	20156	21235	25318	19818
Forest*	6	106	97	4	1	4	3	0	0	0	0	1	0
Grain and Grain Hay	7688	11325	7401	2545	2791	5254	5903	570	1868	1073	2824	4829	4710
Melons	0	0	0	0	0	0	5	0	2	1	302	0	10
Misc. field crops	3029	537	9083	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	146	0	164	0	0	4	278	262	63	61	316	40	446
Open Water*	568	944	770	707	508	239	479	505	493	289	363	435	314
Pasture and Misc. Grasses	1196	1992	3076	6612	3776	5167	2585	764	1385	1335	1598	1466	736
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	15	20	45	388	391
Pistachio (Mature)	0	0	0	138	122	64	61	61	61	56	51	50	58
Pistachio (Young)	0	34	231	784	778	1662	903	1265	2756	2520	4547	3177	6029
Pomegranates (Adolescent)	0	0	0	0	0	0	0	0	0	0	3	16	27
Pomegranates (Young)	0	0	0	10	1005	102	188	996	411	467	1142	933	292
Potatoes, Sugar beets, Turnip etc..	468	0	209	0	0	2	0	0	0	38	0	1	0
Riparian*	0	648	841	190	14	66	27	101	22	212	32	124	43
Small Vegetables	430	2	0	5	0	8	11	14	30	43	4	38	28
Stone Fruit (Adolescent)	0	0	65	0	0	0	0	1	0	0	1	0	4
Stone Fruit (Mature)	408	316	192	3	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	94	245	38	53	95	229	61	94	86	85	32	40
Tomatoes and Peppers	287	51	0	93	2	8	12	2982	3060	1400	2605	2355	2749
Urban, Industrial*	2631	4086	4952	6415	6654	7933	5793	6213	5863	5729	6304	5928	6151
Wine Grapes with 80% canopy	80	317	1706	974	503	254	60	1408	3084	1481	1877	2279	2329
Winter Wheat*	0	0	0	9941	11051	12214	12590	8305	8551	11832	4173	4154	4807
South Fork Kings GSA Irrigated Crop	**45796**	**53338**	**51663**	**44120**	**43896**	**40359**	**43287**	**38359**	**40073**	**33087**	**39198**	**35344**	**40172**
South Fork Kings GSA Total Crop Acı	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**	**71305**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



APPENDIX D1-4

Sum of Crop Acreage (Acres) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Southwest Kings GSA													
Alfalfa Hay and Clover	4524	1347	4850	10391	9787	5943	6228	3472	4626	3475	1381	960	715
Almonds (Adolescent)	0	0	90	0	0	908	2921	304	879	1889	1372	337	235
Almonds (Mature)	1190	143	143	4474	4377	3481	2797	2867	2887	3005	3175	3646	3633
Almonds (Young)	0	90	4957	4922	8214	4248	6657	2329	3744	4631	2555	1577	3997
Berries	20	0	0	0	0	0	0	0	0	0	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	0	0	0	0	0	0
Citrus (no ground cover)	0	0	0	0	3	4	0	0	2	3	59	4	4
Corn and Grain Sorghum	0	17	0	66	18	640	85	492	32	73	34	4	31
Cotton	10438	26255	2279	2960	1746	2428	3832	4690	1444	5300	1466	1388	1671
Dairy Single Crop*	39	0	15	0	0	0	0	0	0	0	0	0	0
Fallow Land*	53229	41443	25225	17464	35584	26521	24733	48292	49251	49716	51859	61821	58286
Forest*	321	527	2617	0	0	0	0	0	0	0	0	3	0
Grain and Grain Hay	1595	4379	14293	1981	1010	2189	1583	188	597	306	132	796	1251
Melons	100	0	257	0	0	0	9	0	0	0	4	0	1
Misc. field crops	8580	5377	20902	0	0	0	0	0	0	0	2	0	0
Onions and Garlic	0	314	0	0	0	2	25	64	104	2	80	20	15
Open Water*	902	1805	1657	606	473	737	891	1233	536	543	749	774	619
Pasture and Misc. Grasses	0	472	276	9716	1984	24511	23979	1343	898	1176	10802	1403	998
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	1	84	293	2212	2288
Pistachio (Mature)	4595	3730	3730	5195	1195	476	21	21	20	17	6	6	6
Pistachio (Young)	0	1316	3094	829	1002	2610	1360	7358	7551	7459	5794	8509	5688
Pomegranates (Young)	0	0	0	49	147	166	16	3397	249	241	161	23	2448
Potatoes, Sugar beets, Turnip etc..	0	0	0	0	0	0	0	2	0	0	0	0	0
Riparian*	0	0	0	76	1	219	186	35	27	13	25	13	12
Small Vegetables	27	0	0	1	1	0	38	14	19	2	9	5	5
Stone Fruit (Adolescent)	0	0	229	0	0	11	6	0	0	0	0	0	0
Stone Fruit (Mature)	445	72	0	518	198	139	11	0	0	0	0	0	0
Stone Fruit (Young)	0	229	1124	289	416	462	83	4	10	4	102	0	2
Tomatoes and Peppers	1689	83	3	19	0	1	0	2601	3012	3	144	7	54
Urban, Industrial*	169	262	546	3643	4212	6157	4050	3619	2776	2885	4250	3199	3148
Wine Grapes with 80% canopy	0	0	1576	1684	1312	788	505	1093	1796	1113	2137	757	1060
Winter Wheat*	0	0	0	22975	16175	5212	7839	4436	7394	5913	1262	388	1688
Southwest Kings GSA Irrigated Crop	**33202**	**43824**	**57801**	**43094**	**31411**	**49008**	**50156**	**30239**	**27869**	**28783**	**29707**	**21654**	**24100**
Southwest Kings GSA Total Crop Ac	**87862**	**87862**	**87860**	**87858**	**87856**	**87855**	**87854**	**87854**	**87853**	**87853**	**87852**	**87852**	**87852**

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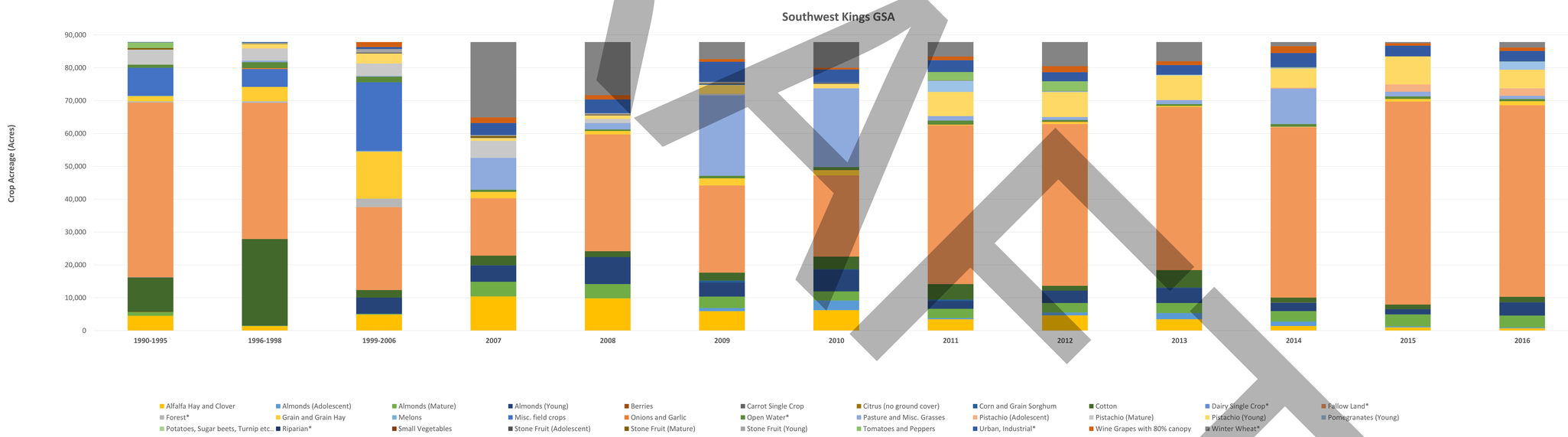

APPENDIX D1-5

Sum of Crop Acreage (Acres) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tri-County Water Authority GSA													
Alfalfa Hay and Clover	2917	488	290	1402	1672	181	469	750	526	544	469	765	159
Almonds (Adolescent)	0	0	0	0	0	0	0	0	0	0	0	0	0
Almonds (Young)	0	0	0	5	28	2	6	42	21	11	12	104	7
Carrot Single Crop	0	0	0	0	0	0	0	2	0	9	0	0	0
Citrus (no ground cover)	0	0	0	0	0	0	0	1	0	0	0	0	0
Corn and Grain Sorghum	0	1486	0	347	123	0	2	274	62	114	20	5	1
Cotton	830	4665	6333	172	952	210	714	49	39	104	147	325	47
Dairy Single Crop*	116	199	205	0	0	0	0	0	0	0	0	0	0
Fallow Land*	35703	21667	19509	15775	17303	25691	29979	26643	41003	41346	32290	39427	39639
Forest*	0	0	14	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	2719	15911	12888	4050	12212	7013	4217	1625	433	130	336	872	1024
Melons	0	0	0	0	0	0	0	0	0	0	0	15	0
Misc. field crops	921	2871	8503	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	0	0	0	0	0	0	3	22	5	0	1	0	2
Open Water*	90	771	305	274	49	13	42	665	86	45	764	51	58
Pasture and Misc. Grasses	0	1	1	9885	8538	11063	10637	6414	3873	4601	11501	4618	4202
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	0	0	0	0	0
Pistachio (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Pistachio (Young)	0	1	1	151	63	164	309	16	11	22	342	212	685
Pomegranates (Young)	0	0	0	0	14	35	22	46	2	8	143	7	5
Potatoes, Sugar beets, Turnip etc..	4803	0	0	0	0	0	0	6	0	1	0	0	0
Riparian*	0	0	0	63	42	0	11	3	67	5	30	9	1
Small Vegetables	0	0	0	0	0	0	6	0	1	30	0	1	1
Stone Fruit (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	0	0	1	0	0	0	0	0	0	1	0	0
Tomatoes and Peppers	0	0	0	0	0	0	0	17	1	4	20	46	24
Urban, Industrial*	0	39	50	1247	1374	1594	1184	1122	722	740	1413	910	868
Wine Grapes with 80% canopy	0	0	0	2	36	0	3	2	6	2	3	2	0
Winter Wheat*	0	0	0	14715	5675	2104	462	10361	1199	337	563	685	1327
Irrigated Crop Acreage	**12191**	**25423**	**28017**	**16014**	**23638**	**18668**	**16387**	**9267**	**4981**	**5582**	**12994**	**6971**	**6157**
Total Crop Acreage	**48099**	**48099**	**48099**	**48088**	**48081**	**48070**	**48064**	**48061**	**48059**	**48056**	**48053**	**48053**	**48051**

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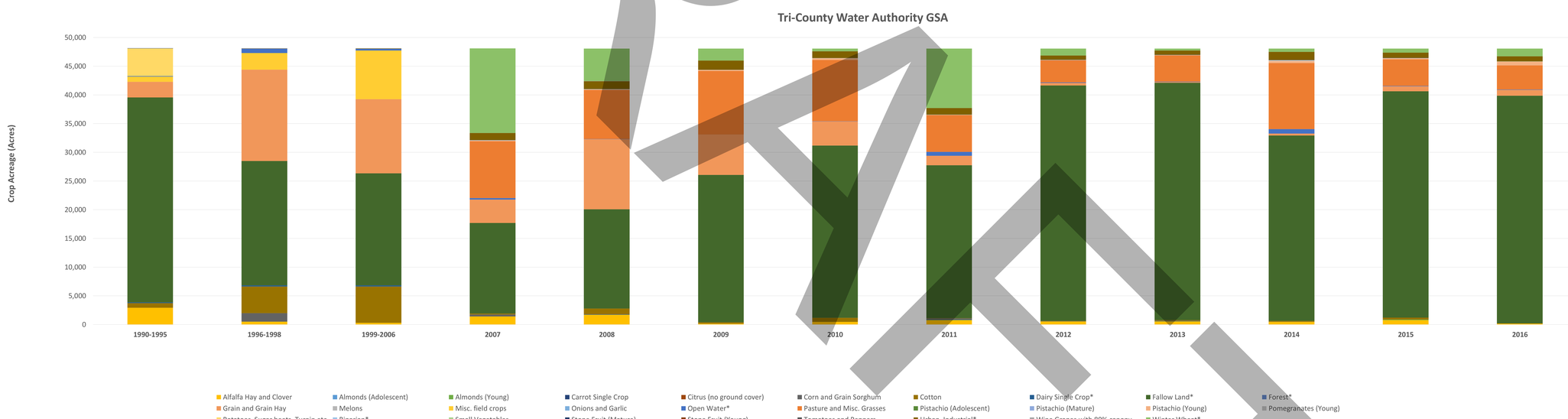

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Sum of Crop Acreage (Acres) — **APPENDIX D1-6**

Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tulare Lake Subbasin													
Alfalfa Hay and Clover	41604	32564	54301	72459	80600	71504	69685	38789	42131	49318	35820	29665	24245
Almonds (Adolescent)	0	0	2908	0	0	5127	7927	3222	4464	7476	6526	6222	5365
Almonds (Mature)	7682	5241	4550	12897	11825	9826	8374	10140	10818	11441	12876	15046	15105
Almonds (Young)	0	3278	9290	16538	25966	14678	20887	13968	14564	20341	17678	16983	21576
Berries	20	0	0	0	0	0	0	0	1	2	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	11	5	12	2	2	16
Citrus (no ground cover)	0	0	25	0	13	14	4	120	29	100	89	22	9
Corn and Grain Sorghum	14280	38896	29349	39271	31762	34643	23031	33780	29175	27566	22638	18826	17400
Cotton	159534	180960	124764	109605	88304	72441	98167	105541	88993	89317	63385	44532	73720
Dairy Single Crop*	3816	4077	4385	0	0	0	0	0	0	0	0	0	0
Fallow Land*	193695	138392	89606	65169	85144	99688	90192	152391	172697	172486	195172	237790	200972
Forest*	420	809	2955	6	5	46	5	0	0	1	0	4	0
Grain and Grain Hay	28708	48533	62962	19266	27870	27406	25980	7758	9968	11194	12213	21196	19069
Melons	250	56	284	0	0	0	14	2	11	7	797	18	86
Misc. field crops	17116	12819	51311	0	2	0	0	0	0	0	2	0	0
Onions and Garlic	457	479	770	0	0	7	1358	411	302	94	502	149	644
Open Water*	5568	9092	8968	5576	4296	4049	5434	7703	5443	5045	6824	5919	5435
Pasture and Misc. Grasses	2500	5029	5615	50688	44232	66944	53080	14680	13368	15355	33551	15744	13743
Pistachio (Adolescent)	0	0	0	0	0	0	0	170	218	370	882	3575	3836
Pistachio (Mature)	4694	3808	3804	6096	1907	934	404	394	380	348	330	485	469
Pistachio (Young)	0	1580	4390	4351	4259	8527	8083	12985	14676	15878	19195	22678	22570
Pomegranates (Adolescent)	0	0	0	0	0	0	0	0	0	0	3	16	27
Pomegranates (Young)	0	0	0	61	1705	545	256	5012	804	1395	2207	1312	3111
Potatoes, Sugar beets, Turnip etc..	5736	1	209	6	0	3	0	9	0	41	0	2	2
Riparian*	0	668	1120	517	134	398	615	226	138	313	239	248	194
Small Vegetables	1599	647	4518	20	2	13	212	142	133	244	165	78	198
Stone Fruit (Adolescent)	0	0	1478	0	0	14	66	100	125	69	47	191	170
Stone Fruit (Mature)	7070	4985	3854	1314	544	168	18	3	23	41	23	27	39
Stone Fruit (Young)	0	1827	4185	672	1609	1573	2502	1077	712	1641	1340	1183	713
Tomatoes and Peppers	5634	1627	14676	117	2	110	12	21482	23670	7114	11922	19211	23420
Urban, Industrial*	12654	17391	19875	33427	34711	44471	32218	32091	28576	29366	33901	30530	30930
Wine Grapes with 80% canopy	2948	3226	5779	5588	3499	2240	2746	5361	9228	4655	6472	4672	10985
Winter Wheat*	0	0	0	72238	67458	50451	64526	48212	45118	44530	30950	19420	21690
Tulare Lake Subbasin Irrigated Crop	**299832**	**345557**	**389021**	**338951**	**324102**	**316717**	**322806**	**275156**	**263796**	**264018**	**248665**	**221837**	**256519**
Tulare Lake Subbasin Total Crop Acr	**515986**	**515986**	**515931**	**515883**	**515849**	**515821**	**515796**	**515779**	**515768**	**515759**	**515751**	**515747**	**515741**

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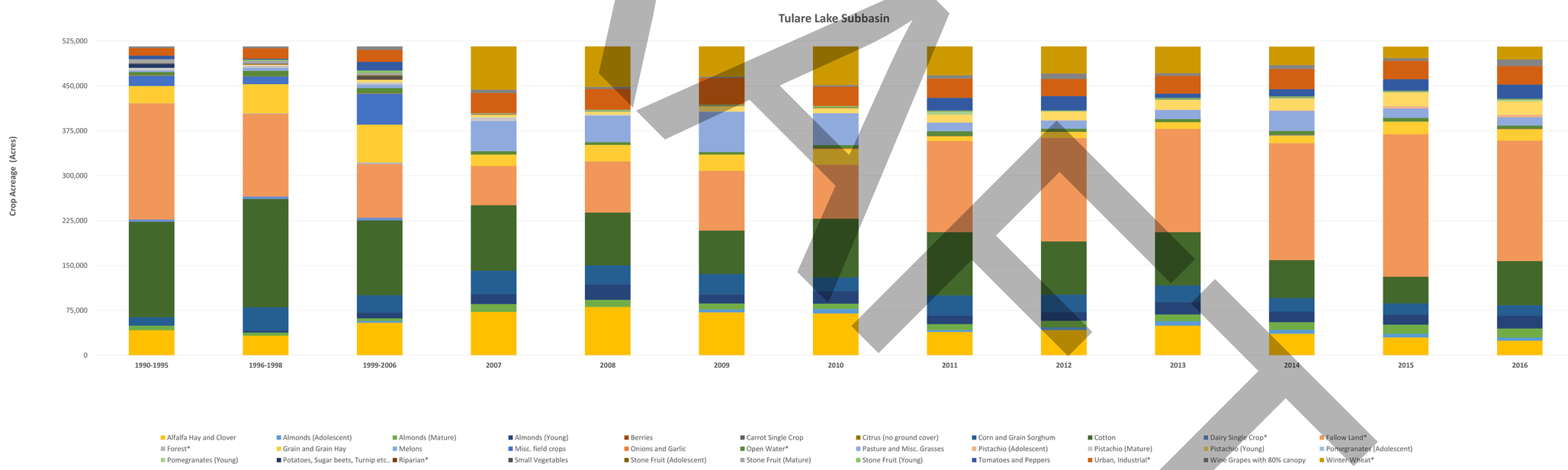

APPENDIX D1-7

Sum of Crop Acreage (Acres) Kaweah Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kaweah Subbasin													
Alfalfa Hay and Clover	27850	25488	29418	43095	41094	43668	40716	32231	33810	31880	30293	28662	26949
Almonds (Adolescent)	0	0	771	0	0	1532	2066	872	1229	1617	1456	1803	3445
Almonds (Mature)	3153	2535	2191	1736	1410	1077	921	1634	1819	1926	2456	2749	2995
Almonds (Young)	0	790	398	6870	11485	6194	8294	5130	4634	6064	9091	13550	14488
Berries	0	9	9	0	0	0	0	0	0	0	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	26	2	0	3	0	4
Citrus (no ground cover)	0	0	0	4	10	15	4	12	10	53	73	5	8
Corn and Grain Sorghum	26638	43219	43776	27456	32303	22468	21812	45387	47930	48395	48640	42286	34456
Cotton	59129	39071	33139	13910	9429	11494	18937	17481	13112	10144	9699	6535	10619
Dairy Single Crop*	4739	5962	6386	0	0	0	0	0	0	0	0	0	0
Fallow Land*	9002	7460	7147	2975	2992	3242	3633	15205	9874	13007	11274	12526	11575
Forest*	176	46	35	0	1	20	0	0	0	1	3	0	0
Grain and Grain Hay	7117	7703	8178	6799	501	2199	1849	745	1957	2730	1408	2541	1462
Melons	153	101	101	0	0	1	0	3	1	14	0	2	102
Misc. field crops	1745	1167	1439	0	1	1	0	0	0	0	0	0	0
Onions and Garlic	429	229	229	0	0	0	33	167	24	1	9	4	277
Open Water*	1210	726	866	246	233	247	516	579	378	199	277	492	424
Pasture and Misc. Grasses	1206	1112	1494	14364	26396	9090	9378	3711	6078	5345	5242	4515	4501
Pistachio (Adolescent)	0	0	0	0	0	0	0	336	493	880	1833	4513	4211
Pistachio (Mature)	1020	955	955	2307	1657	1343	1083	1034	886	794	771	1046	900
Pistachio (Young)	0	1985	2037	2026	2702	4762	4110	8081	9263	8907	9834	8573	8411
Pomegranates (Young)	0	0	0	4	155	10	3	89	52	430	128	102	395
Potatoes, Sugar beets, Turnip etc..	419	684	611	6	0	1	0	107	58	3	205	155	188
Riparian*	0	934	934	16	14	32	3	13	15	59	34	9	58
Small Vegetables	1749	3208	3163	89	1	5	2	175	490	782	766	780	725
Stone Fruit (Adolescent)	0	0	1320	0	0	22	26	20	128	382	403	82	30
Stone Fruit (Mature)	1645	883	762	125	24	5	0	19	3	7	70	94	17
Stone Fruit (Young)	0	1360	310	120	828	489	824	923	1191	818	1005	558	258
Tomatoes and Peppers	752	2013	1691	14	1	16	0	1188	384	697	546	1415	1750
Urban, Industrial*	3123	3412	3648	7583	7565	10932	7414	7056	6340	6453	6684	6941	6921
Wine Grapes with 80% canopy	801	1007	1036	1909	1183	630	547	1589	1944	1146	1170	862	4520
Winter Wheat*	0	0	0	20373	12023	32495	29802	8152	9855	9222	8580	11152	12262
Kaweah Subbasin Irrigated Crop Acr	**133807**	**133516**	**133027**	**120832**	**129180**	**105020**	**110604**	**120961**	**125498**	**123017**	**125103**	**120831**	**120710**
Kaweah Subbasin Total Crop Acreag	**152057**	**152057**	**152044**	**152025**	**152007**	**151987**	**151972**	**151966**	**151959**	**151957**	**151955**	**151951**	**151949**

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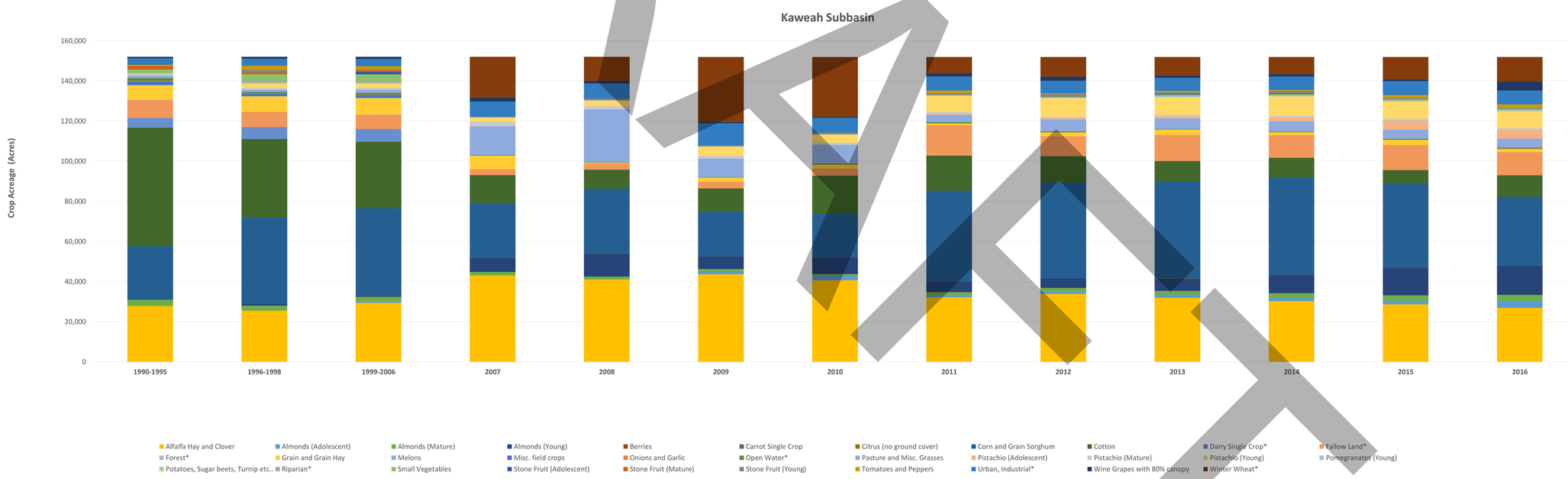

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APPENDIX D1-8

Sum of Crop Acreage (Acres) Kern County Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kern County Subbasin													
Alfalfa Hay and Clover	4901	4407	1624	4680	3816	4559	6610	2076	2224	3033	3011	2533	2915
Almonds (Adolescent)	0	0	812	0	0	1015	2696	295	249	1001	1166	529	567
Almonds (Mature)	1966	1035	402	2459	2384	2079	1689	1674	1889	1875	1878	2559	2635
Almonds (Young)	0	835	2229	5818	7283	2776	1820	1994	3570	4715	3756	3421	2367
Berries	0	0	0	0	0	0	0	0	0	8	0	0	0
Carrot Single Crop	53	0	0	0	0	0	0	0	0	3	1	1	2
Citrus (no ground cover)	0	0	0	0	131	278	0	2	19	2	152	1	1
Corn and Grain Sorghum	234	184	439	635	878	504	218	964	1186	852	491	614	144
Cotton	7102	10686	800	474	798	283	1970	614	385	66	120	30	62
Dairy Single Crop*	1	0	331	0	0	0	0	0	0	0	0	0	0
Fallow Land*	48223	31069	38616	13275	16082	6615	6146	40232	43273	36573	35547	40594	38237
Forest*	168	3	4832	0	1	1	0	0	2	0	0	0	0
Grain and Grain Hay	4362	11541	8261	506	1043	838	1682	1944	1374	1267	1078	1121	2860
Melons	0	0	0	0	0	1	0	0	21	8	1	0	4
Misc. field crops	2316	1463	1842	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	130	56	0	0	0	0	9	52	71	10	16	34	102
Open Water*	2	308	376	513	376	796	241	553	408	202	331	137	126
Pasture and Misc. Grasses	1641	3129	2856	35869	32488	45504	44155	8180	8962	13185	18668	10827	9311
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	0	2	61	758	807
Pistachio (Mature)	1847	1786	1775	2033	207	1	0	0	0	0	0	0	0
Pistachio (Young)	0	1906	4110	1063	631	663	1182	5304	7047	7601	4011	8202	6088
Pomegranates (Young)	0	0	0	0	361	0	0	5246	486	199	188	59	3850
Potatoes, Sugar beets, Turnip etc..	84	0	0	0	0	1	0	0	1	0	2	5	1
Riparian*	0	4723	4997	1015	956	1662	470	406	748	1307	571	1029	788
Small Vegetables	22	0	50	0	2	0	12	4	12	9	6	11	12
Stone Fruit (Adolescent)	0	0	20	0	0	0	0	0	0	0	0	0	3
Stone Fruit (Mature)	1600	245	202	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	27	3	5	124	60	14	42	14	25	246	24	119
Tomatoes and Peppers	724	766	0	0	0	1	0	83	80	17	24	28	127
Urban, Industrial*	16	237	266	2445	2462	4764	3065	2002	1443	1807	2236	1848	1751
Wine Grapes with 80% canopy	1779	2764	2324	2284	1647	852	1439	1520	1657	1530	2223	1418	1343
Winter Wheat*	0	0	0	4077	5456	3860	3684	3907	1963	1781	1292	1290	2849
Kern County Subbasin Irrigated Crop	**28760**	**40830**	**27749**	**55826**	**51792**	**59414**	**63495**	**29994**	**29247**	**35407**	**37098**	**32174**	**33318**
Kern County Subbasin Total Crop Ac	**77170**	**77170**	**77168**	**77150**	**77125**	**77111**	**77102**	**77094**	**77084**	**77078**	**77074**	**77073**	**77070**

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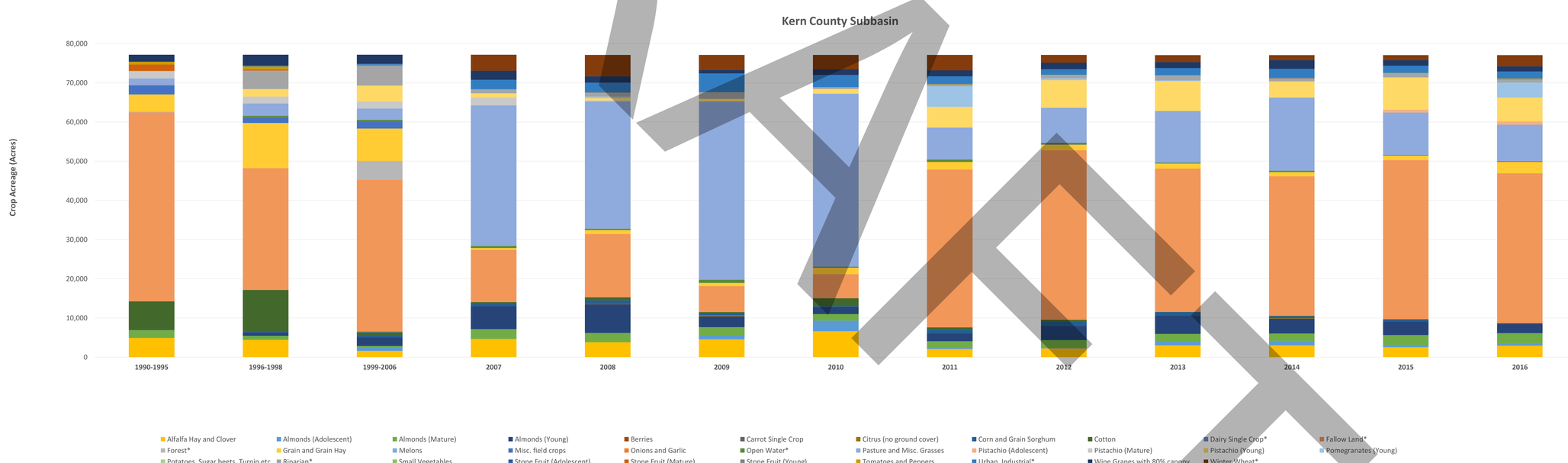

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Sum of Crop Acreage (Acres) — **APPENDIX D1-9**

Kings Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kings Subbasin													
Alfalfa Hay and Clover	16306	11835	14019	24478	21394	30890	33571	14356	14247	13523	17393	14242	12182
Almonds (Adolescent)	0	0	3414	0	0	10231	8066	3031	3819	5446	5193	4806	8502
Almonds (Mature)	4542	3495	3350	5386	4752	3247	2623	5737	5882	3838	4426	6262	5965
Almonds (Young)	0	3529	1164	26493	40739	14505	10844	19230	18486	16474	23168	29556	14910
Berries	0	3	3	0	0	0	0	0	2	16	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	14	1	2	36	0	8
Citrus (no ground cover)	532	557	557	74	93	851	57	206	148	1165	2395	975	570
Corn and Grain Sorghum	9363	14915	13000	5986	10644	6420	7212	13547	12495	9374	12586	9486	8811
Cotton	17806	11022	8861	3151	3700	3875	7667	6017	4335	2911	4225	2613	3156
Dairy Single Crop*	2549	2553	2615	0	0	0	0	0	0	0	0	0	0
Fallow Land*	9327	7519	6268	4149	1922	4614	3512	10692	11063	6697	5755	7343	8050
Forest*	413	229	266	17	9	22	9	2	11	2	2	4	16
Grain and Grain Hay	3299	2801	3445	1384	1109	2770	3757	987	1365	3407	1774	2054	677
Melons	407	180	130	0	3	18	4	1	10	33	7	9	29
Misc. field crops	3315	3204	3954	0	0	1	0	0	0	0	0	0	0
Onions and Garlic	0	0	106	27	58	91	38	175	73	65	389	107	236
Open Water*	671	893	1398	536	483	241	350	473	459	471	418	539	374
Pasture and Misc. Grasses	3833	2326	1914	9370	10809	5861	6552	1431	2665	2291	1789	1361	1172
Pistachio (Adolescent)	0	0	0	0	0	0	0	3	10	3	21	38	34
Pistachio (Mature)	172	109	109	96	73	66	59	59	58	58	56	56	34
Pistachio (Young)	0	9	121	1806	1466	3603	1931	5141	3223	3251	4585	2899	4214
Pomegranates (Young)	0	0	0	142	194	337	312	966	661	581	601	414	315
Potatoes, Sugar beets, Turnip etc..	0	31	233	1	0	2	0	9	0	0	0	2	0
Riparian*	0	584	821	417	54	454	44	280	110	147	219	75	67
Small Vegetables	1465	961	728	9	38	3	15	80	133	591	63	20	52
Stone Fruit (Adolescent)	0	0	8693	0	0	9	87	120	241	326	234	311	141
Stone Fruit (Mature)	20143	16740	16500	1663	324	64	42	12	15	12	32	24	14
Stone Fruit (Young)	0	8804	865	632	3153	3757	6595	4583	2872	14281	4299	3588	1501
Tomatoes and Peppers	51	450	309	15	4	147	23	632	484	1101	554	489	1483
Urban, Commercial*	234	0	0	0	0	0	0	0	0	0	0	0	0
Urban, Industrial*	4096	4846	4942	9013	8793	12129	8555	8395	7942	10273	7943	8218	8190
Wine Grapes with 80% canopy	20602	21532	21331	16829	6248	5113	8126	17826	21517	14294	17966	19448	34154
Winter Wheat*	0	0	0	7416	3009	9737	8988	5024	6696	8390	2883	4070	4153
Kings Subbasin Irrigated Crop Acrea	**101836**	**102501**	**102807**	**97542**	**104801**	**91860**	**97580**	**94163**	**92742**	**93040**	**101794**	**98762**	**98160**
Kings Subbasin Total Crop Acreage	**119125**	**119125**	**119116**	**119090**	**119071**	**119056**	**119038**	**119030**	**119023**	**119019**	**119014**	**119012**	**119009**

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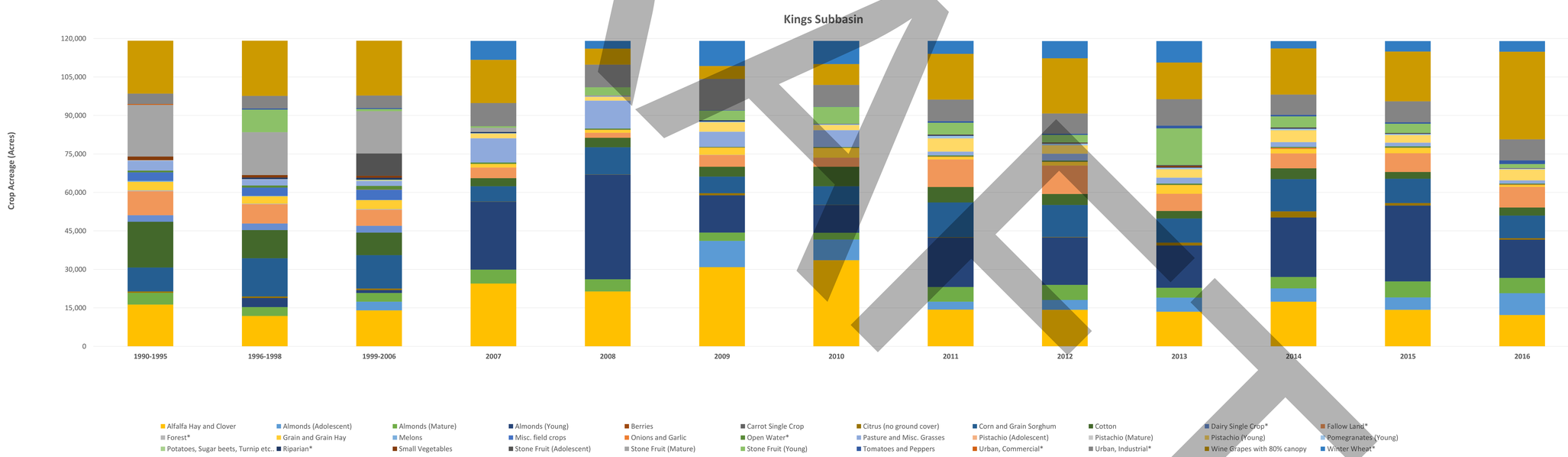
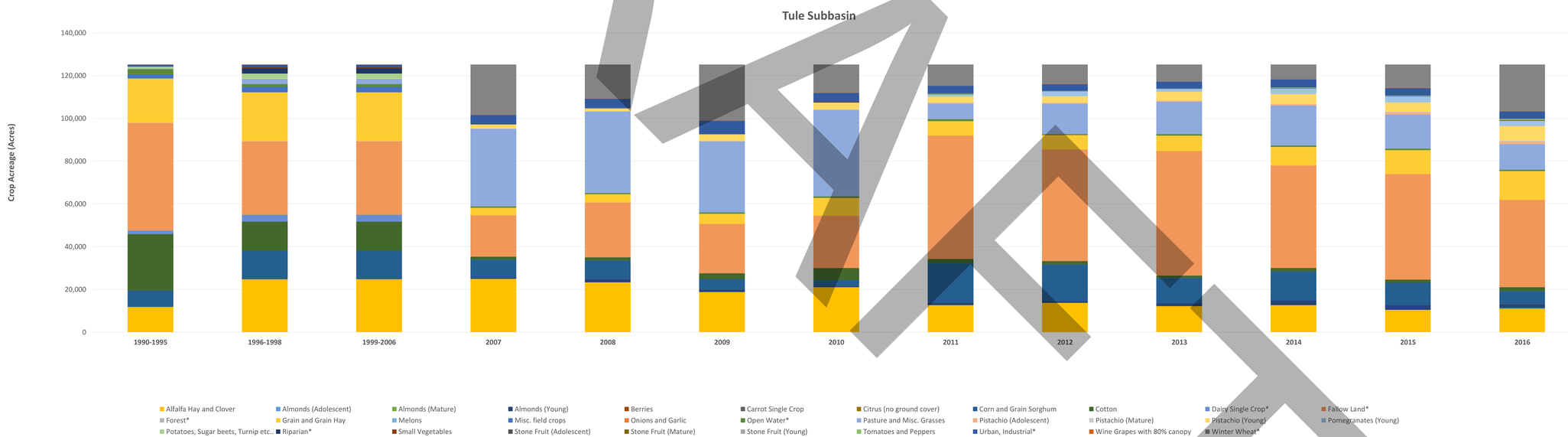


Sum of Crop Acreage (Acres) — **APPENDIX D1-10**

Tule Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tule Subbasin													
Alfalfa Hay and Clover	11815	24766	24766	24935	23335	18778	21039	12659	13696	12191	12634	10375	10831
Almonds (Adolescent)	0	0	2	0	0	48	32	5	3	20	48	98	413
Almonds (Mature)	43	13	13	0	0	0	0	3	0	0	0	6	6
Almonds (Young)	0	2	0	656	1520	1020	306	1111	740	1320	2101	2193	1892
Berries	0	0	0	0	0	0	0	0	0	0	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	1	0	0	0	1	17
Citrus (no ground cover)	0	0	0	0	0	0	0	5	0	3	4	2	1
Corn and Grain Sorghum	7656	13330	13330	8428	8660	5049	3069	18412	17304	11863	13687	10594	6087
Cotton	26378	13577	13577	1320	1507	2684	5541	2100	1527	1080	1498	1346	1809
Dairy Single Crop*	1668	3213	3213	0	0	0	0	0	0	0	0	0	0
Fallow Land*	50291	34370	34370	19350	25634	23018	24491	57622	52185	58262	47946	49332	40907
Forest*	59	9	9	0	0	13	0	0	0	0	0	0	0
Grain and Grain Hay	20747	22935	22934	3486	3875	4813	8244	6775	6675	7204	8679	11225	13366
Melons	12	0	0	0	0	5	0	1	2	1	65	4	27
Misc. field crops	1909	2492	2494	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	2	0	0	1	0	0	83	41	103	1	5	20	59
Open Water*	2437	1373	1373	686	547	653	788	935	437	716	654	700	650
Pasture and Misc. Grasses	238	2419	2419	36249	38175	33240	40465	7292	14196	15170	18730	15904	11931
Pistachio (Adolescent)	0	0	0	0	0	0	0	459	371	429	624	995	1192
Pistachio (Mature)	0	0	0	100	67	41	33	33	33	32	32	398	398
Pistachio (Young)	0	201	201	1954	1313	3170	3336	2747	3086	4184	4677	4328	6906
Pomegranates (Young)	0	0	0	2	98	67	17	1076	2311	1363	2648	2709	2393
Potatoes, Sugar beets, Turnip etc..	929	2278	2278	0	0	1	0	1	1	1	4	7	1
Riparian*	0	2509	2509	199	121	57	183	186	58	158	68	63	47
Small Vegetables	0	517	517	1	1	5	204	10	33	31	55	43	236
Stone Fruit (Adolescent)	0	0	20	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Mature)	9	0	0	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	20	0	7	72	9	2	35	31	1	43	41	6
Tomatoes and Peppers	2	18	18	1	0	2	0	105	108	72	268	233	658
Urban, Industrial*	950	1116	1116	4262	4258	6251	4117	3636	3116	3057	3771	3517	3402
Wine Grapes with 80% canopy	71	61	61	35	93	33	99	124	187	32	106	119	136
Winter Wheat*	0	0	0	23544	15937	26255	13161	9833	9005	8017	6859	10955	21832
Tule Subbasin Irrigated Crop Acreag	**69813**	**82629**	**82629**	**77175**	**78716**	**68963**	**82470**	**52997**	**60406**	**54997**	**65908**	**60640**	**58368**
Tule Subbasin Total Crop Acreage	**125218**	**125218**	**125218**	**125215**	**125214**	**125210**	**125209**	**125208**	**125207**	**125206**	**125206**	**125206**	**125205**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



APPENDIX D1-11

Sum of Crop Acreage (Acres) Westside Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Westside Subbasin													
Alfalfa Hay and Clover	3565	1318	4209	5516	7401	9897	6821	2099	2614	2755	1895	1262	1284
Almonds (Adolescent)	0	0	485	0	0	1873	2016	183	381	1622	1309	802	736
Almonds (Mature)	152	0	0	1044	968	729	240	1962	2029	2068	2348	3129	2866
Almonds (Young)	0	492	680	3525	4619	1617	3064	2645	2375	2820	2693	2702	3720
Berries	12	9	11	0	0	0	0	0	194	0	0	0	30
Carrot Single Crop	0	0	0	0	0	0	0	52	0	1	3	28	2
Citrus (no ground cover)	8	7	18	0	37	16	0	72	0	128	276	27	146
Corn and Grain Sorghum	484	805	423	3151	3625	4814	1747	312	302	9	29	8	45
Cotton	39262	43751	28342	19395	8364	4552	11801	22437	17678	8400	5293	4097	5286
Dairy Single Crop*	95	0	0	0	0	0	0	0	0	0	0	0	0
Fallow Land*	12574	9781	4611	12872	16866	19744	11787	11910	13995	19578	26359	36778	32844
Forest*	47	0	0	11	3	112	206	0	0	11	0	0	0
Grain and Grain Hay	5433	4637	8954	2865	5720	1326	3954	952	7891	2061	3743	1900	2345
Melons	777	2323	1020	3	3702	556	2743	368	414	741	394	158	85
Misc. field crops	5520	3801	14307	0	0	0	14	0	0	0	0	0	0
Onions and Garlic	1997	2306	3392	767	381	1373	385	3942	4252	4107	3712	3762	4236
Open Water*	517	986	678	490	351	385	275	348	379	233	369	479	364
Pasture and Misc. Grasses	0	2	74	2414	2521	2822	4201	429	894	988	881	254	280
Pistachio (Adolescent)	0	0	0	0	0	0	0	900	1016	1184	1676	1740	1956
Pistachio (Mature)	1089	1048	1046	748	387	3	2	2	2	1	0	874	876
Pistachio (Young)	0	382	481	3177	3380	2036	3957	4225	4973	5282	7563	3854	4571
Pomegranates (Adolescent)	0	0	0	0	0	0	0	0	0	24	0	0	0
Pomegranates (Young)	0	0	0	259	395	136	645	251	168	210	13	168	239
Potatoes, Sugar beets, Turnip etc..	0	0	1051	106	0	0	0	30	0	0	0	0	2
Riparian*	0	0	0	19	8	348	39	11	2	17	10	6	8
Small Vegetables	651	537	281	2210	421	286	305	834	878	1259	2529	385	814
Stone Fruit (Adolescent)	0	0	67	0	0	87	42	50	40	13	53	0	0
Stone Fruit (Mature)	865	712	508	1081	867	605	494	435	1	0	6	0	0
Stone Fruit (Young)	0	101	1173	250	485	452	1600	520	127	114	86	2	60
Tomatoes and Peppers	4765	4606	4502	2001	77	1284	497	7045	8011	10820	9286	6558	6171
Urban, Commercial*	21	0	0	0	0	0	0	0	0	0	0	0	0
Urban, Industrial*	2219	2465	3683	6617	6463	8360	6217	5623	4131	4533	4628	4411	4697
Wine Grapes with 80% canopy	353	341	408	1780	1265	714	686	725	1333	1503	1881	1261	1756
Winter Wheat*	0	0	0	10100	12089	16257	16641	12017	6298	9893	3340	5724	4952
Westside Subbasin Irrigated Crop Ac	**64932**	**67173**	**71432**	**50291**	**44615**	**35179**	**45215**		**55572**	**46111**	**45668**	**32972**	**37506**
Westside Subbasin Total Crop Acrea	**80405**	**80405**	**80404**	**80400**	**80394**	**80386**	**80381**	**80378**	**80376**	**80375**	**80373**	**80371**	**80371**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year

Appendix D2
Monthly Surface water Deliveries by GSA and Subbasin

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APPENDIX D2-1

Surface Water Delivery (Acre-Feet)	El Rico GSA	Mid-Kings River GSA	South Fork Kings GSA	Southwest Kings GSA	Tri-County Water Authority GSA	Tulare Lake Subbasin Total
Jan-90	12096	0	799	2753	12	15660
Feb-90	15780	532	389	4646	439	21787
Mar-90	13668	183	0	3383	136	17370
Apr-90	5311	0	0	3008	136	8454
May-90	1550	0	0	3191	159	4900
Jun-90	21777	24810	10647	6343	2198	65774
Jul-90	38337	21228	17294	8527	3431	88817
Aug-90	32604	16448	8315	7059	3826	68253
Sep-90	2580	0	0	4198	328	7106
Oct-90	788	0	0	2760	78	3626
Nov-90	1498	0	0	2048	164	3709
Dec-90	7192	0	0	6100	889	14181
Jan-91	8679	0	0	1104	181	9965
Feb-91	8930	0	0	1727	185	10843
Mar-91	9149	547	0	1291	182	11170
Apr-91	3017	45	0	1251	62	4375
May-91	114	0	0	1304	1	1420
Jun-91	11492	19825	8674	2059	6	42056
Jul-91	20315	29037	15627	6390	1621	72990
Aug-91	18326	14618	11119	4857	21	48941
Sep-91	329	202	0	1793	3	2328
Oct-91	58	0	0	1244	1	1303
Nov-91	111	0	0	725	1	837
Dec-91	540	0	0	2339	8	2888
Jan-92	7246	0	0	920	273	8440
Feb-92	10577	299	0	1569	546	12991
Mar-92	8589	0	0	1126	352	10067
Apr-92	3607	0	0	1104	175	4886
May-92	1444	0	0	1157	101	2702
Jun-92	19886	25477	12628	3649	434	62074
Jul-92	26610	18544	18112	4383	1222	68870
Aug-92	26266	14436	10146	4586	1475	56908
Sep-92	2425	0	17	1607	210	4260
Oct-92	733	0	0	1107	50	1890
Nov-92	1399	0	42	788	105	2334
Dec-92	6752	0	0	2247	568	9567
Jan-93	34635	1882	1061	1250	518	39346
Feb-93	38849	1049	1263	2577	606	44344
Mar-93	42588	15260	6536	1765	484	66632
Apr-93	27978	25934	8549	1783	190	64434
May-93	19683	24280	7672	2096	49	53781
Jun-93	61633	34418	20707	7760	2909	127427
Jul-93	87698	38923	27999	12806	3881	171307
Aug-93	81214	36099	24734	11805	3983	157835
Sep-93	14088	14353	10776	3878	252	43346
Oct-93	2877	4303	0	2120	24	9326
Nov-93	3993	3868	580	3408	51	11900
Dec-93	11465	490	1753	6678	277	20663
Jan-94	10334	2575	689	2961	7	16565
Feb-94	11346	324	3923	4813	240	20646
Mar-94	12003	3460	13518	2370	74	31425
Apr-94	4798	1453	468	2327	74	9121
May-94	2215	1617	63	2408	87	6390
Jun-94	36961	33759	16145	9249	2660	98774
Jul-94	48009	38368	25061	14823	3141	129403
Aug-94	40822	18407	25402	13274	2948	100854
Sep-94	2209	284	6397	4309	208	13407
Oct-94	589	0	0	2259	43	2891
Nov-94	1124	0	0	1123	90	2336
Dec-94	5419	0	0	5487	486	11392
Jan-95	50543	1489	872	2742	4002	59648
Feb-95	56193	1601	1274	5234	4718	69020
Mar-95	57904	12501	3713	3136	4209	81464
Apr-95	29106	22707	6177	3981	1644	63614
May-95	59386	29180	4786	3452	2211	99016
Jun-95	30642	33398	15773	9446	1637	90896
Jul-95	93097	54051	24738	17192	4769	193847
Aug-95	75149	55594	25997	14978	4617	176335
Sep-95	18055	28881	10439	6469	600	64444
Oct-95	3250	5460	4122	4404	130	17366
Nov-95	2410	0	1993	2751	275	7430
Dec-95	12155	1222	586	9321	1489	24773
Jan-96	44804	3917	4812	8505	2349	64387
Feb-96	53068	1691	6610	5587	3070	70027
Mar-96	67724	28082	7981	5191	2808	111787
Apr-96	41794	32997	10433	9367	1218	95808
May-96	34362	40058	8963	7192	410	90985
Jun-96	58752	51099	24996	13079	1533	149459
Jul-96	79092	52174	27425	16679	3469	178839
Aug-96	89843	40906	24649	14773	4495	174666
Sep-96	24394	10256	8963	9114	940	53668
Oct-96	2515	415	373	5858	131	9293
Nov-96	4276	0	0	1720	277	6274
Dec-96	21009	507	0	8581	1500	31597
Jan-97	38642	12784	0	2864	9282	63572
Feb-97	40362	16730	2192	6744	9729	75757
Mar-97	51972	41932	11303	6310	9411	120928
Apr-97	24596	12751	9437	5063	3232	55079
May-97	16136	29820	12593	5395	166	64110
Jun-97	12763	36157	19809	12465	842	82036
Jul-97	20865	41549	24488	17688	2223	106812
Aug-97	34090	38432	18975	15742	4045	111285
Sep-97	20520	2208	7805	6062	2594	39189
Oct-97	2187	0	294	3743	581	6804
Nov-97	1598	4010	0	1392	172	7173
Dec-97	1959	2947	0	9663	931	15499
Jan-98	27236	9019	488	7448	5942	50133
Feb-98	31844	15587	1993	5453	6191	61069
Mar-98	34696	24491	4235	3483	6014	72919
Apr-98	14460	14200	3219	3832	2058	37768
May-98	8776	17329	3981	4124	109	34318
Jun-98	10527	23256	10677	7449	401	52311
Jul-98	25767	42068	22992	12083	1124	104033
Aug-98	37026	49842	21467	11524	1358	121217
Sep-98	18449	21166	13410	7283	192	60500
Oct-98	4362	4005	5516	3488	45	17417
Nov-98	7941	9537	2820	3536	99	23932
Dec-98	22517	18341	3900	12154	528	57440
Jan-99	21858	22424	3602	3790	92	51766
Feb-99	32889	12418	5423	6632	105	57468
Mar-99	22875	10239	9343	4919	89	47466
Apr-99	11286	4682	8966	4310	35	29278
May-99	6892	9519	9693	5002	8	31114
Jun-99	34267	34956	18737	10197	60	98216
Jul-99	70847	41958	24375	16565	114	153859
Aug-99	80450	32271	19217	14414	173	146525
Sep-99	13128	3880	13204	7652	87	37951
Oct-99	2379	0	306	5179	4	7868
Nov-99	5597	1225	223	3566	9	10619
Dec-99	26748	3260	3	10193	47	40249
Jan-00	19168	16688	0	3981	1203	41040
Feb-00	24248	5154	3492	7221	2132	42247
Mar-00	20602	6407	9117	5813	1472	43410
Apr-00	11770	6319	10455	4060	687	33292
May-00	17655	18463	12305	3963	345	52732
Jun-00	44925	37946	20771	10132	1476	115251
Jul-00	77296	63999	24480	15187	4158	185120
Aug-00	66535	35841	19517	13197	5017	140108
Sep-00	10350	7067	11589	5866	714	35586
Oct-00	2705	0	0	3524	169	6399
Nov-00	6375	1920	167	1939	357	10757
Dec-00	18044	4739	148	9827	1933	34689
Jan-01	8961	6643	306	3439	7	19357
Feb-01	12104	5840	413	4738	249	23344
Mar-01	9359	3393	955	5022	77	18805
Apr-01	3836	1392	0	3725	77	9030
May-01	2267	621	0	3302	90	6280
Jun-01	31309	35031	19672	7838	2141	95991
Jul-01	50997	33980	20650	10499	3334	119460
Aug-01	49055	24248	20927	9909	3350	107488
Sep-01	2898	319	7363	4769	186	15535
Oct-01	808	0	0	3235	44	4088
Nov-01	1545	0	0	1047	93	2685
Dec-01	7472	0	0	7351	505	15328
Jan-02	23954	3915	0	2950	50	30869
Feb-02	34366	7194	9184	5270	523	56538
Mar-02	27523	5518	11211	3970	187	48409
Apr-02	8687	535	9845	4403	163	23633
May-02	6720	10074	4546	4164	176	25680
Jun-02	25952	40777	15782	9963	815	93288
Jul-02	51918	51345	19135	13258	2180	137837
Aug-02	47781	31068	13428	10907	2618	105802
Sep-02	3024	974	0	5499	364	9861
Oct-02	753	0	0	3507	86	4346
Nov-02	3255	2826	0	1030	182	7292
Dec-02	8335	2524	0	8095	984	19937
Jan-03	17035	6380	178	2599	251	26443
Feb-03	18975	3997	356	5205	759	29292
Mar-03	16464	3997	12382	4018	398	37259
Apr-03	6235	1332	536	3573	240	11916
May-03	3104	2694	180	3447	189	9614
Jun-03	35955	48545	14724	7872	2655	109751
Jul-03	65530	42356	20487	11279	5552	145204
Aug-03	58315	30398	19584	10022	4429	122748
Sep-03	10724	14051	4602	5418	390	35185
Oct-03	5060	6628	0	3235	93	15015
Nov-03	3534	3270	0	1849	195	8849
Dec-03	13310	8954	246	7783	1057	31349
Jan-04	21193	6202	887	2469	169	30920
Feb-04	22630	2751	421	5211	232	31245
Mar-04	19750	1700	16892	4331	188	42861
Apr-04	7463	567	11364	3817	76	23287
May-04	7649	1847	202	4028	23	13750
Jun-04	43669	36111	15703	8761	1864	106108
Jul-04	56276	39905	15616	12716	2044	126557
Aug-04	46550	20059	4869	9753	2102	83334
Sep-04	2893	0	0	5344	48	8285
Oct-04	1143	426	0	3106	11	4686
Nov-04	2473	1234	27	1335	24	5093
Dec-04	9313	1915	630	7305	130	19292
Jan-05	28328	8681	318	3073	2183	42584
Feb-05	34297	8543	211	5698	2211	50959
Mar-05	29485	7573	9716	3712	2191	52678
Apr-05	17953	14774	12322	4882	736	50667
May-05	48534	32390	9719	4539	2573	97756
Jun-05	83212	42082	19626	10292	4362	159573
Jul-05	81301	45958	24885	14477	2262	168883
Aug-05	71251	30263	21741	15052	2244	140551
Sep-05	20198	12158	12151	8680	770	53957
Oct-05	4823	2388	126	3795	5	11137
Nov-05	3751	1321	193	3261	10	8536
Dec-05	18891	4407	951	10899	57	35205
Jan-06	59292	10338	592	3257	2512	75991
Feb-06	63754	12505	6626	6422	2541	91849
Mar-06	64764	17538	6973	4837	2663	96774
Apr-06	41883	13691	3840	5137	2833	67383
May-06	76704	32999	11252	8857	5127	134938
Jun-06	67064	38328	21556	12485	2077	141510
Jul-06	82441	45232	27164	17302	2425	174563
Aug-06	75475	31743	21761	15341	2036	146355
Sep-06	15527	12043	11907	9365	807	49649
Oct-06	1262	853	149	4680	33	6977
Nov-06	2510	1310	156	1921	11	5908
Dec-06	11319	3168	1686	11288	62	27522
Jan-07	13171	2716	1406	4102	0	21395
Feb-07	18115	4927	4753	4776	12	32582
Mar-07	18252	4158	11450	3792	2061	39713
Apr-07	7207	3220	7950	3630	4	22010
May-07	8494	8585	313	3894	4	21291
Jun-07	42957	37657	17154	10846	5784	114397
Jul-07	53608	28757	20138	15667	6199	124370
Aug-07	40221	14702	22073	14551	3777	95325
Sep-07	3237	0	300	6629	473	10638
Oct-07	1095	474	0	2879	2	4449
Nov-07	2519	1514	0	1013	5	5050
Dec-07	8543	1666	0	7129	24	17363

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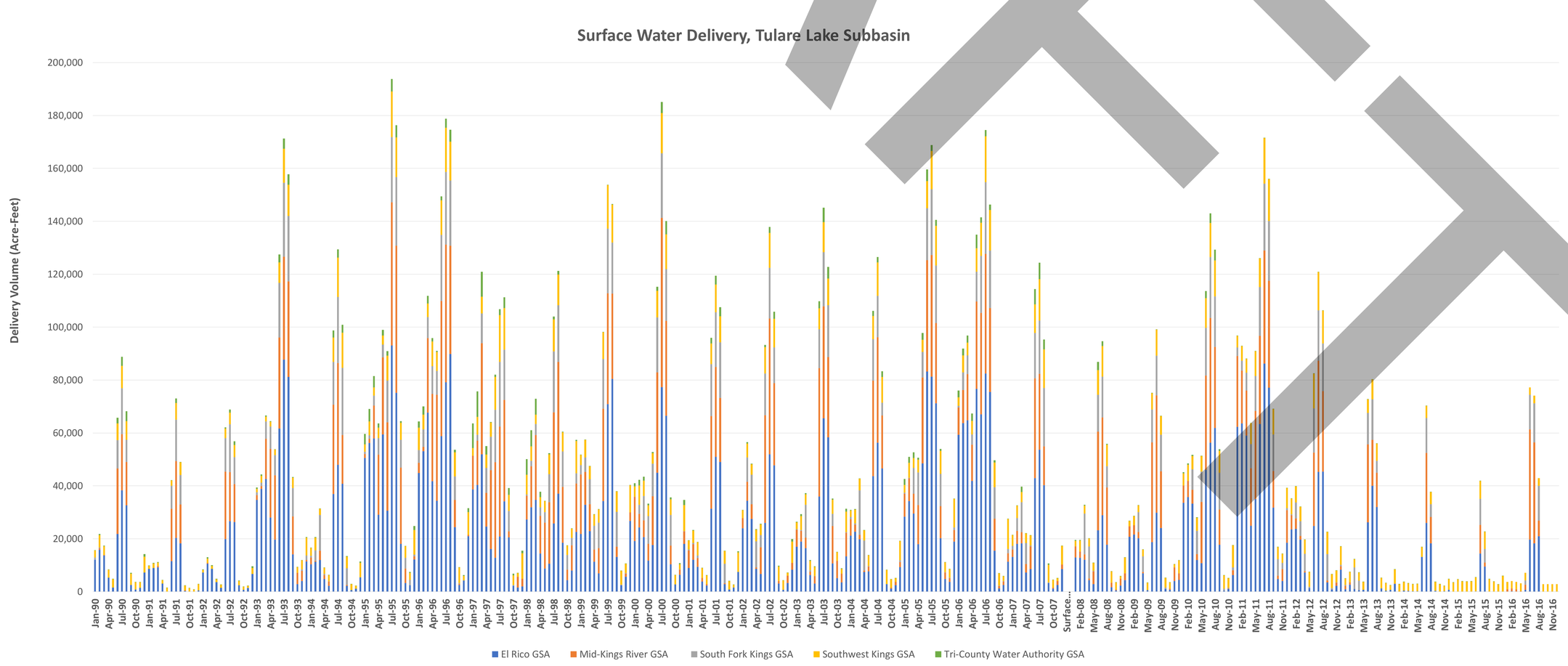
APPENDIX D2-1 (Cont)

Surface Water Delivery (Acre-Feet)	El Rico GSA	Mid-Kings River GSA	South Fork Kings GSA	Southwest Kings GSA	Tri-County Water Authority GSA	Tulare Lake Subbasin Total
Jan-08	12877	4236	0	2158	249	19521
Feb-08	12794	2358	0	4154	286	19592
Mar-08	12030	2029	15452	3035	260	32806
Apr-08	4310	676	12129	2975	94	20185
May-08	2848	4804	280	2918	14	10863
Jun-08	23201	37252	14023	9327	3063	86866
Jul-08	28911	36960	15430	11570	1795	94666
Aug-08	17737	21618	8115	8066	321	55857
Sep-08	1686	1694	0	4266	28	7674
Oct-08	535	324	0	2614	7	3479
Nov-08	2311	2600	0	966	14	5891
Dec-08	4305	2578	0	6083	77	13042
Jan-09	20714	4035	0	1996	0	26745
Feb-09	21578	3528	0	3511	2	28619
Mar-09	20219	2386	7422	2559	1	32585
Apr-09	6912	583	5834	2571	1	15900
May-09	626	0	0	2805	1	3432
Jun-09	18684	37791	12420	6179	3	75077
Jul-09	29891	44375	14955	9897	7	99125
Aug-09	24119	21353	13859	7115	9	66454
Sep-09	992	0	583	3621	1	5197
Oct-09	662	513	0	2362	0	3537
Nov-09	4030	5151	0	1119	1	10300
Dec-09	4435	2475	0	4964	3	11878
Jan-10	33578	6591	0	4533	503	45205
Feb-10	35716	6121	0	6119	503	48460
Mar-10	33280	5202	7720	5041	503	51746
Apr-10	11965	2285	8767	4939	168	28125
May-10	10826	23142	11452	5874	0	51294
Jun-10	45995	35698	18042	11282	2611	113628
Jul-10	56367	47091	23080	12815	3684	143036
Aug-10	61845	30709	19039	13661	4026	129280
Sep-10	17793	13208	13979	8270	556	53806
Oct-10	417	0	736	5071	0	6224
Nov-10	1053	221	221	3629	0	5126
Dec-10	6255	1797	1065	8405	1	17524
Jan-11	62292	26805	3271	4336	0	96704
Feb-11	63568	19954	3729	5631	17	92899
Mar-11	58959	17047	6734	5266	5	88011
Apr-11	24884	21763	9084	8007	5	63744
May-11	34998	33281	13176	9466	6	90927
Jun-11	63404	33286	18476	10767	26	125958
Jul-11	86173	42788	25299	17245	72	171578
Aug-11	77137	40417	22548	15888	87	156077
Sep-11	31800	13857	13793	9652	12	69114
Oct-11	4824	1194	6244	4587	3	16851
Nov-11	4056	4435	2415	3445	6	14358
Dec-11	18473	12326	750	7661	34	39243
Jan-12	23492	5381	289	6088	0	35250
Feb-12	23705	4034	5923	6199	14	39875
Mar-12	19686	1379	5543	5520	4	32131
Apr-12	7287	460	6581	5292	4	19625
May-12	1402	0	454	5644	5	7504
Jun-12	24802	27755	16731	13201	21	82510
Jul-12	45234	42066	19057	14465	60	120883
Aug-12	45391	30434	18014	12409	72	106320
Sep-12	3441	840	9880	8366	10	22537
Oct-12	777	123	405	5250	2	6556
Nov-12	2219	1192	59	4525	5	8001
Dec-12	8318	1267	508	7047	28	17168
Jan-13	893	1266	330	2519	0	5009
Feb-13	2596	939	7	3906	14	7463
Mar-13	1013	33	8164	3040	4	12254
Apr-13	613	11	3540	3028	4	7196
May-13	717	0	0	3016	5	3738
Jun-13	26176	29510	11863	5136	22	72707
Jul-13	39994	17398	15372	7502	61	80327
Aug-13	31989	12980	4464	6522	74	56030
Sep-13	1222	0	0	4031	11	5264
Oct-13	371	0	0	2910	2	3284
Nov-13	665	0	0	1723	5	2393
Dec-13	3004	99	0	5274	29	8405
Jan-14	31	27	0	2773	0	2831
Feb-14	331	0	7	3338	9	3686
Mar-14	231	138	0	2791	3	3163
Apr-14	120	0	0	2745	3	2869
May-14	141	0	0	2816	3	2959
Jun-14	13183	0	0	3744	14	16941
Jul-14	25975	26500	13175	4647	41	70337
Aug-14	18326	9961	4790	4555	49	37681
Sep-14	246	0	90	3414	7	3757
Oct-14	71	0	0	2751	2	2824
Nov-14	138	0	0	2041	3	2182
Dec-14	681	0	0	4106	19	4806
Jan-15	4	0	0	3439	0	3443
Feb-15	32	0	0	4691	2	4725
Mar-15	45	0	31	3836	3	3915
Apr-15	27	0	11	3764	2	3804
May-15	32	0	0	3840	2	3874
Jun-15	55	0	65	5326	4	5451
Jul-15	14382	10880	9816	6779	10	41868
Aug-15	9458	1549	5162	6539	9	22718
Sep-15	23	0	0	4764	2	4788
Oct-15	17	0	0	3743	1	3761
Nov-15	25	0	0	2725	2	2752
Dec-15	75	0	0	5887	6	5968
Jan-16	0	896	0	2854	0	3750
Feb-16	116	1103	0	2854	0	4073
Mar-16	0	896	0	2854	0	3750
Apr-16	0	299	0	2854	0	3153
May-16	672	2004	1559	2854	0	7089
Jun-16	19693	41699	12988	2854	0	77234
Jul-16	18328	38082	14830	2854	0	74094
Aug-16	20982	5884	13154	2854	0	42874
Sep-16	0	0	0	2854	0	2854
Oct-16	0	0	0	2854	0	2854
Nov-16	0	0	0	2854	0	2854
Dec-16	0	0	0	2854	0	2854



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APPENDIX D2-2

Surface Water Delivery (Acre-Feet)	Kaweah Subbasin	Kern County Subbasin	Kings Subbasin	Tule Subbasin	Westside Subbasin
Jan-90	47	1371	641	98	14547
Feb-90	130	3377	1373	244	14780
Mar-90	1444	4469	1141	386	6613
Apr-90	1596	2992	1217	636	6917
May-90	1731	4044	2573	1121	9906
Jun-90	9129	7032	16562	3468	16410
Jul-90	12238	10939	14508	2300	19830
Aug-90	5593	6916	6048	4178	7587
Sep-90	2007	1975	1688	1038	1151
Oct-90	652	1725	781	670	1147
Nov-90	85	936	851	296	1291
Dec-90	41	1201	324	59	1575
Jan-91	8	307	94	53	2212
Feb-91	42	378	461	131	3188
Mar-91	605	178	324	159	1529
Apr-91	760	466	259	269	1647
May-91	4621	1175	2598	2722	4730
Jun-91	22007	3359	20363	4708	11412
Jul-91	24361	4596	25900	5856	12927
Aug-91	9982	2702	6574	5370	7908
Sep-91	3052	1040	1852	547	1387
Oct-91	1344	1418	1184	359	1441
Nov-91	53	485	336	159	972
Dec-91	143	566	763	32	960
Jan-92	7	103	99	82	508
Feb-92	55	251	386	204	558
Mar-92	1716	798	320	249	1368
Apr-92	3133	2152	715	429	3036
May-92	4802	4154	2222	941	7373
Jun-92	17030	6905	22629	5580	12539
Jul-92	10891	7189	11734	4545	12735
Aug-92	7065	3767	6252	4529	9834
Sep-92	2278	1713	1418	842	1429
Oct-92	1139	1486	843	560	1418
Nov-92	35	460	326	248	374
Dec-92	24	270	322	49	366
Jan-93	3	233	45	223	283
Feb-93	24	1115	327	1878	329
Mar-93	11765	4796	3525	6456	2058
Apr-93	16628	6952	15864	5452	5331
May-93	31394	10498	29534	11882	13180
Jun-93	36360	11963	31144	17772	19969
Jul-93	34332	12848	35642	17361	26255
Aug-93	22197	12206	21941	14504	24952
Sep-93	9298	6569	10424	6972	3412
Oct-93	3372	5814	5706	2284	4458
Nov-93	284	4976	3108	248	2854
Dec-93	253	5866	3255	31	6689
Jan-94	293	1859	1457	62	14391
Feb-94	235	4902	2052	154	11245
Mar-94	1174	3746	1735	187	4253
Apr-94	1700	3097	1026	352	4789
May-94	2645	3262	3119	733	4923
Jun-94	14876	7646	24290	5384	15762
Jul-94	21182	10130	21360	9021	19556
Aug-94	11467	5895	10842	5542	12822
Sep-94	2504	1525	2089	759	1917
Oct-94	455	1049	516	434	1230
Nov-94	27	623	151	187	1490
Dec-94	50	801	649	37	2553
Jan-95	62	1517	822	294	3945
Feb-95	107	5076	1466	2446	4999
Mar-95	13717	2946	6844	4178	2134
Apr-95	21008	4724	16379	4430	6216
May-95	22750	7162	26917	6118	9726
Jun-95	38495	12984	35898	13129	22645
Jul-95	44604	16411	43101	19611	27976
Aug-95	36972	16002	33223	19211	24260
Sep-95	17742	8571	13976	8283	5616
Oct-95	3822	5892	2839	3356	7384
Nov-95	171	5241	1991	1162	5016
Dec-95	241	4683	3265	112	7753
Jan-96	257	3830	3497	171	15241
Feb-96	227	4045	2233	2850	9564
Mar-96	17084	4212	8807	5755	4982
Apr-96	14994	8713	16632	6401	10742
May-96	27215	11626	29126	10291	15910
Jun-96	34883	14051	35248	14968	28780
Jul-96	38539	15436	40793	17823	31016
Aug-96	24891	13542	28073	15431	25341
Sep-96	4141	4517	9234	1028	5287
Oct-96	1268	3364	2693	684	4243
Nov-96	43	1779	492	306	1763
Dec-96	33	2734	452	60	2416
Jan-97	465	318	888	96	6174
Feb-97	780	1350	2277	1360	9686
Mar-97	19616	4778	17019	7234	16640
Apr-97	13855	6395	11696	7037	12485
May-97	15904	8934	25906	4524	18409
Jun-97	27570	11860	29858	11890	30312
Jul-97	27017	13740	30387	14320	29306
Aug-97	17755	10410	17428	9734	21987
Sep-97	5995	3886	3381	4308	5058
Oct-97	2392	3114	1834	2352	5550
Nov-97	209	1807	686	391	3755
Dec-97	86	2021	735	57	2950
Jan-98	40	4058	557	53	9421
Feb-98	16	1413	136	180	4800
Mar-98	17198	1462	8816	1500	6959
Apr-98	18553	3193	9764	1807	6464
May-98	21517	5380	17966	4202	7069
Jun-98	26476	7845	22139	8145	12919
Jul-98	39784	14518	35487	15503	28073
Aug-98	32219	14327	32359	12476	23258
Sep-98	18559	8841	16058	6449	7230
Oct-98	4207	4416	3715	2929	6783
Nov-98	184	1743	2377	583	3331
Dec-98	877	2290	4223	202	10884
Jan-99	270	1175	3687	554	15754
Feb-99	128	2220	1732	1655	8688
Mar-99	3039	5126	3462	3523	9463
Apr-99	3354	6552	3010	1742	9135
May-99	9147	10436	16776	6266	16579
Jun-99	21666	14488	28786	10130	25709
Jul-99	28645	16359	31931	12287	27148
Aug-99	18298	9651	19378	10795	17599
Sep-99	3892	4405	8003	1635	3740
Oct-99	1489	6242	3144	537	5503
Nov-99	233	3775	2670	237	2996
Dec-99	186	1789	1369	47	4824
Jan-00	183	2447	1682	75	4298
Feb-00	195	5584	2515	351	7826
Mar-00	13554	5723	3625	3107	6384
Apr-00	10637	5906	5303	4436	8766
May-00	19686	10031	22335	10465	12749
Jun-00	31336	15006	31244	12509	19346
Jul-00	33065	15694	32482	12724	22269
Aug-00	18279	11856	22034	8593	17887
Sep-00	3187	5443	4314	769	3424
Oct-00	618	3815	1001	512	2275
Nov-00	165	2624	1086	226	2571
Dec-00	181	1151	2033	45	6332
Jan-01	96	1721	1304	73	14080
Feb-01	79	836	681	182	8421
Mar-01	1619	2440	1699	222	5282
Apr-01	1845	1588	1697	375	7266
May-01	13061	3564	6552	4061	9234
Jun-01	22013	5679	28434	8687	17537
Jul-01	26342	6281	21764	8711	16982
Aug-01	6921	4870	7429	3397	13782
Sep-01	2808	2297	2379	753	2108
Oct-01	904	1182	867	501	2447
Nov-01	47	561	206	222	1305
Dec-01	58	412	728	44	1826
Jan-02	111	1242	555	77	5044
Feb-02	263	3354	1887	191	10078
Mar-02	1567	2679	2407	232	6151
Apr-02	2279	3694	2782	392	8934
May-02	8056	3793	14135	3426	9804
Jun-02	21134	9403	30090	7238	18587
Jul-02	26501	9237	23318	9796	22521
Aug-02	14993	8456	8492	5606	14048
Sep-02	2807	4270	2133	787	3193
Oct-02	1460	3142	1181	524	2963
Nov-02	54	1076	411	348	1778
Dec-02	127	689	375	57	4261
Jan-03	125	882	459	181	10900
Feb-03	103	2700	1212	218	10555
Mar-03	1043	2788	2060	266	4915
Apr-03	3767	2265	1936	1959	9139
May-03	18843	6246	10425	8209	7639
Jun-03	28702	9500	30798	11859	19955
Jul-03	30699	14946	29784	14417	25924
Aug-03	11713	10773	12405	7635	17902
Sep-03	3771	4893	3616	901	6180
Oct-03	1102	3625	2000	600	3883
Nov-03	224	2201	1216	265	2084
Dec-03	729	2211	1061	53	6090
Jan-04	205	1248	884	83	11775
Feb-04	127	4067	1213	207	5917
Mar-04	3259	7192	4015	252	7697
Apr-04	3828	3913	2446	426	10818
May-04	6348	5772	6833	4041	14128
Jun-04	20114	7846	29563	8286	25508
Jul-04	19954	9223	22297	7586	21170
Aug-04	12796	5486	9468	5573	15280
Sep-04	2383	2398	2093	855	2084
Oct-04	2235	1451	661	569	1365
Nov-04	96	485	345	252	1231
Dec-04	36	392	340	50	3433
Jan-05	37	1723	515	973	4077
Feb-05	142	5371	1397	2875	7664
Mar-05	9329	7917	4535	2312	5803
Apr-05	16557	13449	10234	7101	8779
May-05	22141	11096	23578	9012	7929
Jun-05	36488	14923	33535	15303	24589
Jul-05	36866	15534	36452	19067	28207
Aug-05	29242	14034	26373	16129	26623
Sep-05	7968	9057	11583	4196	6209
Oct-05	1790	7564	4348	715	3728
Nov-05	191	4929	1583	316	4856
Dec-05	574	4297	3944	63	10618
Jan-06	44	3048	619	1536	7565
Feb-06	498	6448	2851	3751	9719
Mar-06	7048	5619	3734	1916	4257
Apr-06	13024	5112	11080	1843	2963
May-06	29347	11068	29089	9981	14873
Jun-06	33094	11030	35571	14724	27155
Jul-06	30714	16449	38124	16978	31089
Aug-06	24962	15057	27330	16460	24540
Sep-06	9862	10336	12634	6849	7608
Oct-06	1096	6974	4504	591	4830
Nov-06	216	5659	1983	261	3936
Dec-06	311	3774	3280	52	8834
Jan-07	261	5025	2830	143	12097
Feb-07	306	2356	2228	298	12803
Mar-07	863	4484	2370	363	10386
Apr-07	985	2811	2165	612	13021
May-07	2965	4835	3624	1350	17784
Jun-07	11494	7256	11801	4407	18668
Jul-07	15168	7529	15169	8696	16893
Aug-07	8858	4901	7301	3060	10555
Sep-07	18477	2571	1890	1228	2441
Oct-07	713	1595	948	818	1590
Nov-07	57	536	396	361	1003
Dec-07	58	366	463	72	896

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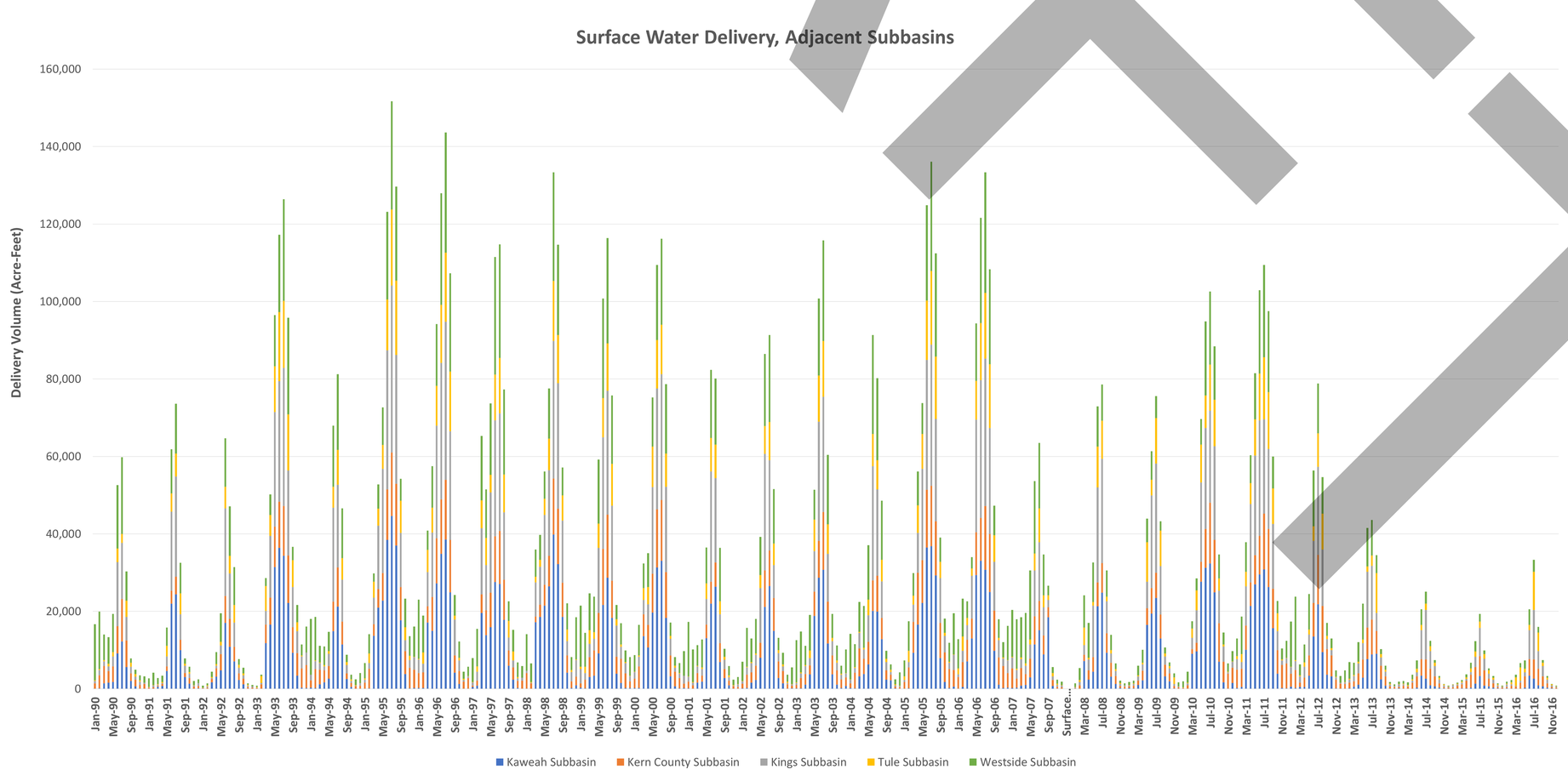
APPENDIX D2-2 (Cont)

Surface Water Delivery (Acre-Feet)	Kaweah Subbasin	Kern County Subbasin	Kings Subbasin	Tule Subbasin	Westside Subbasin
Jan-08	18	152	246	83	902
Feb-08	76	852	802	552	3112
Mar-08	7172	1651	2476	4489	8384
Apr-08	2395	2361	2802	424	9010
May-08	4395	3761	13361	934	10147
Jun-08	21269	6219	24490	10546	10365
Jul-08	24815	7612	26919	9910	9325
Aug-08	9279	5128	8168	1262	6755
Sep-08	3121	3576	2429	849	3966
Oct-08	1277	2028	1254	566	1414
Nov-08	205	549	529	250	602
Dec-08	80	454	359	50	502
Jan-09	228	401	302	81	756
Feb-09	94	767	377	200	680
Mar-09	988	1077	1194	244	2448
Apr-09	2213	2440	1660	416	3365
May-09	16510	4280	6848	10204	6105
Jun-09	19393	6669	23889	3994	7381
Jul-09	23418	6562	28183	11783	5651
Aug-09	13001	6142	12501	9198	2372
Sep-09	3185	3051	2110	827	1515
Oct-09	1964	2051	1283	551	1004
Nov-09	98	627	533	1747	945
Dec-09	52	348	244	48	967
Jan-10	9	193	118	75	1524
Feb-10	91	784	555	203	2815
Mar-10	9084	1151	2912	2390	1932
Apr-10	9661	2259	8354	5168	3111
May-10	27630	5169	20455	9836	6608
Jun-10	31224	10058	26047	8433	19120
Jul-10	32344	15684	23806	11894	18808
Aug-10	24931	13524	24152	12023	13783
Sep-10	7017	9882	8430	3200	6138
Oct-10	1650	5379	3908	511	3096
Nov-10	55	3811	363	226	2129
Dec-10	1501	3942	1547	46	2707
Jan-11	199	4763	2695	829	4520
Feb-11	452	4746	1734	2065	9670
Mar-11	10065	6270	10124	3745	7657
Apr-11	21424	6019	20262	5438	7172
May-11	26993	7494	25764	9322	11941
Jun-11	29531	9935	29828	12067	21540
Jul-11	30783	14434	24313	16092	23798
Aug-11	26314	14932	20716	14640	20960
Sep-11	15653	10223	16679	9216	8234
Oct-11	3935	6062	4893	4634	3188
Nov-11	193	5978	1164	247	2826
Dec-11	101	6460	1375	49	4443
Jan-12	583	3300	1743	82	11629
Feb-12	260	4623	2325	204	16398
Mar-12	442	1161	1600	248	2847
Apr-12	441	2454	2814	1126	4631
May-12	3353	5228	5466	1221	9250
Jun-12	13499	8711	16026	3763	14397
Jul-12	21816	12788	22698	8687	12811
Aug-12	9476	11893	14638	9194	9482
Sep-12	3692	6552	2578	840	3343
Oct-12	3264	5333	1361	559	2483
Nov-12	108	2295	520	247	1604
Dec-12	18	1308	252	49	1642
Jan-13	36	1248	396	82	2969
Feb-13	152	1411	828	204	4297
Mar-13	574	1361	1343	248	3226
Apr-13	1043	2932	2598	419	5102
May-13	2885	4727	4167	923	9255
Jun-13	7655	8186	14386	1376	9966
Jul-13	8922	8924	13925	2653	9178
Aug-13	9089	5862	4616	10351	4590
Sep-13	2433	3503	2168	840	1332
Oct-13	782	2414	1215	559	963
Nov-13	82	597	423	247	375
Dec-13	59	378	269	49	431
Jan-14	109	361	701	82	559
Feb-14	22	840	299	204	616
Mar-14	18	523	202	248	704
Apr-14	63	1566	438	419	1138
May-14	269	2973	990	923	2222
Jun-14	3386	4293	7480	1376	3990
Jul-14	2612	4990	12797	1604	3047
Aug-14	940	4270	4563	1248	1399
Sep-14	647	2565	2645	840	729
Oct-14	287	1166	906	559	381
Nov-14	108	413	376	247	122
Dec-14	22	272	291	49	184
Jan-15	59	336	607	82	70
Feb-15	27	805	325	204	225
Mar-15	114	1076	416	248	433
Apr-15	154	1989	413	419	793
May-15	266	3394	693	923	1440
Jun-15	1336	4267	2704	1376	2637
Jul-15	3306	5141	7295	1604	1975
Aug-15	852	3915	2958	1248	937
Sep-15	610	2046	1250	840	528
Oct-15	287	1166	906	559	381
Nov-15	108	413	376	247	263
Dec-15	22	272	291	49	155
Jan-16	109	361	701	142	559
Feb-16	22	840	299	477	616
Mar-16	18	523	202	2211	704
Apr-16	63	1566	438	3442	1138
May-16	269	2973	990	923	2222
Jun-16	3386	4293	7480	1376	3990
Jul-16	2612	4990	12797	9836	3047
Aug-16	940	4270	4563	4806	1399
Sep-16	647	2565	2645	840	729
Oct-16	287	1166	906	559	381
Nov-16	108	413	376	247	122
Dec-16	22	272	291	49	184



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Appendix D3
Annualized Crop Demand

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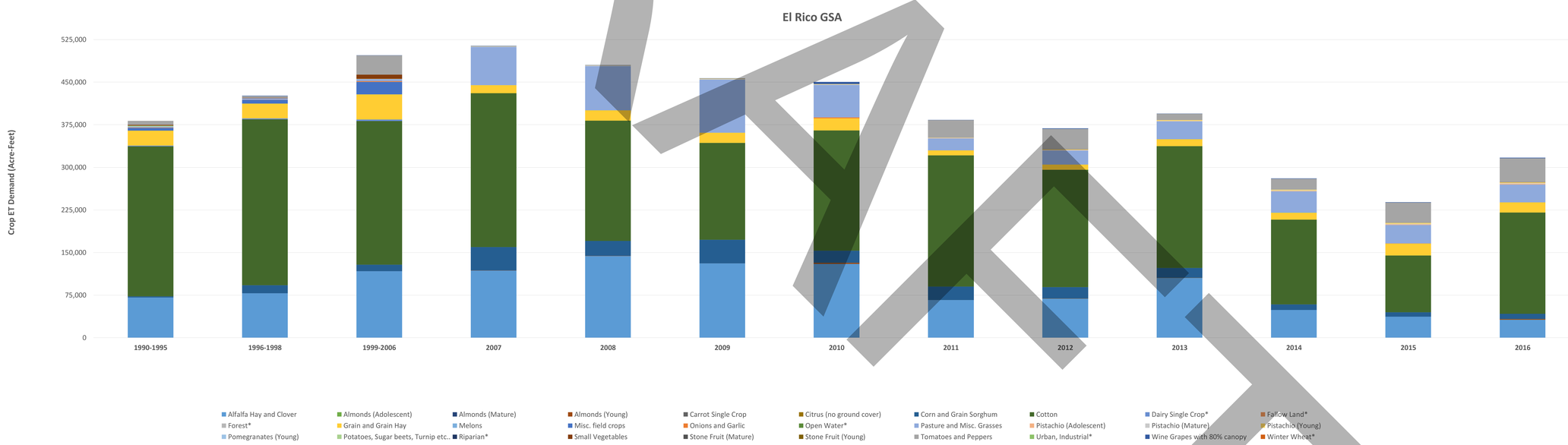
APPENDIX D3-1

Sum of Crop ET Demand (Acre-Feet/Year) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
El Rico GSA													
Alfalfa Hay and Clover	70729	78296	117038	118221	143932	130955	129971	66396	68927	105292	48866	36930	31810
Almonds (Adolescent)	0	0	0	0	0	0	0	3	2	2	18	5	10
Almonds (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Almonds (Young)	0	0	0	188	146	145	1951	180	194	477	170	185	1163
Carrot Single Crop	0	0	0	0	0	0	0	19	8	1	0	0	16
Citrus (no ground cover)	0	0	0	0	0	0	0	16	0	7	0	2	4
Corn and Grain Sorghum	2018	14258	11703	41343	26375	41546	21187	23395	19850	17015	9740	7639	9086
Cotton	264279	292007	252807	270755	211744	170500	211791	231241	206654	214373	149263	99964	178223
Dairy Single Crop*	1445	1847	2688	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	26296	25753	44136	14205	18440	17878	21292	8497	9155	12247	12207	21158	17961
Melons	0	0	0	0	0	0	0	1	8	2	728	4	93
Misc. field crops	4755	6468	22248	0	4	0	0	0	0	0	0	0	0
Onions and Garlic	446	291	1070	0	0	0	1834	47	105	49	77	146	111
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	1917	2947	3895	67107	77436	93539	57165	21110	24818	31286	36605	32424	31157
Pistachio (Adolescent)	0	0	0	0	0	0	0	211	277	370	687	1003	1370
Pistachio (Mature)	0	0	0	1232	1293	983	897	932	917	847	842	1184	1122
Pistachio (Young)	0	23	221	322	376	619	698	392	735	1140	1492	1535	1315
Pomegranates (Young)	0	0	0	0	91	42	4	81	24	93	148	164	162
Potatoes, Sugar beets, Turnip etc..	1508	0	0	14	0	0	0	4	0	4	0	3	3
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	1430	528	7590	0	0	3	94	23	29	107	103	8	116
Stone Fruit (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	0	0	2	9	44	2	3	85	1	2	40	78
Tomatoes and Peppers	7067	3135	33674	11	2	150	0	30683	36052	10959	19043	35729	42194
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	0	503	334	407	362	47	3559	227	1035	92	546	472	958
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
El Rico GSA Irrigated ET Demand	**380445**	**424208**	**494716**	**513807**	**480209**	**456451**	**450445**	**383463**	**368875**	**394364**	**280539**	**238594**	**316952**
El Rico GSA Total ET Demand	**381890**	**426054**	**497404**	**513807**	**480209**	**456451**	**450445**	**383463**	**368875**	**394364**	**280539**	**238594**	**316952**

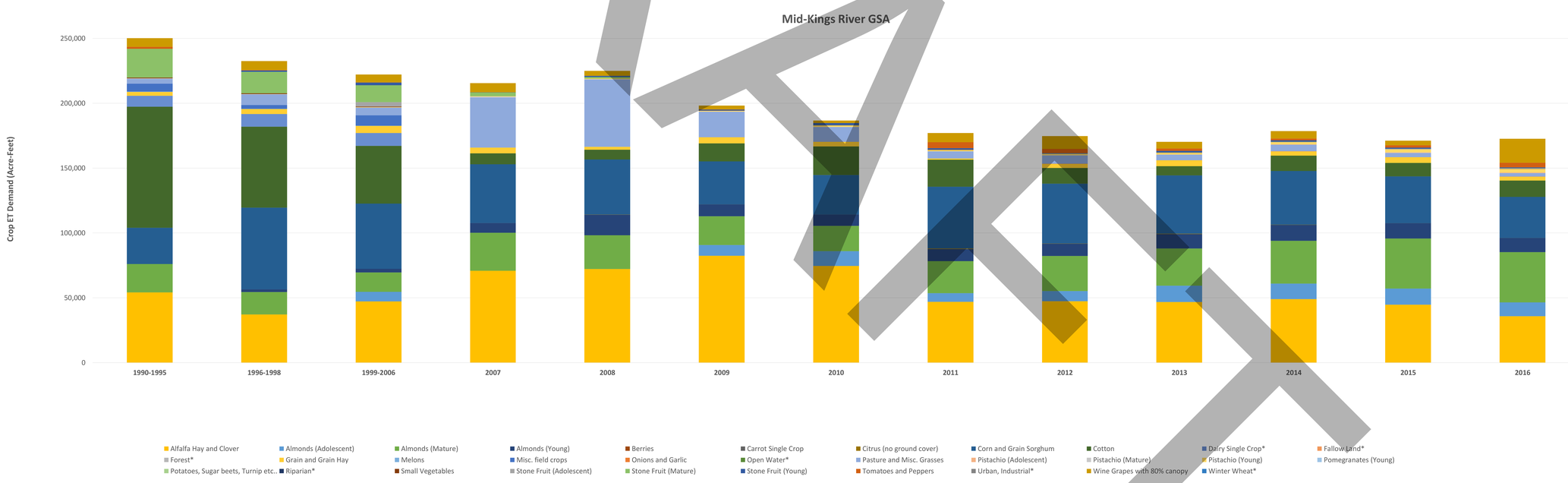
Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



APPENDIX D3-2

Sum of Crop ET Demand (Acre-Feet/Year) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mid-Kings River GSA													
Alfalfa Hay and Clover	54225	37134	47231	70920	72279	82432	74524	46996	47297	46833	49033	44781	35779
Almonds (Adolescent)	0	0	7382	0	0	8287	11414	6655	7948	12571	11964	12357	10700
Almonds (Mature)	21899	17282	14900	29318	25948	22195	19532	24669	27021	28629	33006	38590	38813
Almonds (Young)	0	2093	2798	7469	15899	9090	8694	9270	9515	11128	12224	11764	10892
Berries	0	0	0	0	0	0	0	0	1	6	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	4	7	1	7	0	14
Citrus (no ground cover)	0	0	75	0	32	31	14	370	89	299	102	56	12
Corn and Grain Sorghum	27832	63039	50239	45210	42440	33204	30445	47662	46154	44975	41460	36068	31535
Cotton	93307	62361	44507	8474	7660	13894	22023	20867	12109	7001	11789	10353	12573
Dairy Single Crop*	8529	9826	9984	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	2897	3811	5457	4423	2221	4688	3586	868	3163	4629	3337	4457	3095
Melons	248	92	45	0	0	0	0	2	5	6	0	0	20
Misc. field crops	6082	3065	8059	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	102	0	0	0	0	1	36	65	126	7	109	13	210
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	3717	8128	5877	38630	51880	19656	11431	5495	6343	4322	5084	3241	2570
Pistachio (Adolescent)	0	0	0	0	0	0	0	2	18	55	152	343	350
Pistachio (Mature)	321	254	241	675	270	135	86	83	57	52	45	46	55
Pistachio (Young)	0	34	215	326	374	674	983	947	885	1156	1706	2353	2641
Pomegranates (Young)	0	0	0	0	4	1	1	20	10	46	40	5	13
Potatoes, Sugar beets, Turnip etc..	0	4	0	5	0	5	0	1	0	1	0	1	2
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	595	617	418	24	2	4	158	159	103	164	139	46	147
Stone Fruit (Adolescent)	0	0	3393	0	0	5	126	230	290	171	105	414	416
Stone Fruit (Mature)	22291	16483	13130	2753	1199	102	26	11	80	141	79	95	136
Stone Fruit (Young)	0	1079	2020	237	879	730	1645	958	386	1186	1054	845	560
Tomatoes and Peppers	1355	304	110	2	0	77	0	4695	3145	1754	1343	1699	3679
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	7381	6981	6093	7034	3829	2999	1976	7037	10002	5141	5696	3681	18346
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Mid-Kings River GSA Irrigated ET De	**242254**	**222759**	**212189**	**215500**	**224914**	**198211**	**186699**	**177065**	**174754**	**170274**	**178474**	**171208**	**172557**
Mid-Kings River GSA Total ET Dema	**250784**	**232585**	**222173**	**215500**	**224914**	**198211**	**186699**	**177065**	**174754**	**170274**	**178474**	**171208**	**172557**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



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Sum of Crop ET Demand (Acre-Feet/Year) — **APPENDIX D3-3**

Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
South Fork Kings GSA													
Alfalfa Hay and Clover	16709	11994	39584	62068	70090	57340	56328	29744	36900	35451	42768	33986	29185
Almonds (Adolescent)	0	0	480	0	0	944	1576	777	652	1305	1236	1974	2399
Almonds (Mature)	743	499	472	1396	1211	944	805	1850	1903	2131	2373	2984	3024
Almonds (Young)	0	131	225	812	1861	1270	1646	1631	1226	2518	2843	2414	4672
Berries	0	0	0	0	0	0	0	0	1	0	0	1	0
Carrot Single Crop	0	0	0	0	0	0	0	4	2	7	0	6	26
Citrus (no ground cover)	0	0	17	0	0	0	0	14	3	18	0	2	2
Corn and Grain Sorghum	7027	19269	13851	13800	12846	13062	7622	14201	9097	8717	7123	4889	4232
Cotton	72878	81246	39915	32470	31210	19953	40263	42989	37422	24280	19786	15035	19992
Dairy Single Crop*	3737	2849	2925	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	13435	19790	12933	4435	4864	9156	10285	993	3255	1869	4921	8414	8207
Melons	0	0	0	0	0	0	8	1	2	2	448	0	15
Misc. field crops	7159	1270	21466	0	0	0	0	1	0	0	0	0	0
Onions and Garlic	258	0	289	0	0	8	495	467	112	108	563	71	795
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	5165	8608	13288	28562	16311	22322	11169	3302	5982	5766	6903	6334	3180
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	19	29	64	504	585
Pistachio (Mature)	1	0	0	311	306	176	184	200	199	181	168	162	177
Pistachio (Young)	0	9	83	196	206	442	246	360	878	1028	1600	1130	1957
Pomegranates (Adolescent)	0	0	0	0	0	0	0	0	0	0	5	23	41
Pomegranates (Young)	0	0	0	2	176	19	41	196	121	161	294	393	140
Potatoes, Sugar beets, Turnip etc..	1518	0	676	0	0	5	0	0	0	119	0	3	1
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	762	3	0	8	0	13	18	23	49	69	7	62	44
Stone Fruit (Adolescent)	0	0	188	0	0	0	0	1	1	0	2	0	9
Stone Fruit (Mature)	1463	1135	688	9	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	67	175	26	38	67	167	47	69	61	60	28	28
Tomatoes and Peppers	660	117	0	207	3	17	26	6642	6816	3119	5802	5246	6122
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	205	816	4390	2477	1278	644	153	3578	7838	3765	4771	5792	5920
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
South Fork Kings GSA Irrigated ET D	**127983**	**144955**	**148720**	**146777**	**140400**	**126381**	**131035**	**107022**	**112547**	**90701**	**101735**	**89454**	**90754**
South Fork Kings GSA Total ET Dem	**131720**	**147804**	**151645**	**146777**	**140400**	**126381**	**131035**	**107022**	**112547**	**90701**	**101735**	**89454**	**90754**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year

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APPENDIX D3-4

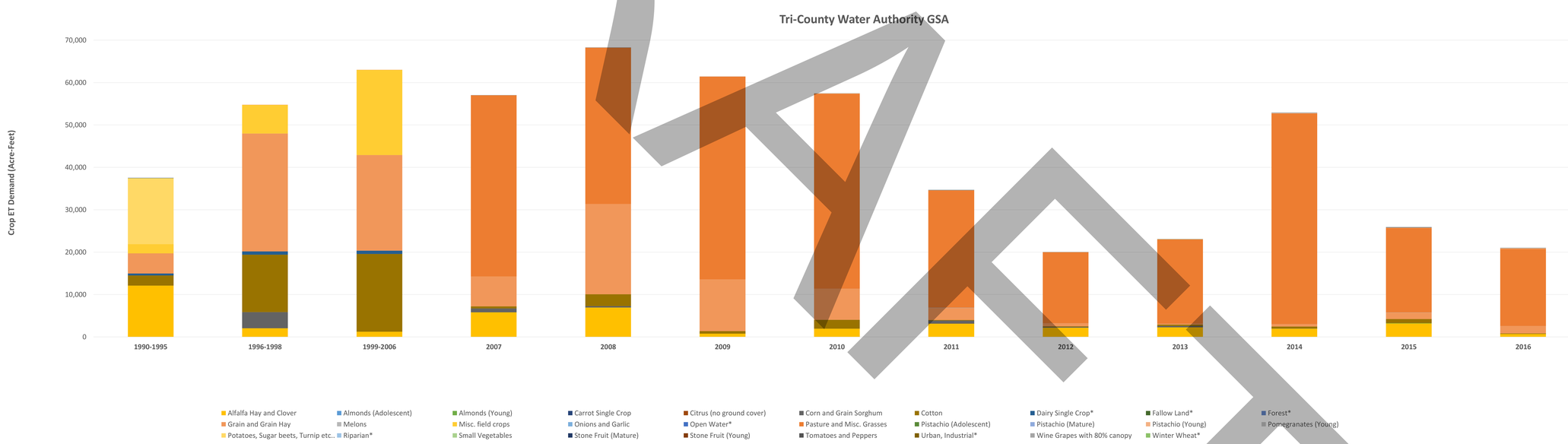
Sum of Crop ET Demand (Acre-Feet/Year) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Southwest Kings GSA													
Alfalfa Hay and Clover	18759	5587	20110	43026	40528	24609	25791	14378	19154	14389	5716	3975	2961
Almonds (Adolescent)	0	0	251	0	0	1987	6874	691	2030	4651	3718	819	604
Almonds (Mature)	4150	497	497	16316	15963	12694	10200	10456	10526	10960	11577	13295	13247
Almonds (Young)	0	63	3457	3590	8199	4939	5669	2319	3629	4328	2374	1340	3474
Berries	47	0	0	0	0	0	0	0	0	0	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	1	0	0	0	0	1
Citrus (no ground cover)	0	0	0	0	10	15	0	1	6	12	197	13	13
Corn and Grain Sorghum	0	45	0	170	47	1654	219	1271	82	188	89	10	80
Cotton	30305	76227	6616	8666	5111	7109	11217	13730	4226	15517	4291	4063	4891
Dairy Single Crop*	145	0	55	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	2788	7652	24977	3452	1759	3814	2758	328	1041	533	231	1387	2180
Melons	165	0	423	0	0	0	14	0	1	0	6	0	1
Misc. field crops	20277	12708	49397	0	1	0	0	0	0	0	4	0	0
Onions and Garlic	0	555	0	0	0	3	45	113	186	3	143	36	26
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	0	2040	1192	41974	8570	105889	103590	5801	3878	5081	46667	6062	4311
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	1	105	387	2863	3399
Pistachio (Mature)	14907	12101	12101	15614	3811	1532	68	68	64	55	20	20	20
Pistachio (Young)	0	328	1744	208	396	675	390	2026	3269	4168	3397	3156	2931
Pomegranates (Young)	0	0	0	9	30	30	3	596	56	74	30	5	430
Potatoes, Sugar beets, Turnip etc..	0	0	0	0	0	0	0	7	0	0	0	0	1
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	47	0	0	1	1	0	61	23	30	2	14	8	8
Stone Fruit (Adolescent)	0	0	658	0	0	23	12	0	0	0	0	0	0
Stone Fruit (Mature)	1596	257	0	1799	688	482	38	0	0	0	0	0	0
Stone Fruit (Young)	0	164	806	200	307	376	64	3	7	3	70	0	1
Tomatoes and Peppers	3889	191	6	42	0	2	0	5793	6709	6	321	16	120
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	0	0	4055	4280	3334	2002	1284	2777	4565	2829	5430	1925	2694
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Southwest Kings GSA Irrigated ET D	**96929**	**118416**	**126291**	**139347**	**88756**	**167834**	**168296**	**60381**	**59459**	**62904**	**84684**	**38993**	**41393**
Southwest Kings GSA Total ET Dem	**97074**	**118416**	**126346**	**139347**	**88756**	**167834**	**168296**	**60381**	**59459**	**62904**	**84684**	**38993**	**41393**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year

APPENDIX D3-5

Sum of Crop ET Demand (Acre-Feet/Year) Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tri-County Water Authority GSA													
Alfalfa Hay and Clover	12097	2022	1204	5806	6923	750	1941	3106	2180	2254	1941	3166	659
Almonds (Adolescent)	0	0	0	0	0	0	0	0	0	0	0	0	0
Almonds (Young)	0	0	0	4	21	1	4	30	16	8	9	76	5
Carrot Single Crop	0	0	0	0	0	0	0	9	0	32	0	0	0
Citrus (no ground cover)	0	0	0	0	0	0	0	4	0	0	0	0	0
Corn and Grain Sorghum	0	3839	0	895	319	1	5	706	160	294	51	13	2
Cotton	2410	13544	18387	505	2786	616	2089	143	115	306	431	952	136
Dairy Single Crop*	433	747	768	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	4751	27805	22522	7057	21279	12220	7349	2832	755	227	585	1519	1785
Melons	0	0	0	0	0	0	0	0	0	0	0	22	0
Misc. field crops	2177	6785	20095	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	0	0	0	0	0	0	6	40	9	0	1	0	4
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	0	4	4	42701	36886	47791	45951	27710	16730	19878	49684	19952	18152
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	0	0	0	0	0
Pistachio (Mature)	0	0	0	0	0	0	0	0	0	0	0	0	0
Pistachio (Young)	0	0	1	38	18	44	78	4	3	5	87	57	180
Pomegranates (Young)	0	0	0	0	2	6	4	8	0	1	25	1	1
Potatoes, Sugar beets, Turnip etc..	15578	0	0	0	0	0	0	17	0	3	0	0	0
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	0	0	0	0	0	0	10	1	1	48	1	2	2
Stone Fruit (Mature)	1	0	0	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	0	0	1	0	0	0	0	0	0	0	0	0
Tomatoes and Peppers	0	0	0	0	0	0	0	38	3	8	46	102	53
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	0	0	0	5	91	0	7	6	16	6	7	5	1
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Irrigated ET Demand	**37015**	**53999**	**62214**	**57010**	**68324**	**61429**	**57443**	**34654**	**19988**	**23072**	**52867**	**25868**	**20980**
Total ET Demand	**37449**	**54746**	**62982**	**57010**	**68324**	**61429**	**57443**	**34654**	**19988**	**23072**	**52867**	**25868**	**20980**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



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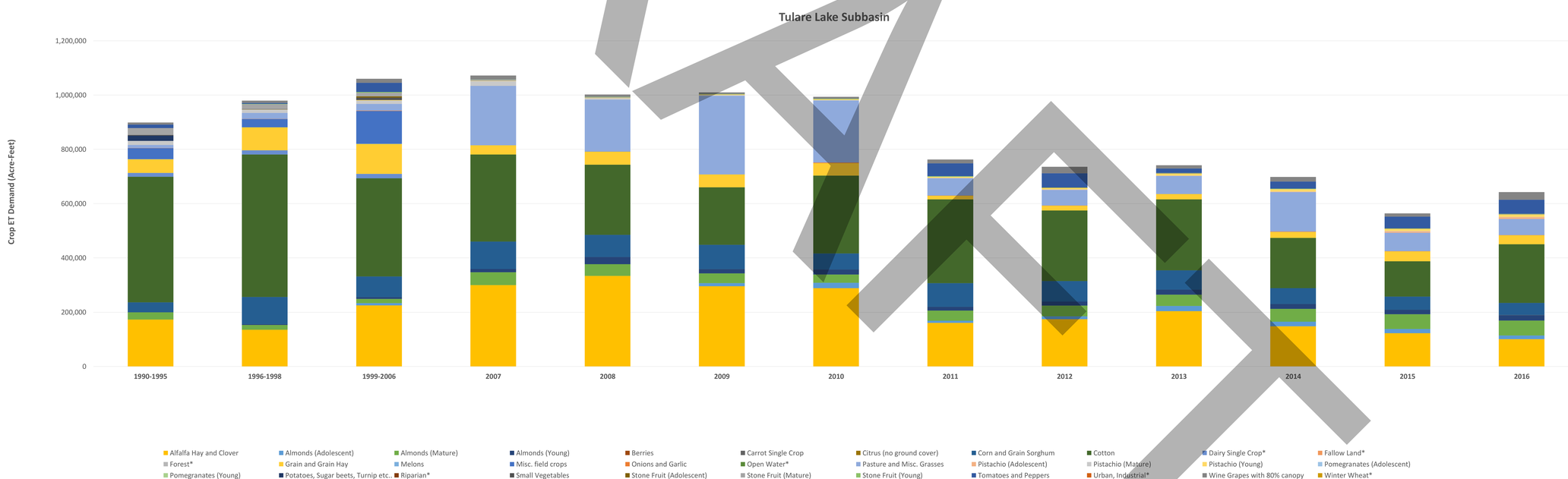
Sum of Crop ET Demand (Acre-Feet/Year) — **APPENDIX D3-6**

Tulare Lake Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tulare Lake Subbasin													
Alfalfa Hay and Clover	172519	135032	225167	300041	333752	296086	288555	160621	174457	204219	148325	122839	100395
Almonds (Adolescent)	0	0	8113	0	0	11218	19864	8127	10631	18529	16937	15155	13714
Almonds (Mature)	26791	18278	15869	47030	43122	35832	30537	36976	39450	41720	46956	54869	55084
Almonds (Young)	0	2287	6480	12062	26125	15445	17964	13431	14580	18458	17621	15779	20206
Berries	47	0	0	0	0	0	0	0	2	6	0	1	0
Carrot Single Crop	0	0	0	0	0	0	0	37	16	41	7	6	56
Citrus (no ground cover)	0	0	91	0	42	46	14	405	99	335	300	74	32
Corn and Grain Sorghum	36877	100450	75793	101418	82027	89467	59478	87236	75344	71190	58462	48619	44935
Cotton	463179	525386	362232	320870	258511	212071	287383	308970	260527	261476	185559	130368	215815
Dairy Single Crop*	14290	15268	16421	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	50167	84811	110025	33572	48563	47755	45271	13518	17369	19505	21282	36934	33228
Melons	413	92	468	0	0	0	21	3	16	10	1182	27	128
Misc. field crops	40450	30296	121265	0	5	0	0	1	0	0	4	0	0
Onions and Garlic	807	846	1359	0	0	12	2417	731	538	167	893	266	1146
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	10799	21726	24256	218974	191082	289198	229306	63417	57751	66333	144942	68014	59370
Pistachio (Adolescent)	0	0	0	0	0	0	0	213	315	559	1290	4713	5704
Pistachio (Mature)	15229	12354	12341	17831	5680	2825	1236	1283	1237	1135	1075	1412	1374
Pistachio (Young)	0	394	2269	1091	1370	2454	2395	3729	5770	7498	8281	8231	9024
Pomegranates (Adolescent)	0	0	0	0	0	0	0	0	0	0	5	23	41
Pomegranates (Young)	0	0	0	11	303	99	52	901	210	376	537	567	746
Potatoes, Sugar beets, Turnip etc..	18604	4	676	19	0	10	0	29	0	127	0	7	7
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	
Small Vegetables	2835	1147	8009	33	3	20	340	227	212	390	264	126	317
Stone Fruit (Adolescent)	0	0	4238	0	0	28	138	232	291	171	106	414	425
Stone Fruit (Mature)	25350	17875	13818	4560	1886	584	64	11	80	141	79	95	136
Stone Fruit (Young)	0	1310	3001	466	1234	1217	1879	1010	547	1250	1186	913	667
Tomatoes and Peppers	12971	3747	33791	261	5	246	26	47851	52725	15847	26555	42793	52168
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	7586	8301	14872	14203	8893	5692	6980	13625	23455	11832	16450	11874	27920
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Tulare Lake Subbasin Irrigated ET De	**884626**	**964336**	**1044130**	**1072442**	**1002603**	**1010305**	**993918**	**762584**	**735624**	**741315**	**698299**	**564117**	**642636**
Tulare Lake Subbasin GSA Total ET D	**898916**	**979604**	**1060551**	**1072442**	**1002603**	**1010305**	**993918**	**762584**	**735624**	**741315**	**698299**	**564117**	**642636**

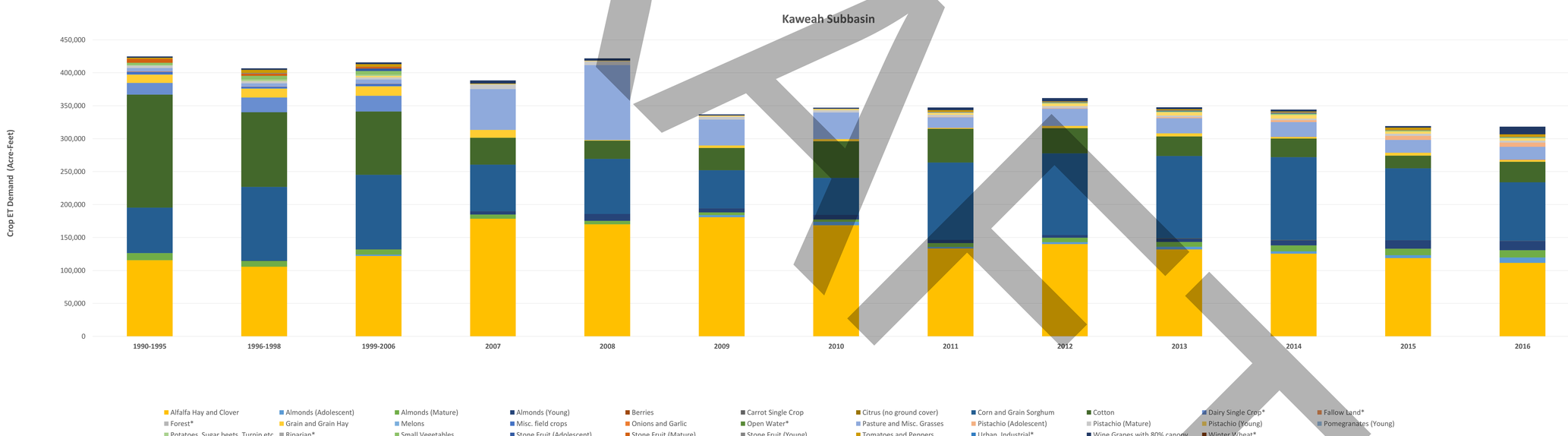
Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



APPENDIX D3-7

Sum of Crop Acreage (Acres) Kaweah Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kaweah Subbasin													
Alfalfa Hay and Clover	115486	105689	121989	178448	170164	180822	168599	133463	140002	132011	125440	118685	111593
Almonds (Adolescent)	0	0	2151	0	0	3352	5331	2218	2912	4107	3639	4441	8087
Almonds (Mature)	10994	8841	7642	6331	5140	3927	3359	5959	6632	7023	8956	10024	10922
Almonds (Young)	0	551	277	5010	10534	5981	7005	4784	4303	5354	7935	12728	14258
Berries	0	20	20	0	0	0	0	0	1	1	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	91	6	0	10	1	14
Citrus (no ground cover)	0	0	0	14	32	52	14	41	35	178	247	18	26
Corn and Grain Sorghum	68793	111613	113052	70905	83423	58024	56330	117213	123778	124980	125613	109204	88983
Cotton	171670	113435	96213	40721	27603	33648	55438	51177	38387	29695	28395	19132	31086
Dairy Single Crop*	17748	22327	23914	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	12438	13462	14290	11846	873	3831	3221	1298	3410	4757	2453	4427	2548
Melons	253	167	167	0	0	1	0	4	2	21	0	3	151
Misc. field crops	4124	2758	3400	0	2	2	0	0	0	0	0	0	0
Onions and Garlic	758	404	404	0	0	0	59	297	43	2	16	7	492
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	5210	4802	6452	62054	114029	39268	40513	16032	26257	23092	22644	19504	19446
Pistachio (Adolescent)	0	0	0	0	0	0	0	421	701	1303	2697	6183	6637
Pistachio (Mature)	3309	3097	3097	7106	5394	4376	3529	3368	2888	2586	2512	3113	2640
Pistachio (Young)	0	495	1590	508	928	1646	1688	2718	4237	5070	5543	3449	3661
Pomegranates (Young)	0	0	0	1	28	2	0	16	9	76	24	22	81
Potatoes, Sugar beets, Turnip etc..	1361	2217	1983	18	0	2	0	332	180	9	634	478	580
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	3100	5686	5606	142	2	7	3	281	783	1251	1226	1248	1160
Stone Fruit (Adolescent)	0	0	3787	0	0	45	68	44	272	852	1000	191	70
Stone Fruit (Mature)	5897	3165	2730	433	84	18	0	66	9	25	244	328	60
Stone Fruit (Young)	0	975	222	83	602	359	606	770	1131	749	864	472	255
Tomatoes and Peppers	1732	4634	3894	31	2	36	0	2646	855	1553	1216	3151	3897
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	2062	2591	2667	4852	3006	1600	1390	4039	4940	2914	2975	2190	11487
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Kaweah Subbasin Irrigated ET Dema	**407187**	**384603**	**392034**	**388504**	**421846**	**336999**	**347154**	**347277**	**361772**	**347610**	**344283**	**318999**	**318135**
Kaweah Subbasin Total ET Demand	**424935**	**406930**	**415948**	**388504**	**421846**	**336999**	**347154**	**347277**	**361772**	**347610**	**344283**	**318999**	**318135**

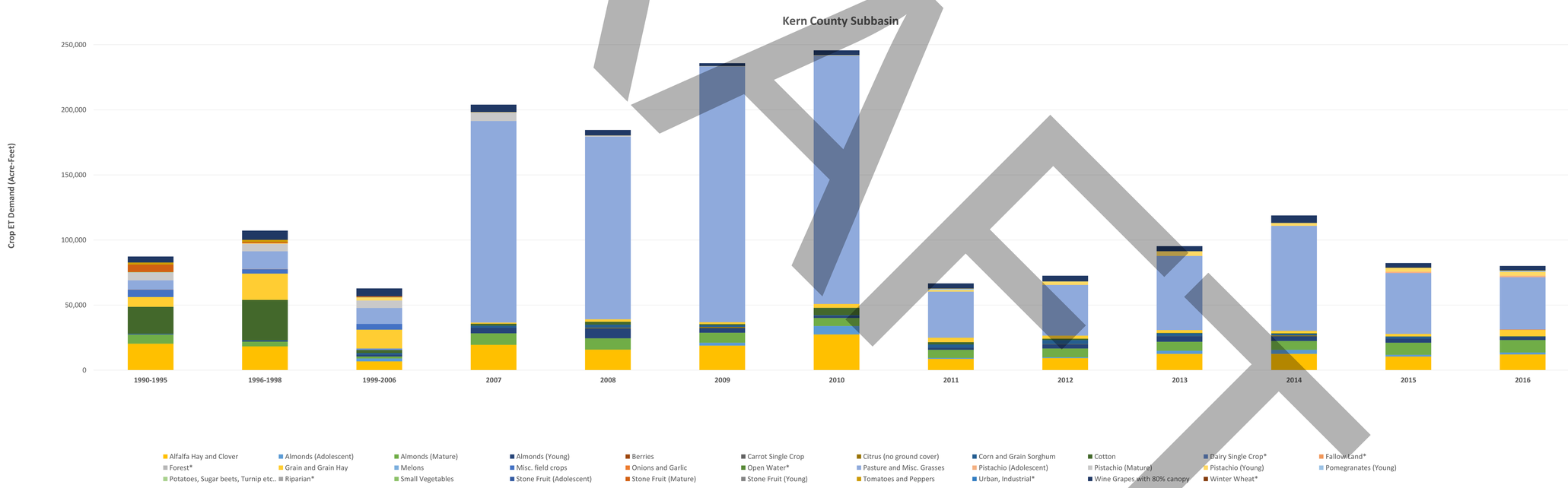
Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



APPENDIX D3-8

Sum of Crop ET Demand (Acre-Feet/Year) Kern County Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kern County Subbasin													
Alfalfa Hay and Clover	20321	18273	6736	19380	15803	18878	27373	8596	9207	12561	12467	10488	12071
Almonds (Adolescent)	0	0	2266	0	0	2222	6474	833	571	2331	3094	1258	1413
Almonds (Mature)	6857	3611	1401	8966	8694	7583	6160	6105	6889	6838	6847	9333	9610
Almonds (Young)	0	583	1555	4243	7634	3583	1592	1620	3251	4381	3710	3081	2335
Berries	0	0	0	0	0	0	0	0	0	18	0	0	0
Carrot Single Crop	188	0	0	0	0	0	0	1	0	10	5	3	5
Citrus (no ground cover)	0	0	0	0	440	935	0	6	64	7	510	4	3
Corn and Grain Sorghum	603	475	1135	1640	2267	1302	562	2488	3062	2200	1269	1586	371
Cotton	20621	31026	2324	1387	2337	829	5767	1798	1127	192	351	89	181
Dairy Single Crop*	3	0	1239	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	7623	20168	14436	881	1817	1460	2931	3387	2394	2208	1878	1953	4984
Melons	0	0	0	0	0	1	0	0	31	12	2	0	6
Misc. field crops	5473	3458	4354	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	230	99	0	0	0	1	16	92	127	18	28	60	181
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	7088	13517	12338	154954	140349	196576	190751	35338	38717	56959	80646	46771	40224
Pistachio (Adolescent)	0	0	0	0	0	0	0	0	0	2	77	966	1205
Pistachio (Mature)	5993	5796	5758	6465	674	2	0	0	0	0	0	0	0
Pistachio (Young)	0	476	2322	266	174	174	300	1350	2464	3525	2055	2939	2940
Pomegranates (Young)	0	0	0	0	63	0	0	921	158	42	35	16	679
Potatoes, Sugar beets, Turnip etc..	272	0	0	0	0	2	0	1	2	0	6	17	2
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	38	0	88	0	2	0	19	6	19	14	9	17	19
Stone Fruit (Adolescent)	0	0	58	0	0	0	0	0	0	0	0	0	7
Stone Fruit (Mature)	5735	877	723	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	19	2	4	86	44	10	30	11	18	174	22	85
Tomatoes and Peppers	1667	1763	0	0	0	2	0	185	178	37	53	63	283
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	4578	7112	5979	5806	4185	2166	3657	3862	4212	3889	5651	3603	3413
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Kern County Subbasin Irrigated ET D	**87287**	**107253**	**61474**	**203992**	**184526**	**235758**	**245611**	**66619**	**72486**	**95264**	**118867**	**82269**	**80017**
Kern County Subbasin Total ET Dem	**87290**	**107253**	**62713**	**203992**	**184526**	**235758**	**245611**	**66619**	**72486**	**95264**	**118867**	**82269**	**80017**

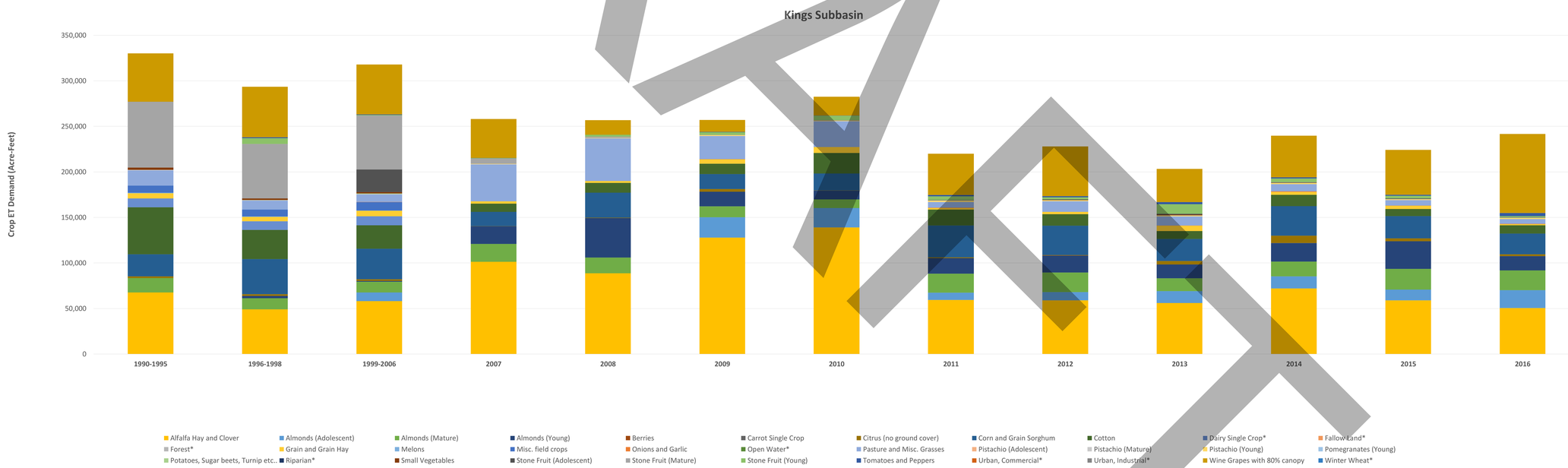
Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



Sum of Crop ET Demand (Acre-Feet/Year) — **APPENDIX D3-9**

Kings Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Kings Subbasin													
Alfalfa Hay and Clover	67617	49074	58132	101357	88588	127908	139012	59444	58992	55996	72022	58974	50444
Almonds (Adolescent)	0	0	9525	0	0	22385	21317	7909	9004	13168	13348	11819	19720
Almonds (Mature)	15841	12188	11683	19642	17328	11842	9567	20922	21449	13995	16138	22835	21754
Almonds (Young)	0	2461	812	19323	43483	16082	9544	17088	18720	15125	20298	30152	15595
Berries	0	8	8	0	0	0	0	1	5	38	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	48	5	7	126	0	30
Citrus (no ground cover)	1912	2002	2002	249	313	2861	192	694	496	3915	8050	3278	1915
Corn and Grain Sorghum	24180	38518	33574	15458	27487	16580	18626	34985	32268	24209	32503	24496	22755
Cotton	51696	32000	25728	9225	10830	11344	22446	17615	12690	8521	12370	7650	9240
Dairy Single Crop*	9546	9561	9791	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	5766	4894	6019	2412	1933	4827	6546	1719	2379	5936	3092	3579	1179
Melons	671	297	215	0	5	27	6	1	15	48	11	14	42
Misc. field crops	7835	7572	9345	0	0	2	0	0	0	0	0	0	0
Onions and Garlic	0	0	188	47	103	162	67	312	130	116	692	190	420
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	16557	10047	8269	40480	46696	25318	28303	6182	11512	9898	7730	5879	5061
Pistachio (Adolescent)	0	0	0	0	0	0	0	4	13	4	27	50	50
Pistachio (Mature)	558	353	353	289	229	212	192	192	188	187	184	183	111
Pistachio (Young)	0	2	37	453	385	955	571	1349	1006	949	1302	943	1353
Pomegranates (Young)	0	0	0	25	38	67	71	189	187	119	107	97	60
Potatoes, Sugar beets, Turnip etc..	0	99	754	2	0	5	0	27	1	1	1	8	0
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	2596	1703	1291	15	61	5	24	127	212	945	102	32	84
Stone Fruit (Adolescent)	0	0	24935	0	0	19	185	261	517	747	529	673	329
Stone Fruit (Mature)	72220	60018	59160	5770	1126	223	144	42	51	41	111	84	48
Stone Fruit (Young)	0	6313	620	439	2253	2798	4964	4060	2371	10498	4070	2798	1273
Tomatoes and Peppers	117	1037	711	33	9	327	51	1407	1078	2452	1235	1090	3304
Urban, Commercial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	53016	55408	54892	42775	15880	12995	20652	45308	54690	36332	45665	49431	86809
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Kings Subbasin Irrigated ET Demand	**320581**	**283996**	**308252**	**257993**	**256747**	**256945**	**282481**	**219886**	**227981**	**203247**	**239711**	**224256**	**241575**
Kings Subbasin Total ET Demand	**330127**	**293556**	**318043**	**257993**	**256747**	**256945**	**282481**	**219886**	**227981**	**203247**	**239711**	**224256**	**241575**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



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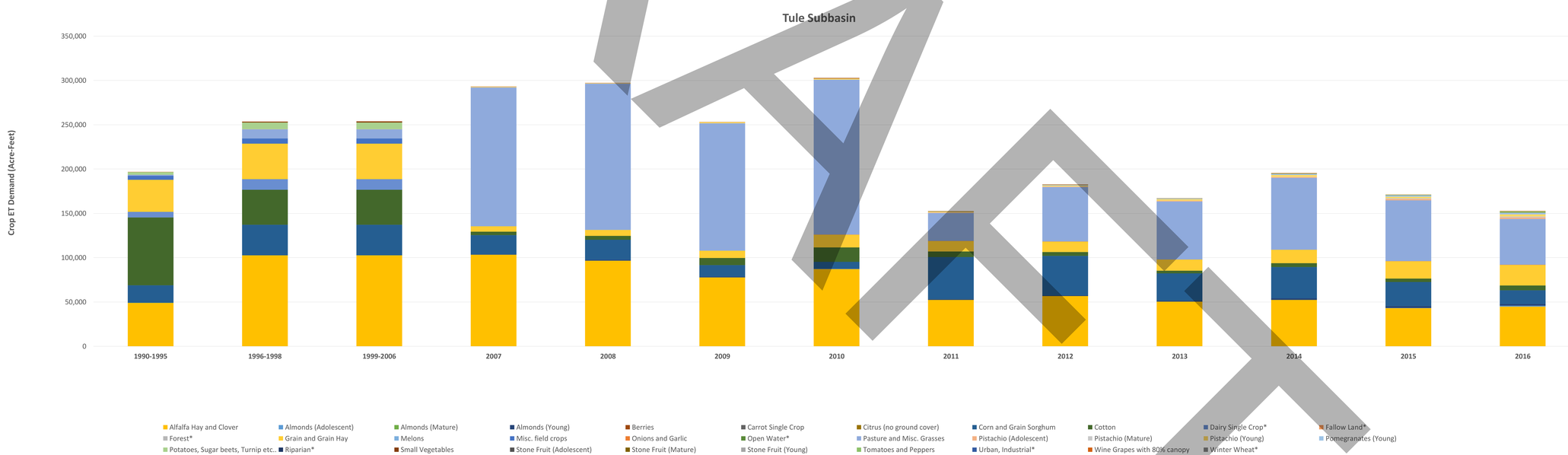
Sum of Crop ET Demand (Acre-Feet/Year) — **APPENDIX D3-10**

Tule Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tule Subbasin													
Alfalfa Hay and Clover	48995	102696	102695	103253	96627	77757	87117	52421	56712	50482	52317	42961	44851
Almonds (Adolescent)	0	0	6	0	0	104	83	13	8	45	113	223	943
Almonds (Mature)	152	45	45	0	0	0	0	12	1	1	1	22	22
Almonds (Young)	0	2	0	479	1195	833	245	820	590	1052	1679	1995	1722
Berries	0	0	0	0	0	0	0	0	0	0	0	0	0
Carrot Single Crop	0	0	0	0	0	0	0	4	2	1	0	2	61
Citrus (no ground cover)	0	0	0	0	0	0	0	17	1	11	15	7	4
Corn and Grain Sorghum	19772	34425	34425	21765	22365	13040	7925	47549	44687	30636	35347	27359	15720
Cotton	76583	39418	39418	3865	4411	7859	16222	6149	4469	3160	4387	3940	5296
Dairy Single Crop*	6246	12030	12030	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	36255	40079	40077	6075	6753	8386	14365	11806	11631	12553	15122	19560	23291
Melons	20	0	0	0	0	7	0	2	4	2	96	5	40
Misc. field crops	4512	5890	5893	0	0	0	0	0	0	0	0	0	0
Onions and Garlic	4	0	0	1	0	0	147	73	183	1	9	36	105
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	1030	10450	10450	156596	164915	143596	174809	31502	61326	65535	80914	68705	51541
Pistachio (Adolescent)	0	0	0	0	0	0	0	575	558	722	1073	1324	1792
Pistachio (Mature)	0	0	0	301	218	135	108	107	106	106	105	929	1021
Pistachio (Young)	0	50	201	490	528	1184	1246	793	1182	1770	2221	1795	2525
Pomegranates (Young)	0	0	0	0	17	12	3	189	545	585	1024	1409	1596
Potatoes, Sugar beets, Turnip etc..	3015	7388	7388	0	0	2	0	4	3	2	11	21	3
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	0	916	916	1	1	7	326	15	53	49	88	68	378
Stone Fruit (Adolescent)	0	0	58	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Mature)	33	0	0	0	0	0	0	0	0	0	0	0	0
Stone Fruit (Young)	0	15	0	5	50	6	1	25	22	1	30	29	5
Tomatoes and Peppers	4	40	40	3	0	5	0	234	239	159	597	518	1466
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	183	157	157	88	237	83	252	314	476	81	269	304	346
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Tule Subbasin Irrigated ET Demand	**190557**	**241571**	**241770**	**292921**	**297316**	**253017**	**302850**	**152624**	**182797**	**166953**	**195419**	**171213**	**152727**
Tule Subbasin Total ET Demand	**196803**	**253600**	**253800**	**292921**	**297316**	**253017**	**302850**	**152624**	**182797**	**166953**	**195419**	**171213**	**152727**

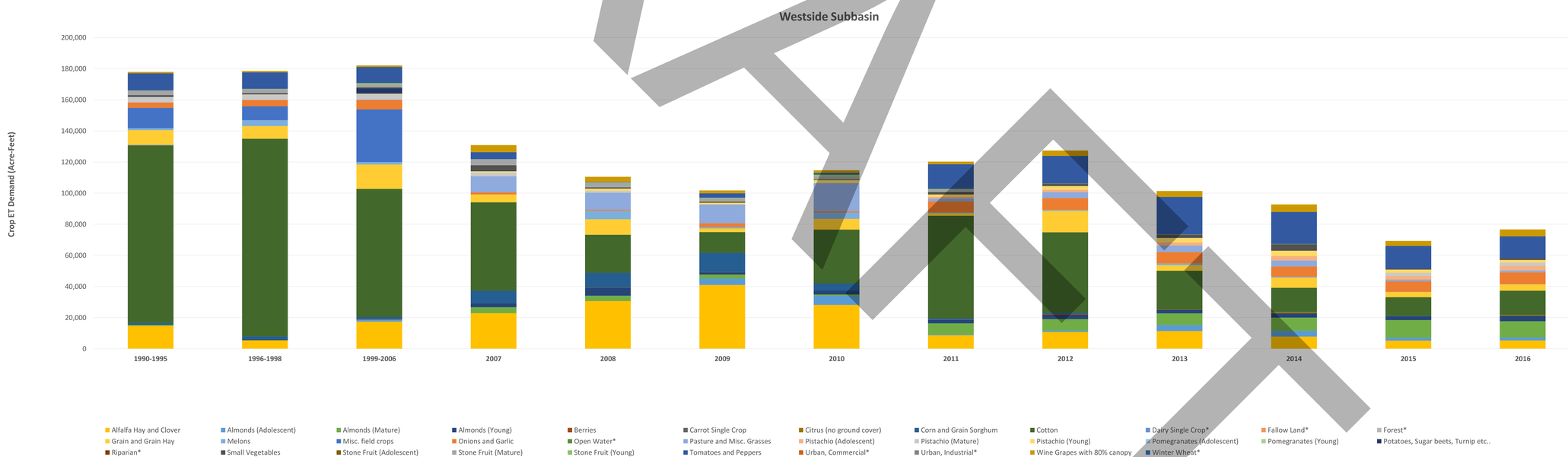
Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



Sum of Crop ET Demand (Acre-Feet/Year)

Westside Subbasin	1990-1995	1996-1998	1999-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Westside Subbasin													
Alfalfa Hay and Clover	14783	5463	17452	22840	30645	40982	28245	8690	10822	11407	7847	5227	5318
Almonds (Adolescent)	0	0	1353	0	0	4098	5704	471	870	3772	3691	1847	1898
Almonds (Mature)	530	0	0	3808	3528	2660	877	7155	7400	7542	8563	11411	10450
Almonds (Young)	0	343	474	2571	5132	1461	2712	2247	2802	2334	2597	2396	3486
Berries	29	22	27	0	0	0	0	0	462	0	0	0	71
Carrot Single Crop	0	0	0	0	0	0	0	183	2	5	10	99	9
Citrus (no ground cover)	30	23	64	0	124	53	0	241	0	430	927	90	491
Corn and Grain Sorghum	1249	2078	1093	8137	9361	12433	4512	806	779	23	75	20	115
Cotton	113990	127022	82287	56779	24486	13325	34546	65685	51753	24591	15497	11995	15476
Dairy Single Crop*	354	0	0	0	0	0	0	0	0	0	0	0	0
Fallow Land*	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest*	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain and Grain Hay	9494	8102	15647	4992	9968	2311	6890	1659	13750	3591	6523	3310	4086
Melons	1280	3829	1681	4	5492	824	4069	545	615	1099	584	235	126
Misc. field crops	13047	8983	33812	0	0	33	0	0	0	0	0	0	0
Onions and Garlic	3528	4074	5993	1365	678	2444	685	7017	7569	7310	6608	6697	7539
Open Water*	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasture and Misc. Grasses	0	7	320	10430	10890	12191	18149	1854	3863	4268	3807	1098	1211
Pistachio (Adolescent)	0	0	0	0	0	0	0	1128	1498	1959	2858	2443	2926
Pistachio (Mature)	3533	3399	3392	2354	1261	11	6	6	6	3	0	1971	2172
Pistachio (Young)	0	95	399	796	1355	1077	1795	1444	2313	2857	3446	2046	1707
Pomegranates (Adolescent)	0	0	0	0	0	0	0	0	0	35	0	0	0
Pomegranates (Young)	0	0	0	45	90	43	139	91	65	49	2	30	42
Potatoes, Sugar beets, Turnip etc..	0	0	3407	326	0	0	0	92	0	0	0	0	7
Riparian*	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Vegetables	1154	951	498	3536	674	458	488	1335	1405	2014	4046	616	1302
Stone Fruit (Adolescent)	0	0	191	0		182	101	112	83	35	112	0	0
Stone Fruit (Mature)	3100	2553	1822	3750	3010	2099	1713	1511	3	1	20	0	0
Stone Fruit (Young)	0	72	841	174	419	391	1171	527	95	119	68	2	41
Tomatoes and Peppers	10971	10604	10367	4457	172	2860	1108	15693	17844	24101	20685	14607	13747
Urban, Commercial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Urban, Industrial*	0	0	0	0	0	0	0	0	0	0	0	0	0
Wine Grapes with 80% canopy	907	877	1050	4524	3216	1815	1743	1842	3387	3819	4781	3205	4462
Winter Wheat*	0	0	0	0	0	0	0	0	0	0	0	0	0
Westside Subbasin Irrigated ET Dem	**177626**	**178498**	**182172**	**130889**	**110499**	**101717**	**114687**	**120333**	**127387**	**101365**	**92746**	**69345**	**76682**
Westside Subbasin Total ET Demand	**177980**	**178498**	**182172**	**130889**	**110499**	**101717**	**114687**	**120333**	**127387**	**101365**	**92746**	**69345**	**76682**

Notes: Fields with an Asterisk (*) are not Irrigated; Annual Total is by Calendar Year



Appendix D4
Annualized Specified Pumping by Well Field

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Annualized Specified Pumping

Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
Angiola	E1	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E10	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E11	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E13	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E14	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E15	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E16	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E17	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E18	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E19	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	E21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E4	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E5	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	E7	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G1	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G11	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G13	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G14	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G16	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G17	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G18	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G19	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G2(NEW)	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G20	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G21	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G22	0.00	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	G3	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G5	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	G7	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W11	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W12	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W13	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	W15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W6	802.33	371.37	531.65	94.54	260.14	0.00	0.00	0.00	0.00	0.00	107.68	368.95	421.22	356.02	425.48	10.51	2.24	432.82	361.13	419.98	250.76	125.95	215.42	339.20	307.72	335.78	322.74
Angiola	W7	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W8	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
Angiola	W9	1,604.65	742.73	1,063.30	189.08	520.29	0.00	0.00	0.00	0.00	0.00	215.37	737.90	842.44	712.03	850.95	21.02	4.48	865.63	722.27	839.96	501.51	251.90	430.85	678.40	615.44	671.56	645.49
El Rico	ER_C-16	1,800.27	2,870.99	1,808.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,571.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_C-33	2,310.31	1,917.00	2,319.99	0.00	723.00	81.00	0.00	0.00	0.00	0.00	0.00	0.00	635.00	567.00	1,894.00	0.00	0.00	1,774.02	451.00	177.17	0.00	0.00	676.60	692.36	721.93	0.00	0.00
El Rico	ER_G-9	0.00	557.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	611.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_Heck1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,155.63	976.07	2,999.27	2,409.04
El Rico	ER_HR-190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,754.98	2,495.81	1,925.97	905.10	7.48	2,119.00	1,963.66	1,667.61	1,279.25	1,120.47
El Rico	ER_HR-28	0.00	835.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,611.30	972.50	449.34	1,175.75	0.00	0.00	1,045.76	1,002.92	914.27	503.12	0.00	1,240.01	868.40	865.22	653.07	211.39
El Rico	ER_HR-29	0.00	739.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,116.93	1,132.31	424.33	1,056.00	0.00	0.00	979.28	755.17	742.50	376.96	3.11	792.86	654.05	533.04	436.01	408.77
El Rico	ER_HR-30	0.00	872.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,018.00	1,042.20	431.86	1,236.00	0.00	0.00	1,031.59	1,209.69	788.33	400.12	3.22	881.46	704.78	668.79	562.82	501.81
El Rico	ER_M-137	2,847.89	2,264.10	2,855.99	247.00	1,829.00	42.98	0.00	0.00	0.00	0.00	204.00	2,001.81	1,470.62	1,297.66	2,097.00	0.00	0.00	2,047.10	2,261.11	2,271.83	896.08	6.20	2,050.50	1,369.69	1,879.81	1,526.53	1,849.82
El Rico	ER_M-140	2,150.06	1,811.41	2,157.00	261.00	1,459.00	35.01	0.00	0.00	0.00	0.00	1,102.84	2,286.25	1,710.31	1,045.01	1,756.00	0.00	0.00	1,875.32	2,064.27	1,891.50	1,143.24	52.52	1,846.08	1,408.40	570.87	411.26	0.00
El Rico	ER_M-141	1,176.07	885.72	1,180.00	146.00	573.00	21.00	0.00	0.00	0.00	0.00	860.64	1,162.00	798.00	543.00	805.00	0.00	0.00	727.97	69.14	655.19	342.10	2.60	0.00	0.00	0.00	0.00	0.00
El Rico	ER_M-143	1,017.51	883.69	1,022.00	131.00	1,690.00	24.00	0.00	0.00	0.00	0.00	580.31	1,240.48	843.00	493.00	590.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_M-144	1,837.75	1,248.17	1,844.00	241.00	1,186.00	35.01	0.00	0.00	0.00	0.00	1,117.95	1,782.20	1,041.81	502.87	1,101.00	0.00	0.00	1,086.25	928.44	833.34	242.64	5.58	865.23	791.49	658.50	185.54	683.66
El Rico	ER_M-145	1,268.00	1,065.48	1,268.00	172.00	878.00	24.00	0.00	0.00	0.00	0.00	820.56	1,334.00	999.00	606.00	783.00	0.00	0.00	898.42	967.08	820.42	476.67	3.57	1,210.60	1,085.95	1,041.87	912.18	636.02
El Rico	ER_M-146	1,125.00	980.69	1,125.00	145.00	875.00	30.00	0.00	0.00	0.00	0.00	865.15	1,713.00	1,076.00	692.00	555.00	0.00	0.00	1,074.51	1,038.96	517.93	332.79	0.00	1,041.64	781.67	494.71	404.75	351.36
El Rico	ER_M-147	2,298.75	1,695.17	2,304.99	205.00	1,411.00	40.00	0.00	0.00	0.00	0.00	944.77	2,163.00	1,509.00	995.00	1,501.00	0.00	0.00	1,368.64	1,389.19	1,215.32	429.98	13.42	1,015.01	938.89	1,700.98	1,777.19	1,779.69
El Rico	ER_M-148	3,241.85	2,353.72	3,250.99	362.00	2,009.00	55.00	0.00	0.00	0.00	0.00	1,553.20	2,601.99	2,049.00	1,251.00	2,180.99	0.00	0.00	2,229.32	2,555.65	2,400.02	1,366.79	41.82	2,535.94	2,111.49	2,253.66	2,289.41	2,275.77
El Rico	ER_M-149	2,739.24	2,182.51	2,746.99	264.00	1,663.00	47.00	0.00	0.00	0.00	0.00	1,592.32	2,389.99	1,937.00	1,032.00	2,080.00	0.00	0.00	1,755.84	1,804.78	495.83	1,394.04	49.18	2,045.42	2,154.85	1,995.12	657.24	0.00
El Rico	ER_M-150	2,509.06	2,156.20	2,515.99	283.00	1,045.00	14.00	0.00	0.00	0.00	0.00	1,097.00	2,673.99	1,866.00	1,149.00	2,161.00	0.00	0.00	2,094.07	2,558.80	2,194.59	1,186.13	50.26	2,225.49	2,046.19	1,761.41	1,642.53	1,503.20
El Rico	ER_M-151	2,081.75	792.00	2,088.00	234.00	1,300.00	0.00	0.00	0.00	0.00	0.00	103.98	431.00	0.00	0.00	419.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_M-153	2,282.17	1,905.10	2,288.99	300.00	1,270.00	27.00	0.00	0.00	0.00	0.00	0.00	1,375.00	1,417.00	419.00	1,811.00	0.00	0.00	1,536.96	1,878.58	1,621.68	629.88	6.61	1,835.05	2,307.41	2,093.23	1,684.08	1,388.40
El Rico	ER_M-154	2,199.44	1,761.58	2,205.99	275.00	1,222.00	25.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	240.05	1,615.00	0.00	0.00	1,509.29	1,523.09	1,568.91	618.14	6.45	448.82	0.00	0.00	789.05	1,514.80

Annualized Specified Pumping

Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
El Rico	ER_M-158	2,232.55	1,527.82	2,238.99	132.00	1,323.00	0.00	0.00	0.00	0.00	0.00	0.00	661.00	1,400.00	846.00	1,190.00	0.00	0.00	677.03	1,736.03	1,542.60	616.54	16.26	825.51	0.00	0.00	0.00	0.00
El Rico	ER_M-159	0.00	75.00	908.00	101.00	361.00	825.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_M-161	0.00	0.00	1,840.00	375.00	1,728.00	42.98	0.00	0.00	0.00	0.00	129.11	3,048.72	1,916.85	661.65	2,271.99	0.00	0.00	1,259.21	1,953.95	1,996.68	841.78	7.98	1,943.88	1,984.78	318.00	0.00	0.00
El Rico	ER_M-163	0.00	0.00	1,680.00	318.00	1,778.00	966.00	0.00	0.00	0.00	0.00	173.73	2,395.99	1,344.00	619.00	1,481.00	0.00	0.00	1,210.58	1,728.49	1,099.94	513.17	4.13	1,317.26	523.36	0.00	0.00	0.00
El Rico	ER_M-166	0.00	0.00	1,671.00	346.00	1,758.00	42.98	0.00	0.00	0.00	0.00	593.35	2,699.66	2,148.02	1,280.59	2,262.99	0.00	0.00	2,247.74	2,390.46	2,402.21	725.28	6.82	2,328.07	1,810.63	0.00	0.00	0.00
El Rico	ER_M-168	0.00	0.00	1,254.00	320.00	1,546.00	32.02	0.00	0.00	0.00	0.00	325.06	2,667.79	1,735.12	592.18	1,117.00	0.00	0.00	1,672.00	2,185.50	1,940.01	784.63	0.04	2,027.28	2,070.43	1,386.28	1,832.52	1,772.13
El Rico	ER_M-169	0.00	0.00	1,381.00	316.00	1,526.00	30.03	0.00	0.00	0.00	0.00	325.67	2,724.11	1,755.43	645.10	2,174.00	0.00	0.00	1,733.90	2,405.69	1,549.94	257.02	4.94	1,077.09	1,111.80	1,011.80	913.28	0.00
El Rico	ER_M-170	0.00	0.00	254.00	304.00	1,534.00	32.02	0.00	0.00	0.00	0.00	307.88	2,575.19	1,683.01	747.92	2,075.00	0.00	0.00	1,731.22	2,450.65	2,231.45	862.97	7.96	2,152.31	2,235.27	2,145.84	2,026.97	1,951.97
El Rico	ER_M-171	0.00	0.00	147.00	1,413.00	1,510.00	28.00	0.00	0.00	0.00	0.00	343.99	2,442.99	1,501.00	666.00	756.00	0.00	0.00	1,526.34	2,208.94	2,000.90	537.82	29.32	0.00	0.00	0.00	0.00	0.00
El Rico	ER_M-172	0.00	0.00	0.00	0.00	772.00	0.00	0.00	0.00	0.00	0.00	253.00	2,315.99	1,447.00	141.00	1,546.00	0.00	0.00	1,179.42	1,821.88	1,344.49	655.27	6.37	1,674.70	1,562.70	1,539.75	1,396.80	1,251.10
El Rico	ER_M-175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	235.20	1,674.00	1,046.00	389.00	1,134.00	0.00	0.00	854.99	1,165.23	1,061.06	280.26	1.45	674.27	648.82	539.98	405.57	0.06
El Rico	ER_M-176	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	223.54	1,577.00	1,125.00	431.00	1,102.00	0.00	0.00	862.71	924.46	618.59	215.46	2.88	821.85	625.79	517.70	511.23	485.09
El Rico	ER_M-178	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,946.00	1,348.00	554.00	1,566.00	0.00	0.00	1,008.86	1,816.84	1,504.51	550.40	5.14	1,412.16	1,476.51	1,344.94	939.62	0.00
El Rico	ER_M-179	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.00	247.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_M-181	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	166.07	1,374.00	872.00	337.00	982.00	0.00	0.00	738.93	931.46	880.21	346.94	3.47	38.47	0.00	0.00	0.00	0.00
El Rico	ER_R-26	2,265.99	411.00	2,265.99	222.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.00	514.00	411.00	0.00	0.00	999.00	746.36	255.13	0.00	0.00	1,221.08	1,143.98	948.86	653.64	174.78
El Rico	ER_R-27	1,861.00	34.00	1,861.00	296.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	443.00	0.00	0.00	0.00	831.00	238.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_R-33	0.00	787.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	42.00	436.00	1,203.00	0.00	0.00	1,440.66	1,668.12	156.32	0.00	0.00	2.00	0.00	0.00	0.00	0.00
El Rico	ER_R-35	2,144.00	471.00	2,144.00	279.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	154.00	30.00	865.00	0.00	0.00	1,351.84	1,004.22	0.00	0.00	0.00	1,435.08	888.81	0.00	0.00	0.00
El Rico	ER_R-47	1,859.48	1,610.93	1,863.00	121.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,228.00	1,344.00	520.00	1,640.00	0.00	0.00	6.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_S-111	90.00	239.00	90.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_S-113	90.00	763.27	90.00	0.00	360.00	0.00	0.00	0.00	0.00	0.00	0.00	822.00	660.00	171.00	678.00	0.00	0.00	359.45	636.40	532.75	230.80	2.08	525.67	384.38	470.03	367.38	263.73
El Rico	ER_S-120	3,124.06	2,198.62	3,132.99	366.22	706.00	43.00	0.00	0.00	0.00	0.00	162.29	2,702.99	1,663.00	604.00	1,984.00	0.00	0.00	1,888.04	2,234.46	1,852.52	691.55	6.36	1,787.12	1,656.47	1,153.40	842.51	351.44
El Rico	ER_S-127	2,904.44	2,011.31	2,911.99	348.00	1,759.00	49.03	0.00	0.00	0.00	0.00	319.14	2,693.46	1,654.08	563.24	1,964.00	0.00	0.00	1,847.00	1,906.27	416.61	830.46	7.27	2,028.06	2,000.17	1,434.00	0.00	0.00
El Rico	ER_S-160	1,615.41	1,776.86	1,622.00	255.00	928.00	20.00	0.00	0.00	0.00	0.00	0.00	1,017.00	1,337.00	487.00	1,657.00	0.00	0.00	908.71	1,722.46	1,049.80	0.00	13.15	1,006.31	934.65	652.22	43.90	370.48
El Rico	ER_S-162	2,015.00	1,912.27	2,015.00	502.00	1,738.00	56.00	0.00	0.00	0.00	0.00	282.02	3,407.99	2,171.00	786.00	2,689.99	0.00	0.00	2,433.37	2,850.05	1,979.59	530.13	7.00	1,926.89	1,854.70	1,649.31	1,422.80	1,393.60
El Rico	ER_S-164	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,461.00	314.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_S-165	1,045.00	1,445.69	1,045.00	220.00	1,030.00	0.00	0.00	0.00	0.00	0.00	74.60	2,489.99	1,641.00	592.00	2,034.00	0.00	0.00	1,639.21	1,711.75	520.57	796.53	10.19	574.24	551.17	394.73	0.00	0.00
El Rico	ER_S-167	1,626.00	1,618.86	1,626.00	384.00	1,888.00	52.00	0.00	0.00	0.00	0.00	152.49	3,048.99	1,893.00	684.00	2,262.99	0.00	0.00	2,065.85	1,245.14	0.00	0.00	0.00	0.00	1,440.79	1,077.44	1,535.36	311.72
El Rico	ER_S-173	0.00	2,085.34	0.00	106.00	2,092.00	63.00	0.00	0.00	0.00	0.00	0.00	2,325.99	2,373.99	886.00	2,969.99	0.00	0.00	1,859.87	2,717.95	2,087.83	998.67	10.23	2,932.26	3,120.53	3,114.65	3,063.55	1,652.10
El Rico	ER_S-174	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,529.99	2,101.00	779.00	2,558.99	0.00	0.00	2,185.60	2,743.38	2,424.90	966.68	7.94	1,877.19	563.24	730.78	603.26	502.54
El Rico	ER_S-188	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	985.80	1,507.20	1,185.16	288.20	3.33	750.92	311.28	679.15	409.23	196.40
El Rico	ER_S-191	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	258.84	0.00	0.00	0.00	0.00	0.00	238.00	0.00	0.00
El Rico	ER_S-192	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,099.00	2,470.89	1,076.58	0.00	2,565.67	2,601.49	2,322.96	2,055.21	1,804.77
El Rico	ER_S-193	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,983.06	2,102.49	1,079.61	9.36	2,559.21	2,639.88	2,346.56	2,241.24	2,036.11
El Rico	ER_S-194	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,558.77	2,582.76	1,082.20	9.02	2,216.67	1,910.75	910.07	358.99	2.97
El Rico	ER_S-195	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,460.00	2,699.86	1,153.29	10.14	2,836.87	3,126.31	2,966.75	2,880.80	2,816.01
El Rico	ER_S-196	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,325.00	2,731.97	1,106.82	9.67	2,402.58	2,731.07	2,569.80	2,426.92	2,298.25
El Rico	ER_S-198	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,213.84	2,609.13	1,148.39	0.00	2,777.98	2,751.41	2,415.86	2,114.48	1,830.73
El Rico	ER_S-199	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	676.34	2,409.49	1,142.78	10.16	2,677.37	2,887.71	2,794.52	2,505.17	2,553.13
El Rico	ER_S-200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,168.99	1,105.84	0.00	2,759.92	2,870.49	2,742.45	2,169.81	1,614.97
El Rico	ER_S-201	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	748.95	1,142.04	10.57	1,918.94	2,450.16	2,382.50	1,667.81	2,142.77
El Rico	ER_S-202	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	544.42	15.16	3,460.57	3,338.14	2,617.87	1,693.30	1,718.73
El Rico	ER_S-203	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	230.77	15.70	3,884.90	4,107.45	4,368.74	4,445.74	4,282.34
El Rico	ER_S-205	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,781.11	5,081.66	4,185.44	3,486.88	5,161.08
El Rico	ER_S-206	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,533.13	4,681.16	4,513.79	3,703.62
El Rico	ER_S-209	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,196.76	3,963.35	3,437.13	3,401.15
El Rico	ER_S-211	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,256.46	4,387.34	4,068.25	3,619.99
El Rico	ER_S-213	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,064.55	3,900.73	3,966.16
El Rico	ER_S-214	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,635.46	4,518.85	4,306.07
El Rico	ER_S-215	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,909.40	3,886.35	3,975.84
El Rico	ER_S-216	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,425.40	4,537.42	4,416.25
El Rico	ER_S-217	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,757.98	4,318.93	4,497.61
El Rico	ER_S-218	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,118.39	4,278.81	4,292.27
El Rico	ER_S-219	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	498.85	4,477.82	4,406.65
El Rico	ER_S-220	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,283.65	4,397.68
El Rico	ER_S-221	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,924.61	3,970.97
El Rico	ER_S-222	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,122.29	3,786.41
El Rico	ER_S-223	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	766.91	3,935.35
El Rico	ER_S-224	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,925.50
El Rico	ER_S-225	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3,580.64
El Rico	ER_S-226	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,928.44
El Rico	ER_S-227	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,191.19
El Rico	ER_S-228	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,146.70
El Rico	ER_S-229	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	864.59
El Rico	ER_S-70	2,569.10	2,001.72	2,574.99	314.00	1,537.00	15.00	0.00	0.00	0.00	0.00	0.00	1,928.00	1,664.00	559.00	1,956.00	0.00	0.00	1,608.48	2,251.61	1,886.48	486.25	90.47	1,655.35	1,622.35	1,081.70	622.95	0.00
El Rico	ER_SR-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	314.00	186.00	484.00	0.00	0.00	424.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_SR-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	208.00	1,430.00	0.00	0.00	585.19	1,471.77	399.48	0.00	0.00	0.00	789.73	1,810.23	1,103.14	0.00
El Rico	ER_SR-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	826.00	544.00	1,209.00	0.00	0.00	1,203.67	1,687.76	295.48	0.00	0.00	0.00	381.63	1,020.65	237.17	0.00
El Rico	ER_SR-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	181.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_SR-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	429.00	453.00	270.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_T-155	3,088.17	2,219.82	3,096.99	362.00	1,759.00	45.00	0.00	0.00	0.00	0.00	0.00	1,761.00	2,039.00	774.00	2,166.00	0.00	0.00	2,213.87	2,242.79	1,778.14	947.64	7.04	1,646.97	2,306.66	1,547.05	1,031.41	0.00
El Rico	ER_T-156	2,771.68	668.00	2,775.99	42.00	498.00	53.00	0.00	0.00	0.00	0.00	0.00	2,541.99	1,238.00	53.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_T-157	3,306.20	2,238.96	3,312.99	384.00	777.00	0.00	0.00	0.00	0.00	0.00	0.00	2,203.99	1,890.00	719.00	1,344.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Annualized Specified Pumping

Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
El Rico	ER_T-177	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	928.17	975.13	389.17	707.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
El Rico	ER_T-182	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,705.00	1,842.00	664.00	1,235.00	0.00	0.00	2,364.40	523.65	0.00	118.30	2.38	518.39	756.61	221.34	0.00	0.00
El Rico	ER_T-61	3,222.89	1,635.00	3,227.99	303.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	424.18	523.48	874.00	0.00	0.00	0.00	1,318.20	305.96	0.00	0.00	1,302.55	0.00	0.00	0.00	0.00
Creighton Ranch	CR_CR-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,626.79	1,849.41	1,705.15	1,320.74
Creighton Ranch	CR_CR-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	433.41	538.08	437.91	289.92
Creighton Ranch	CR_CR-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	170.04	523.12	512.68	511.33
Creighton Ranch	CR_CR-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,022.41	1,342.09	1,098.35	830.86
Creighton Ranch	CR_EC-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	964.80	1,521.00	436.50	2,028.60	0.00	0.00	1,361.81	1,442.77	1,011.40	468.42	3.94	825.11	735.16	834.01	767.03	681.29
Creighton Ranch	CR_EC-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,816.20	1,339.20	437.40	1,433.70	0.00	0.00	752.12	811.61	953.34	353.70	2.89	849.40	897.20	817.27	540.13	517.71
Creighton Ranch	CR_EC-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,686.60	1,033.20	262.80	1,071.90	0.00	0.00	775.64	980.13	486.81	192.35	3.54	1,528.18	999.18	897.40	790.45	691.30
Creighton Ranch	CR_EC-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,782.90	1,187.10	88.20	715.50	0.00	0.00	757.83	1,016.12	887.14	327.42	2.73	925.07	886.85	819.55	780.30	706.68
Creighton Ranch	CR_EC-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	742.50	358.20	1,557.90	0.00	0.00	1,378.09	1,865.43	1,654.84	638.59	0.00	1,507.24	1,543.45	1,420.86	1,348.86	1,157.05
Creighton Ranch	CR_EC-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	474.30	430.20	1,954.80	0.00	0.00	1,449.81	2,367.72	2,217.50	701.82	2.38	1,973.90	2,059.83	2,022.39	1,912.80	279.52
Creighton Ranch	CR_EC-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,329.30	0.00	0.00	1,545.86	2,080.28	2,066.13	674.60	6.43	834.67	1,737.98	1,554.98	1,247.94	1,058.44
Creighton Ranch	CR_S-100	484.00	1,074.20	484.00	110.00	314.00	15.02	0.00	0.00	0.00	0.00	0.00	1,197.05	875.26	261.80	1,050.00	0.00	0.00	923.62	1,118.45	963.91	363.81	3.60	1,104.47	1,106.76	778.83	0.00	0.00
Creighton Ranch	CR_S-103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534.00	0.00	0.00	705.72	1,531.18	1,498.63	612.45	5.52	1,625.00	1,620.42	1,502.45	1,447.79	553.63
Creighton Ranch	CR_S-105	708.30	768.38	708.30	149.40	355.50	29.72	0.00	0.00	0.00	0.00	73.37	1,603.90	1,026.61	283.76	770.40	0.00	0.00	1,231.92	1,223.44	363.33	100.91	2.13	567.39	165.91	0.00	0.00	0.00
Creighton Ranch	CR_S-106	324.00	568.80	324.00	121.50	342.00	36.00	0.00	0.00	0.00	0.00	199.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creighton Ranch	CR_S-108	1,727.10	1,190.05	1,727.10	231.30	1,715.40	2.70	0.00	0.00	0.00	0.00	0.00	1,631.12	1,249.14	314.31	1,623.60	0.00	1.83	1,204.17	1,722.36	1,942.71	804.47	28.36	1,572.01	980.71	669.79	615.39	1,481.35
Creighton Ranch	CR_S-109	1,227.32	1,847.11	1,227.60	244.80	1,749.60	51.30	0.00	0.00	0.00	0.00	204.62	1,324.71	772.55	316.10	1,602.90	0.00	62.02	1,180.48	1,599.53	1,427.47	615.08	27.28	1,294.39	1,561.03	873.80	859.07	1,343.12
Creighton Ranch	CR_S-110	698.12	2,335.62	698.40	0.00	0.00	48.61	0.00	0.00	0.00	0.00	343.99	1,954.25	1,495.75	487.94	2,233.79	0.00	0.00	1,657.27	2,046.15	1,234.31	700.55	16.33	1,647.26	1,635.60	1,468.44	1,304.75	1,317.23
Creighton Ranch	CR_S-114	928.80	1,416.78	928.80	165.60	1,148.40	33.31	0.00	0.00	0.00	0.00	261.45	1,418.76	966.67	384.07	1,386.90	107.10	2.05	989.20	1,273.28	1,170.74	462.43	16.27	434.15	454.04	361.08	274.32	176.55
Creighton Ranch	CR_S-115	666.90	1,254.50	666.90	114.30	817.20	23.38	0.00	0.00	0.00	0.00	185.45	1,221.72	704.39	311.38	1,257.30	89.10	0.00	891.02	1,171.90	894.20	453.19	49.00	1,020.84	946.69	819.85	543.40	507.17
Creighton Ranch	CR_S-116	544.50	1,058.24	544.50	93.60	673.20	19.80	0.00	0.00	0.00	0.00	205.84	1,075.84	803.80	305.65	1,145.70	88.20	1.61	747.45	530.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creighton Ranch	CR_S-117	449.10	1,125.46	449.10	0.00	724.50	21.58	0.00	0.00	0.00	0.00	140.88	1,006.30	706.05	252.59	1,020.60	72.00	1.21	765.57	374.45	291.06	127.03	1.15	815.08	892.15	822.96	753.26	663.00
Creighton Ranch	CR_S-119	513.90	1,080.96	513.90	105.30	762.30	22.50	0.00	0.00	0.00	0.00	339.04	1,780.48	1,407.59	272.69	1,035.00	0.00	0.00	781.30	1,021.43	830.78	349.24	3.50	721.75	919.82	919.48	770.81	915.08
Creighton Ranch	CR_S-121	847.67	1,873.11	847.80	161.10	469.80	37.80	0.00	0.00	0.00	0.00	67.28	1,963.80	1,543.50	435.60	1,830.60	0.00	0.00	1,680.41	1,933.83	1,435.48	553.40	5.57	1,595.17	1,629.63	1,328.48	1,101.72	874.44
Creighton Ranch	CR_S-122	2,289.44	1,427.02	2,295.89	272.70	516.60	38.70	0.00	0.00	0.00	0.00	0.00	1,411.20	1,286.10	379.80	853.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creighton Ranch	CR_S-123	508.37	1,211.83	508.50	95.40	1,029.60	127.80	0.00	0.00	0.00	0.00	227.00	1,639.80	1,062.00	295.20	1,207.80	0.00	0.00	1,125.99	1,361.89	1,066.67	395.97	4.23	1,169.63	1,288.35	1,285.32	978.43	1,006.36
Creighton Ranch	CR_S-124	757.80	511.20	757.80	117.90	1,155.60	35.10	0.00	0.00	0.00	0.00	264.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	719.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creighton Ranch	CR_S-125	1,151.10	1,813.87	1,151.10	201.33	1,332.90	31.51	0.00	0.00	0.00	0.00	335.24	2,151.89	1,446.94	524.45	1,735.20	111.60	1.20	1,420.40	1,714.76	1,417.40	687.57	33.42	1,603.42	1,483.27	1,278.20	1,084.70	1,174.88
Creighton Ranch	CR_S-129	468.90	1,062.90	468.90	119.70	351.90	26.07	0.00	0.00	0.00	0.00	0.00	1,038.39	989.14	276.02	1,067.40	0.00	0.00	997.00	1,387.29	1,195.67	447.46	0.00	1,177.31	1,141.83	1,174.67	1,119.90	1,135.92
Creighton Ranch	CR_S-130	476.00	700.52	476.00	110.00	298.00	22.99	0.00	0.00	0.00	0.00	0.00	1,009.59	830.71	229.05	780.00	0.00	0.00	191.76	924.84	203.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creighton Ranch	CR_S-131	311.40	1,239.39	311.40	123.30	335.70	24.27	0.00	0.00	0.00	0.00	0.00	1,011.77	978.22	283.66	1,216.80	0.00	0.00	1,014.61	1,284.51	1,152.84	449.99	4.01	1,256.76	1,404.28	1,256.95	1,118.88	990.26
Creighton Ranch	CR_S-132	1,333.24	836.22	1,337.40	141.30	358.20	29.72	0.00	0.00	0.00	0.00	0.00	1,127.70	930.20	240.93	709.20	0.00	0.00	1,361.83	1,332.57	1,340.85	513.02	4.58	1,373.03	1,394.13	1,306.25	1,205.36	1,196.98
Creighton Ranch	CR_S-134	345.60	1,211.96	345.60	66.60	511.20	15.31	0.00	0.00	0.00	0.00	0.00	333.32	901.23	287.95	1,387.80	0.00	1.70	995.66	1,358.11	1,217.67	496.88	4.70	980.34	958.35	1,108.44	1,043.79	648.49
Creighton Ranch	CR_S-135	549.00	1,267.62	549.00	138.00	394.00	30.03	0.00	0.00	0.00	0.00	0.00	1,372.00	1,061.00	305.07	1,111.00	0.00	0.00	773.37	701.81	454.06	347.44	3.81	1,070.52	730.93	863.08	835.17	890.83
Creighton Ranch	CR_S-138	1,602.46	1,463.52	1,607.40	196.20	342.00	26.10	0.00	0.00	0.00	0.00	0.00	1,140.30	1,193.40	328.45	1,539.90	0.00	0.00	1,248.92	1,700.89	1,542.83	510.08	10.12	1,457.37	1,035.02	1,300.24	1,288.59	1,304.07
Creighton Ranch	CR_S-183	0.00	1,593.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	801.00	1,554.30	370.80	2,181.59	0.00	0.00	1,765.58	1,797.71	1,785.59	710.78	18.40	1,503.65	1,560.04	1,370.94	691.79	342.08
Creighton Ranch	CR_S-187	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,312.39	1,696.80	1,498.09	538.34	4.52	1,216.82	898.60	748.61	435.77	0.00
Creighton Ranch	CR_S-189	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	676.47	1,397.26	507.94	4.93	1,251.80	864.87	1,089.38	1,090.70	1,085.31
Creighton Ranch	CR_S-197	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,375.06	3,016.17	1,130.32	9.76	2,937.88	2,980.16	3,049.06	3,425.72	3,342.29
Creighton Ranch	CR_S-204	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,989.78	5,174.18	4,814.78	4,644.04	4,492.56
Creighton Ranch	CR_S-207	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	460.40	5,700.81	4,838.66	4,195.61	2,838.11
Creighton Ranch	CR_S-208	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,429.56	5,504.19	5,132.88	4,673.93	4,034.77
Creighton Ranch	CR_S-210	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,853.51	4,542.36	3,990.52	3,818.24
Creighton Ranch	CR_S-212	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	341.65	4,909.10	4,612.65	4,075.88
Creighton Ranch	CR_S-79	1,079.66	1,386.12	1,080.00	142.20	273.60	19.80	0.00	0.00	0.00	0.00	0.00	421.20	1,057.50	237.74	1,513.80	0.00	0.00	1,255.70	1,616.90	1,390.51	499.91	6.25	1,480.50	1,529.03	1,431.37	1,366.64	1,175.41
Creighton Ranch	CR_S-80	738.00	830.23	738.00	121.50	118.80	0.00	0.00	0.00	0.00	0.00	0.00	400.50	636.30	240.30	900.90	0.00	0.00	753.18	798.32	343.46	313.21	2.57	744.00	736.72	721.53	582.38	141.32
Creighton Ranch	CR_S-81	1,371.38	1,280.23	1,375.20	159.30	339.30	25.20	0.00	0.00	0.00	0.00	0.00	1,034.10	1,034.10	310.50	1,264.50	0.00	0.00	1,093.82	1,233.06	916.40	301.90	3.08	1,304.50	1,210.52	934.69	789.60	676.48
Creighton Ranch	CR_S-82	906.86	1,271.32	909.90	63.90	346.50	23.40	0.00	0.00	0.00	0.00	0.00	819.00	801.00	274.13	1,414.80	0.00	0.00	884.21	985.61	971.44	204.58	8.16	320.34	358.49	355.36	300.10	302.90
Creighton Ranch	CR_S-83	1,645.63	442.80	1,650.60	165.60	168.30	12.60	0.00	0.00	0.00	0.00	0.00	6.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Creighton Ranch	CR_S-84	1,746.68	1,157.21	1,751.40	197.10	415.80	28.80	0.00	0.00	0.00	0.00	0.00	1,094.40	573.30	172.80	903.60	0.00	0.00	1,224.11	1,380.55	855.35	416.28	4.44	1,638.18	1,755.27	1,418.07	890.68	644.51
Creighton Ranch	CR_S-88	414.00	1,271.67	414.00	0.00	342.90	25.20	0.00	0.00	0.00	0.00	0.00	1,073.70	1,019.70	279.90	1,264.50	0.00	0.00	1,137.49	2,337.77	1,382.07	768.63	6.34	2,118.27	2,076.08	1,631.52	1,872.64	1,919.45
Creighton Ranch	CR_S-92	406.80	911.70	406.80	106.20	283.50	20.70	0.00	0.00	0.00	0.00	0.00	805.50	639.00	180.00	876.60	0.00	0.00	930.40	1,204.58	78.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_001	2,016.23	1,449.20	898.28	204.16	1,072.20	77.47	157.42	0.00	0.00	247.35	511.99	96.71	137.48	1,030.94	330.71	14.42	0.00	571.89	193.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_002	1,343.58	1,129.61	773.27	276.09	1,236.20	84.51	232.23	0.00	0.00	223.41	300.51	298.76	922.95	331.81	608.88	102.08	0.00	568.81	424.68	488.77	22.38	0.04	511.54	784.41	661.26	269.84	269.84
Corcorian ID	CID_003	2,295.40	2,455.53	1,798.95	272.49	737.44	2.14	61.66	0.00	0.00	255.57	468.39	957.97	1,569.26	871.26	554.29	0.00	0.00	1,334.59	925.45	845.58	281.71	41.63	208.52	0.00	0.00	0.00	0.00
Corcorian ID	CID_004	1,103.53	87.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_005	739.82	589.79	486.41	34.03	284.93	0.00	46.86	0.00	0.00	23.03	131.08	381.60	411.78	284.75	233.00	38.68	55.15	542.51	510.74	271.16	0.00	0.00	210.74	378.57	233.77	562.40	562.40
Corcorian ID	CID_006	554.73	449.73	364.07	26.09	243.38	0.00	45.95	0.00	0.00	102.98	216.29	421.32	598.01	79.91	346.99	99.29	83.11	928.85	590.30	271.35	0.00	0.00	80.23	297.22	683.04	580.99	580.99
Corcorian ID	CID_007	1,472.15	845.16	684.22	66.14	812.91	59.64	416.42	412.17	0.00	619.70	68.04	1,241.44	1,434.43	1,397.27	1,250.77	97.77	0.00	305.84	561.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_008	613.99	509.01	379.24	46.12	287.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_009	544.71	450.01	463.61	86.54	196.62	10.93	10.05	0.00	0.00	3.12	7.90	241.43	759.95	390.53	582.83	0.41	0.00	515.74	518.44	559.73	99.80	0.00	781.35	317.26	150.07	70.00	70.00
Corcorian ID	CID_010	627.86	634.04	535.86	20.58	386.64	0.00	50.68	0.00	0.00	166.19	91.94	560.84	611.82	401.46	637.43	49.50	27.84	563.95	514.06	426.49	144.73	0.05	629.21	743.55	626.48	843.38	843.38
Corcorian ID	CID_011	1,095.87	852.03	699.44	24.83	487.89	0.00	20.24	0.00	0.00	181.05	167.53	281.89	3.23	600.15	1,188.49	88.36	107.58	939.77	800.67	1,339.42	372.23	33.88	235.38	0.05	0.00	0.00	0.00
Corcorian ID	CID_012	2,646.53	2,904.86	2,402.93	731.41	2,376.85	172.13	961.47	832.87	159.92	1,247.80	0.00	0.00	0.00	1,249.09	1,340.48	495.63	552.67	2,241.76	1,920.72	1,547.25	482.90	218.98	929.05	1,794.97	1,578.69	1,413.54	1,413.54
Corcorian ID	CID_013	688.46	424.26	301.06	24.57	278.99	0.00	2.00	0.00	0.00	47.82	129.14	32.96	240.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_014	1,064.50	823.87	638.99	0.00	514.76	0.00	100.05	0.00	0.00	88.62	133.40	247.50	383.97	604.77	439.13	85.99	0.00	1,680.93	417.98	1,111.68	333.57	27.58	1,025.94	1,168.49	765.75	12.56	12.56
Corcorian ID	CID_015	983.35	681.20	471.33	35.58	420.81	0.00	84.55	0.00	0.00	102.53	108.71	631.10	613.15	336.36	580.81	58.85	12.85	465.51	172.01	151.65	0.01	660.30	307.92	122.48	0.00	0.00	0.00
Corcorian ID	CID_016	533.37	547.86	425.90	23.03	351.59	36.12	28.90	0.00	0.00	77.11	106.72	88.60	0.12	52.11	199.39	7.69	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_017	1,278.44	1,386.96	975.15	176.79	1,293.32	206.88	499.85	261.66	0.00	818.02	1,242.18	1,747.47	1,247.56	488.25	448.95	408.94	101.82	1,389.98	1,473.27	1,463.99	133.79	38.17	1,244.58	1,309.51	1,183.41	980.85	980.85

Annualized Specified Pumping

Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
Corcorian ID	CID_018	943.66	749.64	701.03	152.18	949.61	64.22	0.00	0.00	0.00	389.81	552.60	674.14	968.82	810.87	919.52	489.30	96.06	1,480.59	1,008.63	729.60	264.65	240.75	1,249.10	1,122.97	980.39	887.85	887.85
Corcorian ID	CID_019	1,141.43	1,055.25	797.10	130.18	733.06	0.00	116.50	0.00	0.00	258.48	146.36	940.79	750.55	896.51	1,415.36	306.71	199.99	1,279.65	1,343.86	929.27	154.62	81.15	1,217.95	1,479.14	1,039.33	1,226.58	1,226.58
Corcorian ID	CID_020	1,682.59	1,222.03	743.03	73.31	1,142.60	87.36	155.47	0.00	0.00	127.25	523.92	1,049.50	1,208.63	1,367.01	1,039.10	273.64	197.83	843.20	988.20	641.34	300.74	119.40	1,241.00	1,151.67	1,028.68	772.84	772.84
Corcorian ID	CID_021	973.70	1,019.30	717.27	161.22	1,259.62	42.20	283.41	765.16	116.83	574.45	1,003.18	1,414.21	600.80	1,031.67	1,343.40	264.05	220.09	1,377.89	1,046.65	649.39	393.76	12.50	974.52	792.87	797.92	128.61	128.61
Corcorian ID	CID_022	992.52	810.03	693.96	141.75	643.68	75.24	111.76	0.00	0.00	43.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_023	858.00	744.13	547.71	0.00	558.21	26.48	116.26	0.00	0.00	400.61	518.95	462.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_024	1,836.70	2,033.55	1,689.40	368.63	2,092.55	105.69	290.01	980.44	130.41	924.59	1,393.04	1,348.60	1,555.08	523.66	1,441.63	175.26	169.60	1,959.05	1,197.09	2,036.26	709.24	21.26	1,397.81	213.99	1,318.92	195.89	195.89
Corcorian ID	CID_025	2,200.45	1,742.98	1,395.37	237.66	1,347.50	141.01	330.06	599.95	134.92	599.76	1,311.78	1,680.88	1,414.68	951.18	1,395.77	369.19	311.44	2,117.80	1,833.45	1,897.24	401.36	506.80	1,865.98	1,963.80	1,541.33	1,589.06	1,589.06
Corcorian ID	CID_026	2,054.10	1,752.35	2,044.83	332.41	1,992.01	313.63	186.98	755.01	229.09	735.74	1,095.24	1,398.85	1,363.25	309.84	1,420.85	693.28	217.92	2,049.11	1,398.39	1,446.66	108.73	235.06	1,581.51	1,821.77	1,704.64	1,538.76	1,538.76
Corcorian ID	CID_027	1,346.31	1,366.56	837.69	112.16	1,086.54	79.80	538.93	671.98	0.00	369.42	704.45	1,400.45	1,106.74	693.76	388.57	366.41	76.24	332.03	645.93	1,061.16	153.59	125.36	949.56	768.78	500.00	514.07	514.07
Corcorian ID	CID_028	1,759.43	2,454.37	1,851.81	384.68	2,660.59	150.14	845.41	514.20	94.87	1,819.92	2,777.40	3,244.34	1,540.61	2,267.13	2,119.73	347.32	671.10	2,370.25	2,101.08	1,720.37	158.47	0.00	0.00	1,149.04	1,854.99	1,267.36	1,267.36
Corcorian ID	CID_029	1,869.41	2,096.46	1,683.73	321.28	2,311.90	282.17	567.92	372.23	83.58	1,331.91	2,515.63	2,623.93	1,646.22	1,753.96	1,496.24	790.66	0.20	618.44	340.29	0.00	68.66	0.00	0.00	677.62	1,008.13	194.65	194.65
Corcorian ID	CID_030	1,033.99	234.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_031	744.47	606.00	617.43	125.94	688.72	64.45	0.00	0.00	0.00	243.97	433.74	311.91	522.61	794.13	451.74	113.97	132.28	423.17	340.78	185.08	0.00	0.63	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_032	2,478.85	1,769.45	1,965.95	543.81	1,931.68	161.50	804.49	732.98	247.42	1,111.84	0.00	0.00	0.00	301.13	633.74	271.47	0.00	0.00	1,496.72	1,712.44	847.98	65.61	1,540.00	1,633.14	1,514.64	1,385.37	1,385.37
Corcorian ID	CID_033	1,379.94	899.71	1,359.42	306.02	1,413.69	150.67	288.74	0.00	0.00	734.29	1,294.95	1,373.09	1,628.69	1,515.12	1,217.83	337.36	125.60	1,773.95	1,764.90	694.03	630.17	133.66	1,365.41	812.42	22.00	453.53	453.53
Corcorian ID	CID_034	1,618.32	1,291.57	1,024.49	120.41	1,097.03	105.03	37.67	0.00	0.00	480.87	771.69	1,259.83	507.95	654.28	999.16	129.75	62.81	1,283.75	847.22	659.79	115.26	0.00	1,091.28	1,129.49	1,225.34	1,204.38	1,204.38
Corcorian ID	CID_035	1,295.37	1,693.60	1,493.93	333.89	1,721.01	111.08	512.54	273.14	215.25	1,426.21	1,590.00	499.62	0.00	985.65	2,204.94	509.33	437.62	2,442.24	2,187.69	2,419.10	871.86	58.45	1,869.01	496.05	0.00	0.00	0.00
Corcorian ID	CID_036	993.71	1,106.31	1,222.96	292.35	1,126.13	165.28	472.55	253.53	0.00	699.75	1,053.95	1,700.40	1,307.80	1,160.17	897.62	304.18	251.08	1,215.38	1,130.81	1,395.02	1,055.11	316.34	1,239.06	1,380.37	1,078.82	1,278.24	1,278.24
Corcorian ID	CID_037	1,344.64	1,981.76	1,250.45	260.64	1,723.95	150.68	600.69	341.34	65.27	128.13	419.34	741.83	1,268.20	1,484.38	1,878.90	582.54	351.38	1,532.13	1,230.39	1,151.86	538.73	23.36	612.84	0.00	-0.02	0.00	0.00
Corcorian ID	CID_038	2,139.10	2,553.65	2,343.27	360.78	2,614.25	224.79	776.11	378.39	0.00	1,367.84	1,564.95	2,101.25	2,025.91	1,740.78	1,318.42	645.71	484.89	2,221.00	2,099.24	2,049.18	810.60	27.00	1,906.51	1,063.32	2.80	369.57	369.57
Corcorian ID	CID_039	588.86	605.10	338.75	22.95	135.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_040	926.15	1,394.96	2,165.44	856.73	2,185.85	430.57	435.13	222.54	4.40	496.27	226.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_041	1,728.95	1,941.95	1,528.32	166.00	1,191.76	19.27	183.57	60.48	0.00	365.75	330.60	283.99	276.67	239.43	708.61	112.37	26.96	454.23	371.59	370.87	92.05	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_042	1,692.50	864.41	1,239.68	250.66	1,566.67	118.48	210.11	0.00	0.00	616.36	1,002.06	1,448.33	1,428.97	1,081.34	867.66	303.24	288.09	1,578.76	1,448.04	627.67	501.39	152.11	1,365.87	1,229.59	121.05	467.66	467.66
Corcorian ID	CID_043	284.50	1,025.86	788.77	0.00	945.45	0.00	188.63	0.00	0.00	450.51	352.45	735.51	786.59	229.17	743.31	634.30	278.22	1,412.90	1,390.02	1,292.64	351.27	61.51	1,094.73	1,052.46	1,104.45	1,163.51	1,163.51
Corcorian ID	CID_044	2,029.22	2,100.06	1,637.63	709.97	1,802.08	547.81	731.24	162.90	29.33	484.21	922.29	1,556.49	455.60	1,084.36	758.02	104.03	57.82	637.83	1,063.14	1,054.04	174.91	8.30	272.36	121.12	0.02	0.00	0.00
Corcorian ID	CID_045	1,224.74	1,179.34	928.36	211.27	1,088.56	110.45	292.71	464.68	0.00	936.86	1,366.65	1,420.29	1,187.86	1,415.47	757.22	403.80	260.08	1,157.39	555.50	0.03	52.14	21.44	376.24	8.26	0.00	233.10	233.10
Corcorian ID	CID_046	989.39	998.34	534.12	129.56	997.58	218.11	218.98	14.94	0.00	533.14	1,338.92	971.73	1,018.56	505.35	471.23	357.23	286.09	522.10	319.19	1,059.49	388.39	16.28	727.21	0.00	0.00	133.84	133.84
Corcorian ID	CID_047	734.05	533.05	64.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_048	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_049	1,536.11	1,242.17	1,007.51	476.14	1,683.34	172.65	513.42	502.13	102.50	962.82	61.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_050	836.66	847.12	348.50	457.36	1,775.01	319.22	759.79	617.50	114.57	166.79	0.00	772.26	1,706.63	938.81	1,506.57	365.02	464.85	1,370.48	2,063.72	1,776.53	859.53	351.17	1,995.65	1,794.20	1,651.95	1,581.65	1,581.65
Corcorian ID	CID_051	1,263.69	903.10	610.18	13.28	758.27	1.42	166.40	0.00	0.00	168.74	286.75	750.62	883.60	695.86	1,150.74	63.77	0.00	1,168.23	643.60	730.05	776.54	0.00	328.34	498.59	883.24	1,006.86	1,006.86
Corcorian ID	CID_052	1,991.91	995.68	1,036.49	0.00	749.17	80.23	149.37	87.23	0.00	0.69	414.45	750.07	1,464.56	704.16	1,556.32	127.65	0.00	1,189.35	1,446.50	831.86	576.55	72.77	1,394.98	0.36	769.40	1,783.85	1,783.85
Corcorian ID	CID_053	1,836.83	1,344.56	1,165.61	99.22	832.81	0.00	98.02	762.31	0.00	539.91	907.06	1,523.06	1,816.36	676.03	1,526.97	409.15	309.93	1,543.69	1,958.95	1,697.35	534.79	186.30	2,064.82	1,397.63	1,401.31	812.65	812.65
Corcorian ID	CID_054	1,451.67	1,174.62	1,135.27	279.69	1,492.00	217.17	413.17	229.71	121.84	743.08	1,167.10	873.06	544.35	920.54	963.95	257.76	122.34	1,244.66	1,464.17	727.87	526.74	12.28	714.45	1,678.15	1,507.17	1,201.17	1,201.17
Corcorian ID	CID_055	2,365.41	1,436.58	1,476.88	441.19	1,386.77	121.08	275.37	679.83	0.00	564.72	1,197.01	2,607.04	1,613.90	2,007.08	1,746.33	132.10	565.44	1,492.46	1,945.02	1,958.99	1,268.44	210.35	1,910.51	2,189.52	1,816.23	1,667.14	1,667.14
Corcorian ID	CID_056	738.47	899.22	907.33	30.66	525.20	0.00	90.85	0.00	0.00	137.20	146.30	240.95	112.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_057	608.80	531.36	439.66	31.84	571.42	0.00	112.63	0.00	0.00	206.13	124.98	141.95	937.95	465.40	896.06	269.11	382.14	992.97	817.96	677.84	93.08	45.76	655.66	806.32	455.50	190.09	190.09
Corcorian ID	CID_058	782.84	1,487.40	1,445.57	72.68	1,461.54	8.37	275.47	0.00	0.00	592.73	566.75	701.85	1,246.44	1,368.91	2,152.07	435.74	390.39	657.44	1,068.66	767.14	71.18	0.00	220.51	1,016.28	541.40	0.00	0.00
Corcorian ID	CID_059	1,064.65	789.51	878.63	29.92	859.07	0.00	126.21	0.00	0.00	183.55	89.17	444.63	631.08	483.03	1,203.38	83.63	156.67	1,246.42	794.91	608.13	329.65	238.86	887.67	434.38	581.54	1,126.40	1,126.40
Corcorian ID	CID_060	1,186.15	836.46	764.81	24.75	564.07	0.00	59.39	0.00	0.00	148.74	141.85	305.96	524.69	548.08	718.07	15.28	78.66	688.72	627.04	743.75	165.17	43.44	506.06	385.22	555.47	1,243.15	1,243.15
Corcorian ID	CID_061	1,839.79	1,763.78	1,343.82	96.53	1,166.08	0.00	42.90	0.00	0.00	225.47	161.15	749.72	1,345.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_062	1,510.19	1,402.87	851.17	74.78	567.56	0.00	48.19	0.00	0.00	300.69	85.41	49.06	444.21	304.33	526.07	64.98	2.41	164.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_063	2,116.83	2,169.74	1,729.88	664.94	1,792.09	275.77	981.68	887.72	167.38	1,181.73	0.00	0.00	0.00	1,438.93	1,750.63	550.79	538.72	1,868.28	1,484.65	1,675.69	1,293.54	203.43	965.59	280.73	0.03	0.00	0.00
Corcorian ID	CID_064	2,074.68	1,327.64	1,123.30	543.00	1,087.03	2.46	512.08	662.32	126.51	746.76	0.00	0.00	0.00	883.95	1,208.47	440.98	383.93	699.74	0.00	1,510.93	548.35	329.55	1,622.10	816.65	1,052.12	822.86	822.86
Corcorian ID	CID_065	1,942.43	1,804.73	2,012.33	8.49	1,601.31	235.59	660.05	338.52	68.98	7.07	56.60	809.67	361.00	912.87	570.92	294.10	290.66	1,146.88	112.93	27.01	0.87	14.62	706.91	728.36	433.30	489.35	489.35
Corcorian ID	CID_066	898.36	2,125.69	1,738.59	341.96	2,000.57	224.44	632.38	306.49	102.26	1,174.19	1,328.18	1,311.76	1,753.59	1,384.98	1,760.36	518.70	352.57	1,539.70	1,329.17	615.29	680.97	44.63	627.21	1,497.67	1,680.60	1,581.47	1,581.47
Corcorian ID	CID_067	501.07	1,786.21	1,343.64	0.90	1,171.53	362.37	630.97	259.32	60.60	1,063.45	1,475.18	2,016.68	1,693.56	1,248.29	738.11	541.95	256.87	1,379.68	708.03	1,415.60	600.85	44.10	1,440.96	1,606.41	1,662.27	1,577.51	1,577.51
Corcorian ID	CID_068	686.17	2,321.54	2,221.60	590.11	2,542.92	257.96	448.15	331.17	75.84	732.05	1,387.50	1,606.13	2,023.64	2,071.91	2,455.38	783.78	483.49	2,285.23	2,022.20	1,924.91	891.60	122.02	2,103.11	1,980.63	1,948.43	2,031.33	2,031.33
Corcorian ID	CID_069	660.62	1,174.00	1,257.34	83.78	910.55	0.00	118.40	0.00	0.00	322.60	254.88	834.92	1,318.93	1,334.52	1,335.06	142.86	151.90	1,038.21	966.18	1,481.98	581.05	59.73	1,369.45	1,773.00	1,234.69	1,662.08	1,662.08
Corcorian ID	CID_070	184.97	275.55	165.35	27.69	107.46	4.60	21.23	134.21	15.16	14.33	0.00	22.15	257.37	230.30	197.92	17.42	7.54	189.28	10.66	14.26	63.64	6.27	0.00	124.92	124.32	137.06	137.06
Corcorian ID	CID_071	0.00	118.15	142.04	0.00	103.91	9.51	56.51	153.38	17.39	32.98	93.47	255.58	240.42	184.43	216.73	27.04	10.50	59.65	0.00	21.80	106.99	12.30	320.79	344.77	231.63	240.45	240.45
Corcorian ID	CID_072	0.00	95.97	109.90	36.91	29.04	7.31	8.98	22.36	0.00	9.99	104.91	119.09	80.83	0.00	3.58	7.98	6.65	0.00	0.00	0.00	-0.90	0.89	0.01	0.00	0.00	0.04	0.04
Corcorian ID	CID_073	0.00	142.84	310.98	67.77	234.63	11.31	11.59	0.00	0.00	122.98	180.62	243.11	343.09	202.04	163.85	22.48	16.64	226.31	202.17	0.00	60.93	100.01	0.00	196.04	85.09	0.00	0.00
Corcorian ID	CID_074	0.00	0.00	364.26	397.13	1,245.96	125.65	293.08	0.00	0.00	622.39	620.98	1,253.41	1,834.78	1,616.65	2,471.79	1,059.92	512.47	2,121.78	2,147.19	1,894.95	865.95	105.57	330.88	0.57	0.00	0.00	0.00
Corcorian ID	CID_075	0.00	0.00	251.55	225.46	989.02	0.00	105.87	0.00	0.00	305.79	314.55	1,173.34	1,238.55	1,362.63	1,757.47	111.55	91.83	978.03	819.89	843.24	0.00	0.00	2.00	959.89	1,013.14	1,098.97	1,098.97
Corcorian ID	CID_076	0.00	0.00	0.00	0.00	234.89	111.78	634.61	541.05	0.00	272.51	610.40	1,860.09	1,638.49	1,356.17	1,835.78	425.89	380.38	2,196.13	2,152.32	1,863.13	790.24	97.44	1,954.80	2,143.33	219.61	0.36	0.36
Corcorian ID	CID_077	0.00	0.00	0.00	0.00	0.00	0.00	0.00	123.51	0.00	237.17	187.97	225.90	298.14	320.75	99.52	57.46	74.24	140.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_078	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,668.87	1,369.61	1,606.41	1,482.16	308.50	144.84	982.56	962.93	729.61	0.00	81.84	1,049.74	1,049.20	1,186.57	72.24	72.24
Corcorian ID	CID_079	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,735.25	1,734.52	1,824.40	1,342.88	325.61	197.09	1,309.95	1,359.77	1,443.55	340.79	170.81	1,080.45	550.07	746.57	907.46	907.46
Corcorian ID	CID_080	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,660.37	1,583.12	1,635.26	1,523.73	347.82	282.27	1,443.19	871.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_081	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	487.72	1,518.23	1,538.22	152.23	78.55	1,271.28	1,444.23	1,641.26	313.71	99.39	444.08	722.62	1,122.74	1,585.55	1,585.55
Corcorian ID	CID_082	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	315.07	1,287.24	245.95	186.05	1,239.63	492.18	922.72	497.22	18.21	1,269.58	1,409.00	1,376.68	1,127.54	1,127.54
Corcorian ID	CID_083	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.59	663.41	437.53	112.73	1,368.03	1,577.93	1,328.94	465.39	222.46	1,239.53	1,601.77	1,425.61	869.57	869.57
Corcorian ID	CID_084	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125.95	183.58	93.35	834.67	947.18	988.60	223.77	37.16	540.41	0.01	49.57	987.79	987.79
Corcorian ID	CID_085	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	534.63	296.53	1,886.07	1,778.62	1,746.80	709.95	220.89	1,615.89	1,673.35	1,168.21	0.00	0.00
Corcorian ID	CID_086	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	160.70	1,036.72	330.95	1,000.21	397.67	5.91	816.21	398.68	0.04	0.00	0.00
Corcorian ID	CID_087	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	378.71	1,827.95	1,247.36	1,274.21	211.04	224.24	1,023.00	1,371.43	1,466.07	1,521.31	1,521.31
Corcorian ID	CID_088	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,263.58	1,261.12	1,461.71	246.31	0.00	1,146.15	1,440.28	1,179.16	1,313.66	1,313.66
Corcorian ID	CID_089	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	349.93	538.06	1,434.87	454.84	0.00	1,193.74	1,389.61	0.03	0.00	0.00
Corcorian ID	CID_090	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	607.56	1,291.87	467.41	0.00	342.47	1,557.85	1,126.84	1,427.48	1,427.48
Corcorian ID	CID_091	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	859.04	1,767.72	592.13	0.01	1,413.28	2,641.50	1,826.26	1,869.65	1,869.65

Annualized Specified Pumping

Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
Corcorian ID	CID_092	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	859.35	1,550.38	437.84	244.98	1,141.08	1,105.51	1,066.16	1,298.44	1,298.44
Corcorian ID	CID_093	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	741.70	1,487.20	372.01	165.25	750.50	1,032.04	999.00	1,253.67	1,253.67
Corcorian ID	CID_094	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	896.47	1,692.61	626.91	145.20	1,171.04	1,738.69	1,475.47	1,674.79	1,674.79
Corcorian ID	CID_095	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	627.84	1,662.93	573.14	87.26	1,072.90	1,293.26	1,510.39	1,427.72	1,427.72
Corcorian ID	CID_096	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	38.47	54.99	317.46	3,420.23	2,889.80	3,510.53	3,510.53
Corcorian ID	CID_097	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	155.44	3,085.52	2,159.80	2,290.52	2,290.52
Corcorian ID	CID_098	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,056.92	1,361.42	1,473.69	1,473.69
Corcorian ID	CID_099	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,209.37	517.23	517.23
Corcorian ID	CID_100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,885.47	1,884.87	1,884.87
Corcorian ID	CID_101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.34	975.48	975.48
Corcorian ID	CID_102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Corcorian ID	CID_105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Westlands WD	WWD_18S19E-18Q01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_18S19E-19K01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_18S19E-20E01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_18S19E-20F01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_18S19E-28M02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_18S19E-29D01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_18S19E-31N01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-04M01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-05K01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-07N02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-08N04	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-10E02	550.08	725.53	680.15	461.72	573.98	338.21	360.23	325.08	253.81	400.51	512.10	606.57	629.47	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.18	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-15D02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-15D03	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-15E02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-15N01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-18C01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-19K01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-26D03	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-26E03	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-27D01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-27M01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-28K02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-29A01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-29A02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-29A03	328.85	485.30	444.10	316.62	391.76	250.01	282.69	247.40	199.56	283.18	410.21	459.73	477.57	329.33	290.74	199.55	205.46	399.29	552.81	580.16	372.56	215.27	401.83	520.17	556.07	566.97	556.07
Westlands WD	WWD_19S19E-29J01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-30L01	655.02	887.19	827.97	461.72	671.23	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-30M01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-30M02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-31A01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-31D03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_19S19E-31N03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_19S19E-32K01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-33E01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_19S19E-33Q02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S18E-24H01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S18E-25E01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S18E-26K01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S18E-35D02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S18E-35E03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S18E-36C03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S18E-36D05	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-02A01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-02D01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-02E02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-02J01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-02N01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-04D02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-04D03	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-04H01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-06N04	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-07D01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-07G01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-07G02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-08M01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-09D02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-09D03	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-09N02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11

Annualized Specified Pumping

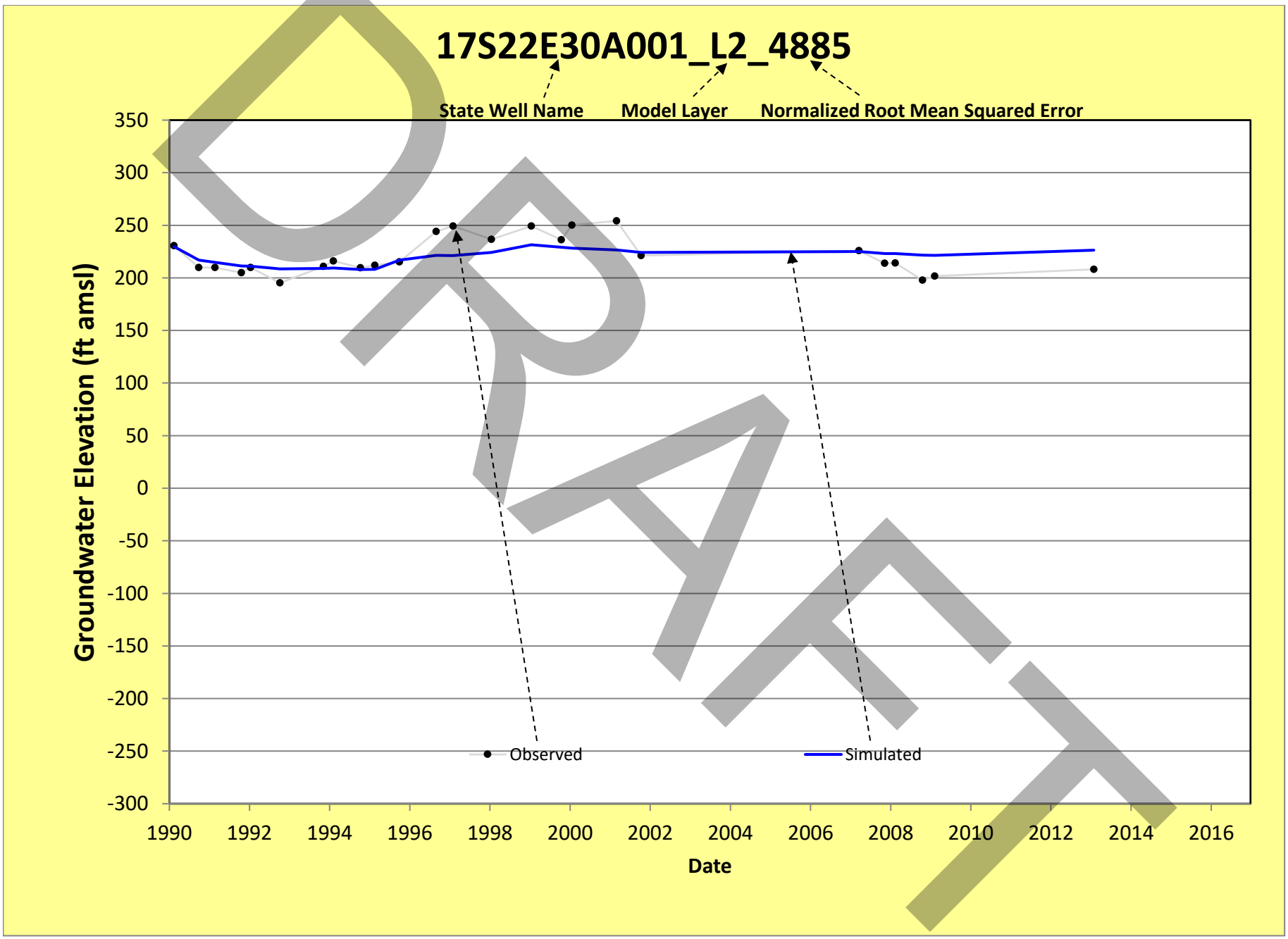
Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
Westlands WD	WWD_20S19E-10E01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-11D03	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-11E01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-14A01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-14E01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-14F01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-14H01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-17M01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-17M02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-18D02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-19D03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-19N01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-19N02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-19R01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-20D01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-20D02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-20D03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-23K01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-26C01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-31D01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_20S19E-35D02	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_20S19E-35M01	686.94	957.05	941.26	461.72	765.21	338.21	360.23	325.08	253.81	413.11	512.10	660.00	688.37	378.27	364.24	199.55	205.46	470.25	653.10	659.00	378.80	215.27	497.87	600.17	728.11	711.26	728.11
Westlands WD	WWD_21S17E-24J01	324.49	578.77	528.71	222.32	333.06	76.85	59.76	85.38	112.32	176.41	280.46	342.34	301.91	155.73	140.09	21.62	7.59	219.12	303.24	431.66	160.11	0.00	247.66	478.21	647.24	652.89	647.24
Westlands WD	WWD_21S18E-01B02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-01N01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-02C03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-02D03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-03G01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-09L01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-10B01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-11C01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-11D03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-11N01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-11Q01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-14M07	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-15M02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-16N01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-16P01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-17N03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-18R01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-22B05	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-22E01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-23B02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-23D07	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-23E01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-26N01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-27B01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-27E01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-27K02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-28G06	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-28Q02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-29E02	324.49	578.77	528.71	222.32	333.06	76.85	59.76	85.38	112.32	176.41	280.46	342.34	301.91	155.73	140.09	21.62	7.59	219.12	303.24	431.66	160.11	0.00	247.66	478.21	647.24	652.89	647.24
Westlands WD	WWD_21S18E-29N02	324.49	578.77	528.71	222.32	333.06	76.85	59.76	85.38	112.32	176.41	280.46	342.34	301.91	155.73	140.09	21.62	7.59	219.12	303.24	431.66	160.11	0.00	247.66	478.21	647.24	652.89	647.24
Westlands WD	WWD_21S18E-31H01	324.49	578.77	528.71	222.32	333.06	76.85	59.76	85.38	112.32	176.41	280.46	342.34	301.91	155.73	140.09	21.62	7.59	219.12	303.24	431.66	160.11	0.00	247.66	478.21	647.24	652.89	647.24
Westlands WD	WWD_21S18E-32R01	324.49	578.77	528.71	222.32	333.06	76.85	59.76	85.38	112.32	176.41	280.46	342.34	301.91	155.73	140.09	21.62	7.59	219.12	303.24	431.66	160.11	0.00	247.66	478.21	647.24	652.89	647.24
Westlands WD	WWD_21S18E-33G01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-33N02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-35D01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-35Q01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S18E-35Q02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-06B01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-07D01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-07N02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-17E01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-17Q01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-18N03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-19C03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-20D01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-30D04	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_21S19E-30D05	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-01E02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-01K01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-02G05	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-03B01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00

Annualized Specified Pumping

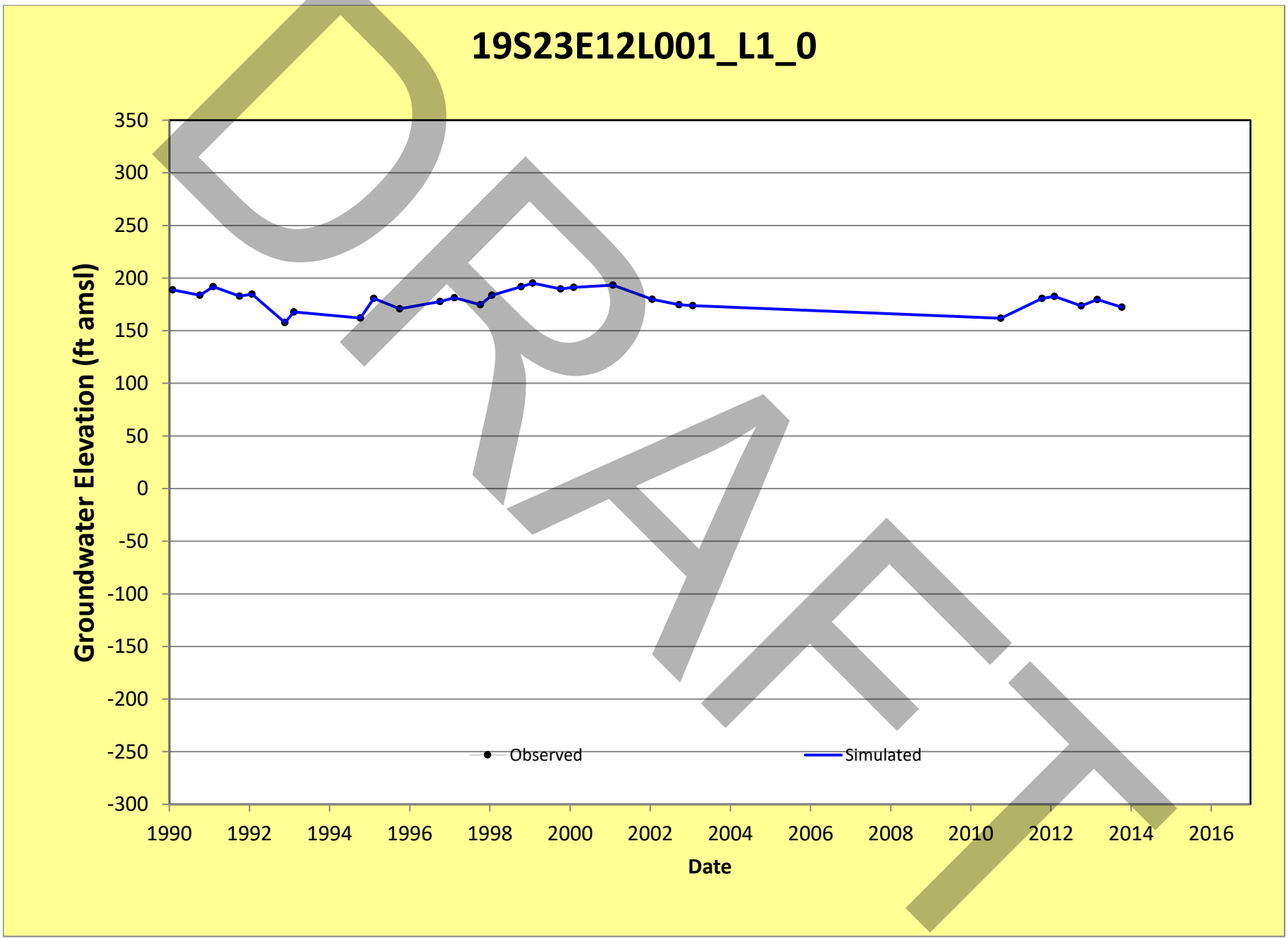
Well field	Well_ID	1990 (AF/Y)	1991 (AF/Y)	1992 (AF/Y)	1993 (AF/Y)	1994 (AF/Y)	1995 (AF/Y)	1996 (AF/Y)	1997 (AF/Y)	1998 (AF/Y)	1999 (AF/Y)	2000 (AF/Y)	2001 (AF/Y)	2002 (AF/Y)	2003 (AF/Y)	2004 (AF/Y)	2005 (AF/Y)	2006 (AF/Y)	2007 (AF/Y)	2008 (AF/Y)	2009 (AF/Y)	2010 (AF/Y)	2011 (AF/Y)	2012 (AF/Y)	2013 (AF/Y)	2014 (AF/Y)	2015 (AF/Y)	2016 (AF/Y)
Westlands WD	WWD_22S18E-04H01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-05B01	324.49	578.77	528.71	222.32	333.06	76.85	59.76	85.38	112.32	176.41	280.46	342.34	301.91	155.73	140.09	21.62	7.59	219.12	303.24	431.66	160.11	0.00	247.66	478.21	647.24	652.89	647.24
Westlands WD	WWD_22S18E-10A01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-10C01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-11C02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-11C03	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-11G01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-12R01	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_22S18E-13K02	311.52	472.04	476.59	181.10	319.20	90.51	81.94	82.06	67.59	130.95	153.24	309.43	288.00	200.33	216.07	35.99	56.71	149.91	276.10	338.57	136.64	34.49	310.36	401.68	562.00	523.80	562.00
Westlands WD	WWD_FARM_24_141	951.61	864.42	802.36	423.25	712.63	212.87	419.18	510.96	243.94	496.07	558.07	770.78	779.45	759.89	763.70	239.73	166.23	639.83	707.60	747.47	496.10	212.44	632.85	857.61	918.01	900.73	918.01
Westlands WD	WWD_FARM_25_012	613.28	515.09	548.89	17.77	269.36	16.44	41.24	119.70	65.89	127.75	104.06	441.50	427.47	413.57	529.14	116.35	52.19	289.39	509.78	542.56	89.33	4.46	311.87	800.63	1,036.48	1,023.31	1,036.67
Westlands WD	WWD_FARM_25_044	613.28	515.09	548.89	17.77	269.36	16.44	41.24	119.70	65.89	127.75	104.06	441.50	427.47	413.57	529.14	116.35	52.19	289.39	509.78	542.56	89.33	4.46	311.87	800.63	1,036.48	1,023.31	1,036.67
Westlands WD	WWD_FARM_26_001	275.60	386.59	450.92	156.07	326.58	44.00	104.66	157.88	36.72	316.41	86.83	162.60	181.16	157.15	177.76	9.55	0.00	89.14	208.00	178.48	2.45	0.00	23.43	190.50	369.83	287.40	369.83
Westlands WD	WWD_FARM_26_003	275.60	386.59	450.92	156.07	326.58	44.00	104.66	157.88	36.72	316.41	86.83	162.60	181.16	157.15	177.76	9.55	0.00	89.14	208.00	178.48	2.45	0.00	23.43	190.50	369.83	287.40	369.83
Westlands WD	WWD_FARM_26_008	275.60	386.59	450.92	156.07	326.58	44.00	104.66	157.88	36.72	316.41	86.83	162.60	181.16	157.15	177.76	9.55	0.00	89.14	208.00	178.48	2.45	0.00	23.43	190.50	369.83	287.40	369.83
Westlands WD	WWD_FARM_26_015	275.60	386.59	450.92	156.07	326.58	44.00	104.66	157.88	36.72	316.41	86.83	162.60	181.16	157.15	177.76	9.55	0.00	89.14	208.00	178.48	2.45	0.00	23.43	190.50	369.83	287.40	369.83
Westlands WD	WWD_FARM_26_029	275.60	386.59	450.92	156.07	326.58	44.00	104.66	157.88	36.72	316.41	86.83	162.60	181.16	157.15	177.76	9.55	0.00	89.14	208.00	178.48	2.45	0.00	23.43	190.50	369.83	287.40	369.83
City of Hanford	Hanford_02	102.40	99.06	105.88	111.91	120.67	118.07	142.15	143.82	129.29	147.07	151.50	156.30	269.50	233.05	299.93	328.43	299.61	334.24	305.46	3.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_11	113.39	112.69	122.58	128.31	140.26	137.11	168.62	167.88	159.18	179.28	184.81	192.29	234.03	230.14	275.32	184.07	266.40	311.91	324.67	291.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_18	186.85	181.48	191.61	204.13	219.22	215.95	254.91	256.53	234.21	263.63	270.19	280.47	520.85	405.58	331.20	317.92	336.53	559.96	854.08	615.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_31	261.74	251.86	263.87	280.59	299.14	294.73	340.76	344.91	307.34	348.05	356.58	368.32	822.26	681.10	697.40	548.66	670.78	707.48	349.60	91.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_32	96.22	95.54	103.07	107.80	116.74	115.68	141.62	140.22	130.28	147.78	151.05	157.56	225.24	134.37	210.78	314.05	158.14	249.19	280.72	154.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_33	206.19	193.86	204.59	218.47	235.94	226.56	269.86	276.06	243.13	274.60	286.68	291.22	587.13	73.84					13.89	426.27	487.42	935.72	285.66	312.93	48.94	31.23	11.56
City of Hanford	Hanford_34	614.68	597.66	631.99	667.18	710.53	705.48	816.25	819.50	741.51	838.28	855.84	887.24	1,846.51	1,293.61	1,238.78	1,121.06	1,770.59	1,731.57	1,188.37	888.77	233.03	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_35	285.27	272.85	287.83	305.56	327.44	319.54	372.41	377.61	337.77	381.36	393.84	404.11	842.03	1,097.87	1,122.26	1,277.45	854.27	464.84	832.93	403.41	347.71	315.84	288.32	278.63	25.49	58.73	68.08
City of Hanford	Hanford_36	211.55	201.39	212.34	226.34	242.33	236.11	276.88	283.06	249.97	282.84	292.62	299.34	629.07	626.07	628.28	901.04	795.99	178.64	995.84	451.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_37																73.90	435.65	374.67	266.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
City of Hanford	Hanford_38	100.71	97.15	105.18	110.65	120.04	116.39	143.06	145.01	129.90	149.22	154.17	159.32	241.52	179.08	116.58	163.01	200.08	223.35	322.31	174.12	283.19	262.46	377.34	430.89	146.21	139.46	5.52
City of Hanford	Hanford_40	404.29	393.17	416.59	438.20	466.63	461.04	535.33	535.83	485.52	548.53	562.80	581.17	1,192.58	1,109.49	1,047.04	862.25	123.37	1,717.66	1,523.56	525.05	601.79	446.13	456.49	814.28	1,077.77	361.24	536.60
City of Hanford	Hanford_41	700.43	682.01	725.15	766.28	818.86	810.69	968.71	974.11	871.39	993.08	1,014.91	1,053.27	1,998.41	357.39	1,593.93	1,953.86	1,871.00	1,941.46	1,909.83	1,060.98	0.00	0.00	0.00	0.00	0.00	0.00	126.92
City of Hanford	Hanford_42	676.84	646.25	684.73	728.22	782.32	760.35	899.56	916.40	815.26	924.48	956.39	981.47	1,916.88	1,433.44	1,197.86	0.00	0.00	0.00	707.22	1,259.53	994.28	1,246.09	1,592.03	1,671.66	1,921.12	1,343.45	1,222.72
City of Hanford	Hanford_43																			80.08	97.72	4.07	96.72	192.33	511.79	520.62	1,265.51	964.64
City of Hanford	Hanford_44																			0.00	67.06	1,326.56	2,300.01	2,306.05	497.23	1,769.99	1,601.15	1,432.46
City of Hanford	Hanford_45(16)	592.06	571.40	602.83	637.05	679.68	669.17	775.47	779.09	701.87	792.49	813.78	839.64	1,789.82	678.50	378.47	433.81	391.24	404.94	0.00	1,182.88	2,173.71	1,624.04	1,697.82	1,836.68	1,207.41	3,184.25	1,505.65
City of Hanford	Hanford_46(8)	387.84	394.83	424.30	442.70	477.72	480.41	581.43	567.39	543.16	611.14	619.96	653.80	908.09	0.55						962.51	1,337.10	643.47	602.00	997.27	1,119.86	926.88	620.64
City of Hanford	Hanford_47(22)	254.40	252.00	271.68	284.61	305.69	303.22	373.64	371.65	338.02	387.11	394.79	412.43	634.56	2.17	1.27	0.17	0.28	0.00	0.00	0.00	127.95	1,195.99	1,034.26	1,497.96	811.55	617.40	694.24
City of Hanford	Hanford_48(25)	296.46	296.08	315.90	330.28	351.96	354.39	423.87	416.57	382.60	436.75	440.52	464.36	834.77	564.41	547.16	711.74	229.77	503.55	344.90	0.00	307.79	951.61	782.60	1,647.20	639.09	246.90	957.11
City of Hanford	Hanford_49	389.12	379.55	405.57	427.31	457.80	453.78	543.29	545.98	490.71	557.99	571.50	591.86	1,064.12	48.56		440.11	356.84	522.45	637.00	361.32	0.00	0.00	0.00	0.00	0.00	0.00	47.23
City of Lemoore	LEM_02	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	0.00	75.87	0.00	360.17	0.00
City of Lemoore	LEM_04	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	446.96	836.73	1,068.20	360.96	4.38
City of Lemoore	LEM_05	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	0.00	86.80	268.55	382.28	60.44
City of Lemoore	LEM_06	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	1,811.88	1,454.78	886.18	599.81	947.31
City of Lemoore	LEM_07	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	185.36	589.68	101.76	461.95	427.91
City of Lemoore	LEM_08	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	292.25	357.47	315.26	423.81	600.92	616.80	601.25	611.47	501.97	548.90	560.06	132.40	75.87	0.00	360.17	0.00
City of Lemoore	LEM_09	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	211.56	191.52	228.92	394.94	559.85	540.33	450.23	538.57	625.12	548.15	528.96	136.28	75.87	0.00	360.17	0.00
City of Lemoore	LEM_10	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	526.94	1,420.70	2,072.97	2,416.84	2,570.42	2,298.46	2,205.27	574.32	590.44	594.39	634.47	620.90	594.92	593.46	1,809.74	1,482.52	1,784.18	862.75	1,541.31
City of Lemoore	LEM_11	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	3,175.77	4,259.05	1,243.12	574.32	590.44	594.39	634.47	620.90	594.92	593.46	661.39	622.93	713.77	506.67	599.20
City of Lemoore	LEM_12	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	473.76	2,597.27	1,461.96	2,834.40	574.32	590.44	594.39	634.47	620.90	594.92	593.46	972.56	873.70	126.17	543.30	535.47
City of Lemoore	LEM_13	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	853.49	1,279.86	1,636.77	862.22	1,445.57
City of Lemoore	LEM_14	290.78	282.54	299.17	316.07	337.92	333.04	390.89	392.77	339.74	309.35	261.46	215.75	178.77	233.66	284.18	574.32	590.44	594.39	634.47	620.90	594.92	593.46	841.73	460.35	1,056.74	709.06	799.97
Apex Ranch	APEX_RW-1	--	--	--	--	--	--	--	--	--	--	--	--	0	105.2	182.4	0	1387.8	1263.8	1087	1535.4	1269	0	1808.8	994	59.6	0	0
Apex Ranch	APEX_RW-2	--	--	--	--	--	--	--	--	--	--	--	--	0	105.2	182.4	0	1387.8	1263.8	1087	1535.4	1269	0	1808.8	994	59.6	0	0
Apex Ranch	APEX_RW-3	--	--	--	--	--	--	--	--	--	--	--	--	0	105.2	182.4	0	1387.8	1263.8	1087	1535.4	1269	0	1808.8	994	59.6	0	0
Apex Ranch	APEX_RW-4	--	--	--	--	--	--	--	--	--	--	--	--	0	105.2	182.4	0	1387.8	1263.8	1087	1535.4	1269	0	1808.8	994	59.6	0	0
Apex Ranch	APEX_RW-5	--	--	--	--	--	--	--	--	--	--	--	--	0	105.2	182.4	0	1387.8	1263.8	1087	1535.4	1269	0	1808.8	994	59.6	0	0

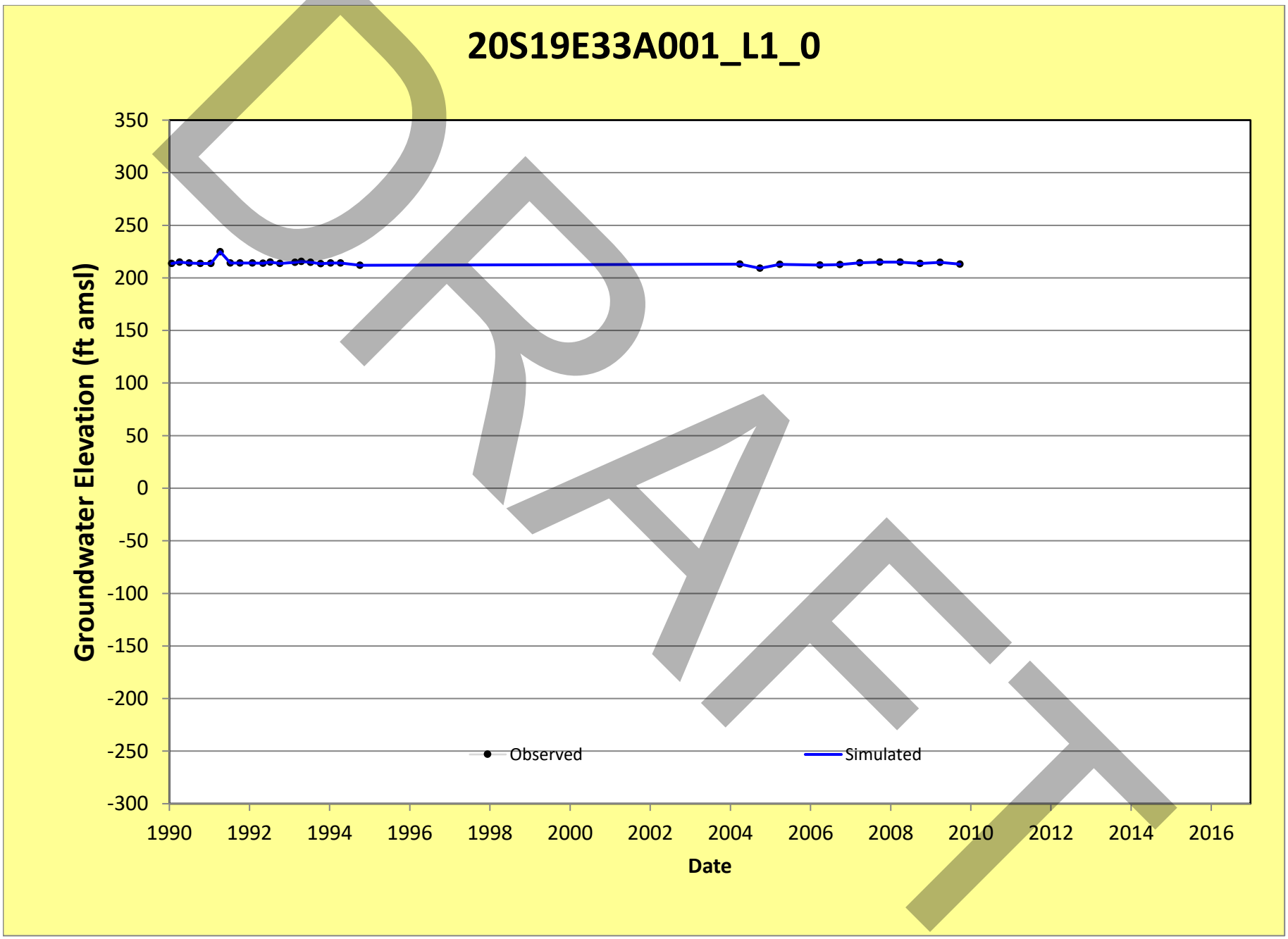
Appendix D5
Observed and Simulated Calibration Target Well Hydrographs

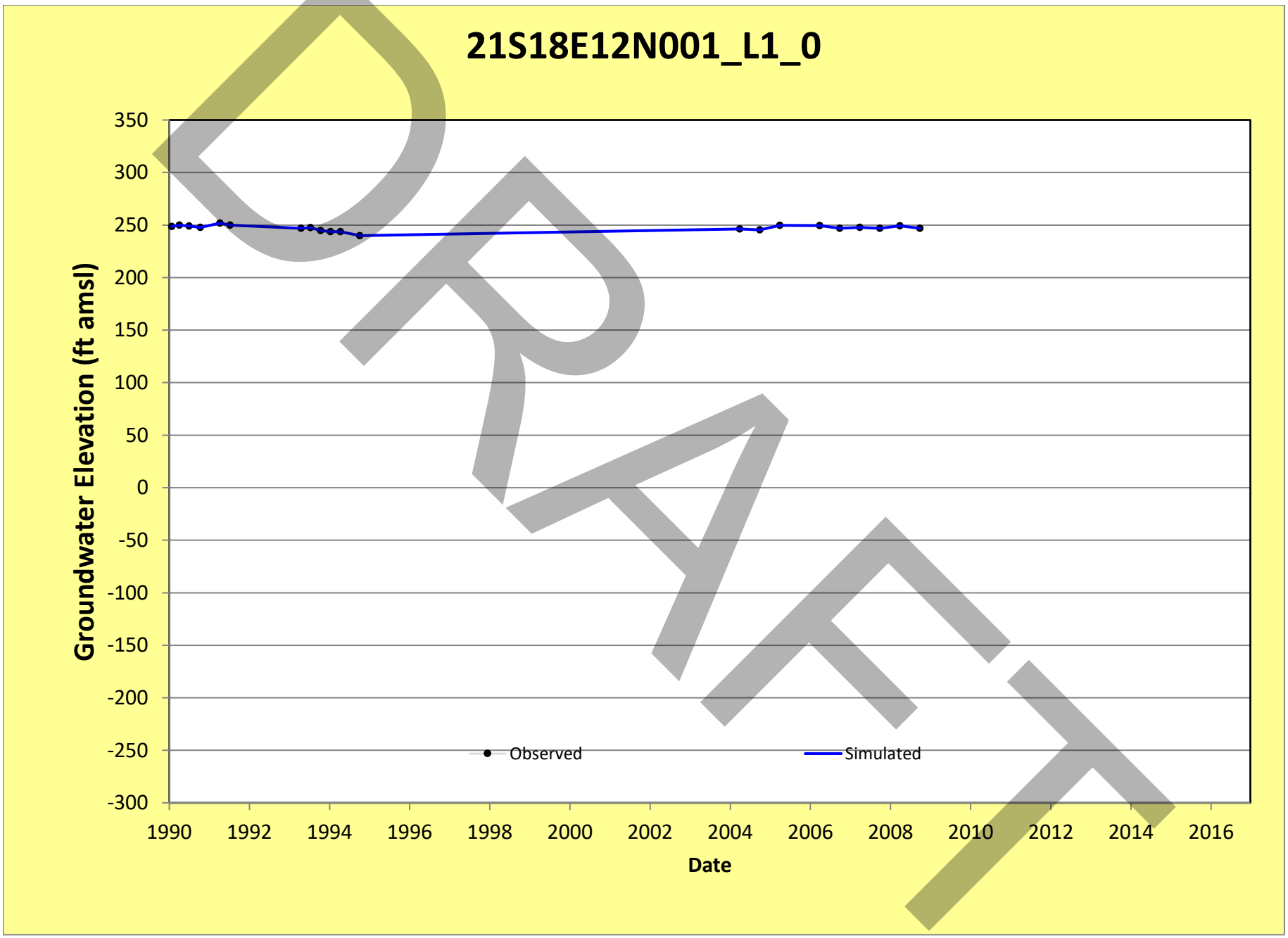
DRAFT

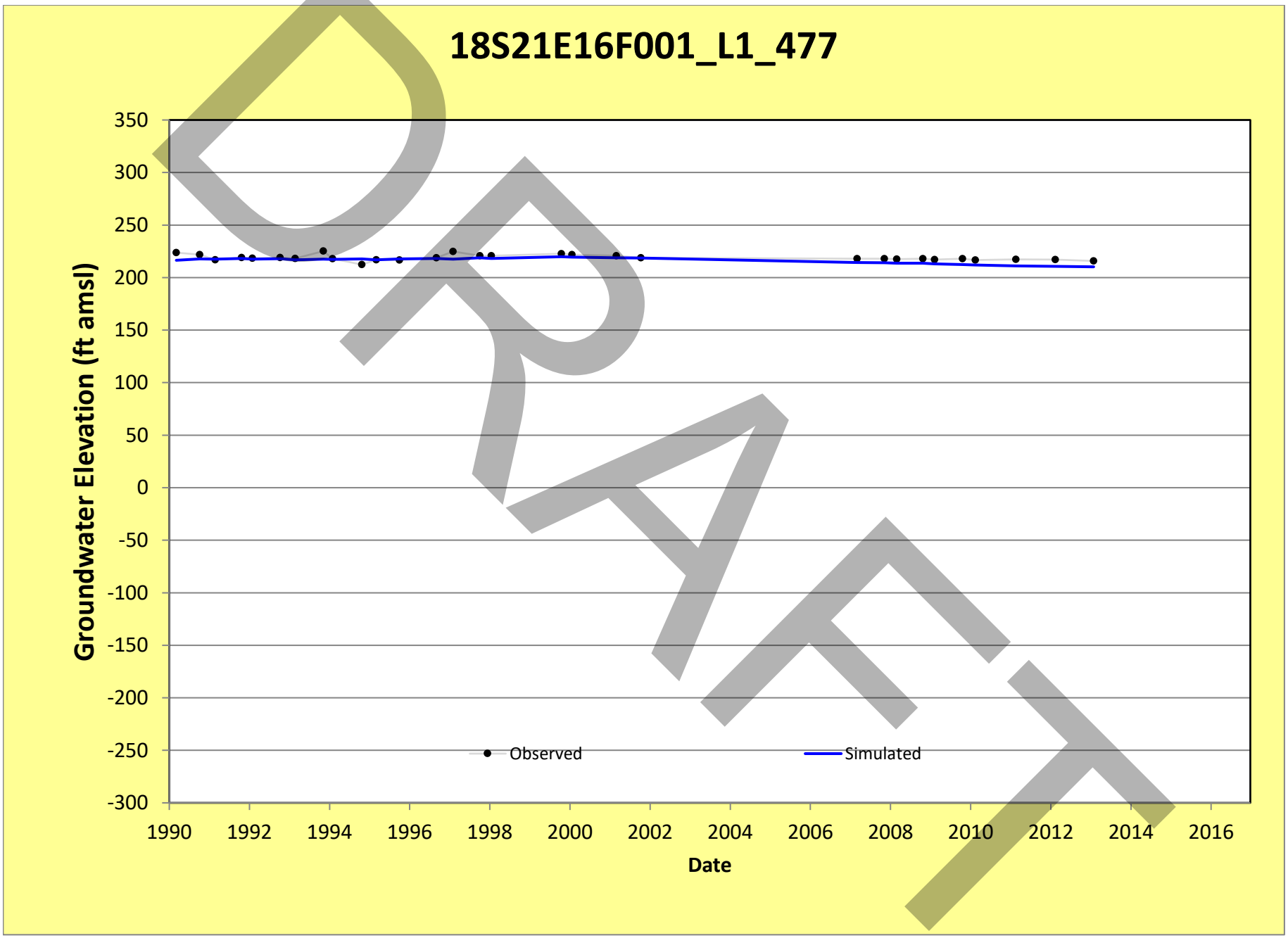

17S22E30A001_L2_4885
State Well Name
Model Layer
Normalized Root Mean Squared Error
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated

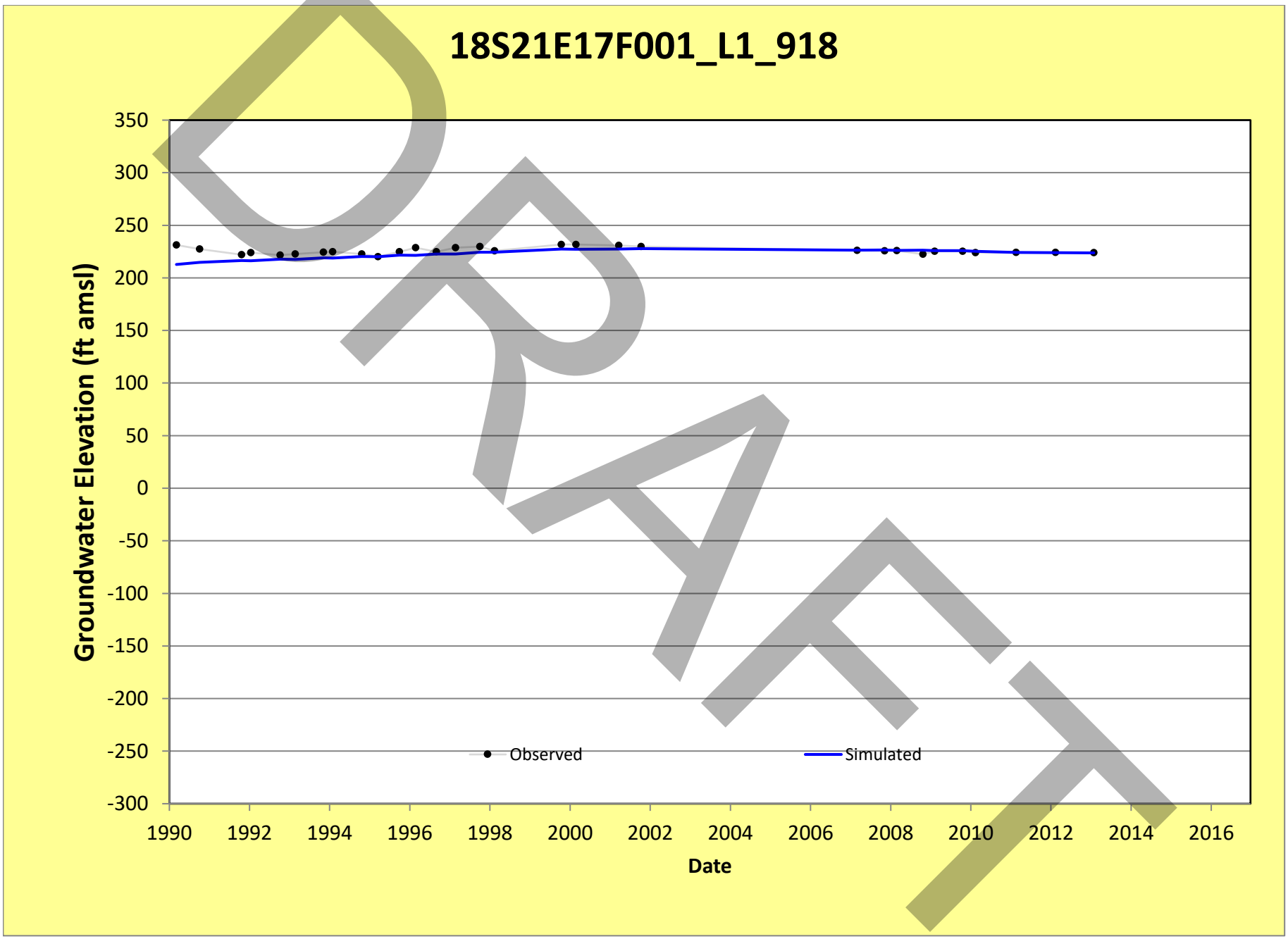
DRAFT

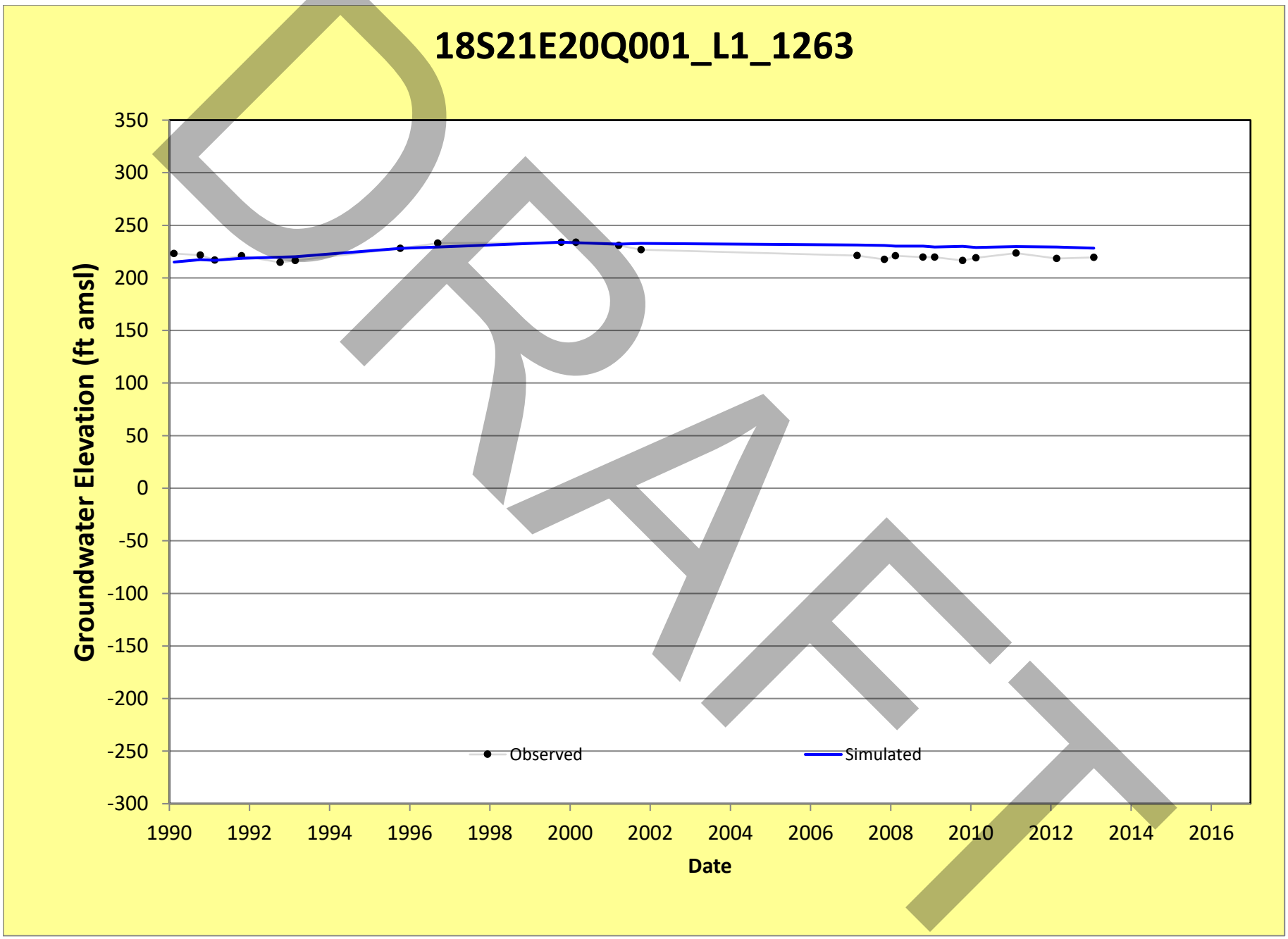

19S23E12L001_L1_0
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT

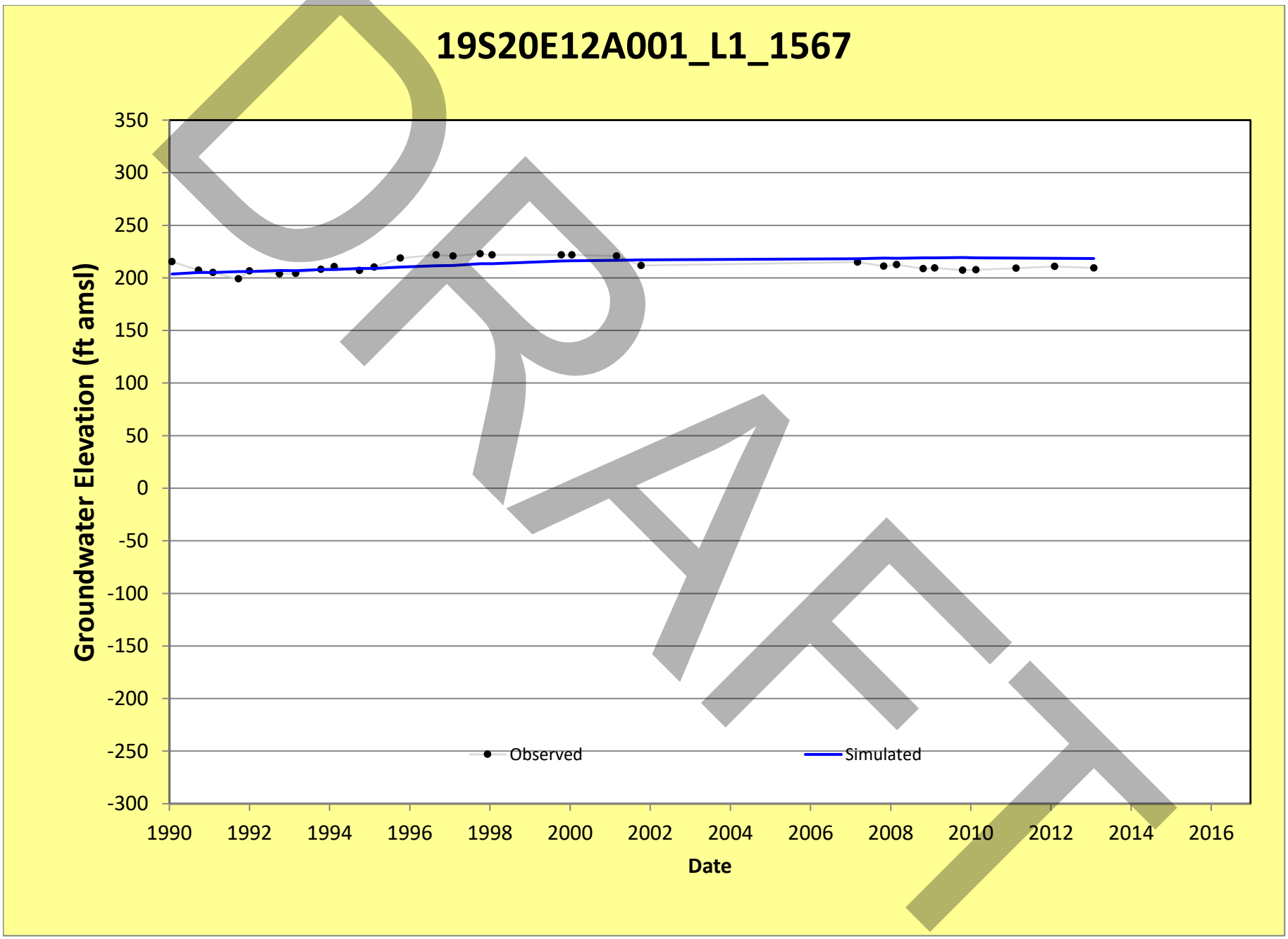

20S19E33A001_L1_0
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT

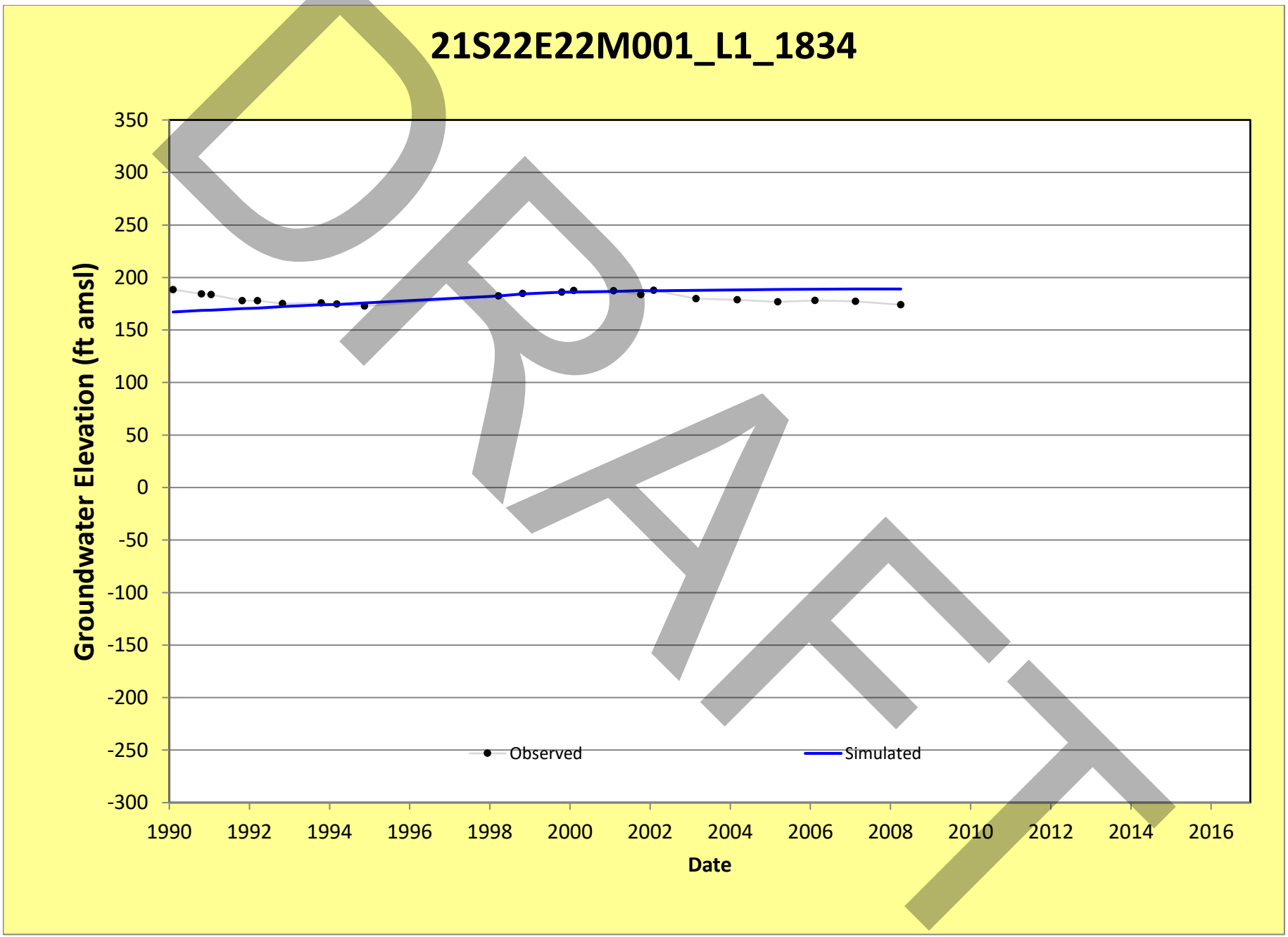

21S18E12N001_L1_0
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT

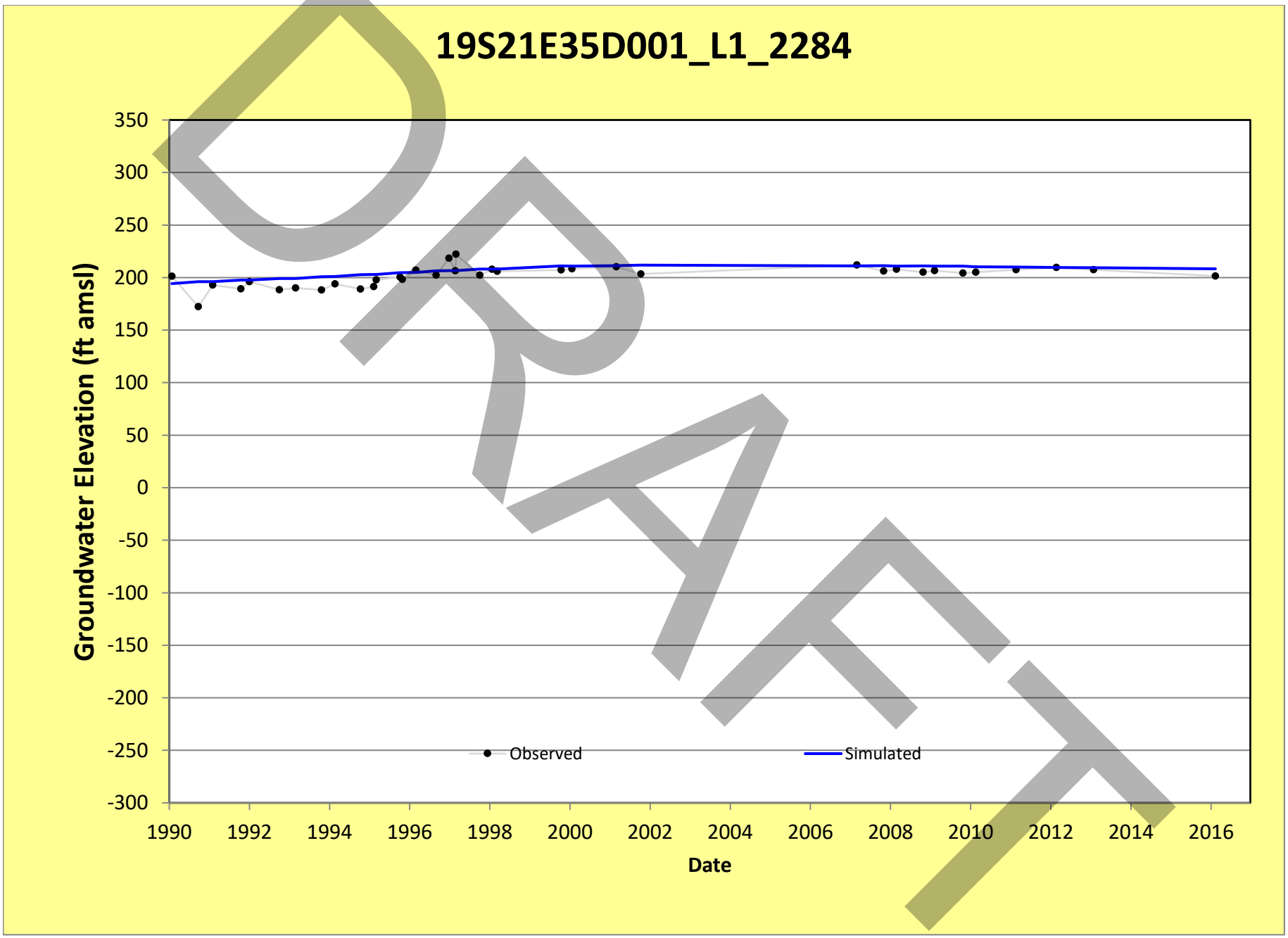

18S21E16F001_L1_477
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT

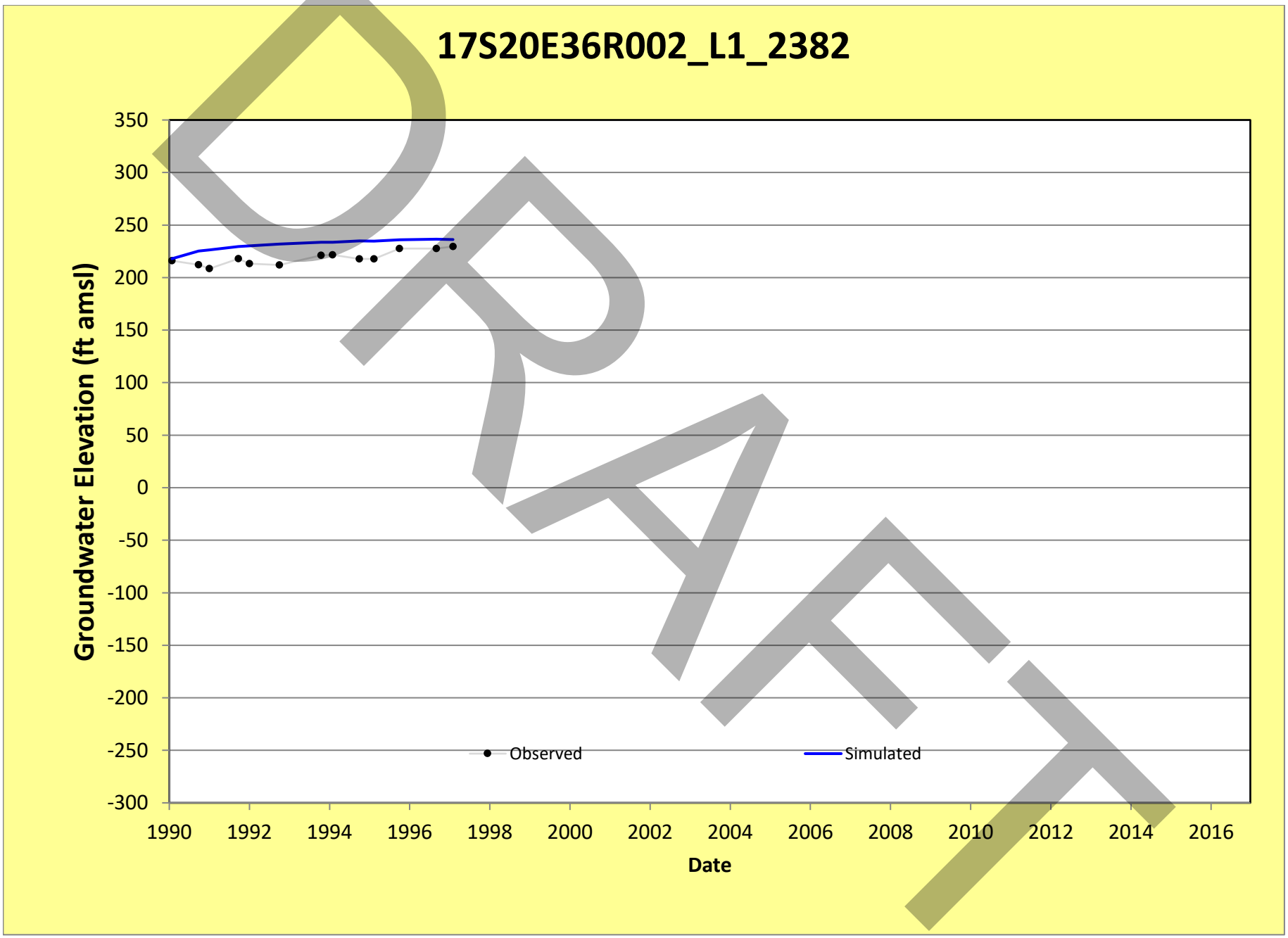

18S21E17F001_L1_918
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT


18S21E20Q001_L1_1263
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT


19S20E12A001_L1_1567
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT


21S22E22M001_L1_1834
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT


19S21E35D001_L1_2284
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Date
Observed
Simulated
DRAFT


17S20E36R002_L1_2382
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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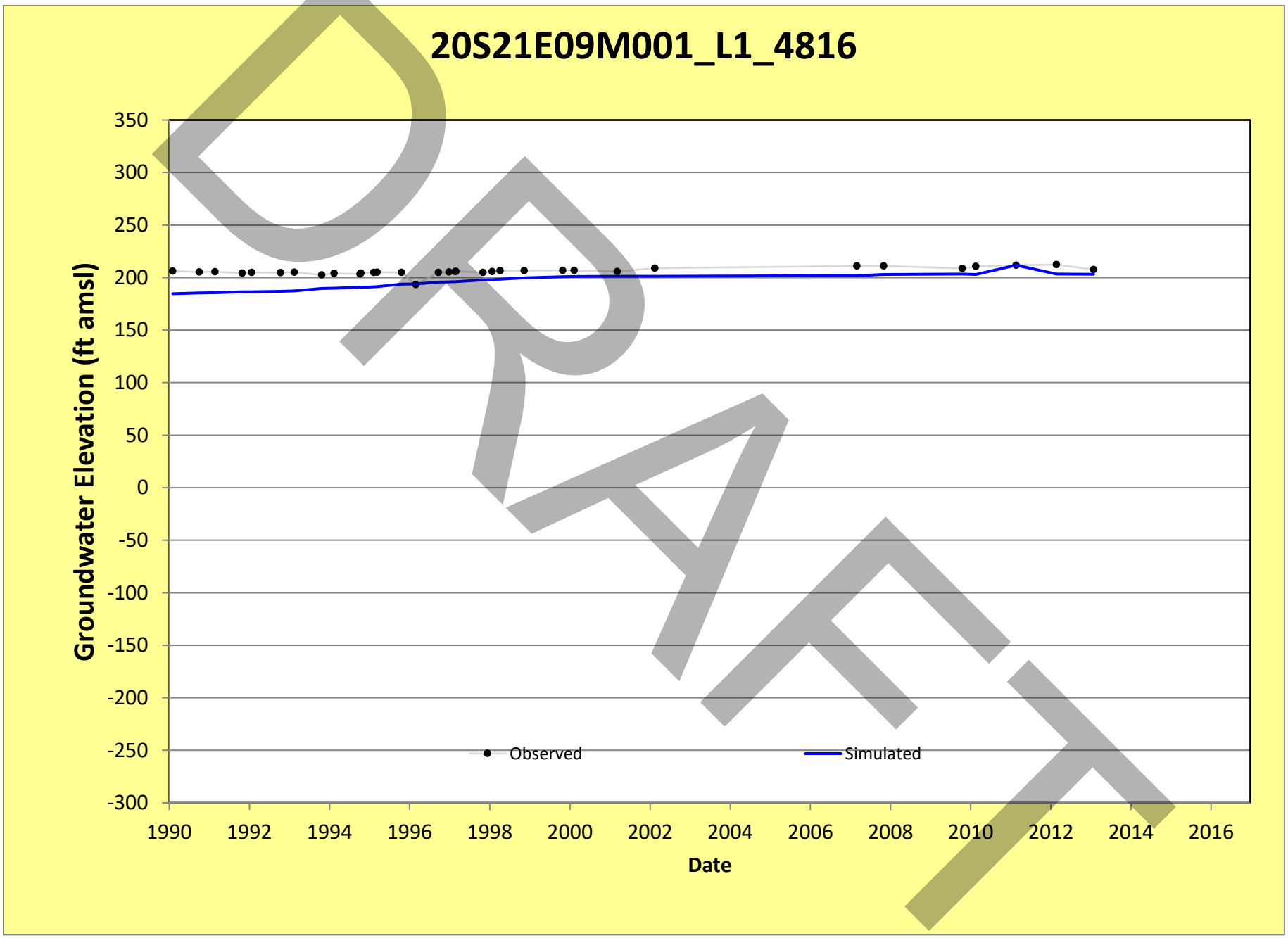
20S21E09M001_L1_4816
Groundwater Elevation (ft amsl)
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250
200
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0
-50
-100
-150
-200
-250
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1990
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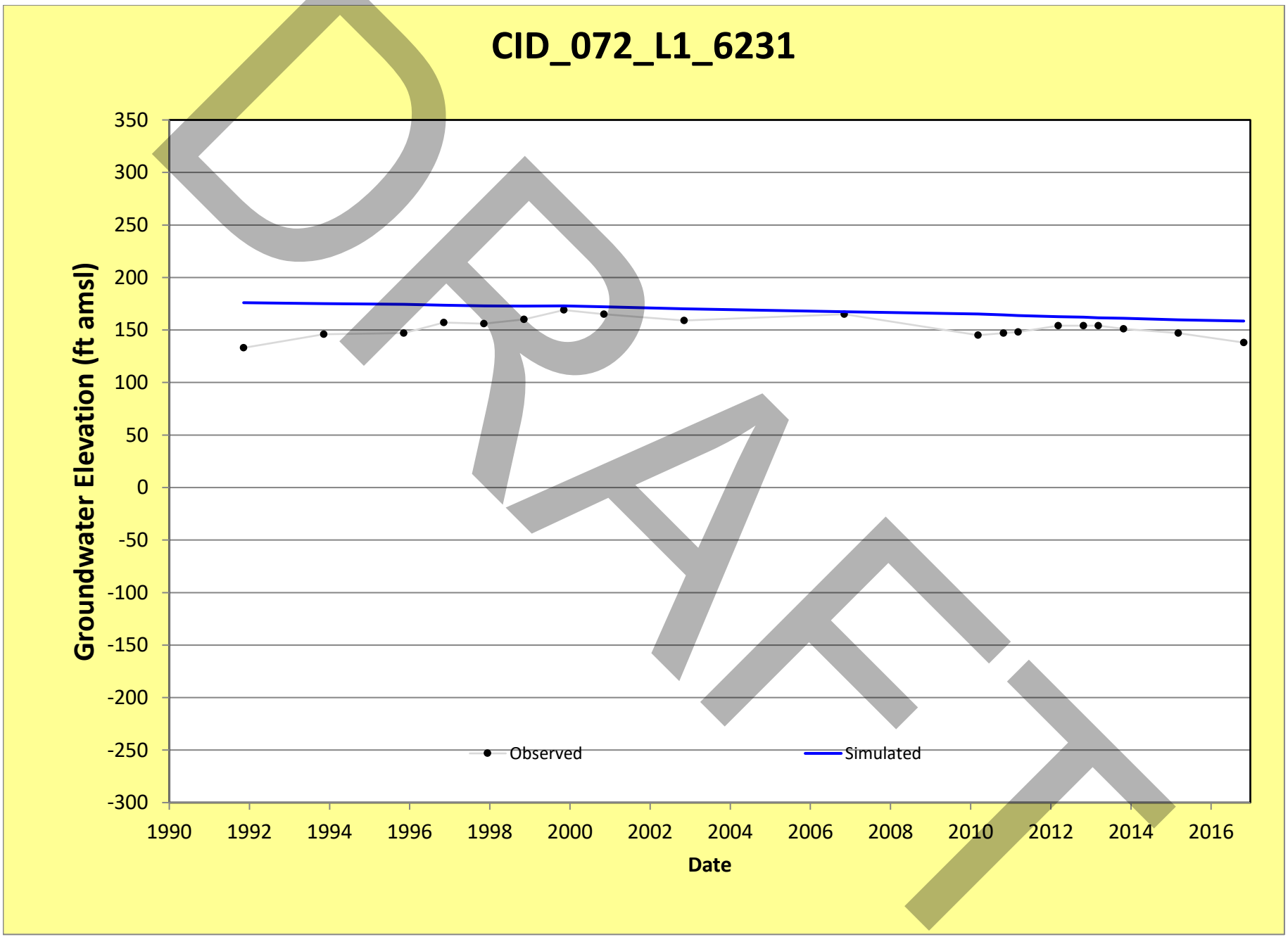
Date
Observed
Simulated
DRAFT


CID_072_L1_6231
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated

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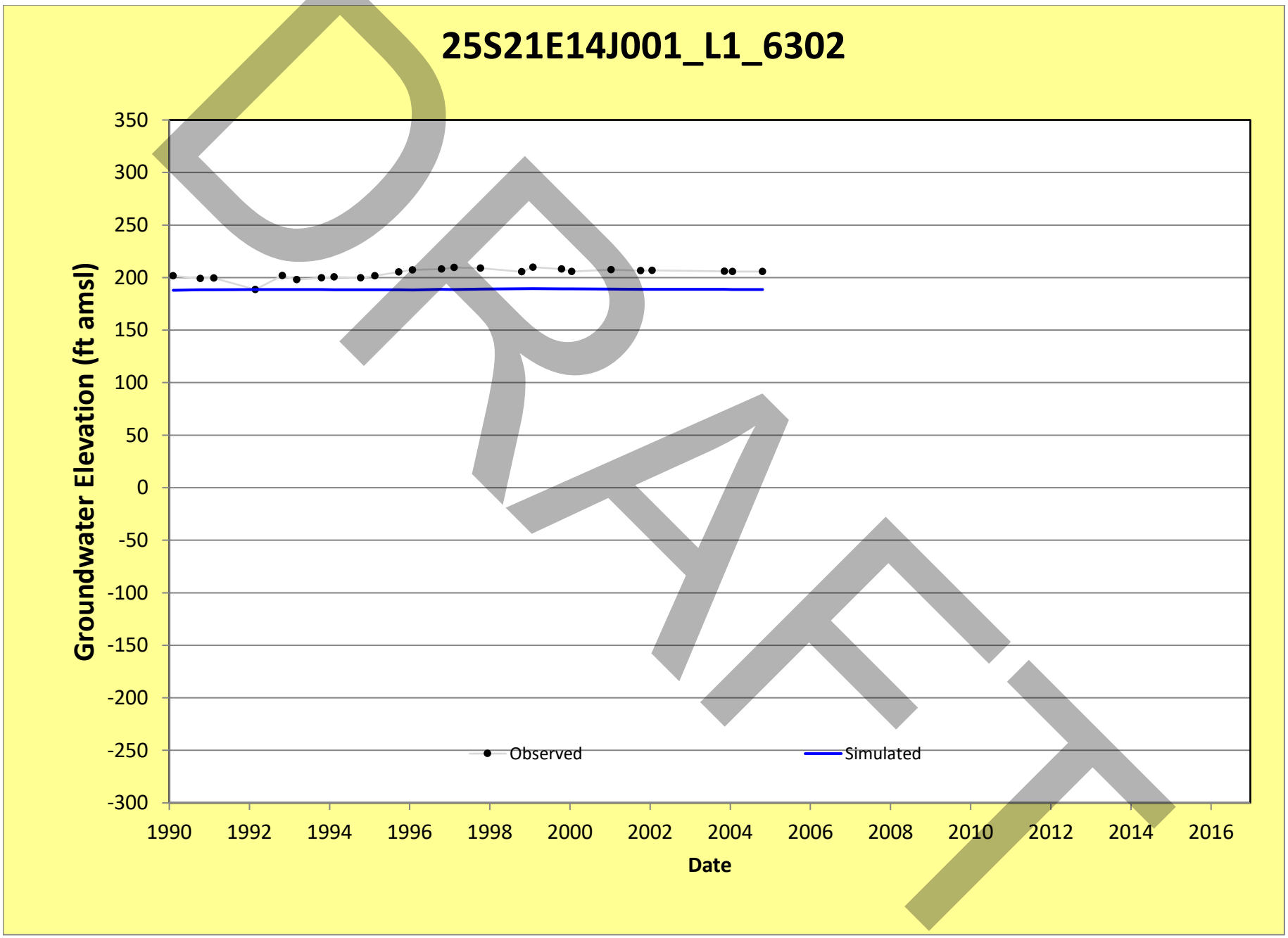
25S21E14J001_L1_6302
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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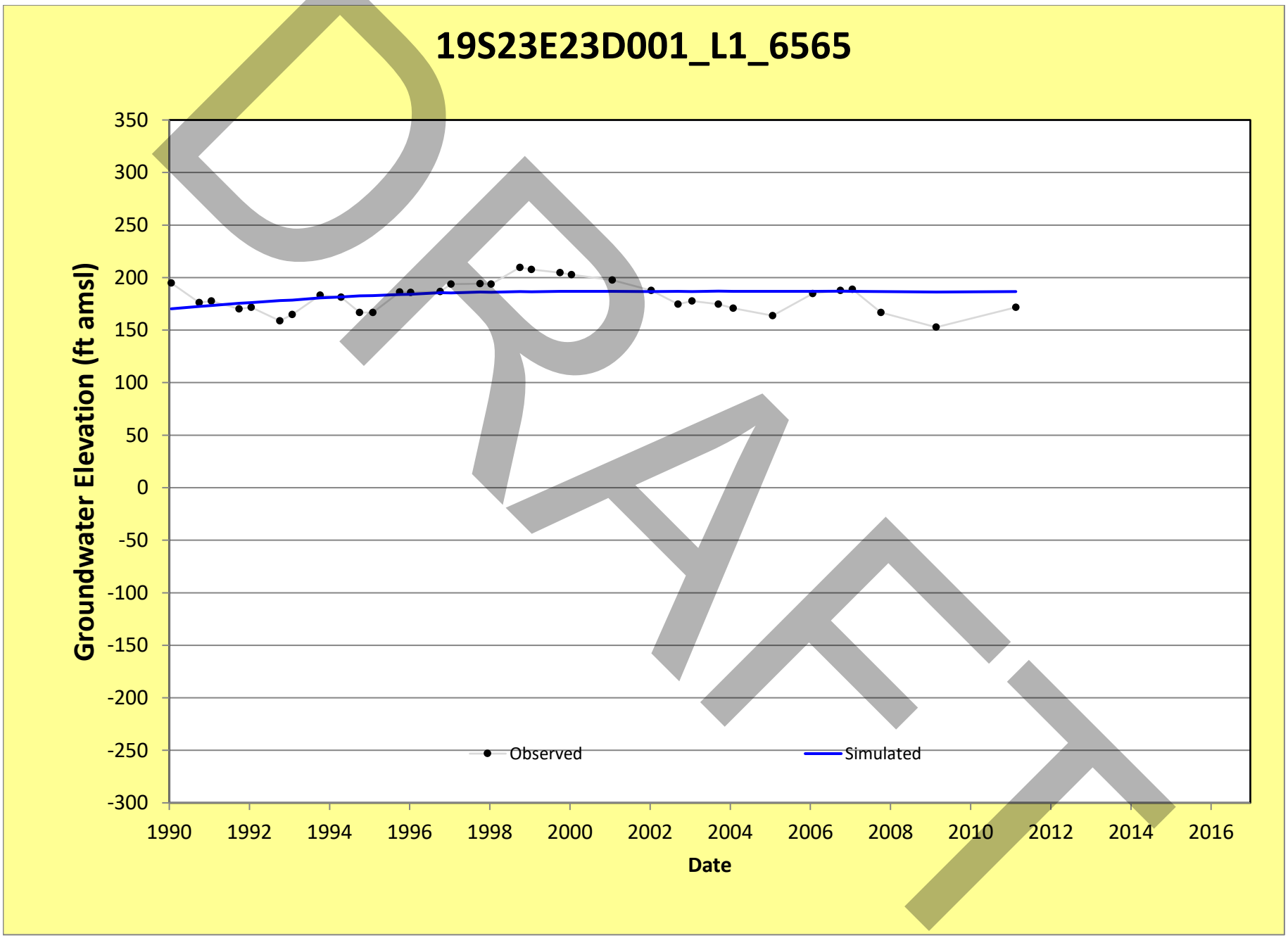
Date
Observed
Simulated
DRAFT


19S23E23D001_L1_6565
Groundwater Elevation (ft amsl)
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300
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200
150
100
50
0
-50
-100
-150
-200
-250
-300
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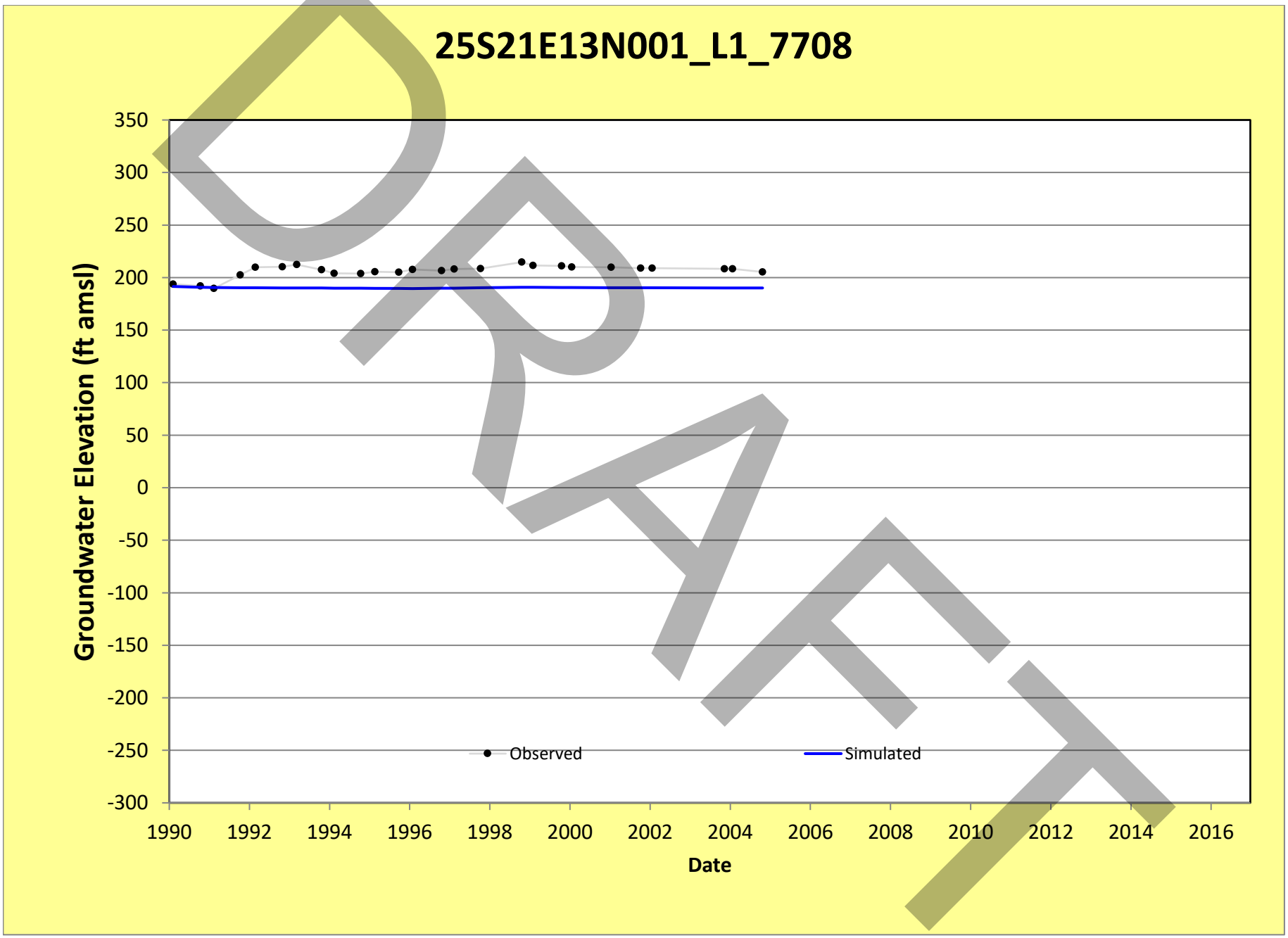
Date
Observed
Simulated
DRAFT


25S21E13N001_L1_7708
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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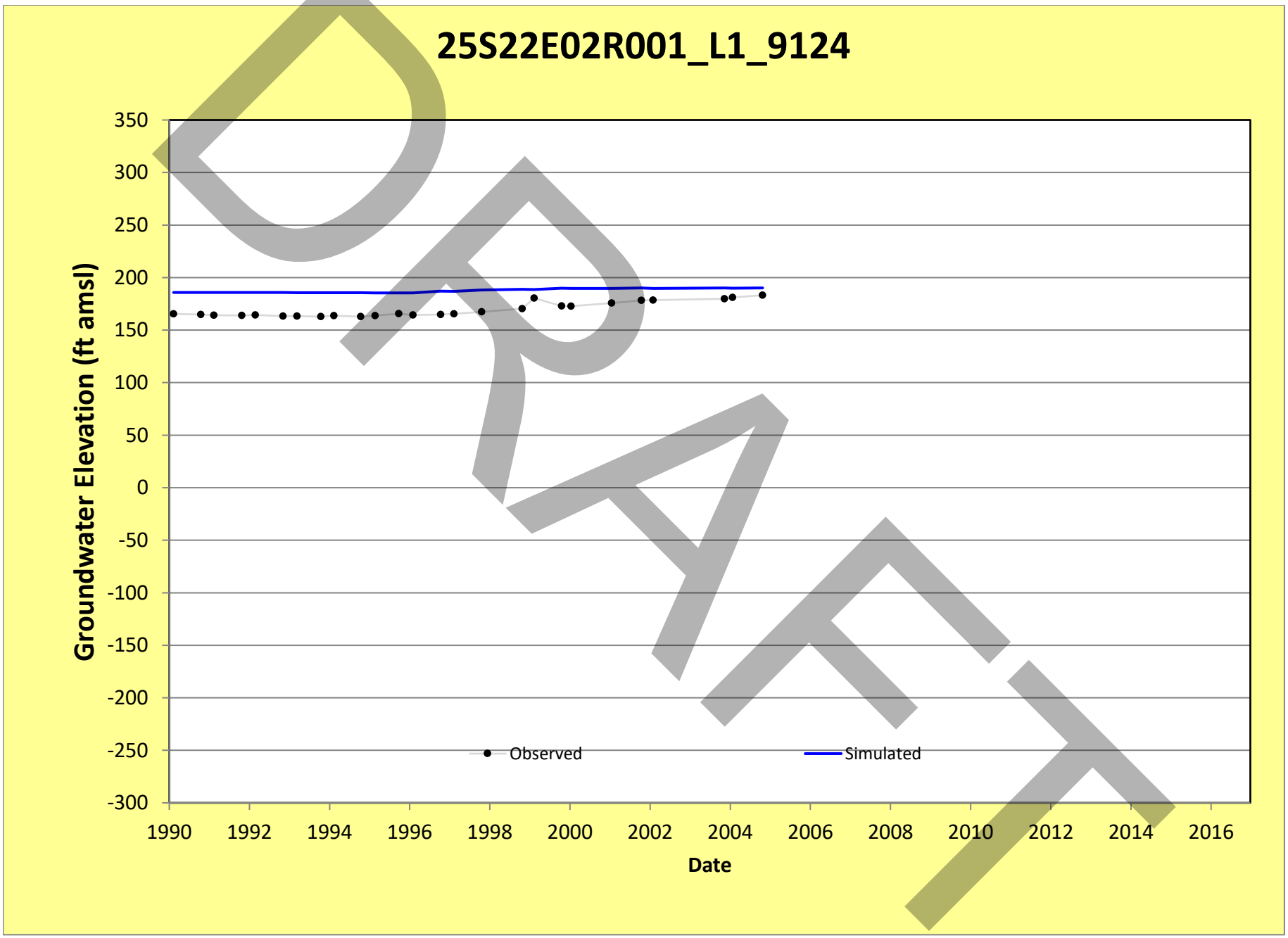
Date
Observed
Simulated
DRAFT


25S22E02R001_L1_9124
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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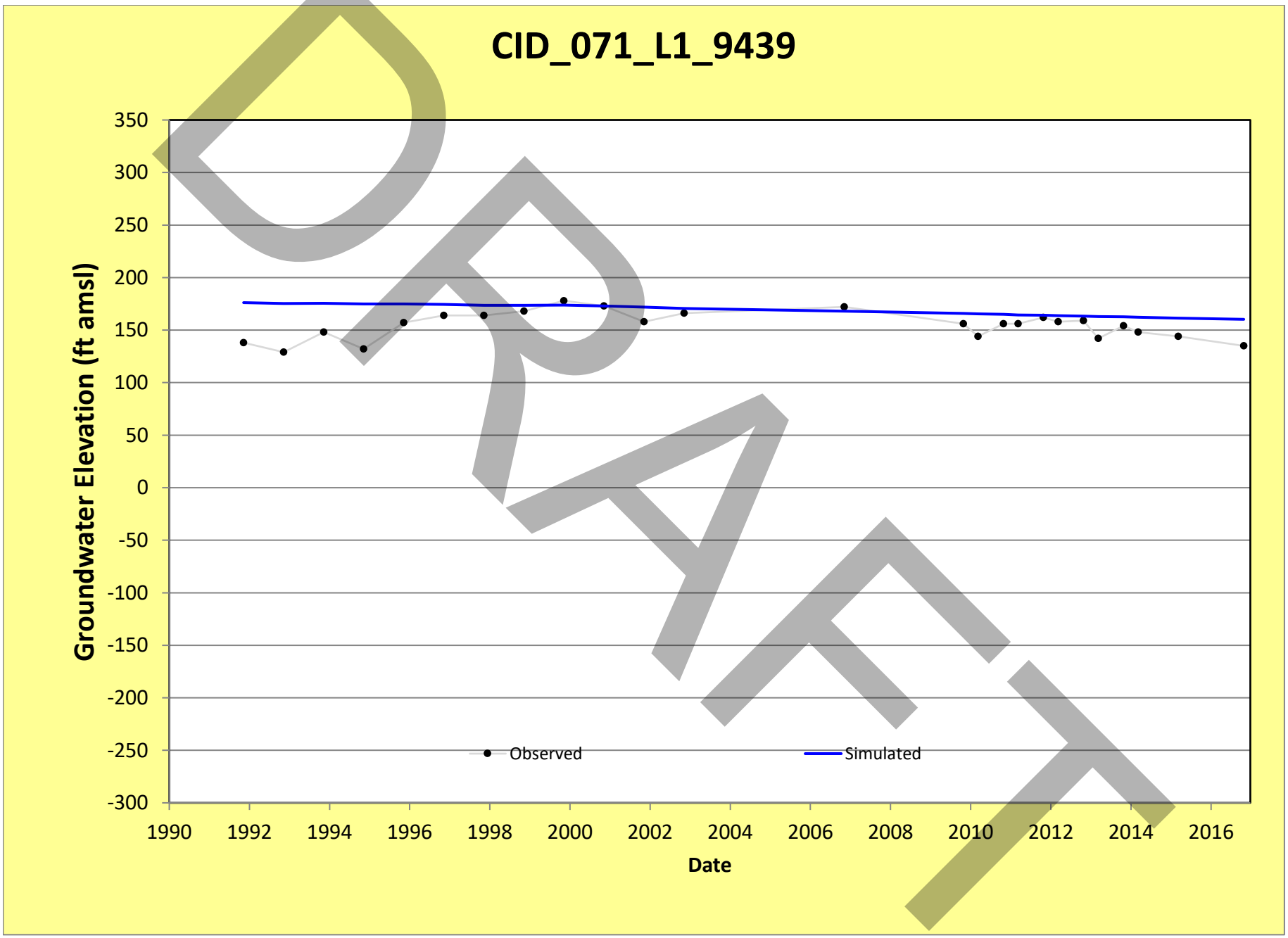
Date
Observed
Simulated
DRAFT


CID_071_L1_9439
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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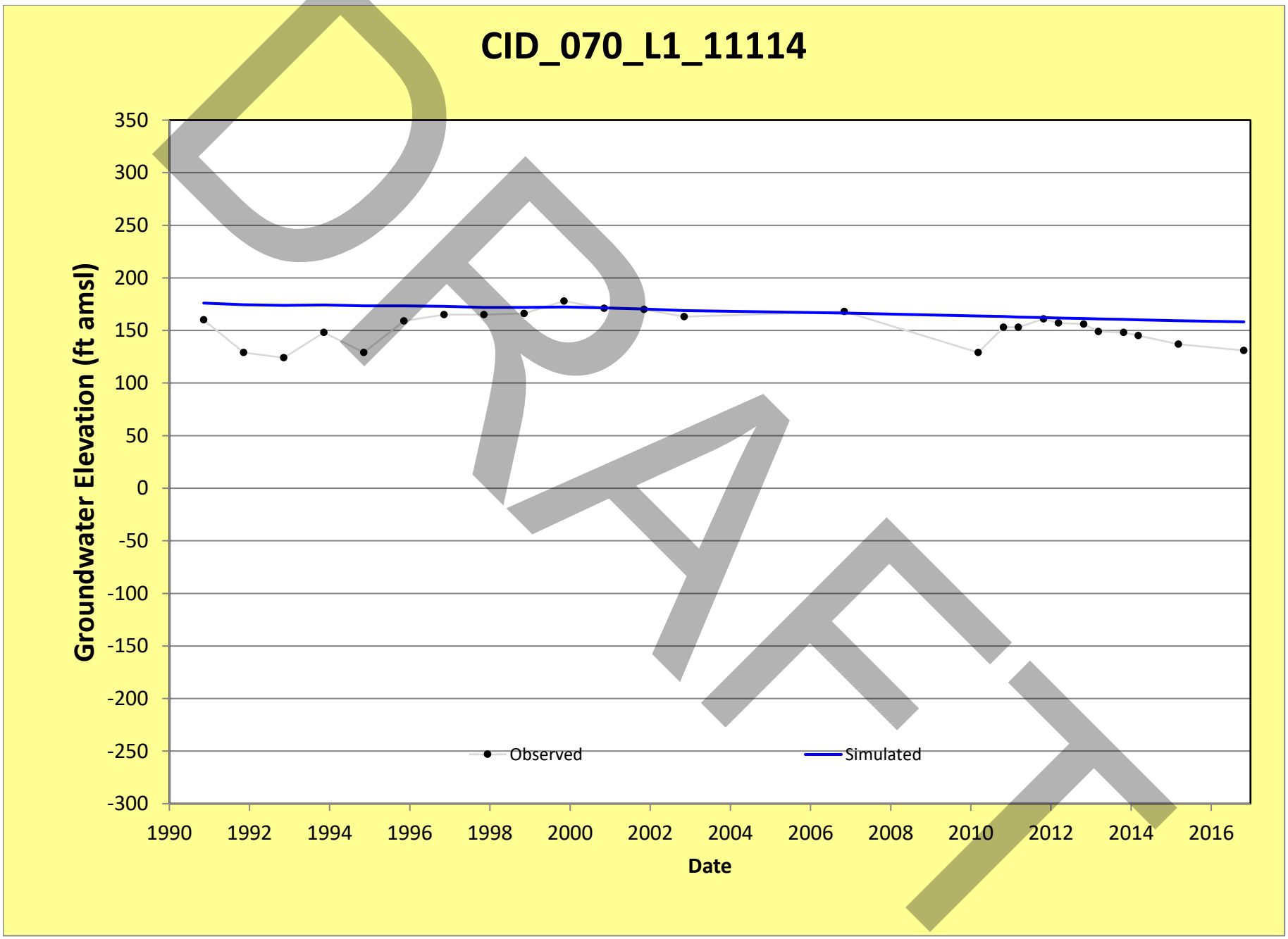
Date
Observed
Simulated
DRAFT


CID_070_L1_11114
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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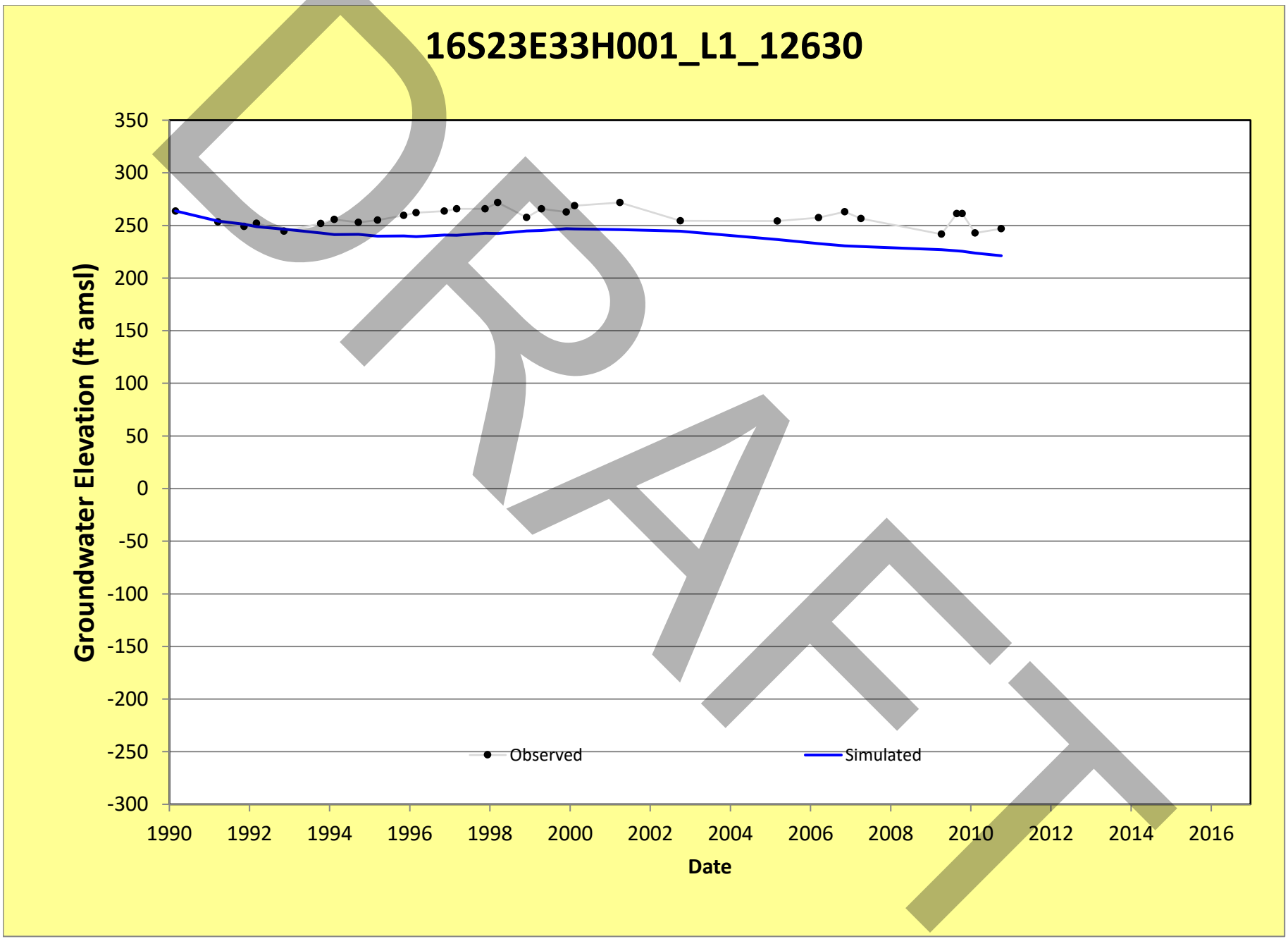
Date
Observed
Simulated
DRAFT


16S23E33H001_L1_12630
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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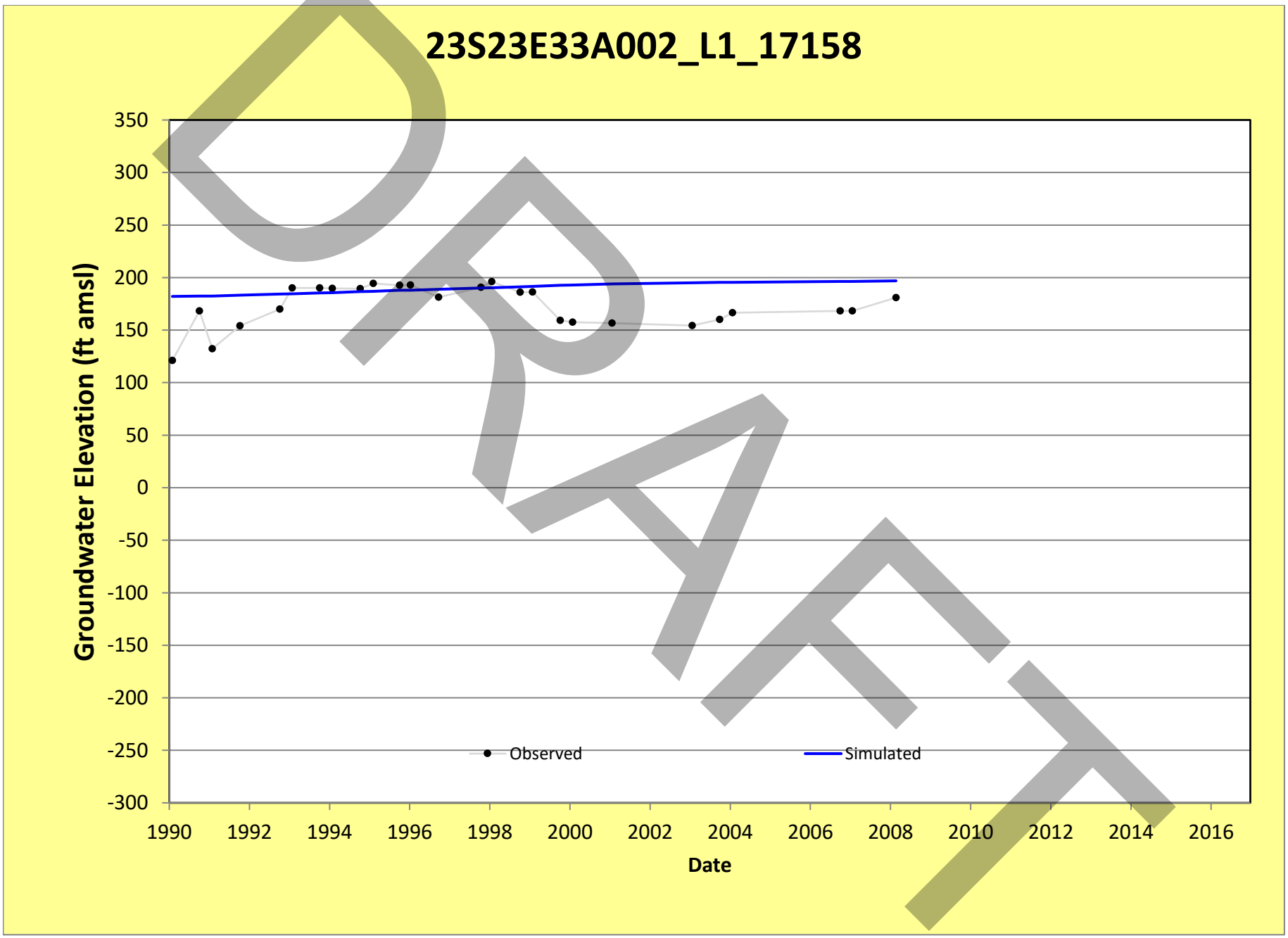
Date
Observed
Simulated
DRAFT


23S23E33A002_L1_17158
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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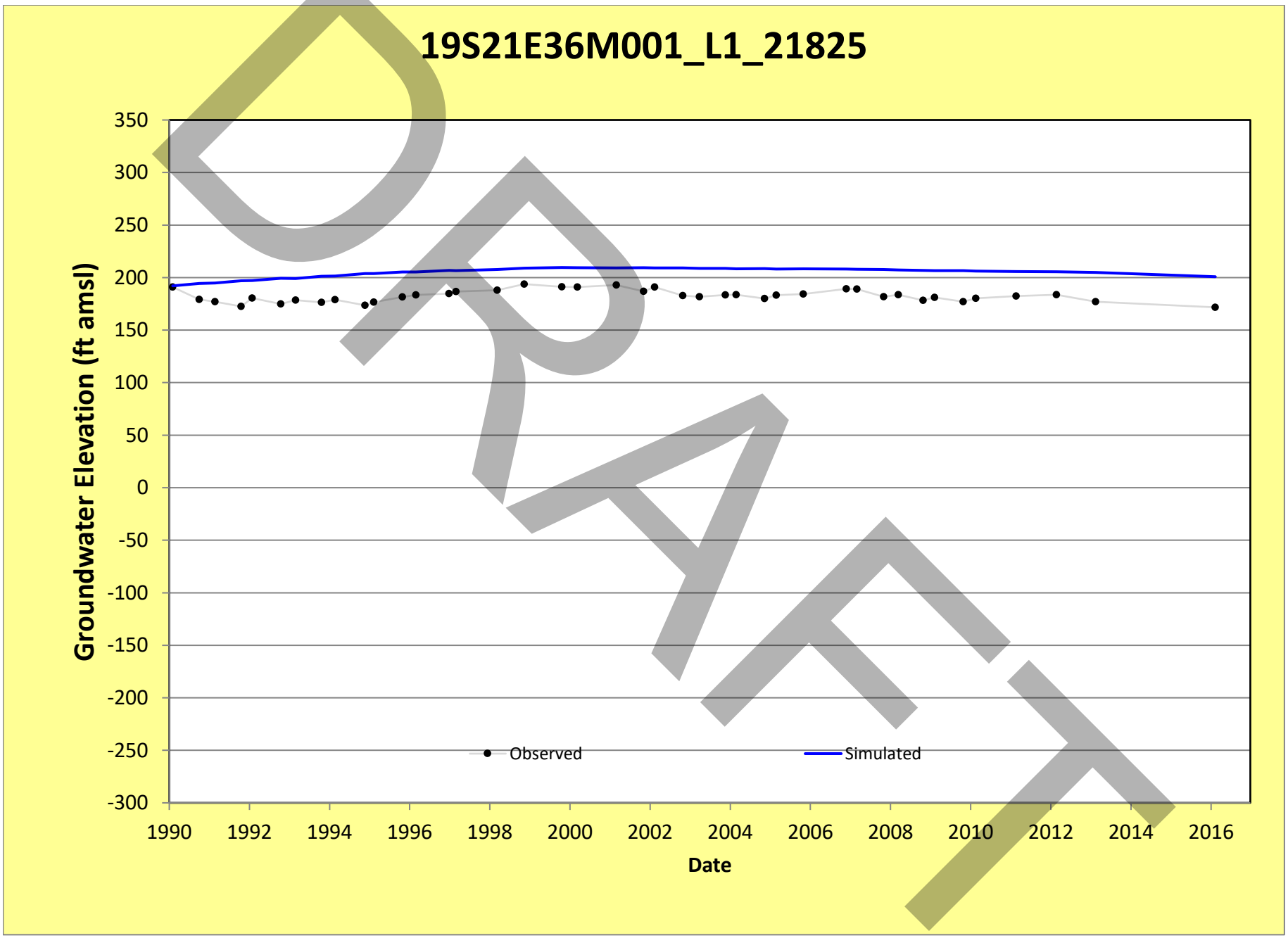
Date
Observed
Simulated
DRAFT


19S21E36M001_L1_21825
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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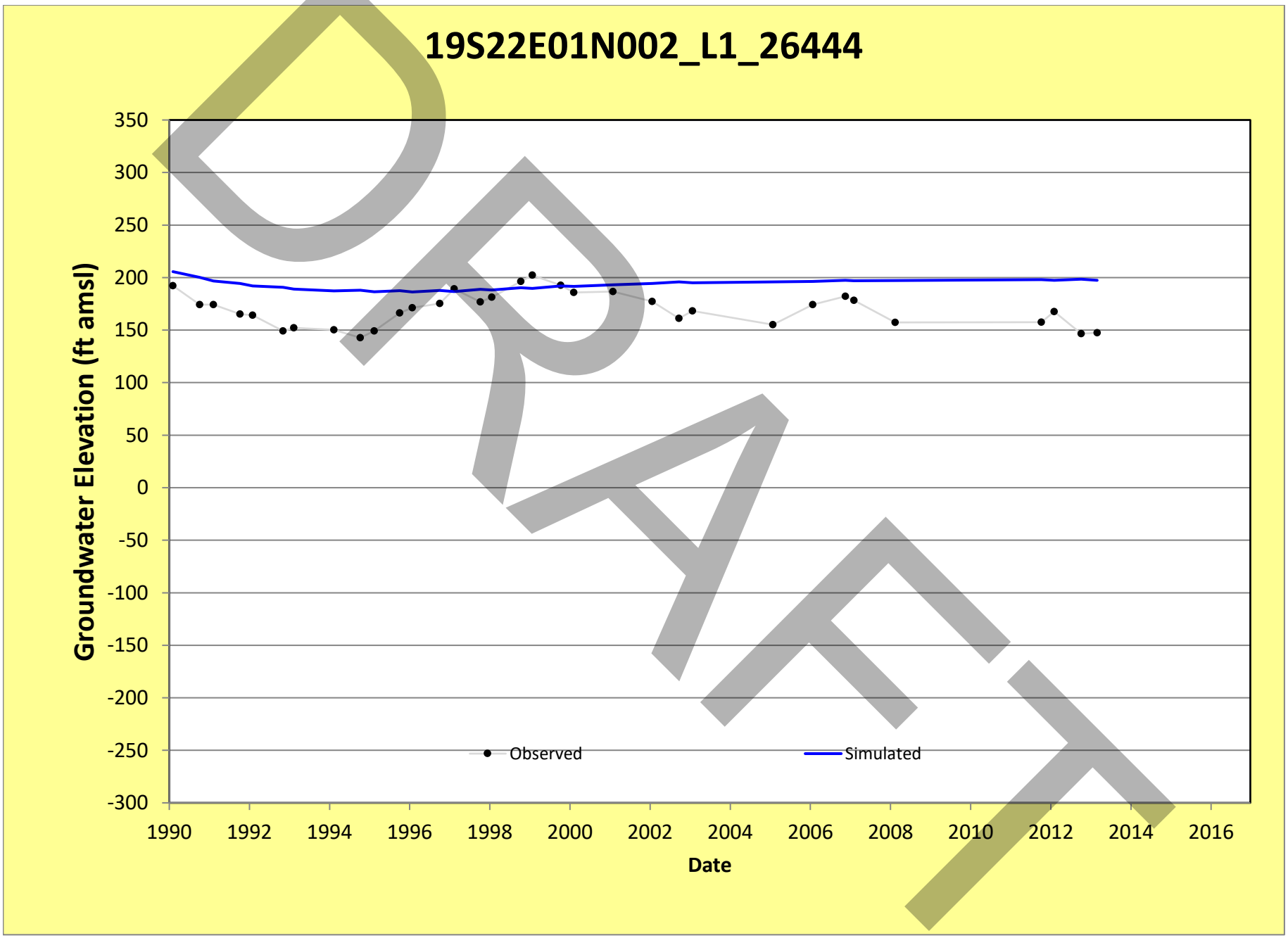
Date
Observed
Simulated
DRAFT


19S22E01N002_L1_26444
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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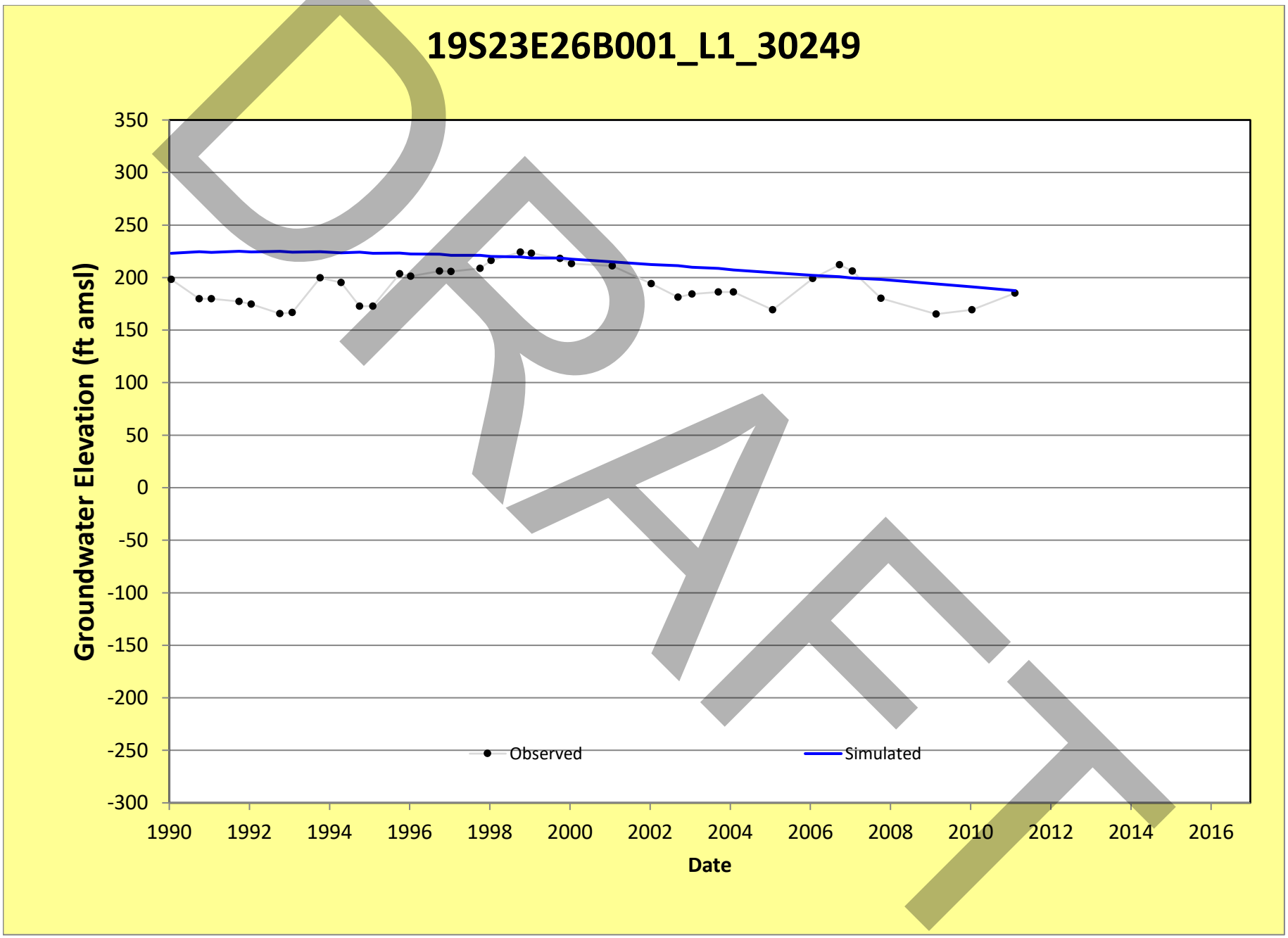
Date
Observed
Simulated
DRAFT


19S23E26B001_L1_30249
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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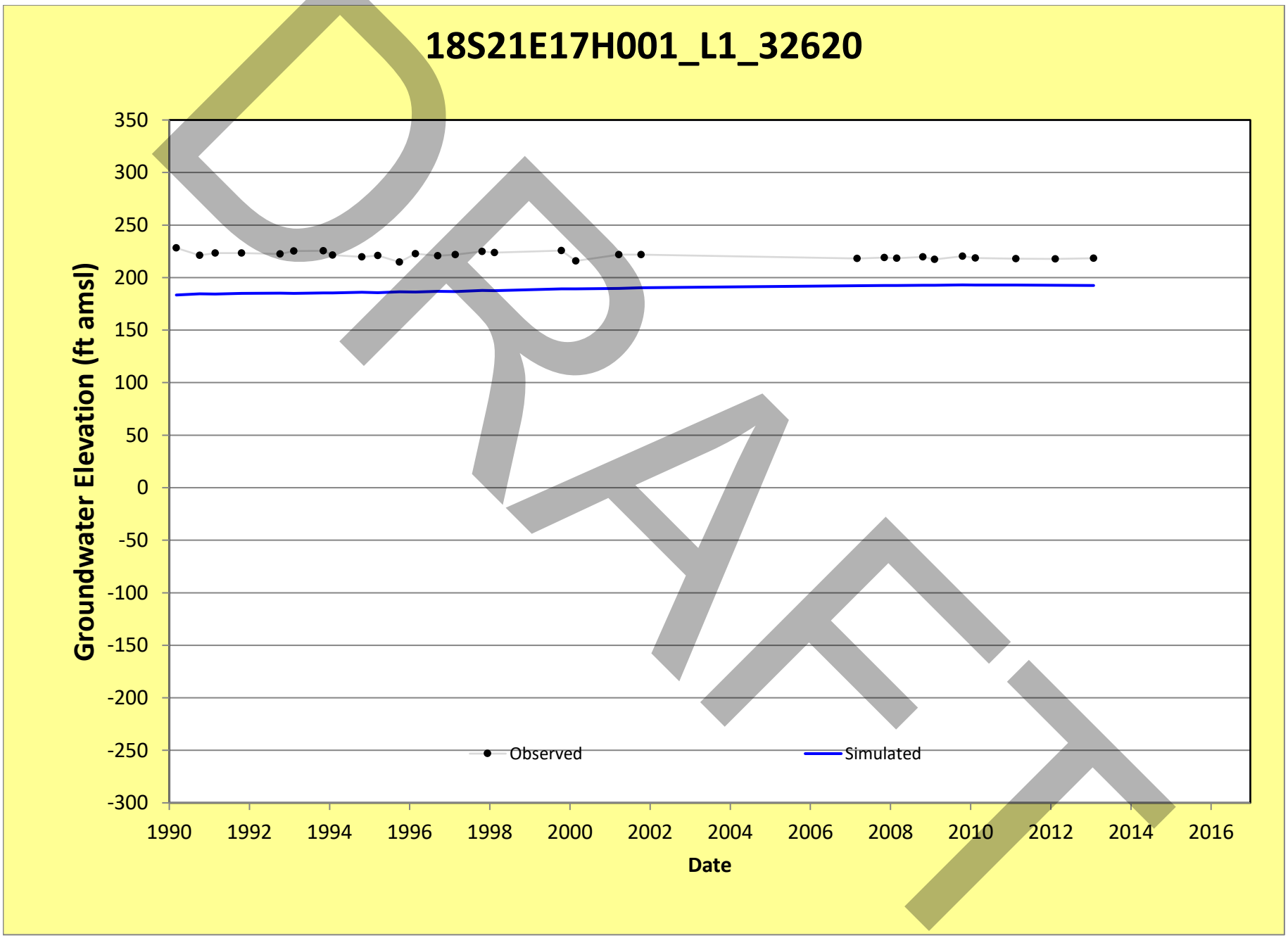
Date
Observed
Simulated
DRAFT


18S21E17H001_L1_32620
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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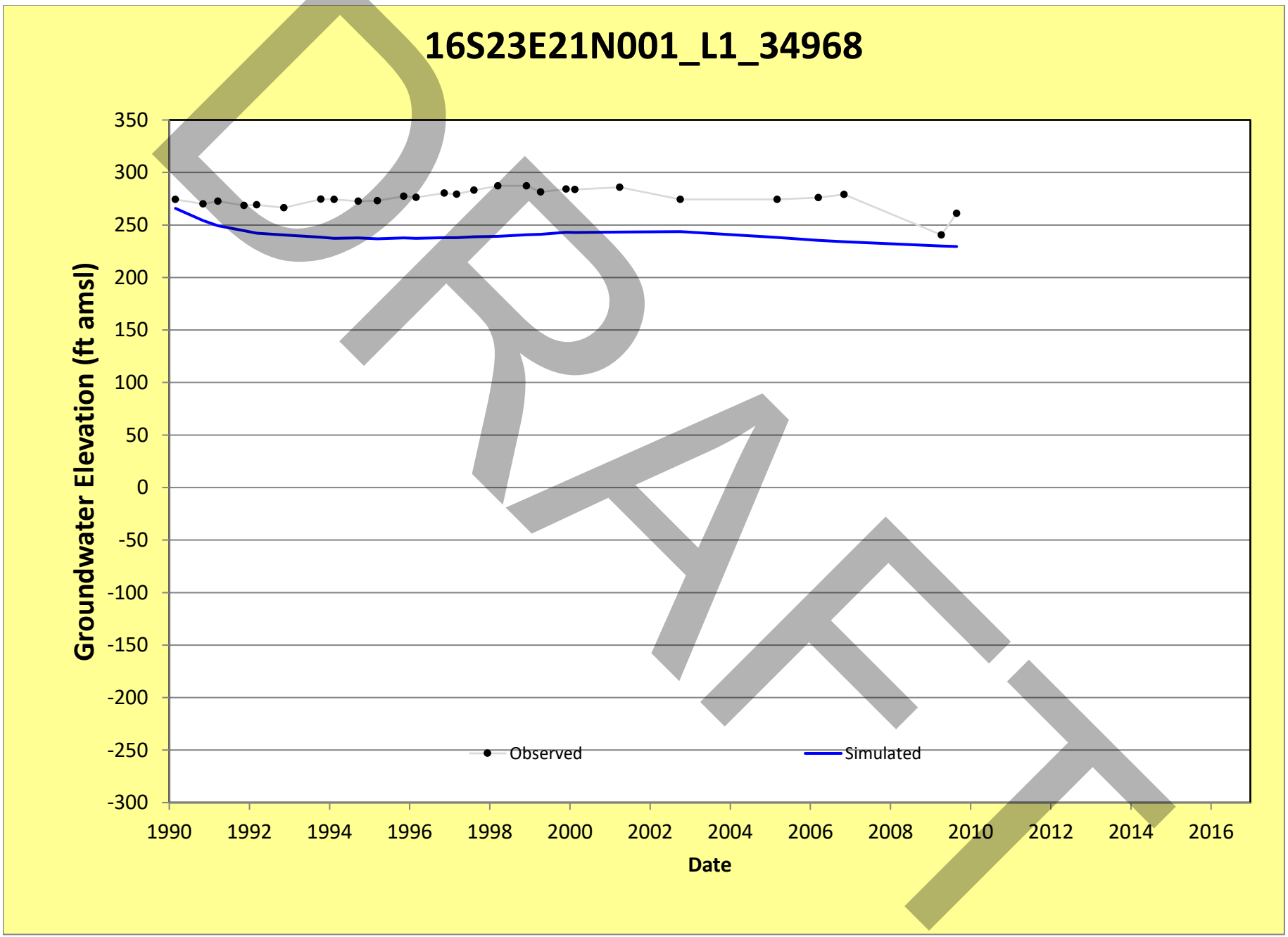
Date
Observed
Simulated
DRAFT


16S23E21N001_L1_34968
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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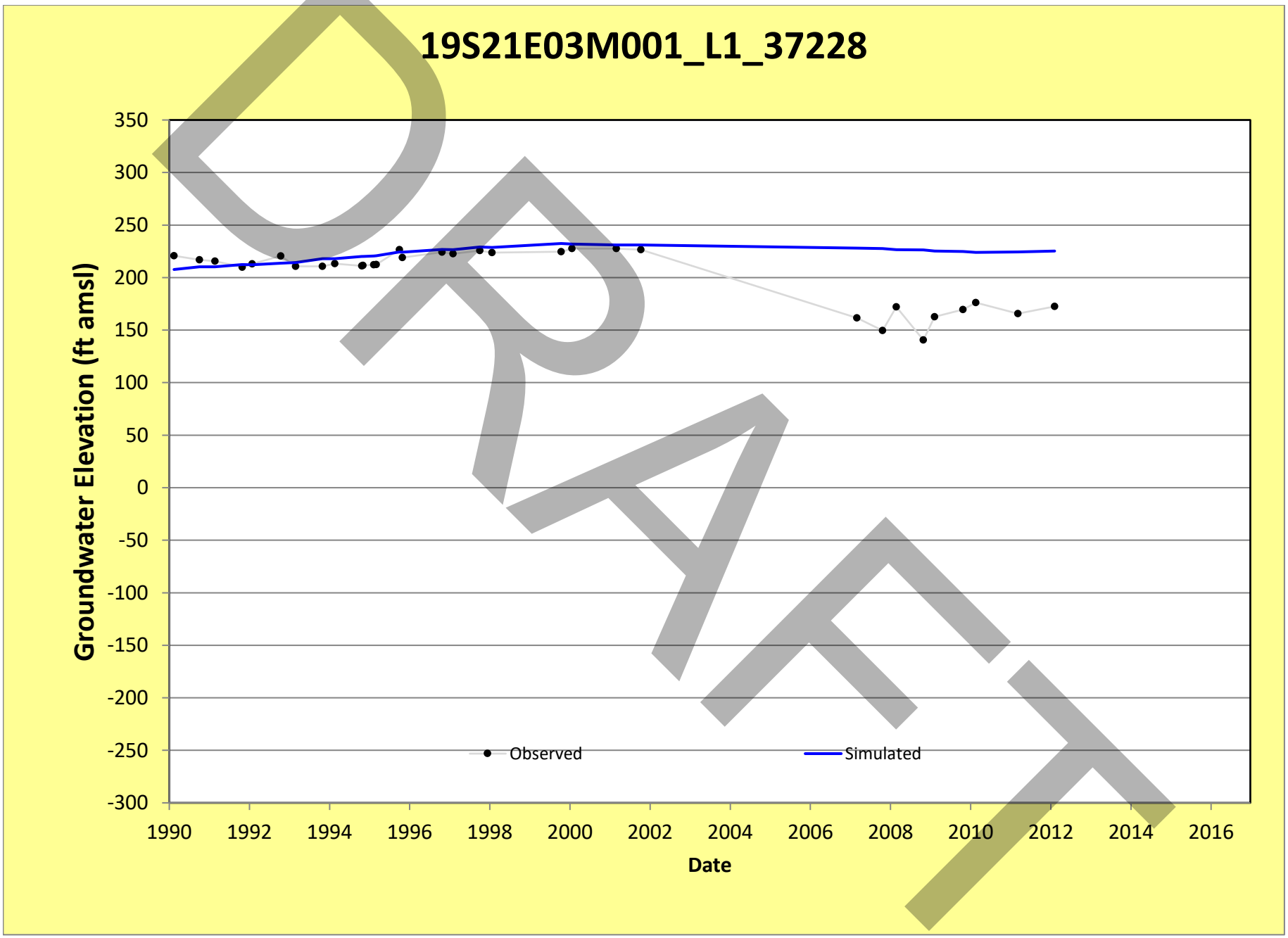
Date
Observed
Simulated
DRAFT


19S21E03M001_L1_37228
Groundwater Elevation (ft amsl)
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250
200
150
100
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0
-50
-100
-150
-200
-250
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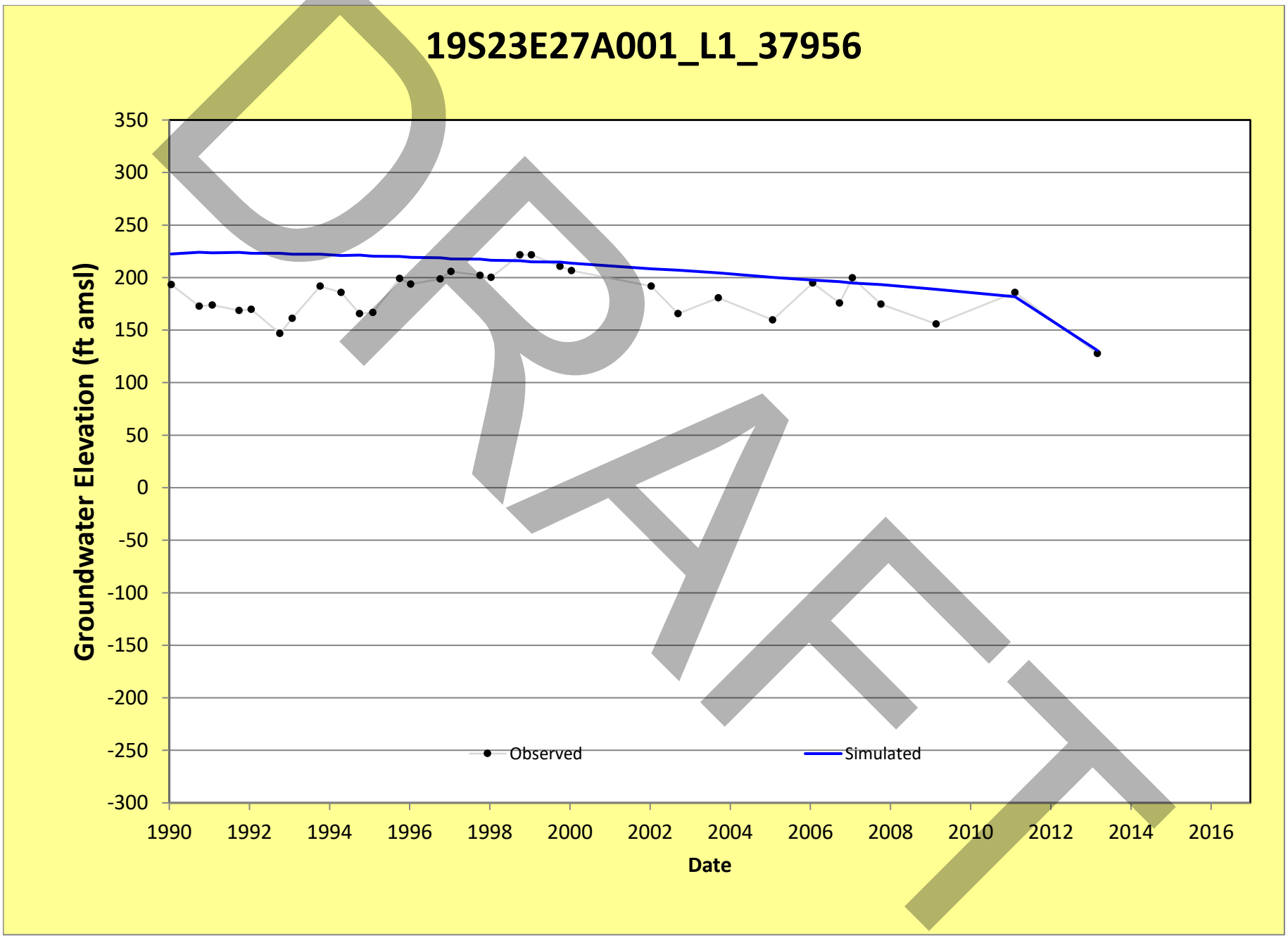
Date
Observed
Simulated
DRAFT


19S23E27A001_L1_37956
Groundwater Elevation (ft amsl)
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200
150
100
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-50
-100
-150
-200
-250
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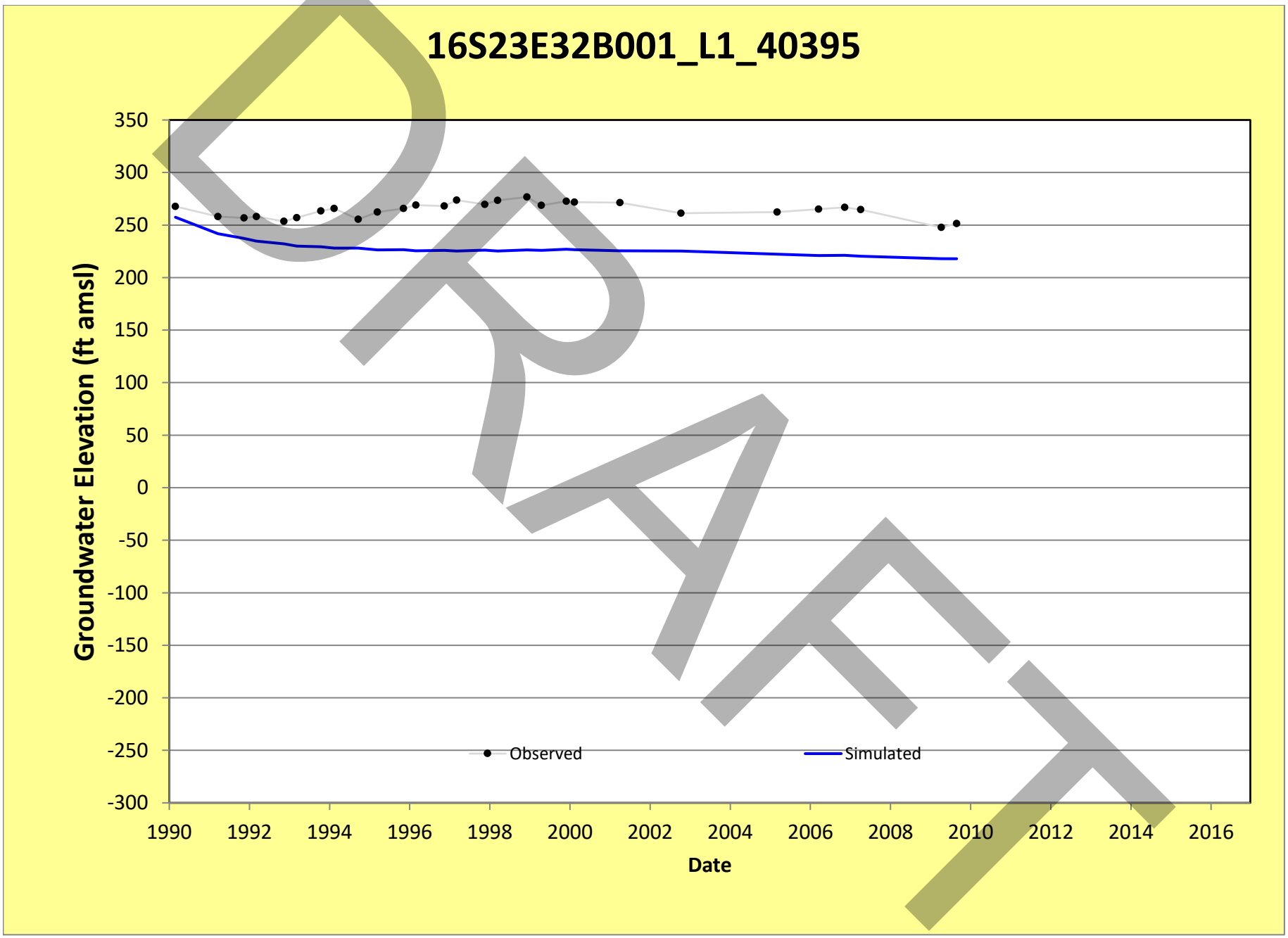
Date
Observed
Simulated
DRAFT


16S23E32B001_L1_40395
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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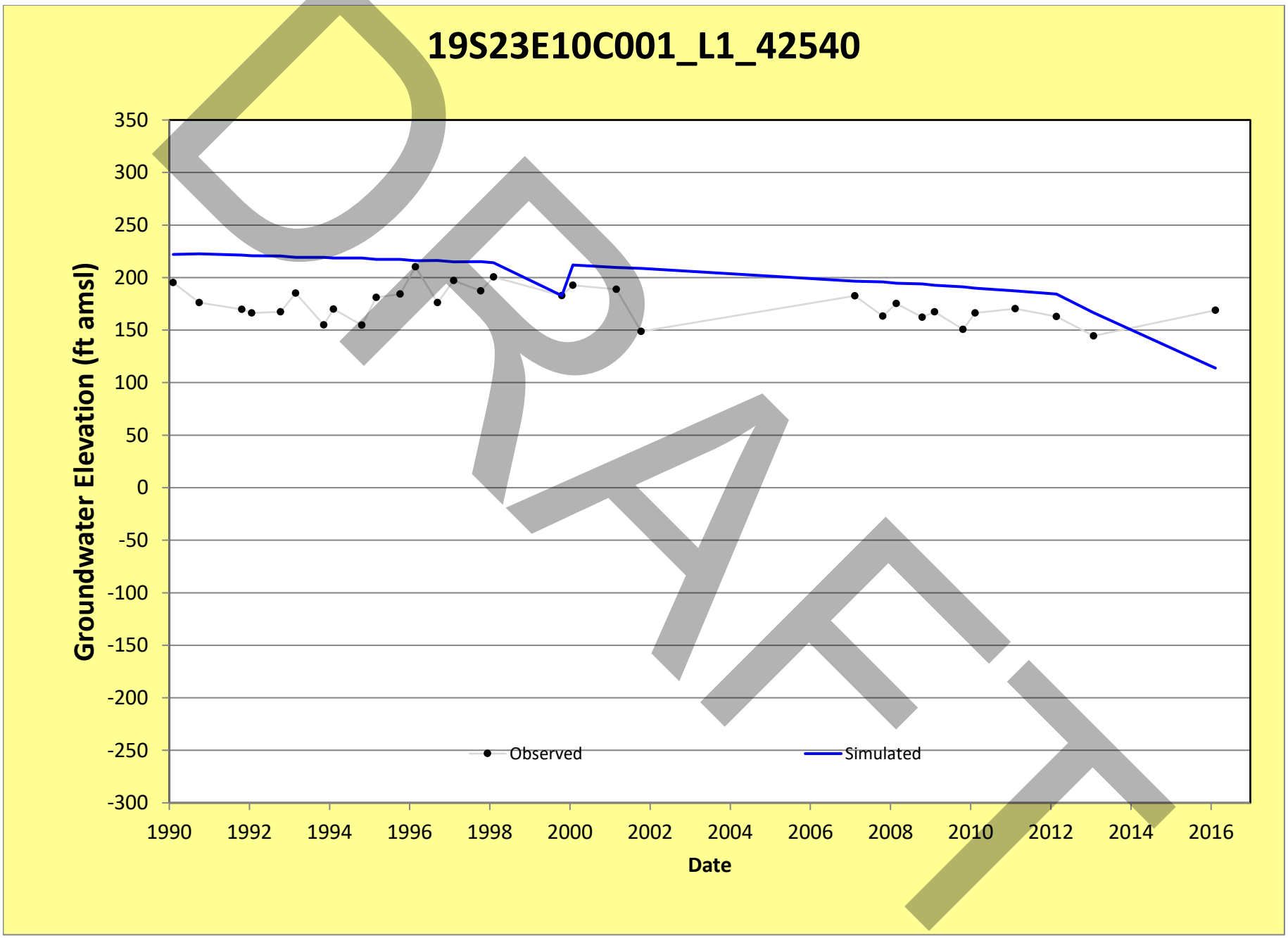
Date
Observed
Simulated
DRAFT


19S23E10C001_L1_42540
Groundwater Elevation (ft amsl)
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150
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-50
-100
-150
-200
-250
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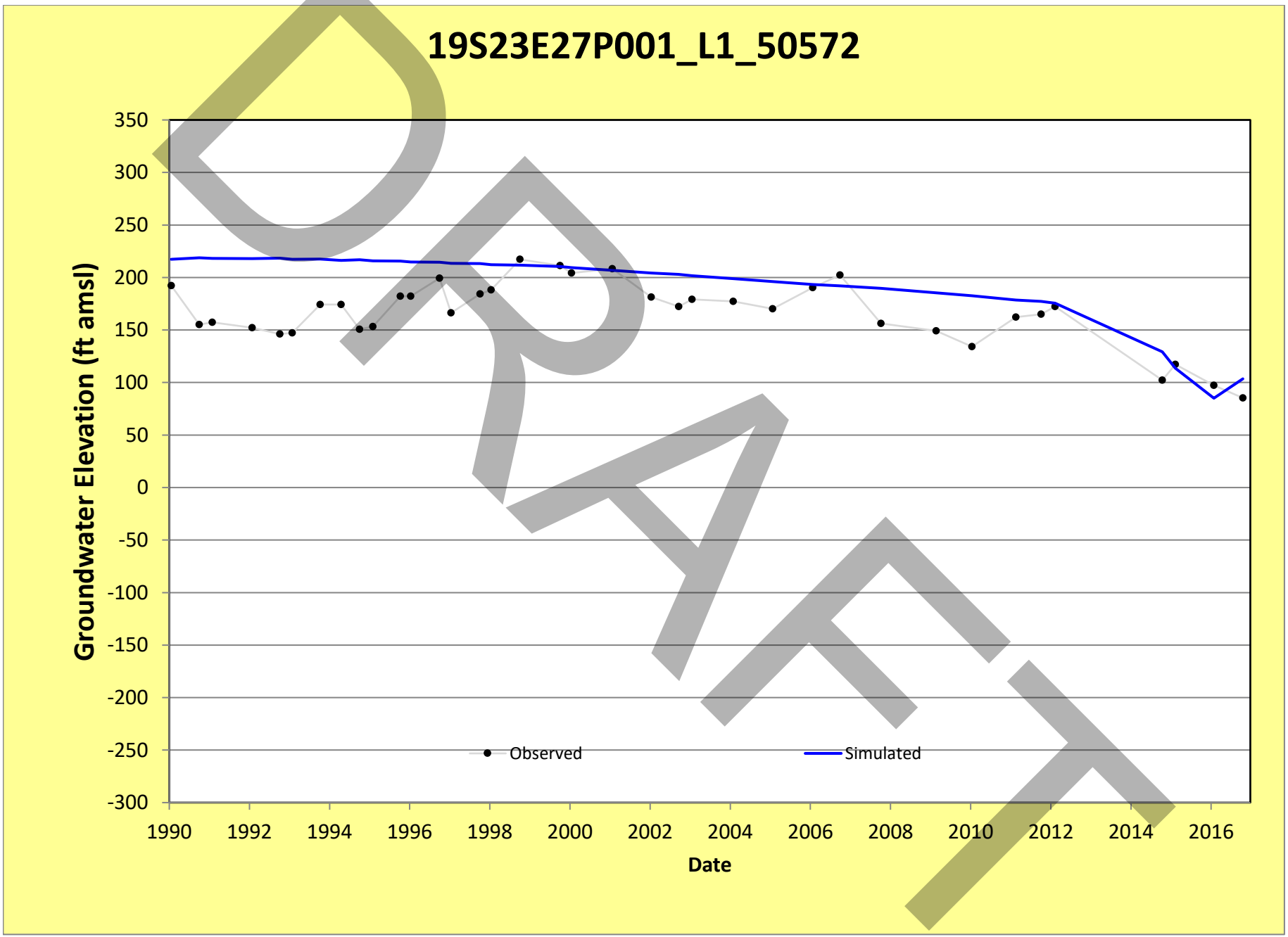
Observed
Simulated
DRAFT


19S23E27P001_L1_50572
Groundwater Elevation (ft amsl)
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300
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200
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100
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-50
-100
-150
-200
-250
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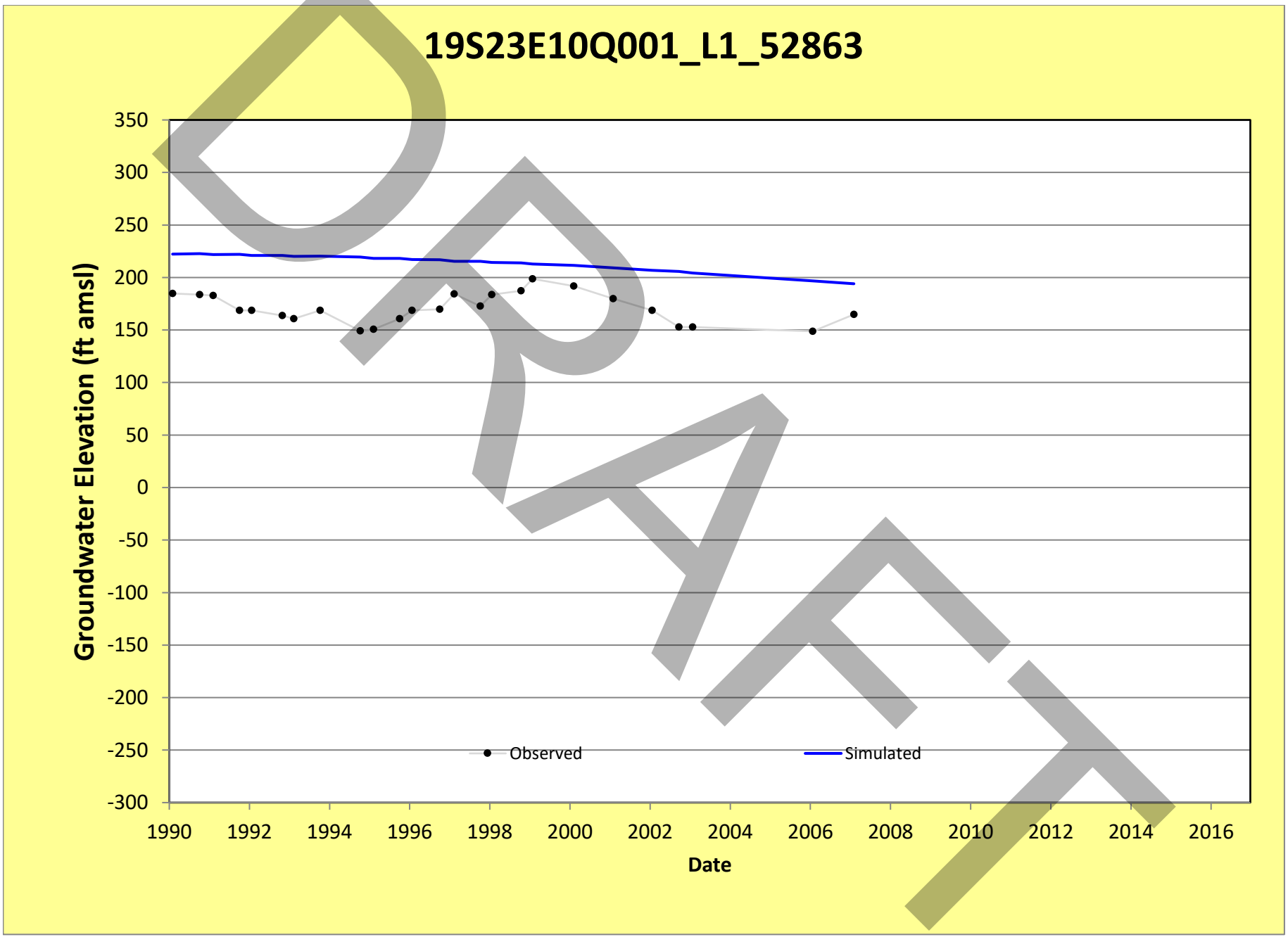
Observed
Simulated
DRAFT


19S23E10Q001_L1_52863
Groundwater Elevation (ft amsl)
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-200
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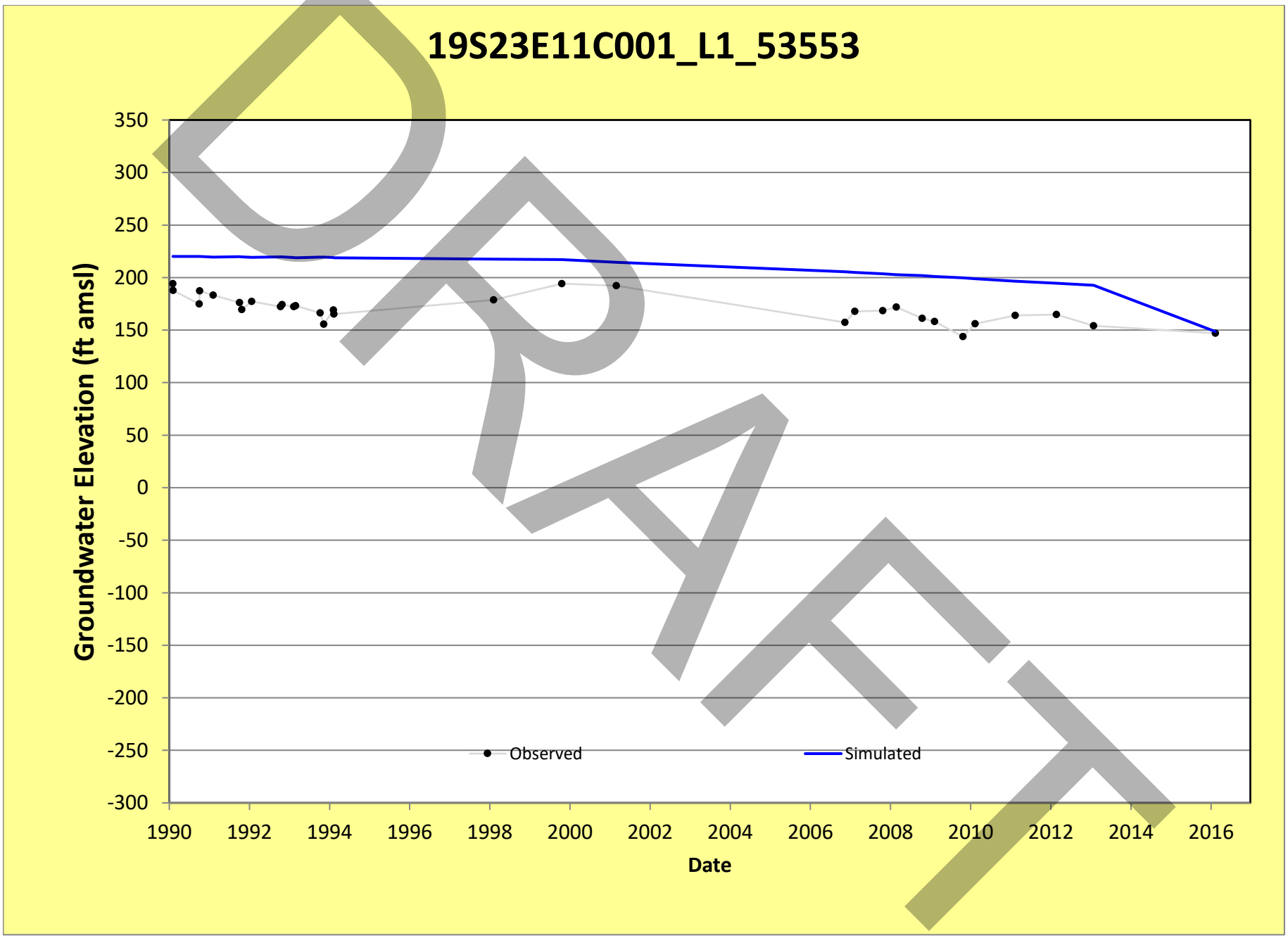
Date
Observed
Simulated
DRAFT


19S23E11C001_L1_53553
Groundwater Elevation (ft amsl)
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200
150
100
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-50
-100
-150
-200
-250
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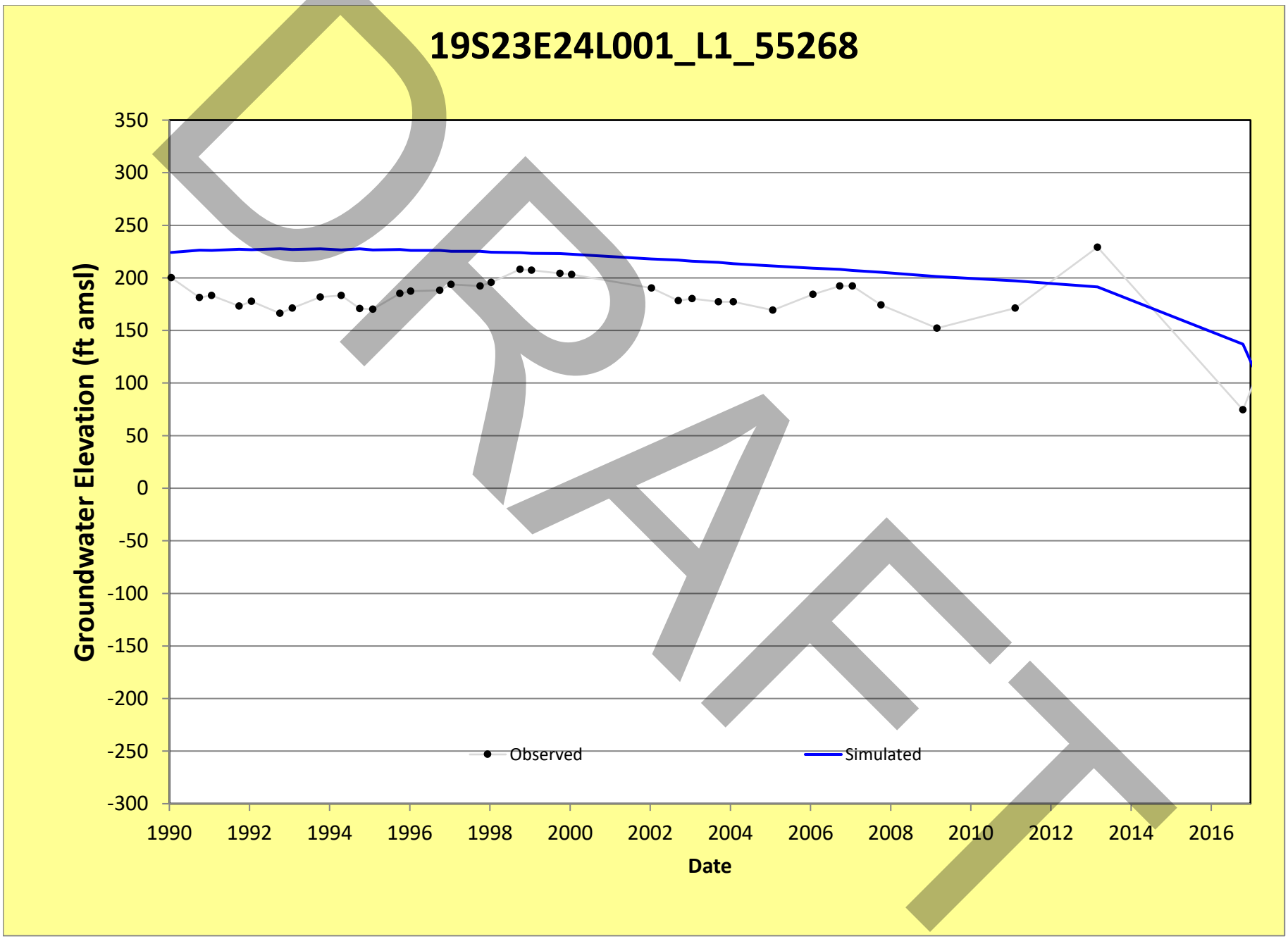
Date
Observed
Simulated
DRAFT


19S23E24L001_L1_55268
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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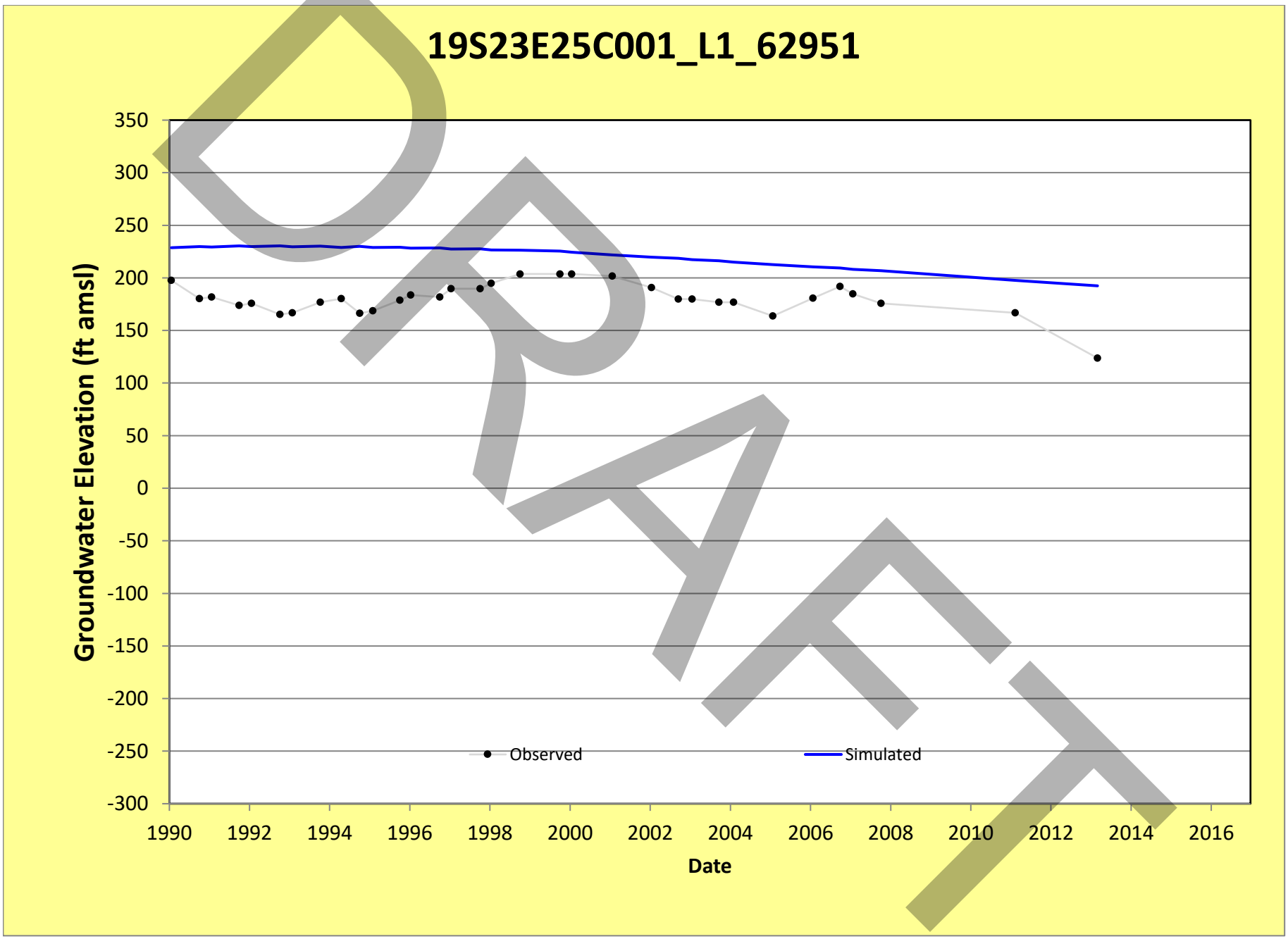
2016
Date
Observed
Simulated
DRAFT


19S23E25C001_L1_62951
Groundwater Elevation (ft amsl)
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200
150
100
50
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-50
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-150
-200
-250
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1990
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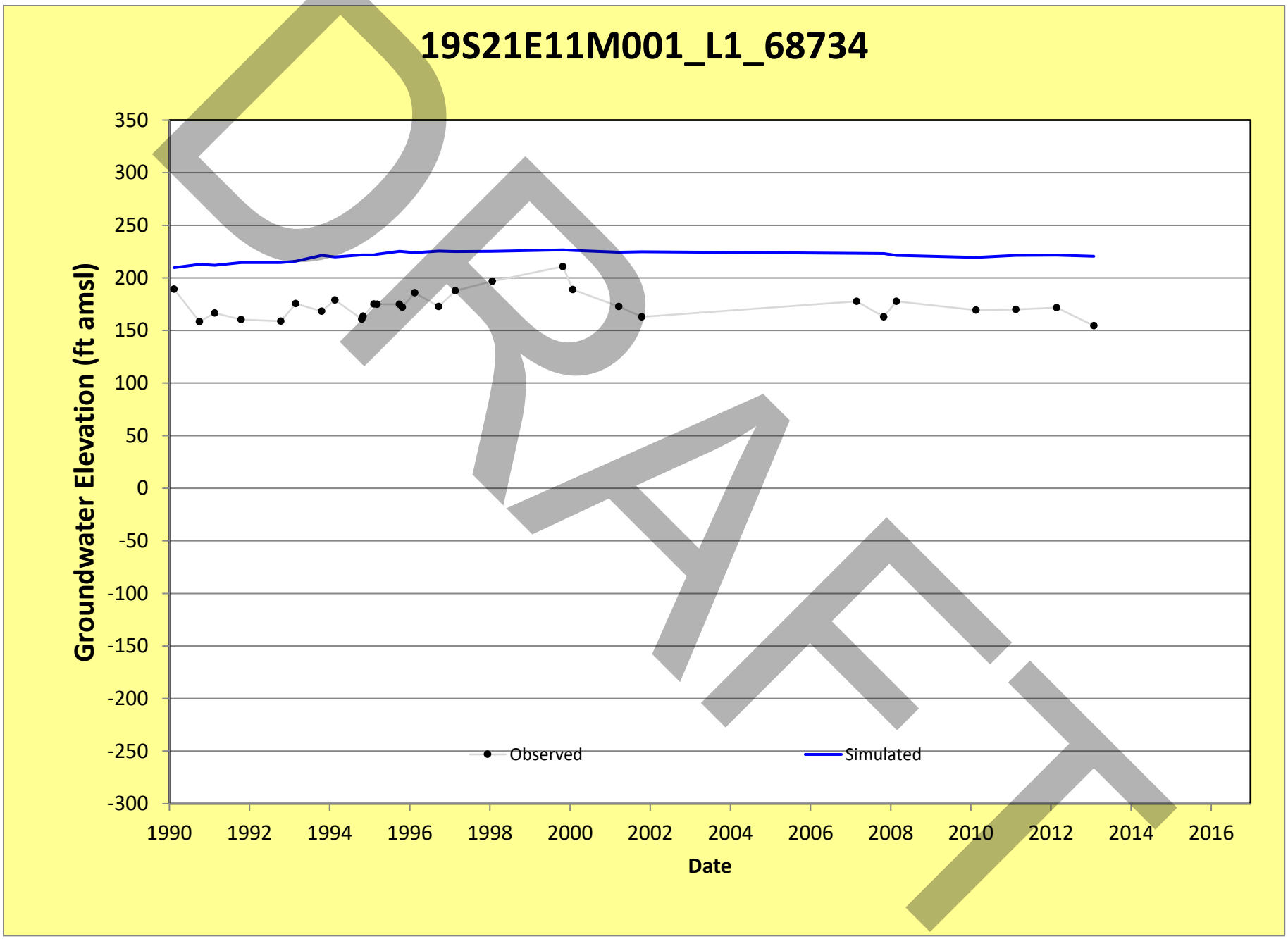
2016
Date
Observed
Simulated
DRAFT


19S21E11M001_L1_68734
Groundwater Elevation (ft amsl)
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200
150
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50
0
-50
-100
-150
-200
-250
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1990
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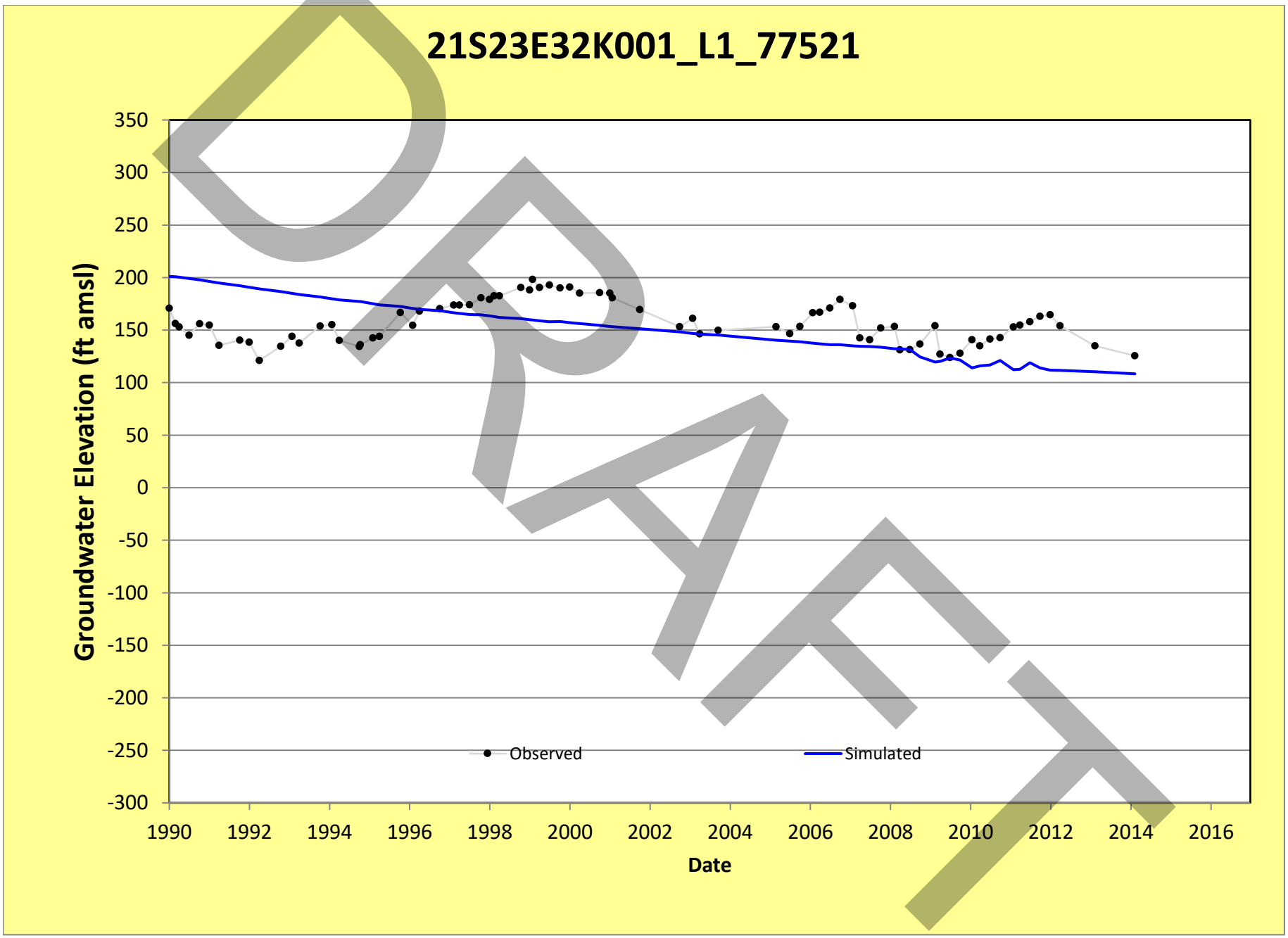
2016
Date
Observed
Simulated
DRAFT


21S23E32K001_L1_77521
Groundwater Elevation (ft amsl)
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200
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-100
-150
-200
-250
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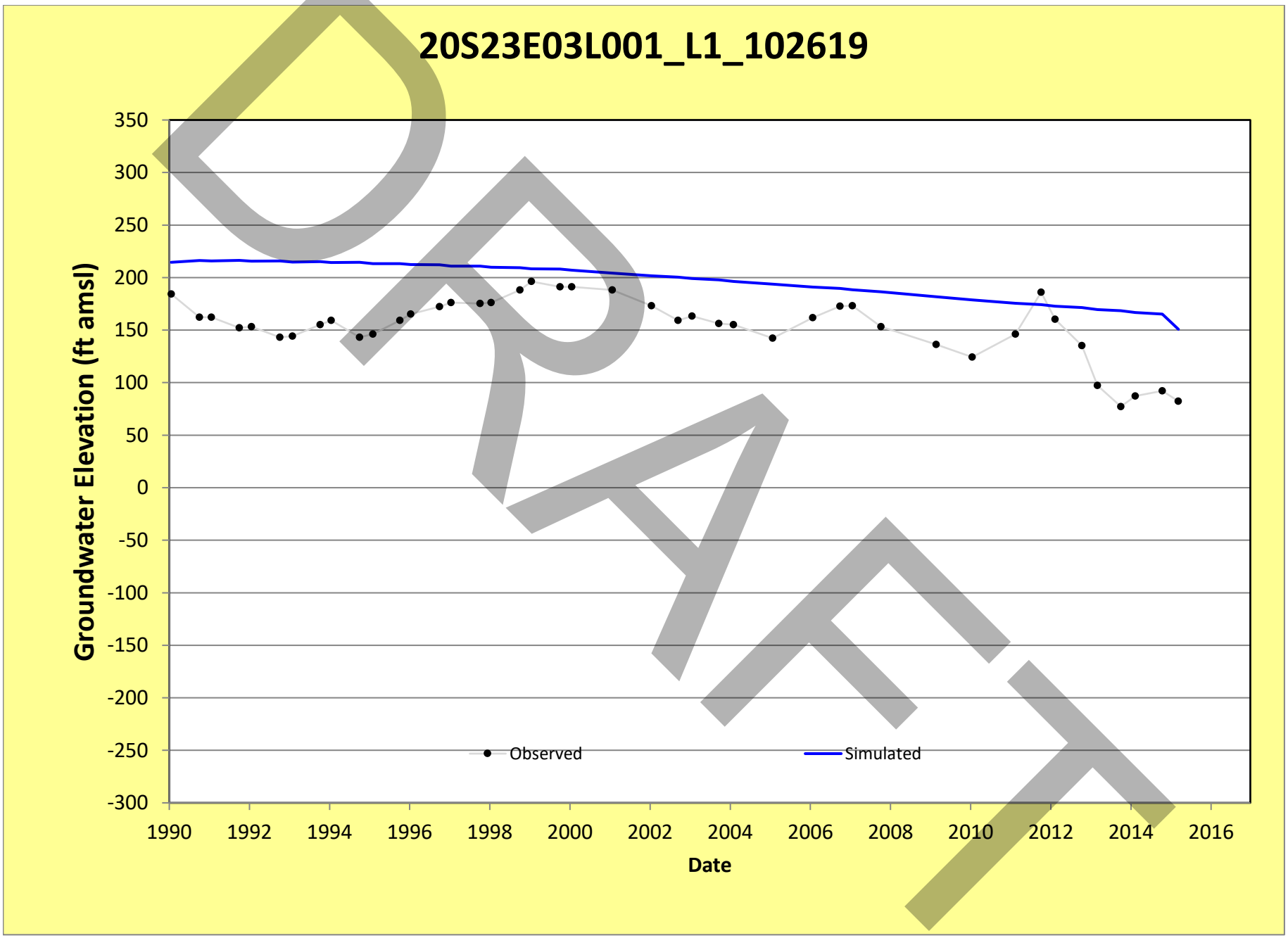
Date
Observed
Simulated
DRAFT


20S23E03L001_L1_102619
Groundwater Elevation (ft amsl)
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200
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-50
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-200
-250
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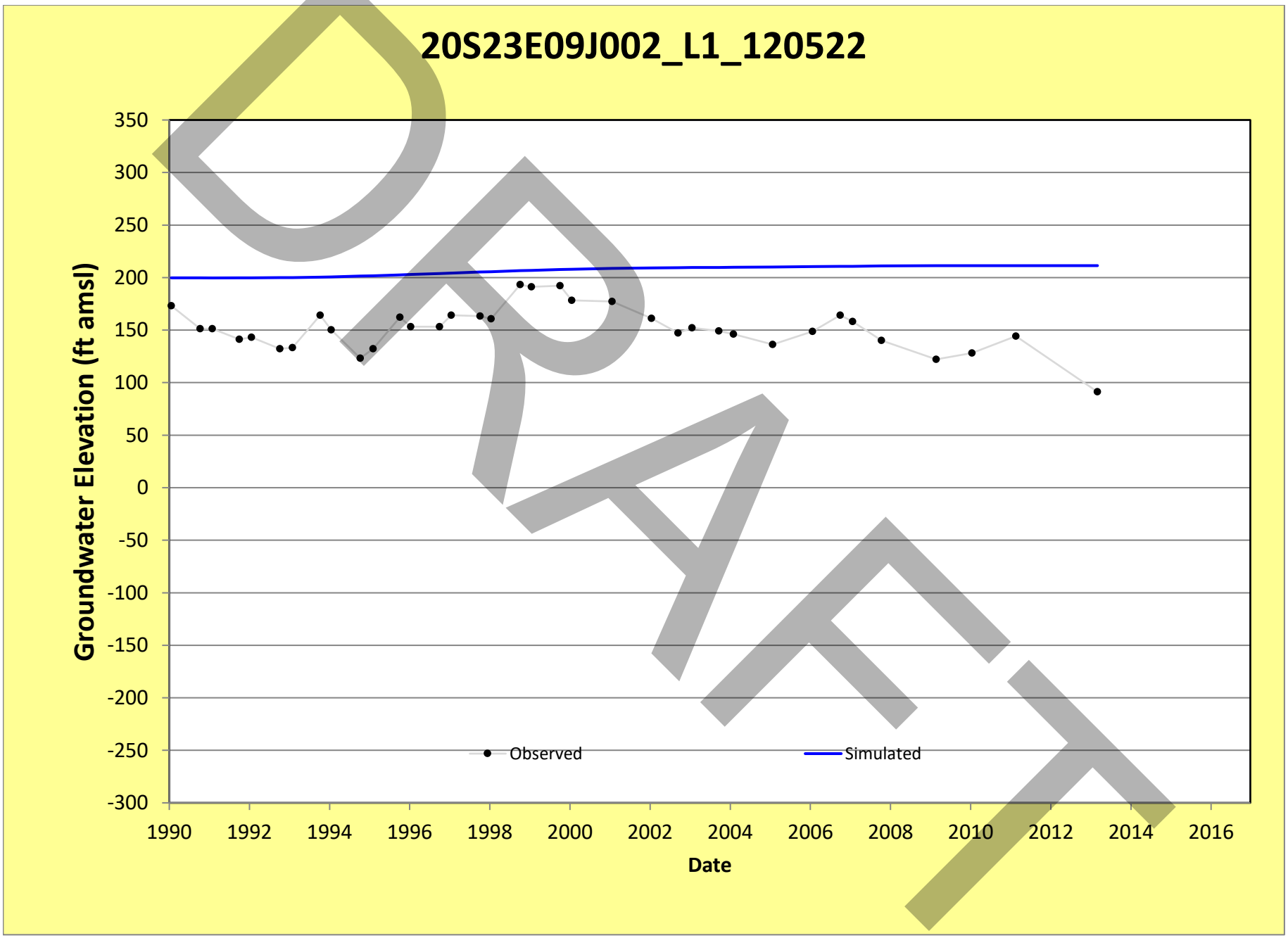
Date
Observed
Simulated
DRAFT


20S23E09J002_L1_120522
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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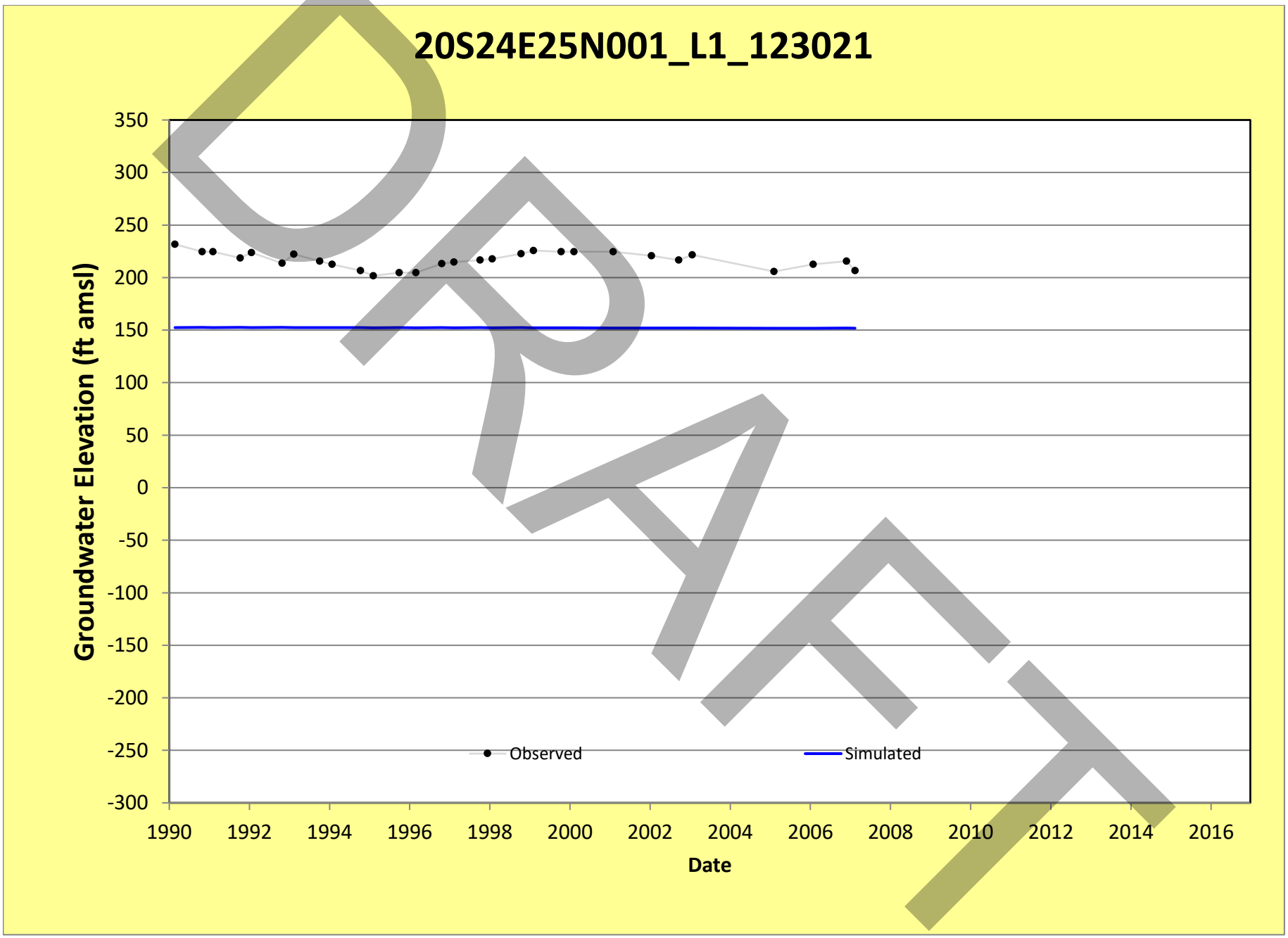
Date
Observed
Simulated
DRAFT


20S24E25N001_L1_123021
Groundwater Elevation (ft amsl)
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200
150
100
50
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-50
-100
-150
-200
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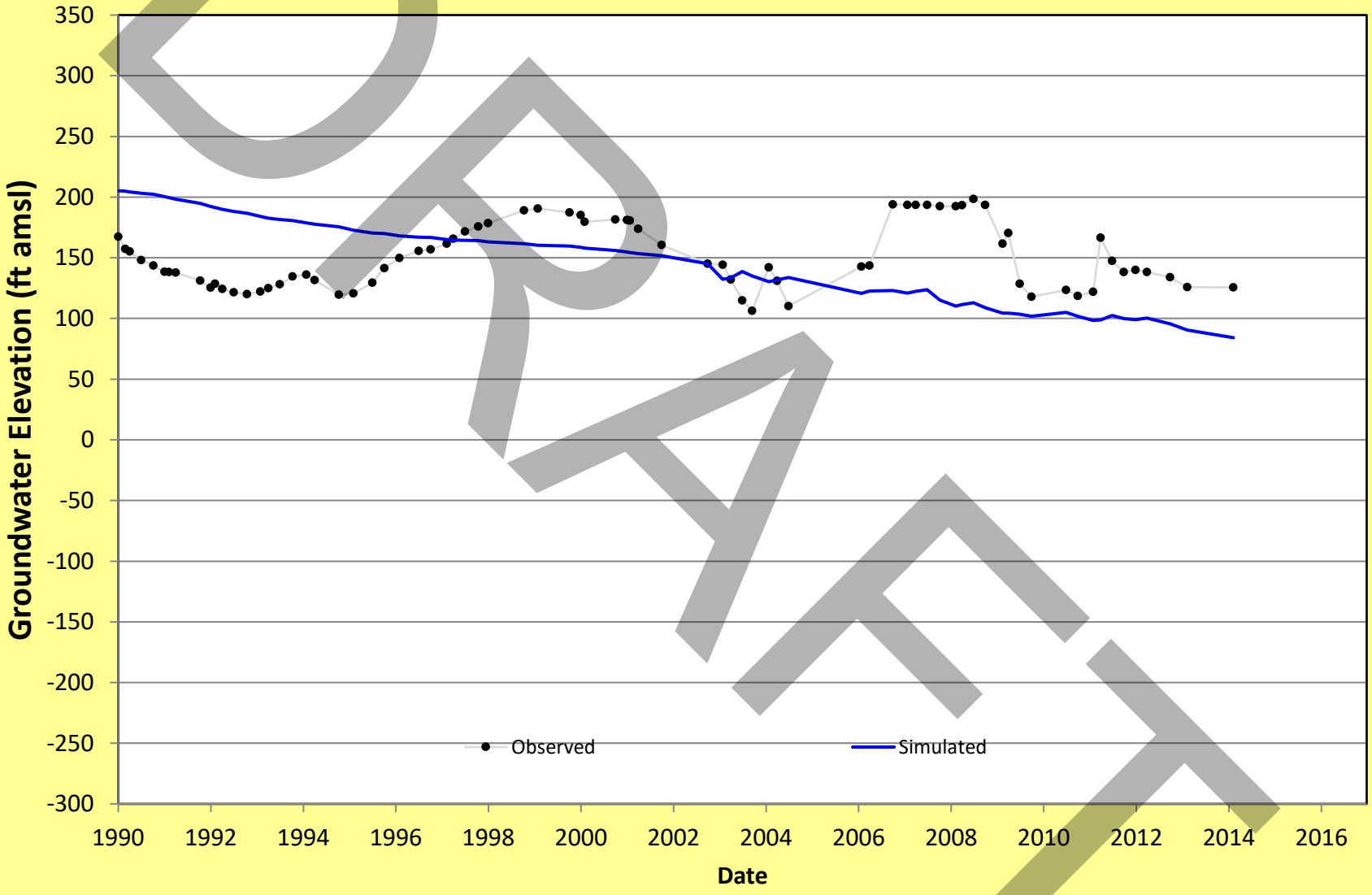
21S24E31D001_L1_163763



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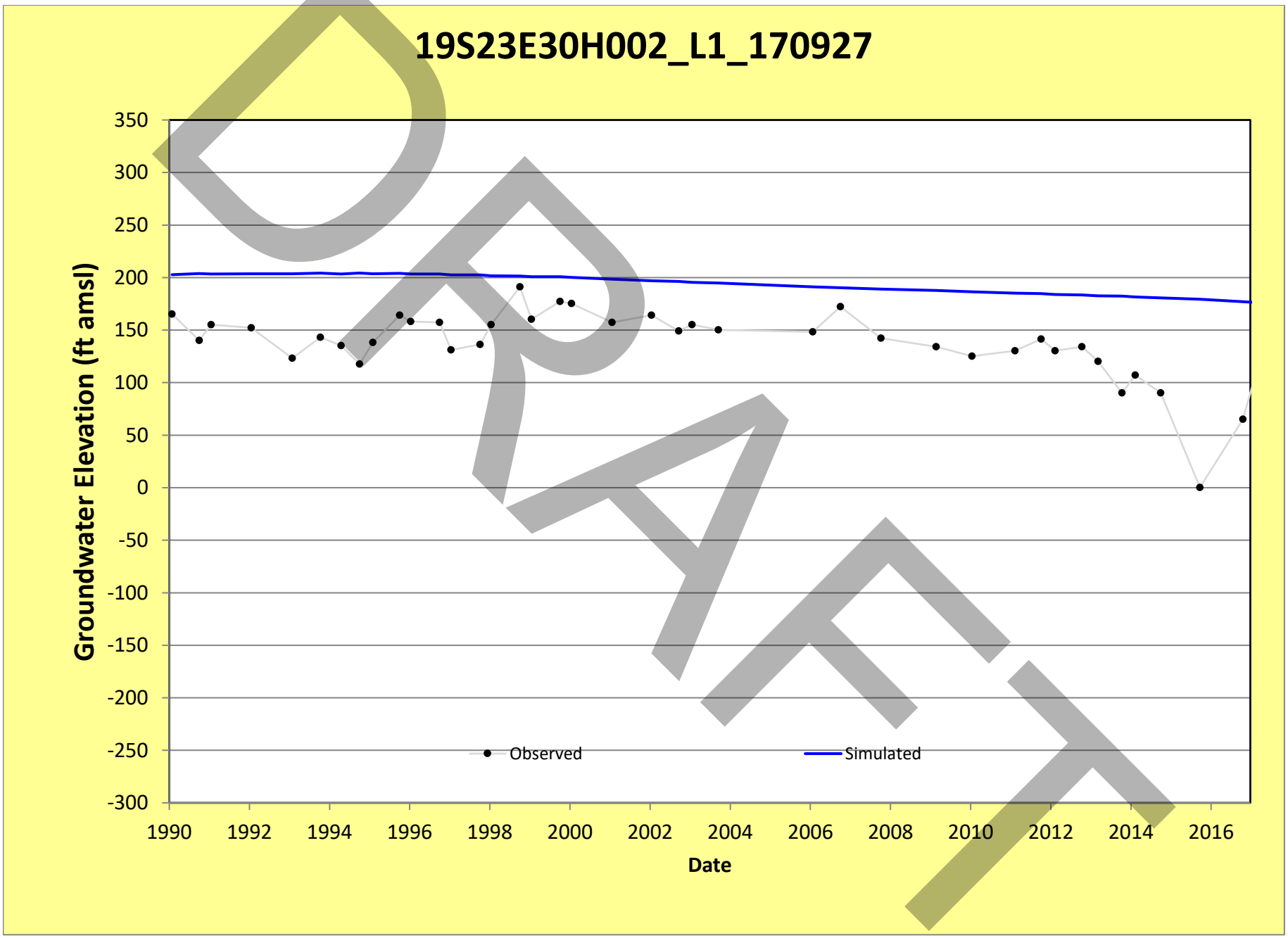
19S23E30H002_L1_170927
Groundwater Elevation (ft amsl)
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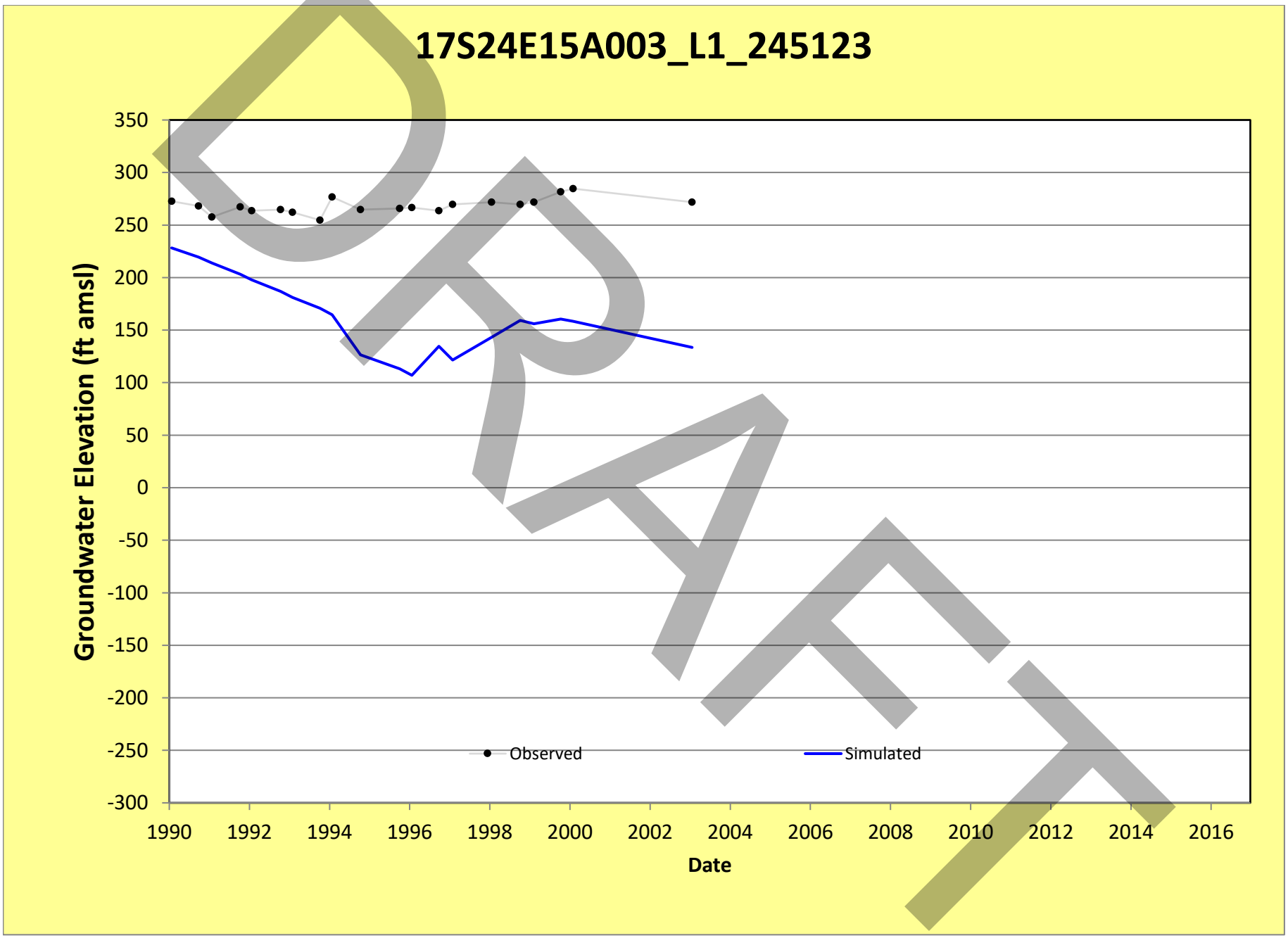
17S24E15A003_L1_245123
Groundwater Elevation (ft amsl)
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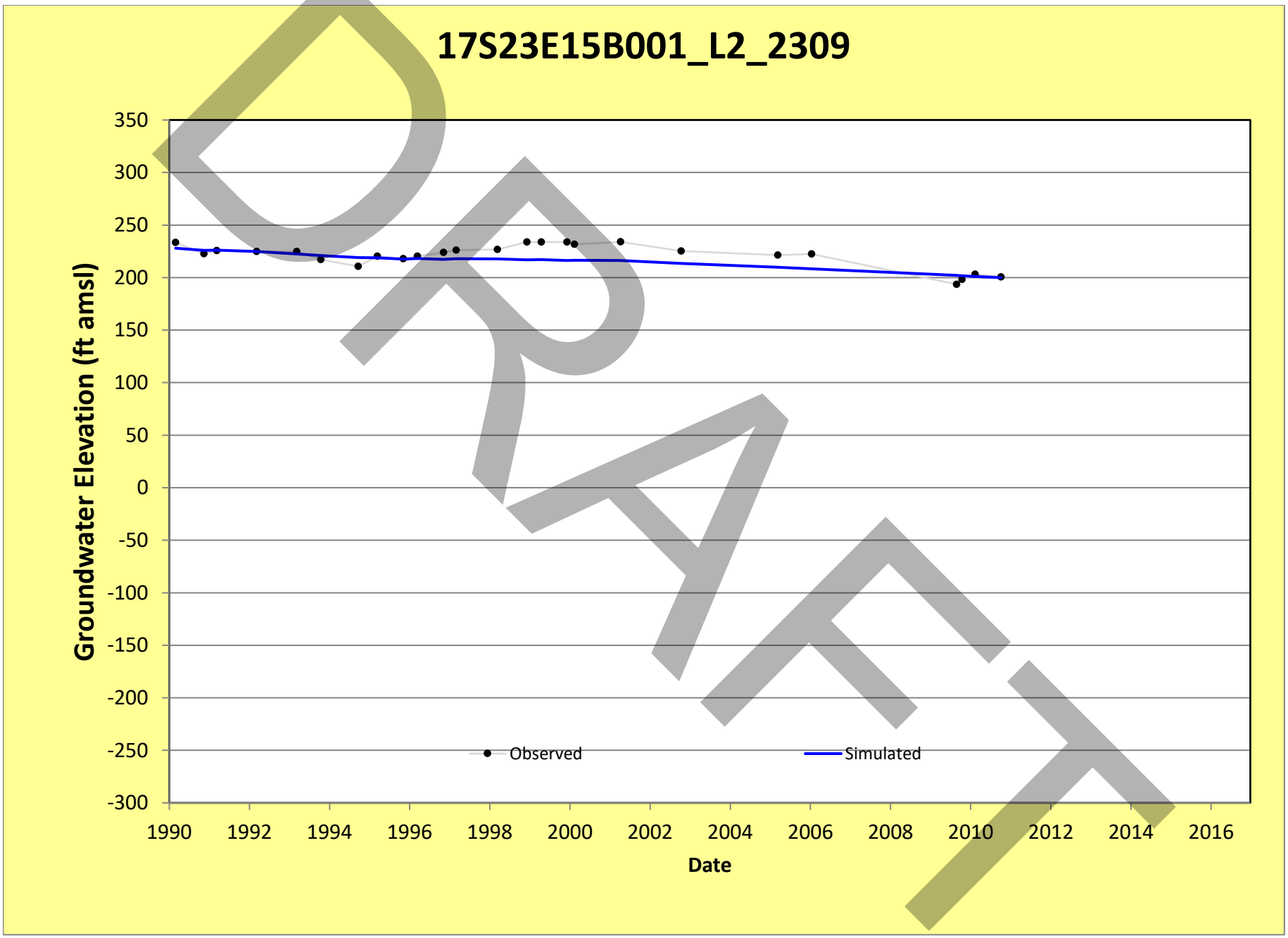
17S23E15B001_L2_2309
Groundwater Elevation (ft amsl)
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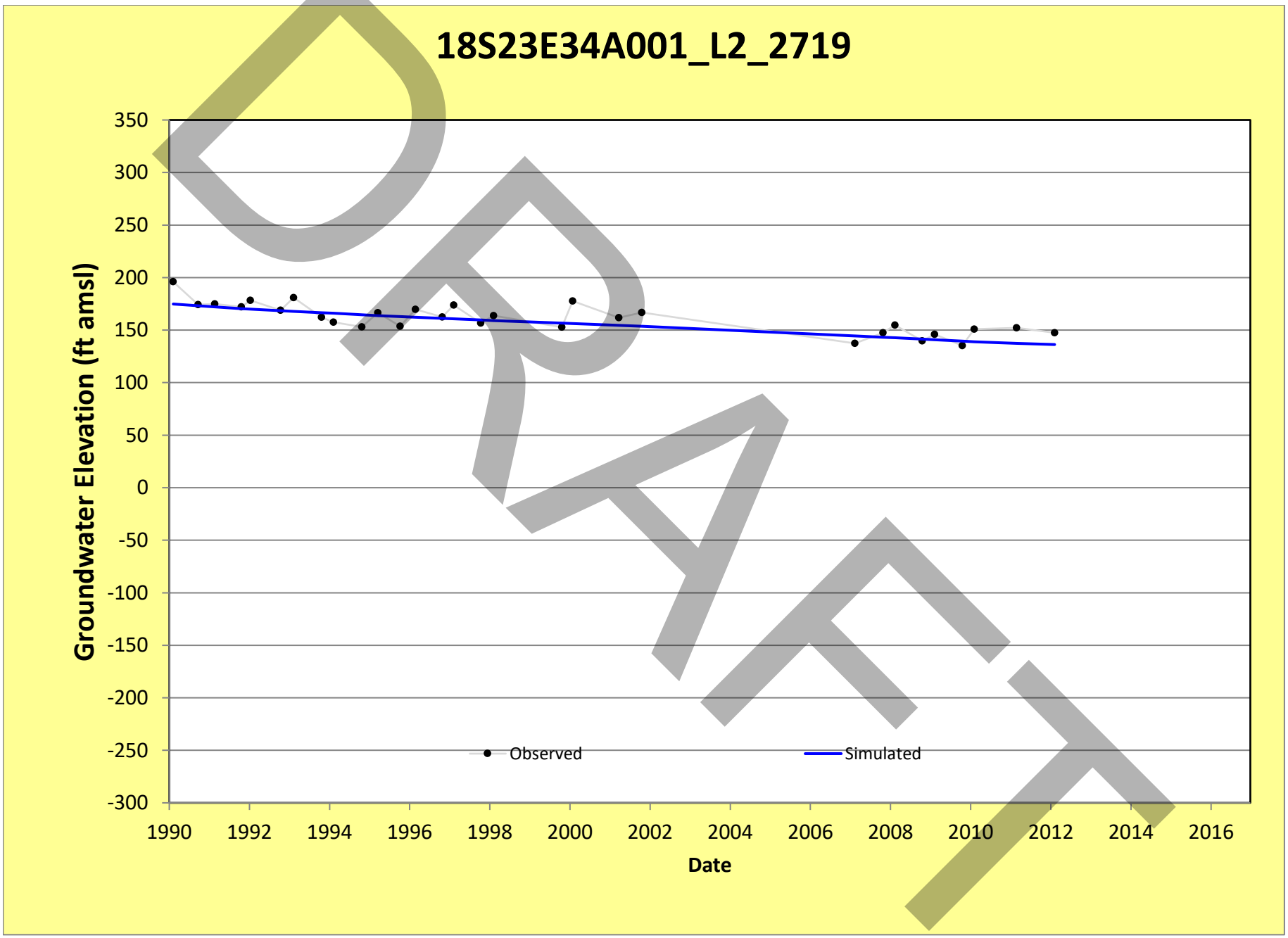
18S23E34A001_L2_2719
Groundwater Elevation (ft amsl)
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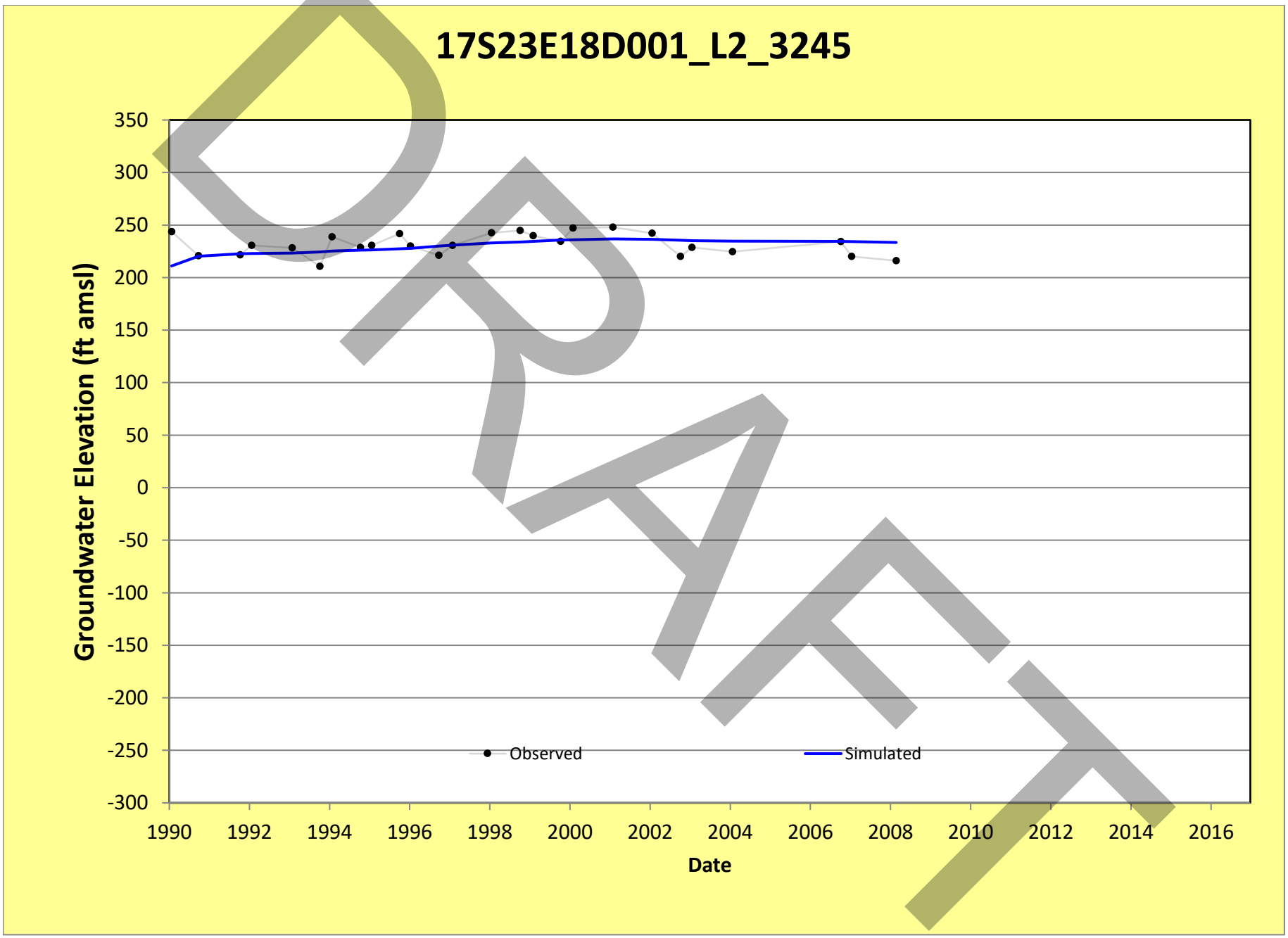
17S23E18D001_L2_3245
Groundwater Elevation (ft amsl)
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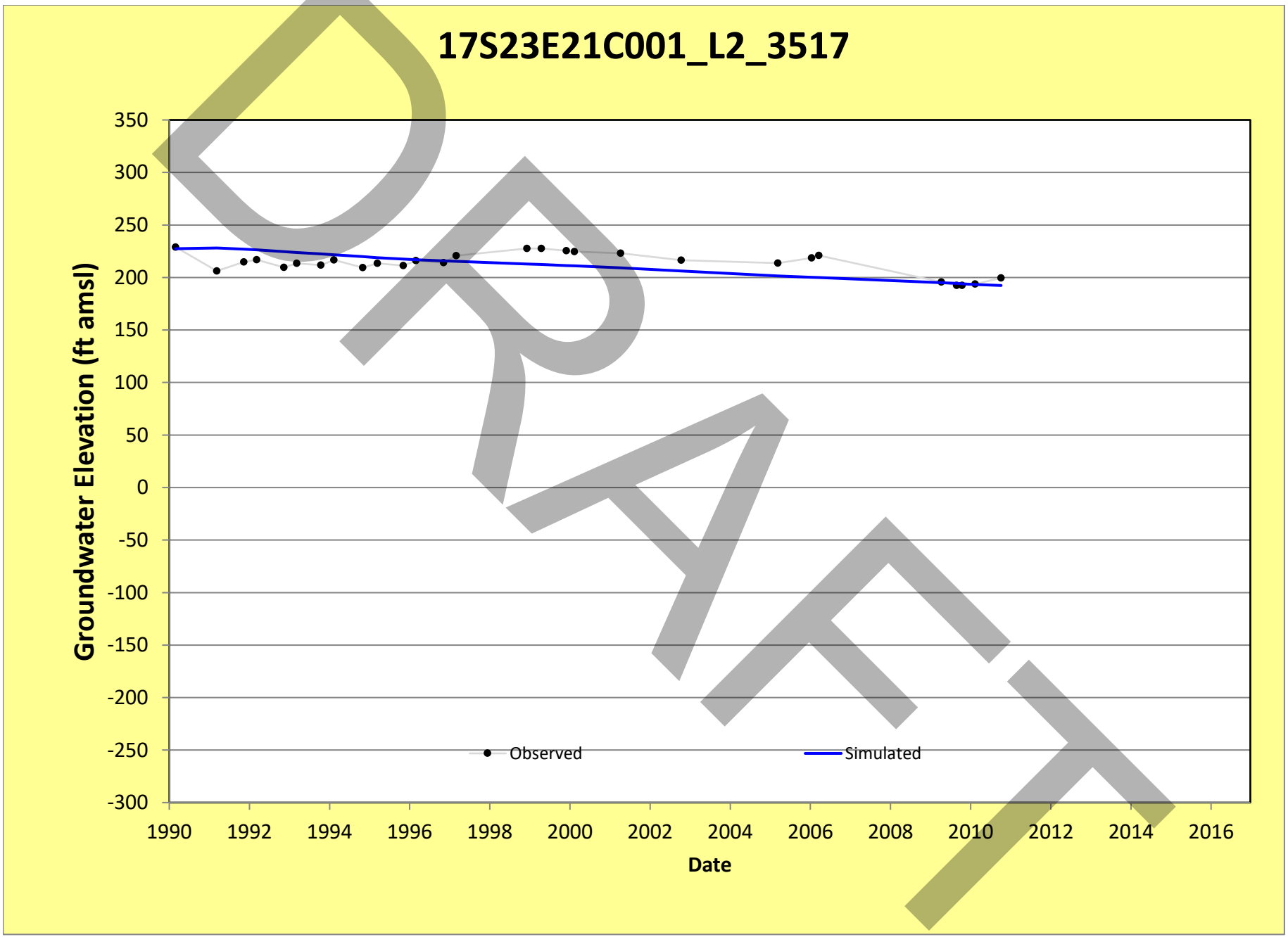
17S23E21C001_L2_3517
Groundwater Elevation (ft amsl)
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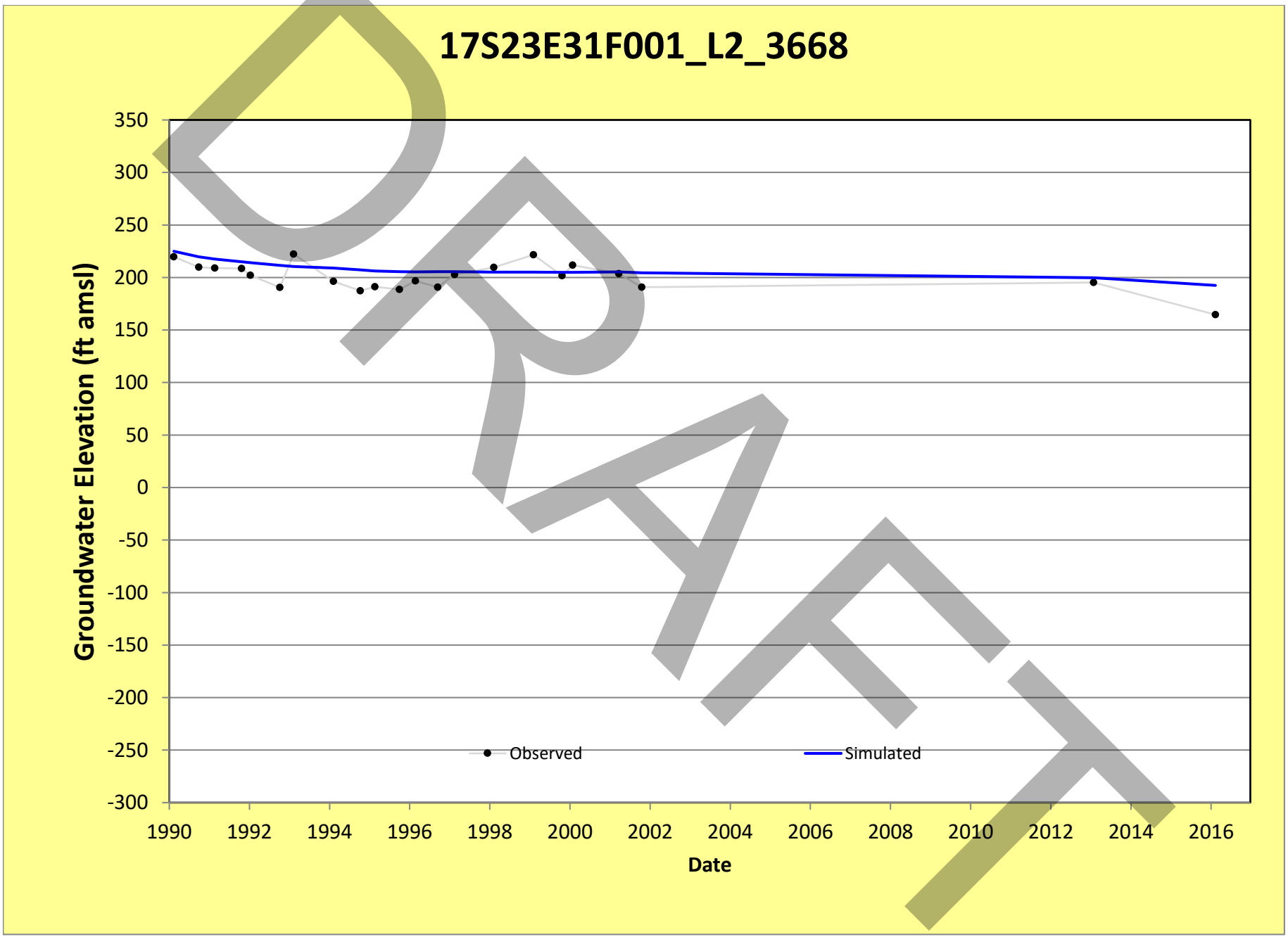
17S23E31F001_L2_3668
Groundwater Elevation (ft amsl)
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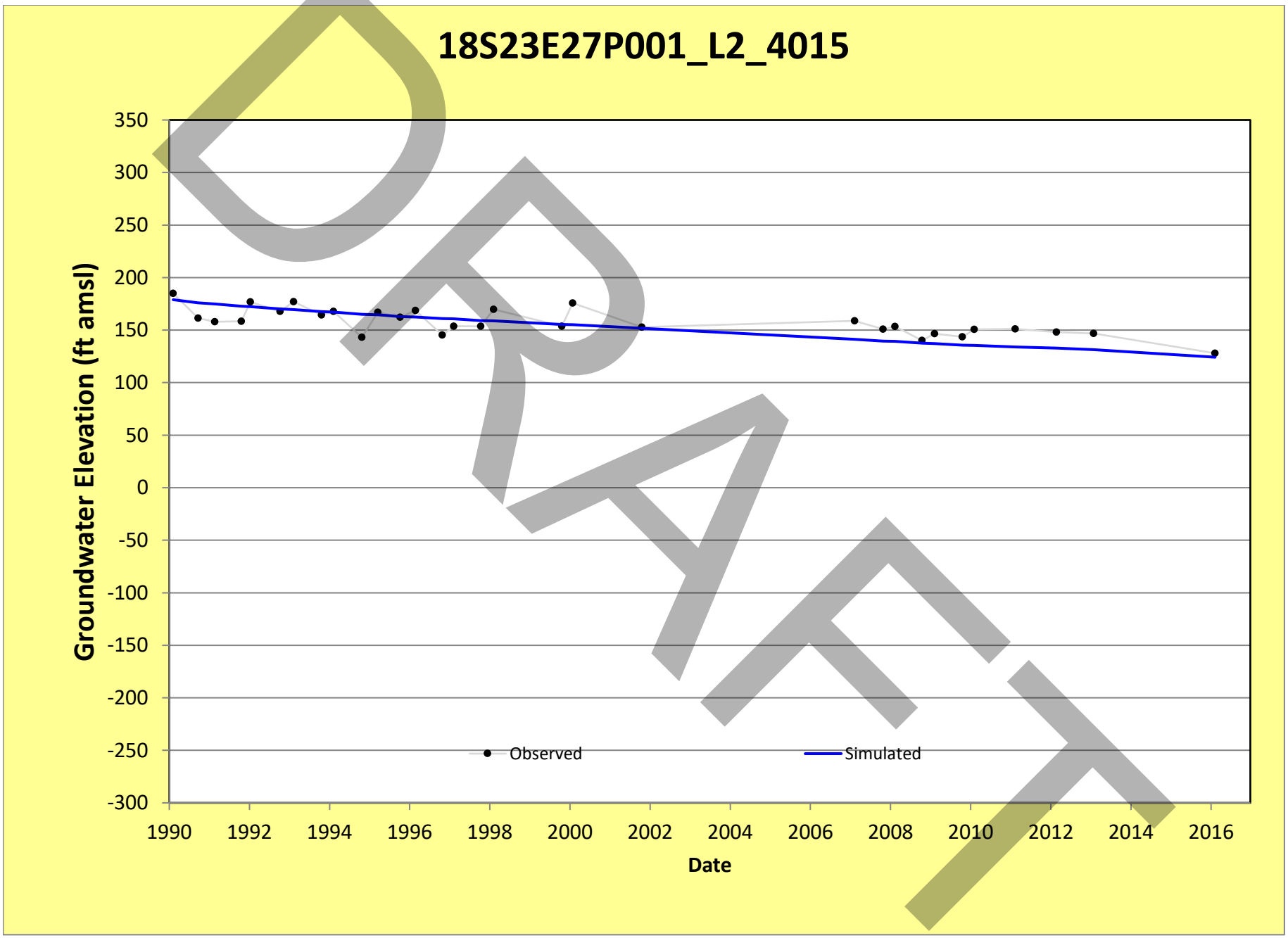
18S23E27P001_L2_4015
Groundwater Elevation (ft amsl)
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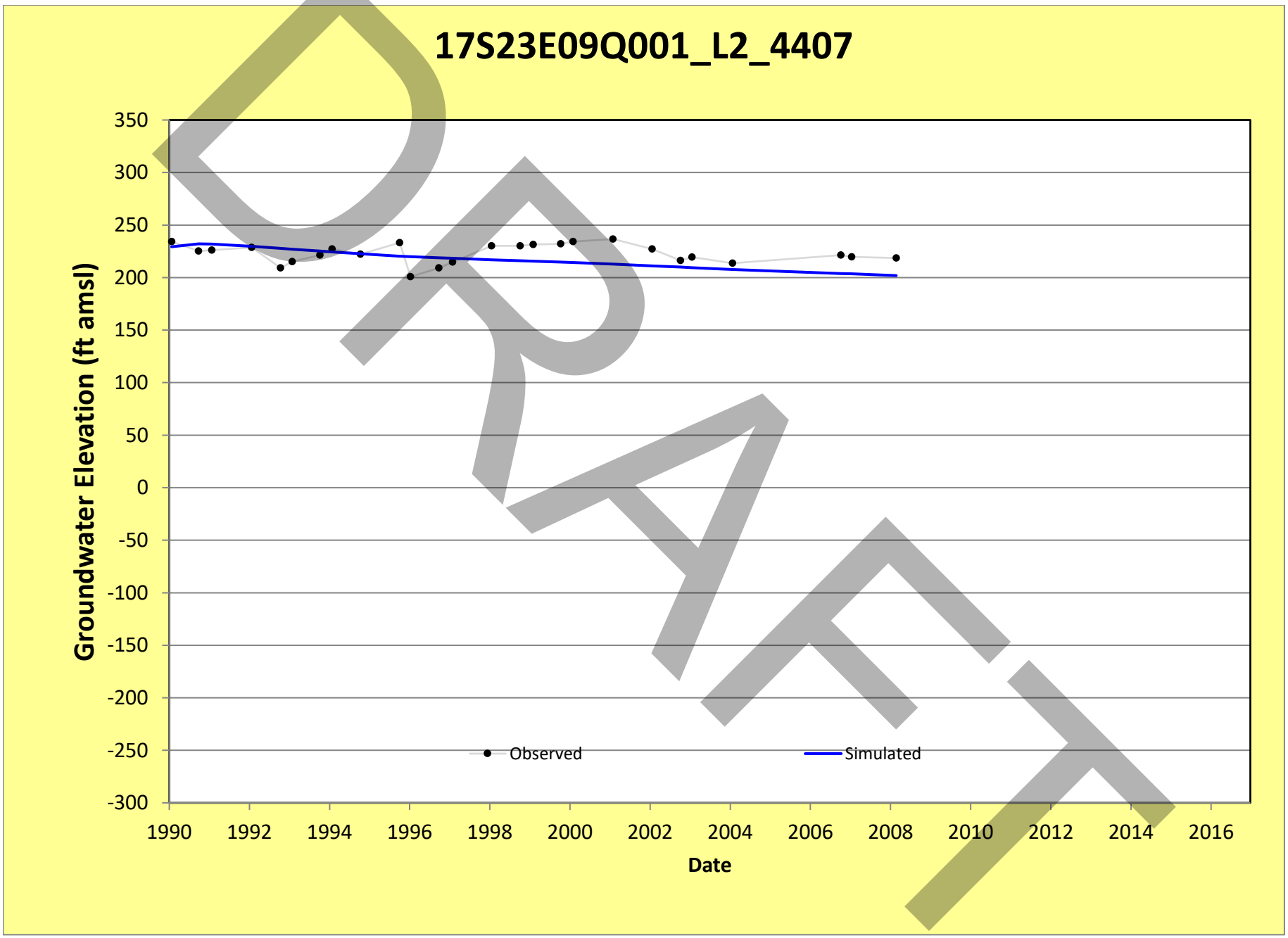
17S23E09Q001_L2_4407
Groundwater Elevation (ft amsl)
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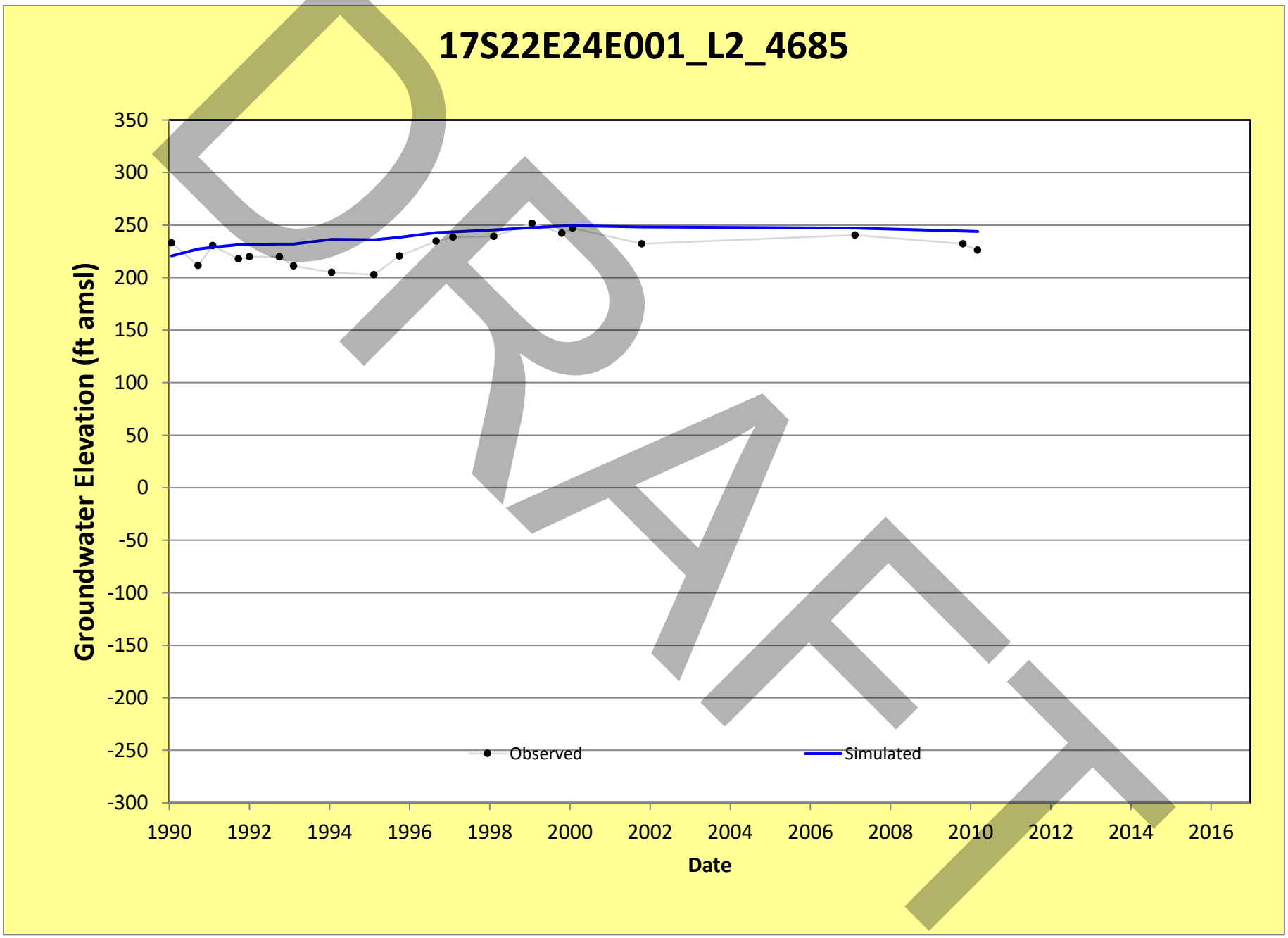
17S22E24E001_L2_4685
Groundwater Elevation (ft amsl)
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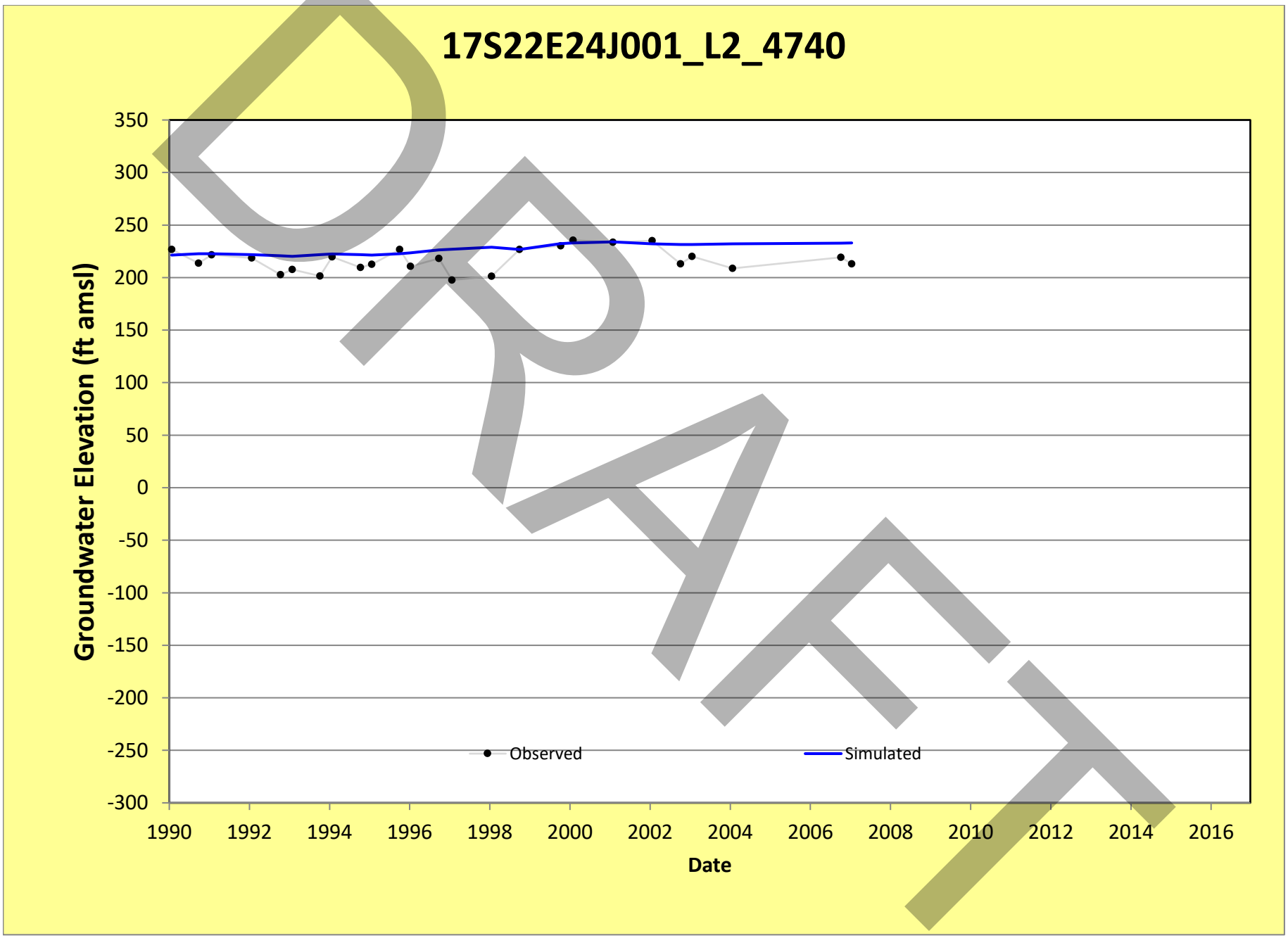
17S22E24J001_L2_4740
Groundwater Elevation (ft amsl)
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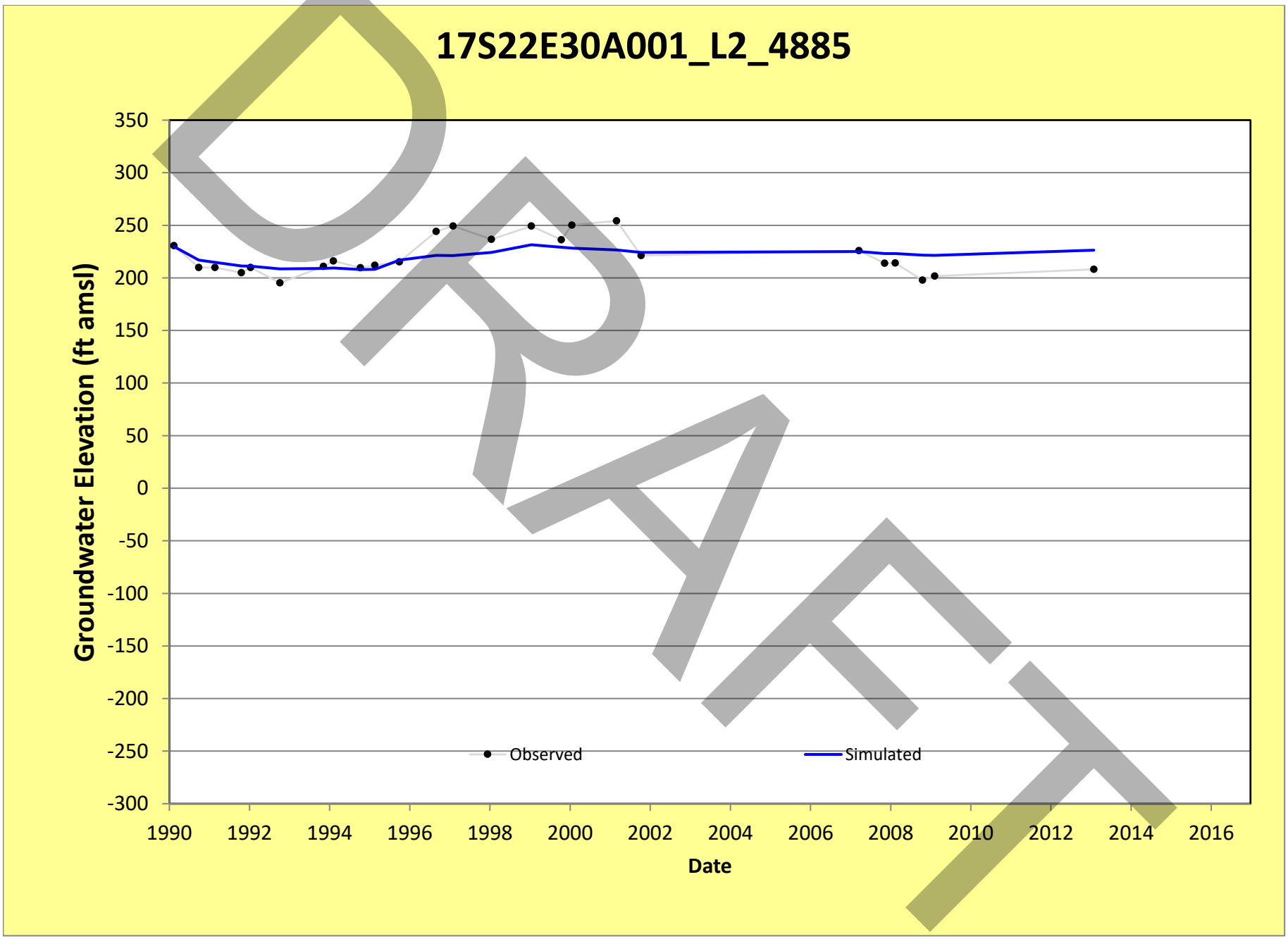
17S22E30A001_L2_4885
Groundwater Elevation (ft amsl)
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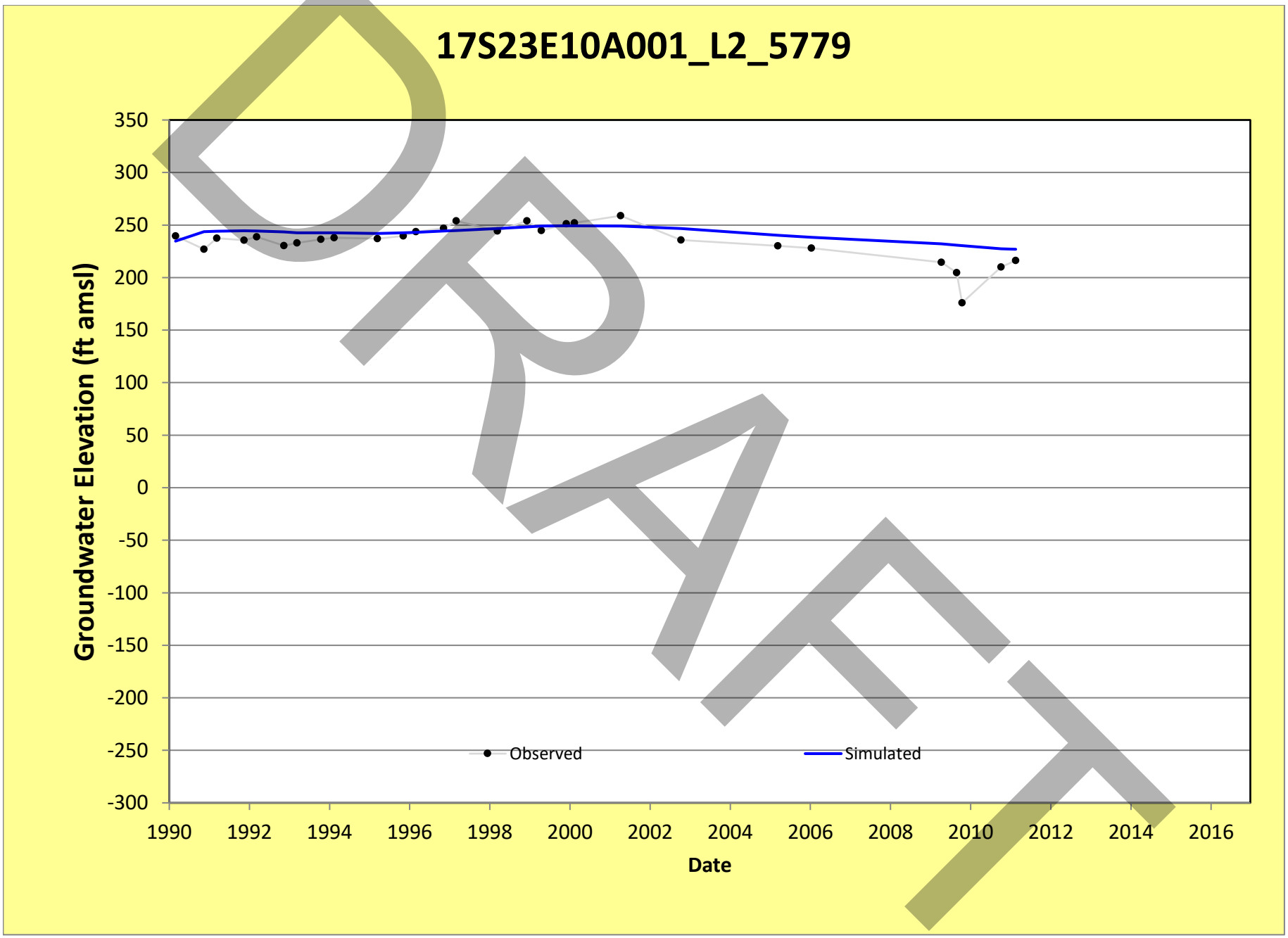
17S23E10A001_L2_5779
Groundwater Elevation (ft amsl)
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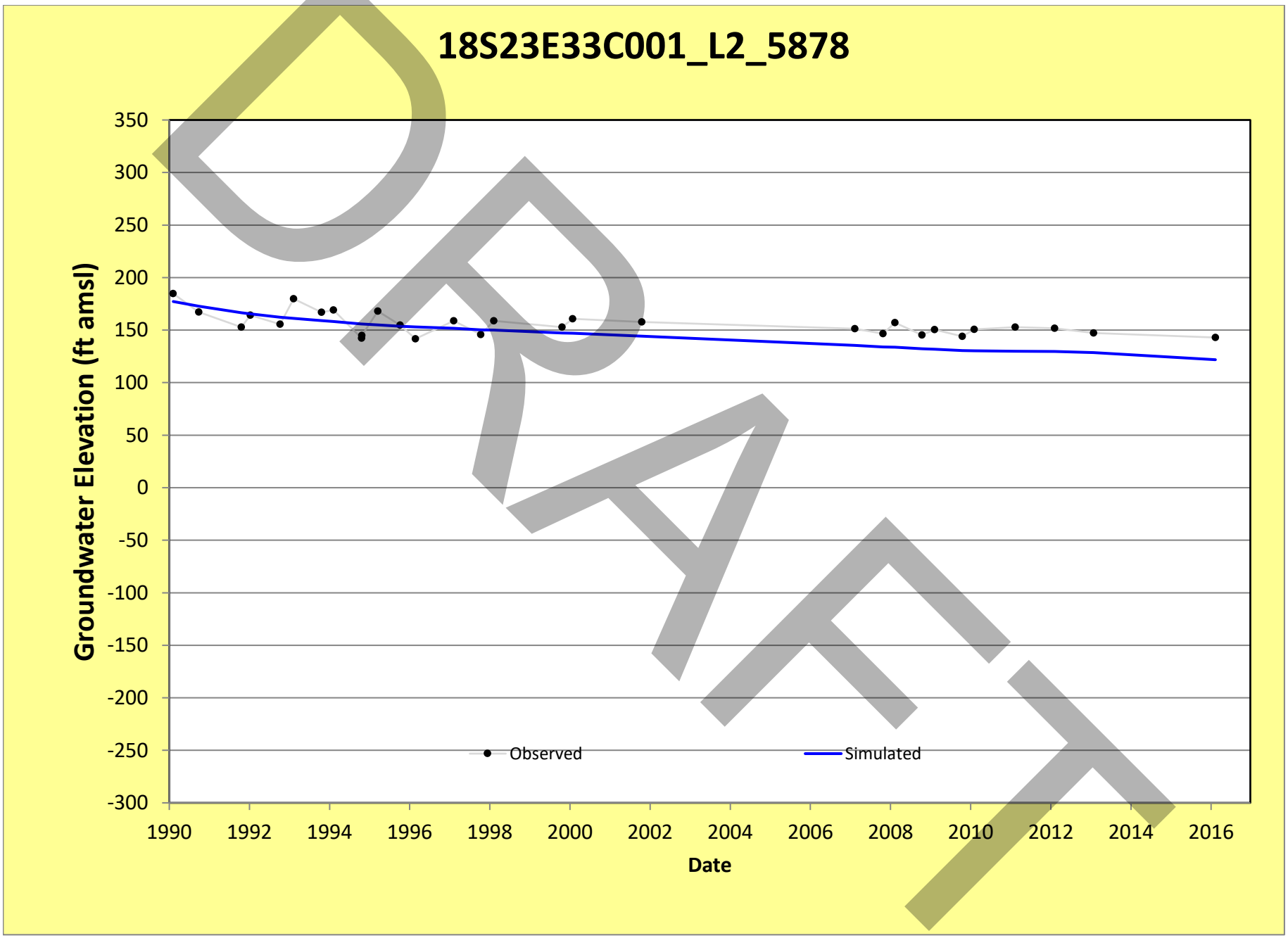
18S23E33C001_L2_5878
Groundwater Elevation (ft amsl)
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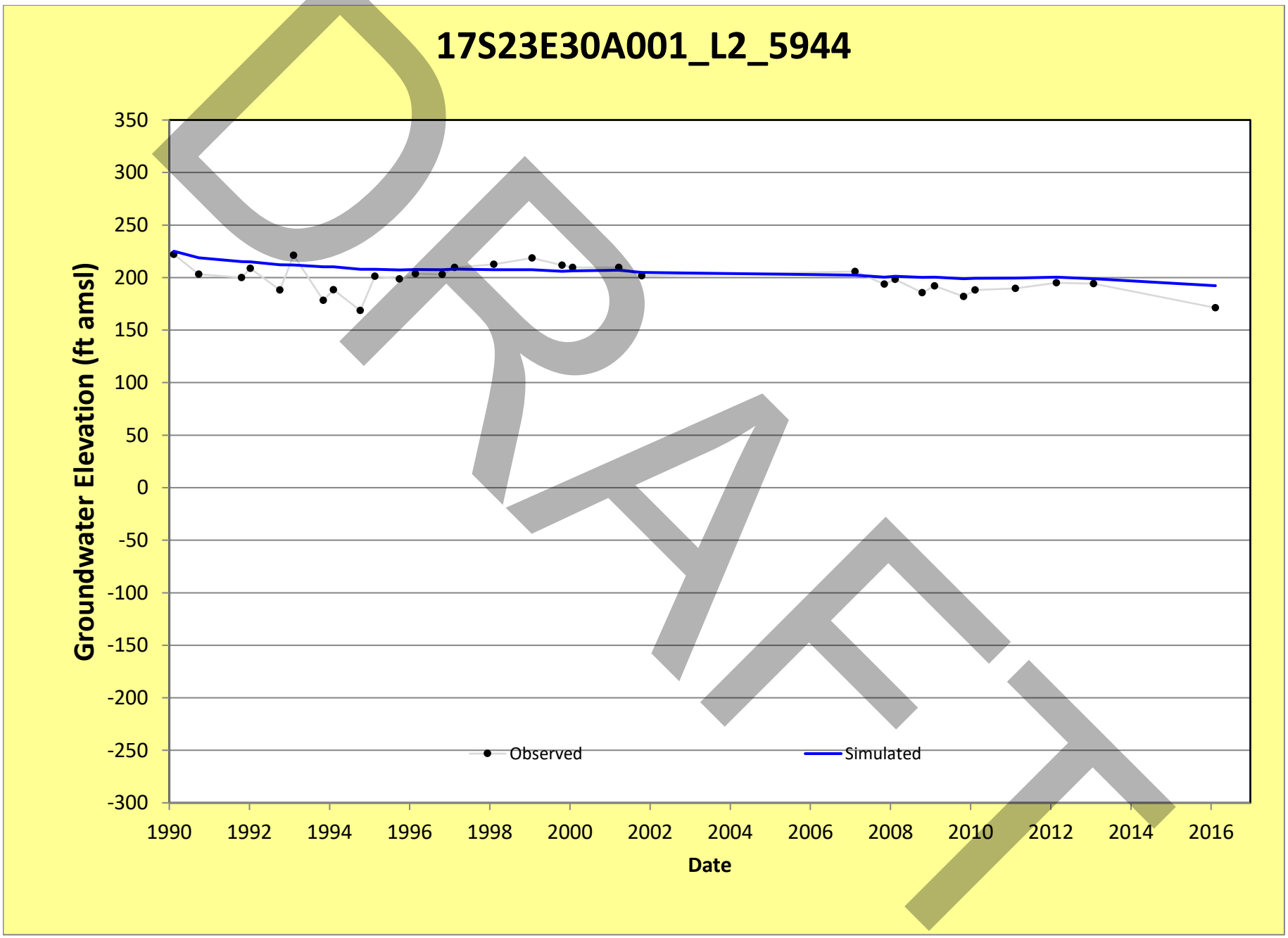
17S23E30A001_L2_5944
Groundwater Elevation (ft amsl)
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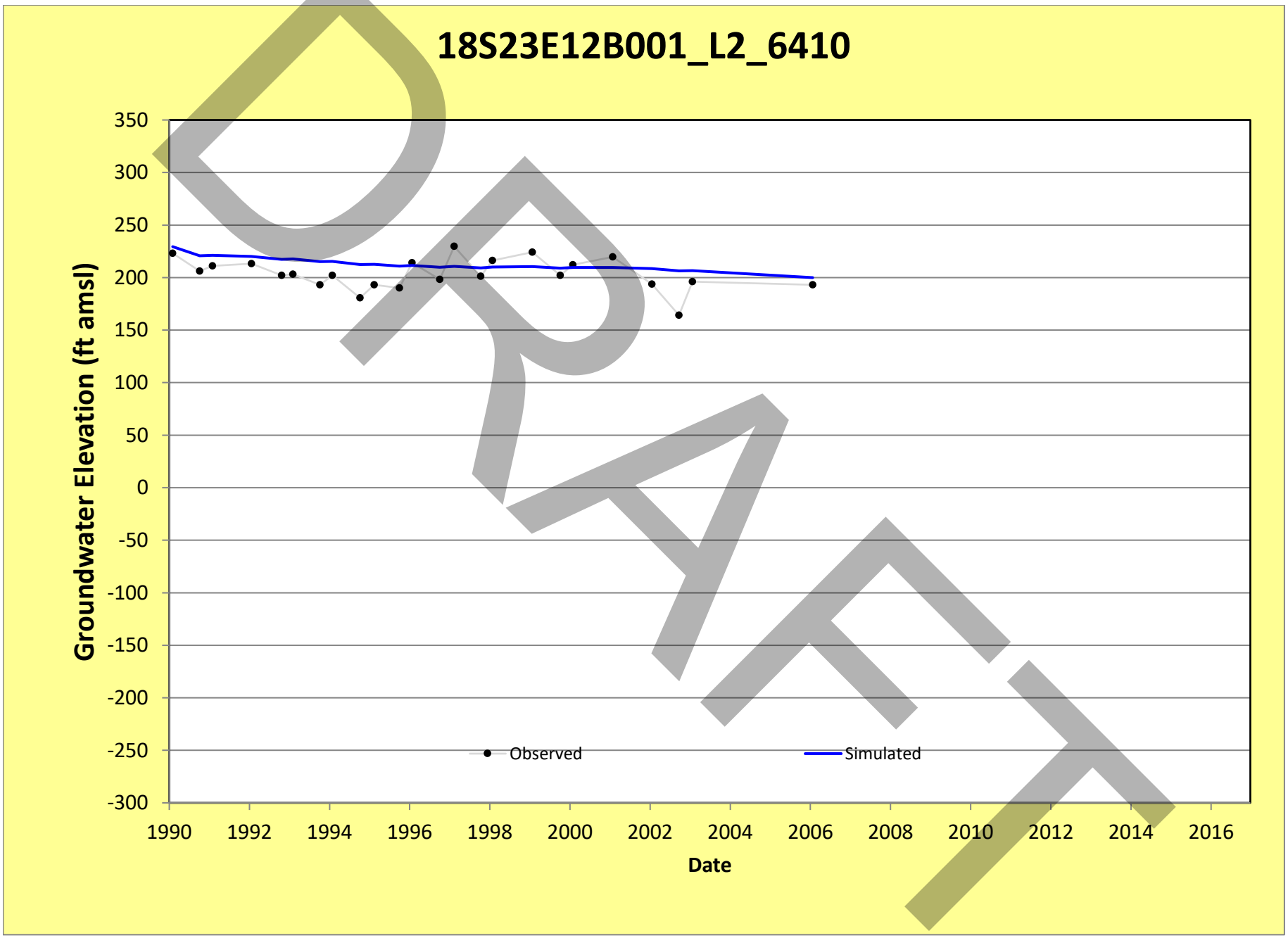
18S23E12B001_L2_6410
Groundwater Elevation (ft amsl)
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Observed
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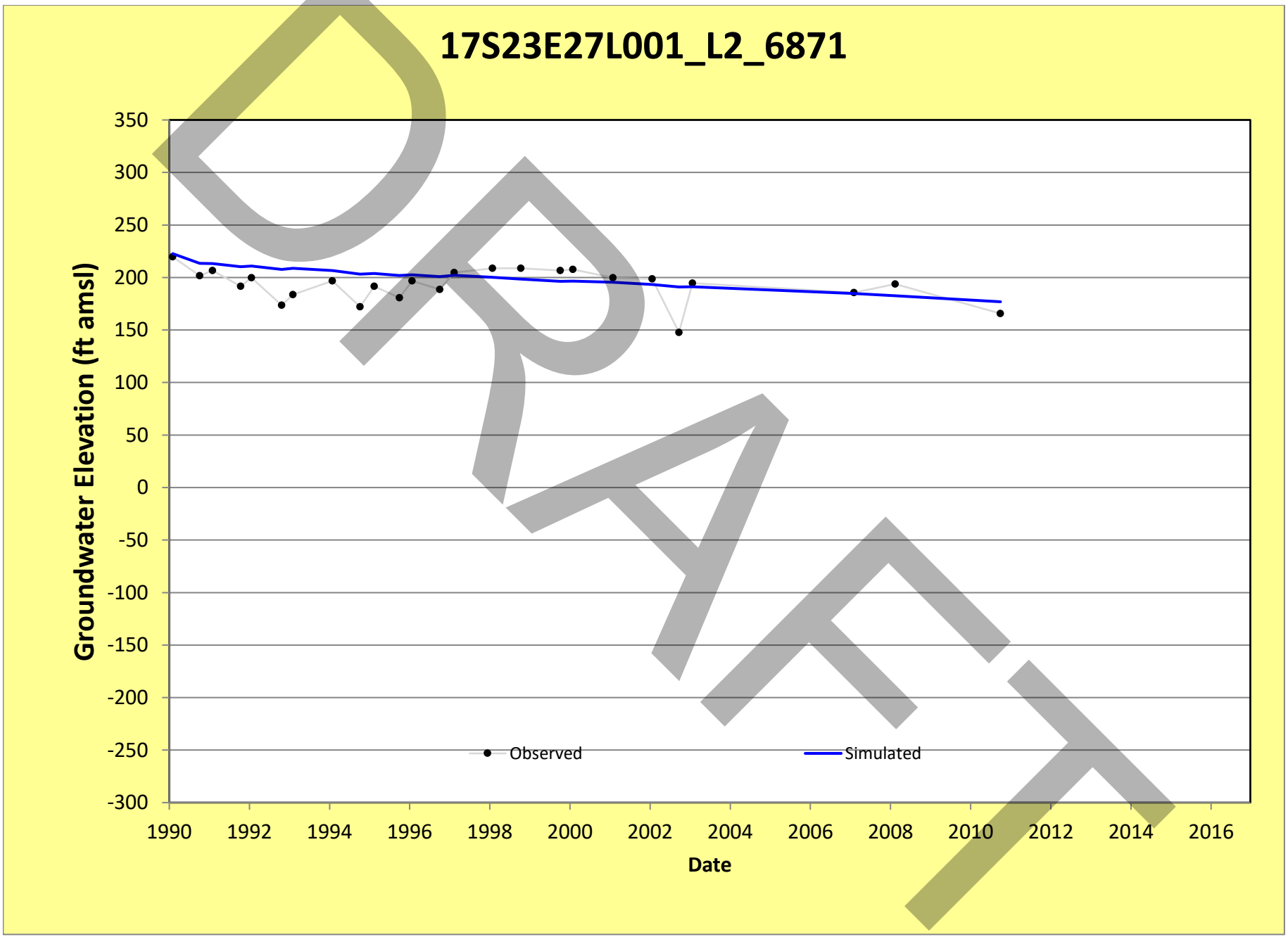
17S23E27L001_L2_6871
Groundwater Elevation (ft amsl)
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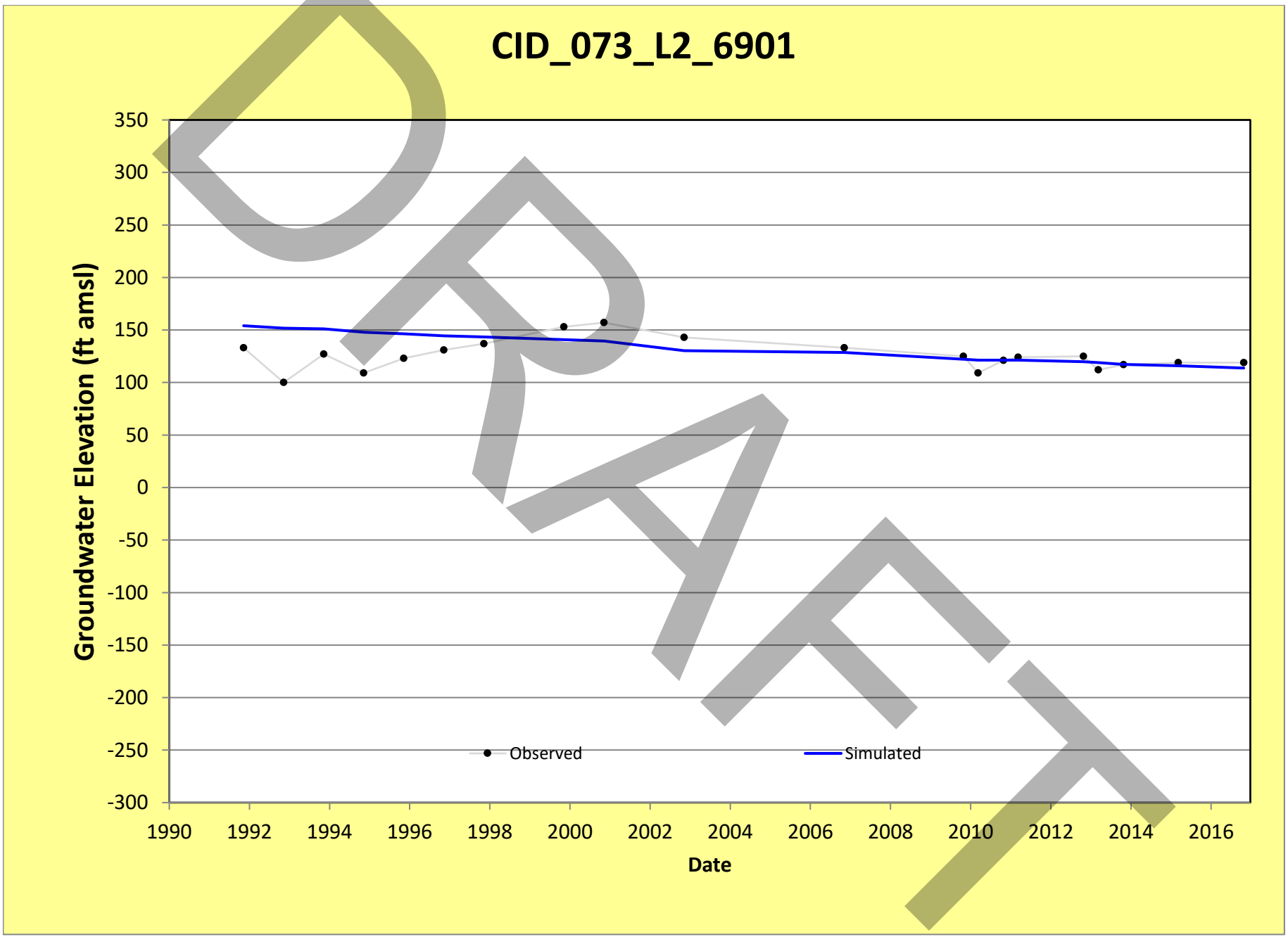
CID_073_L2_6901
Groundwater Elevation (ft amsl)
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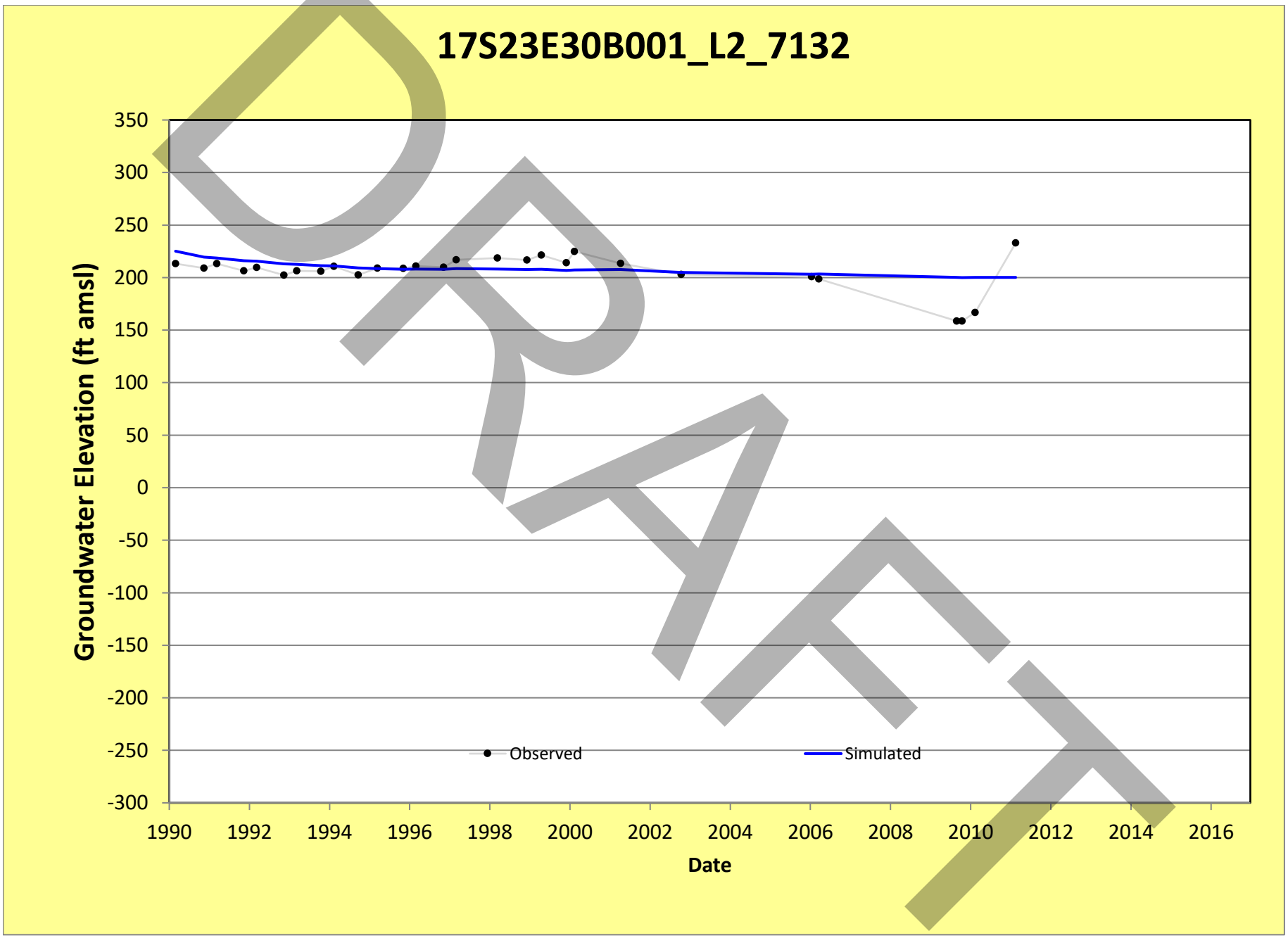
17S23E30B001_L2_7132
Groundwater Elevation (ft amsl)
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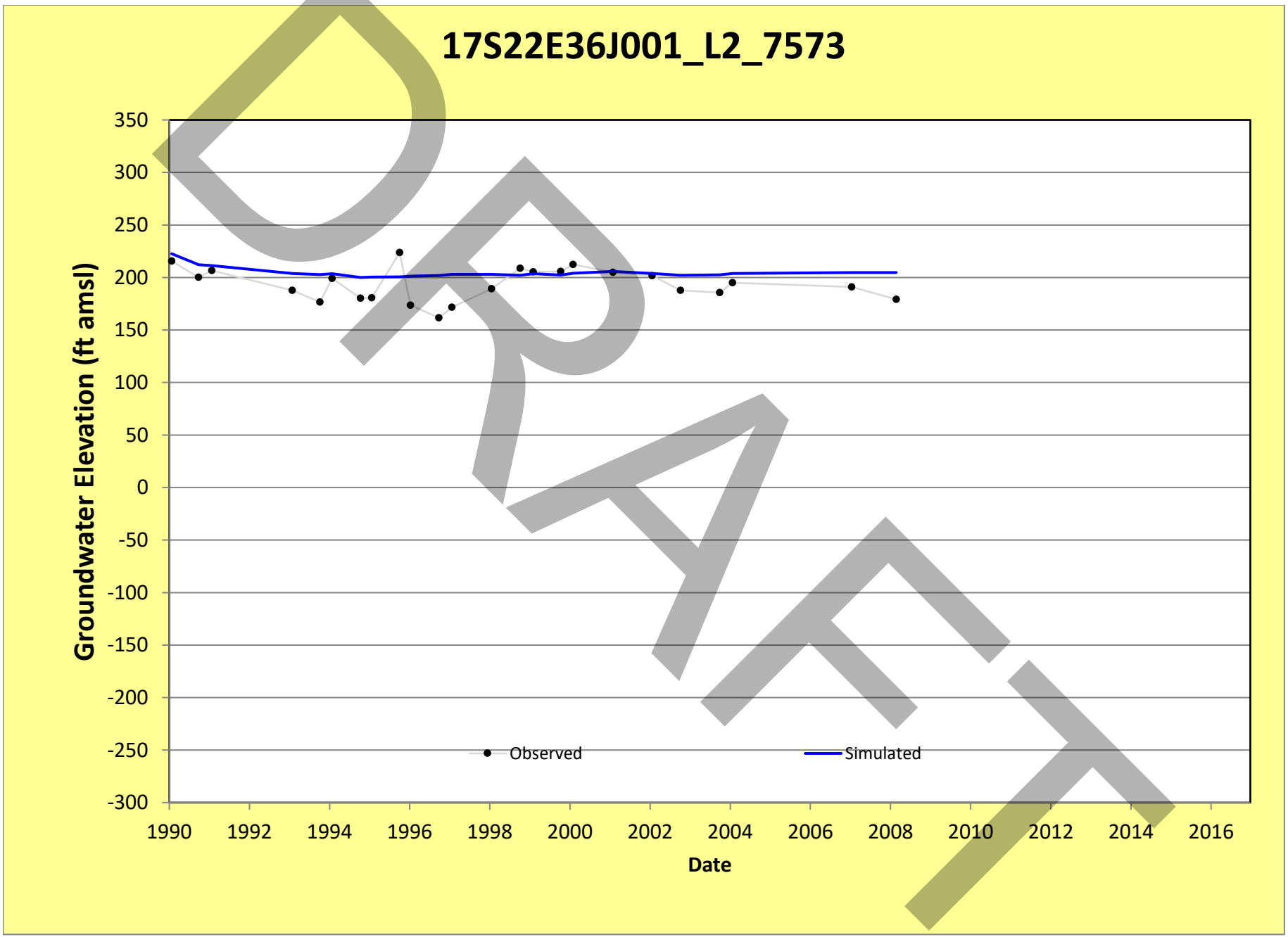
17S22E36J001_L2_7573
Groundwater Elevation (ft amsl)
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Observed
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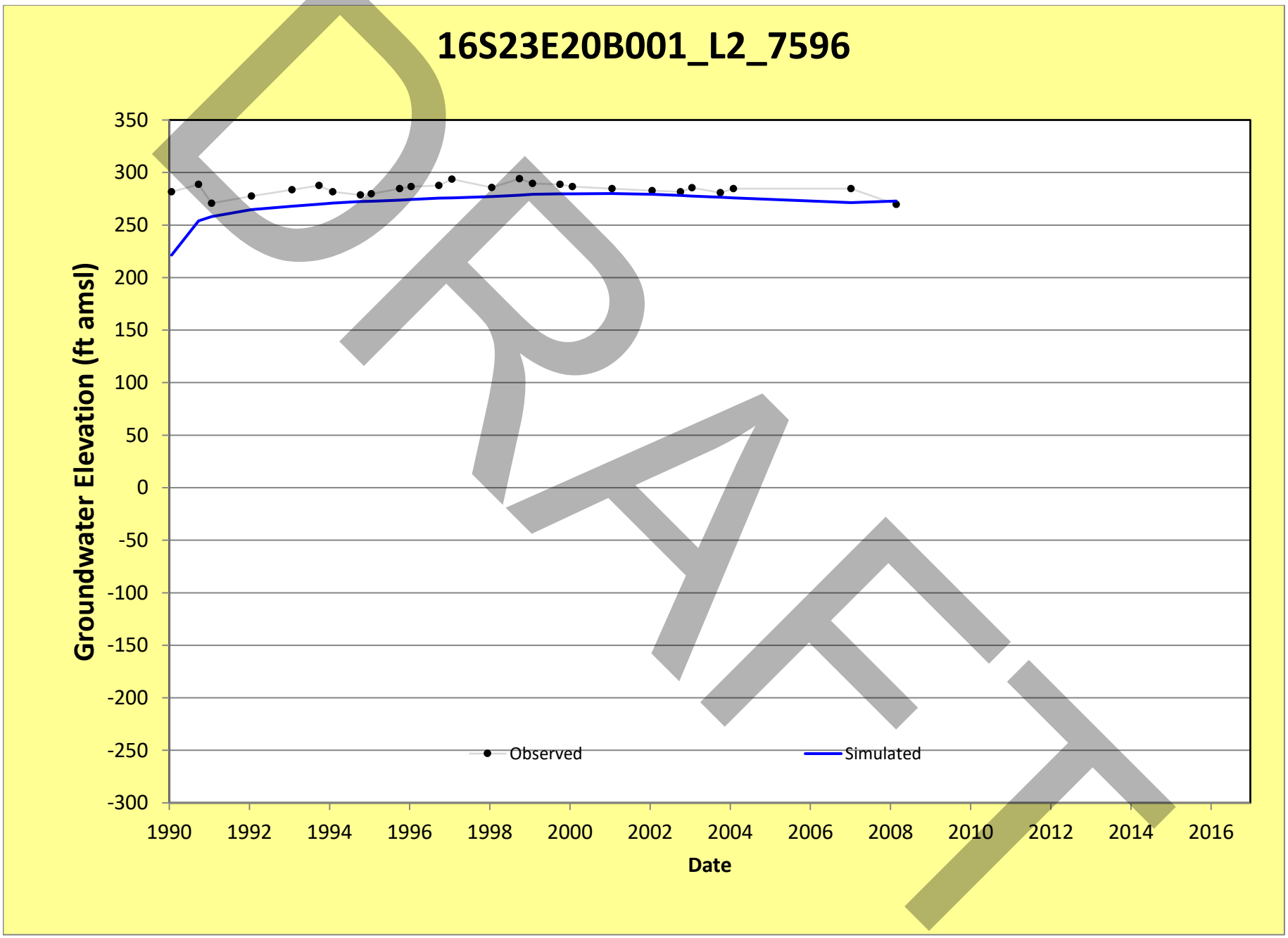
16S23E20B001_L2_7596
Groundwater Elevation (ft amsl)
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Observed
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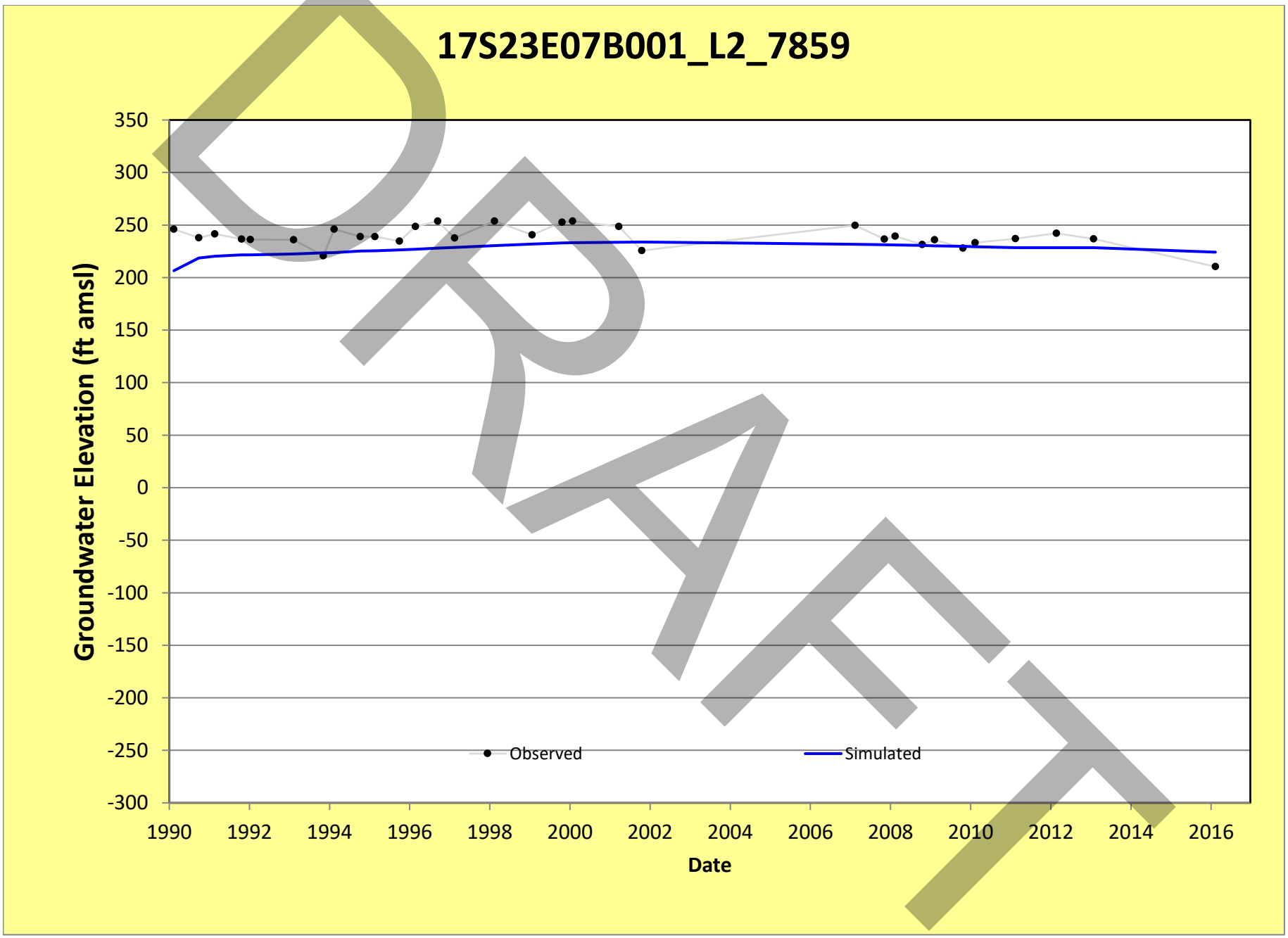
DRAFT


17S23E07B001_L2_7859
Groundwater Elevation (ft amsl)
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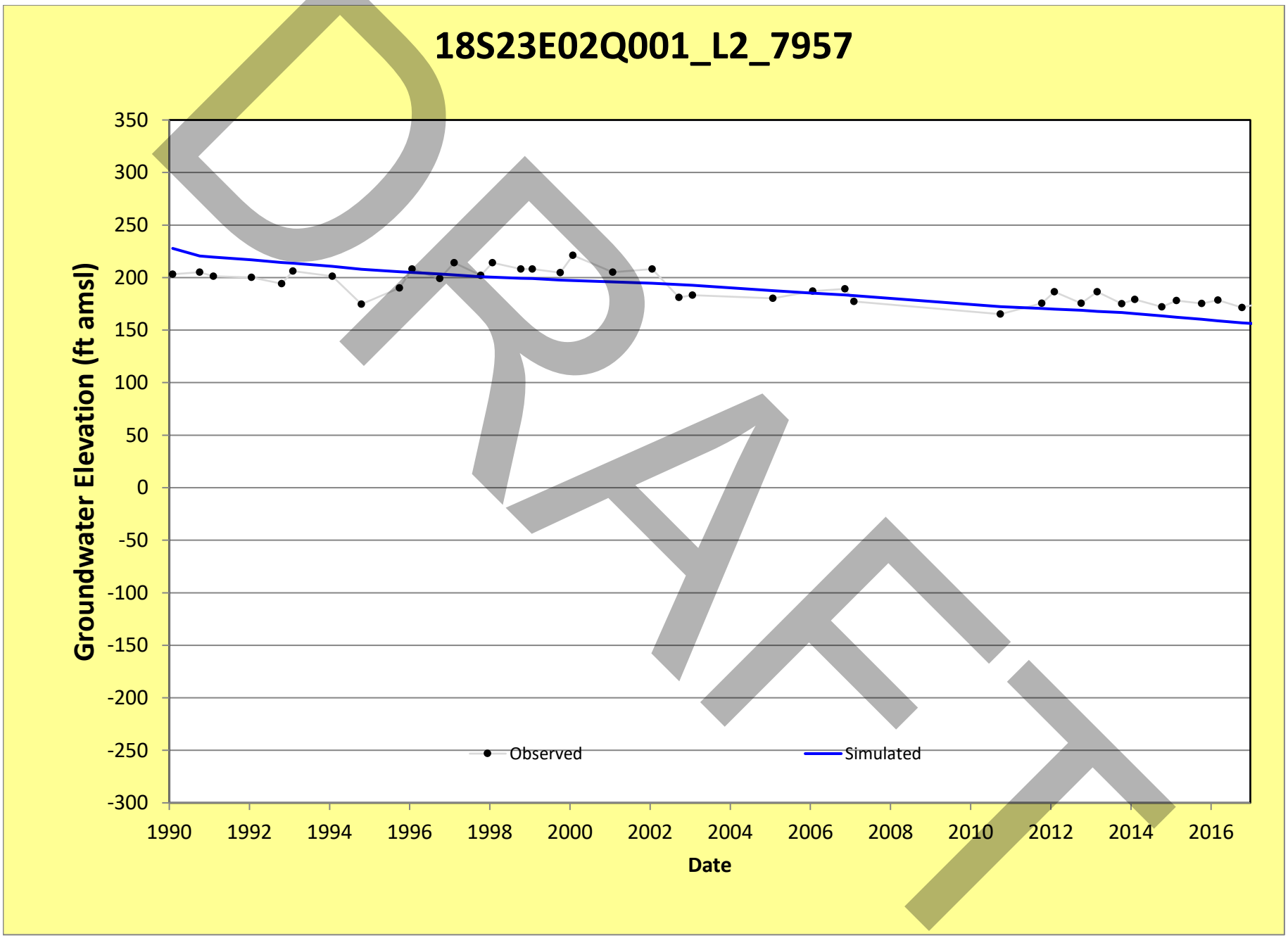
18S23E02Q001_L2_7957
Groundwater Elevation (ft amsl)
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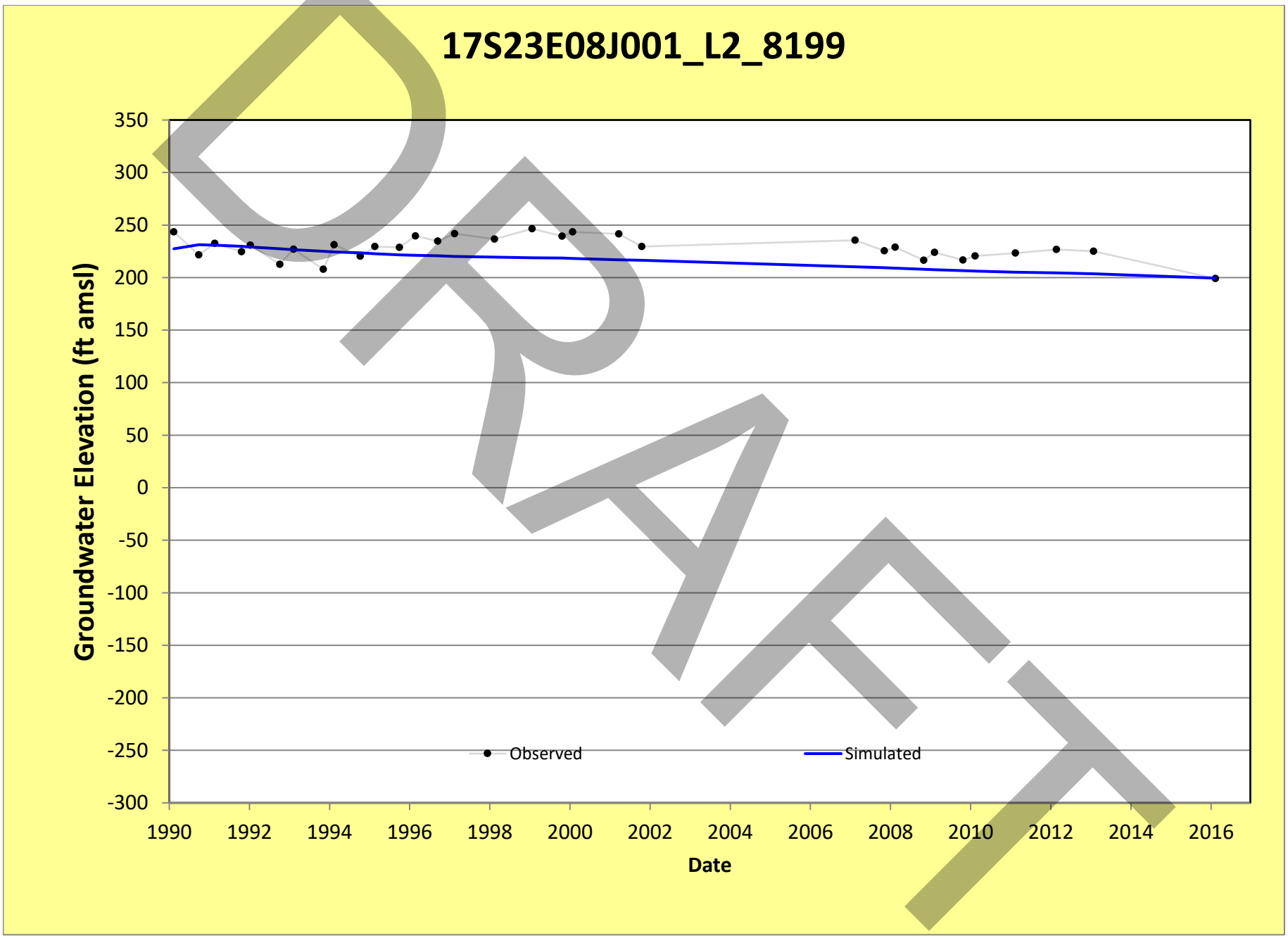
17S23E08J001_L2_8199
Groundwater Elevation (ft amsl)
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Observed
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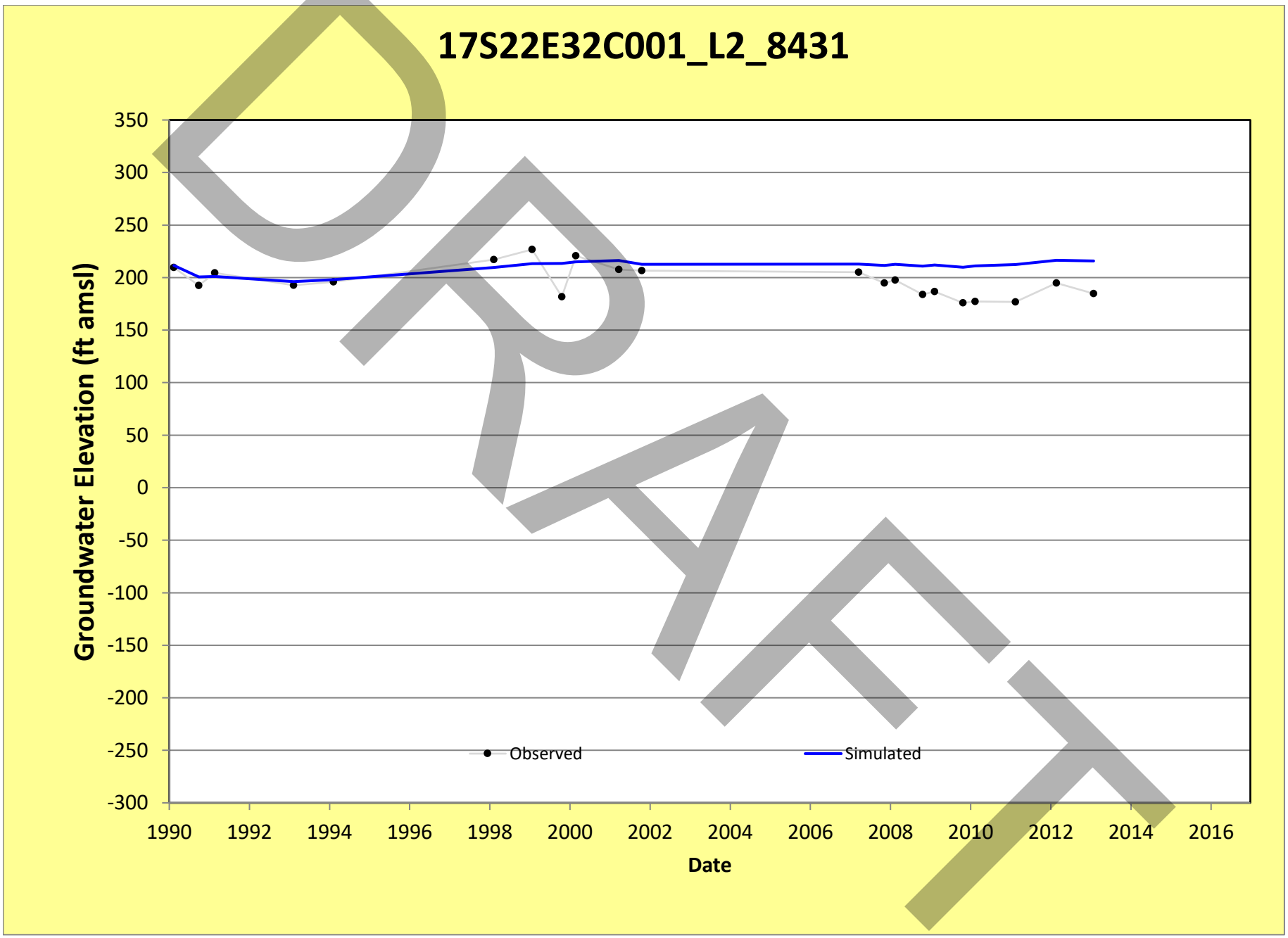
17S22E32C001_L2_8431
Groundwater Elevation (ft amsl)
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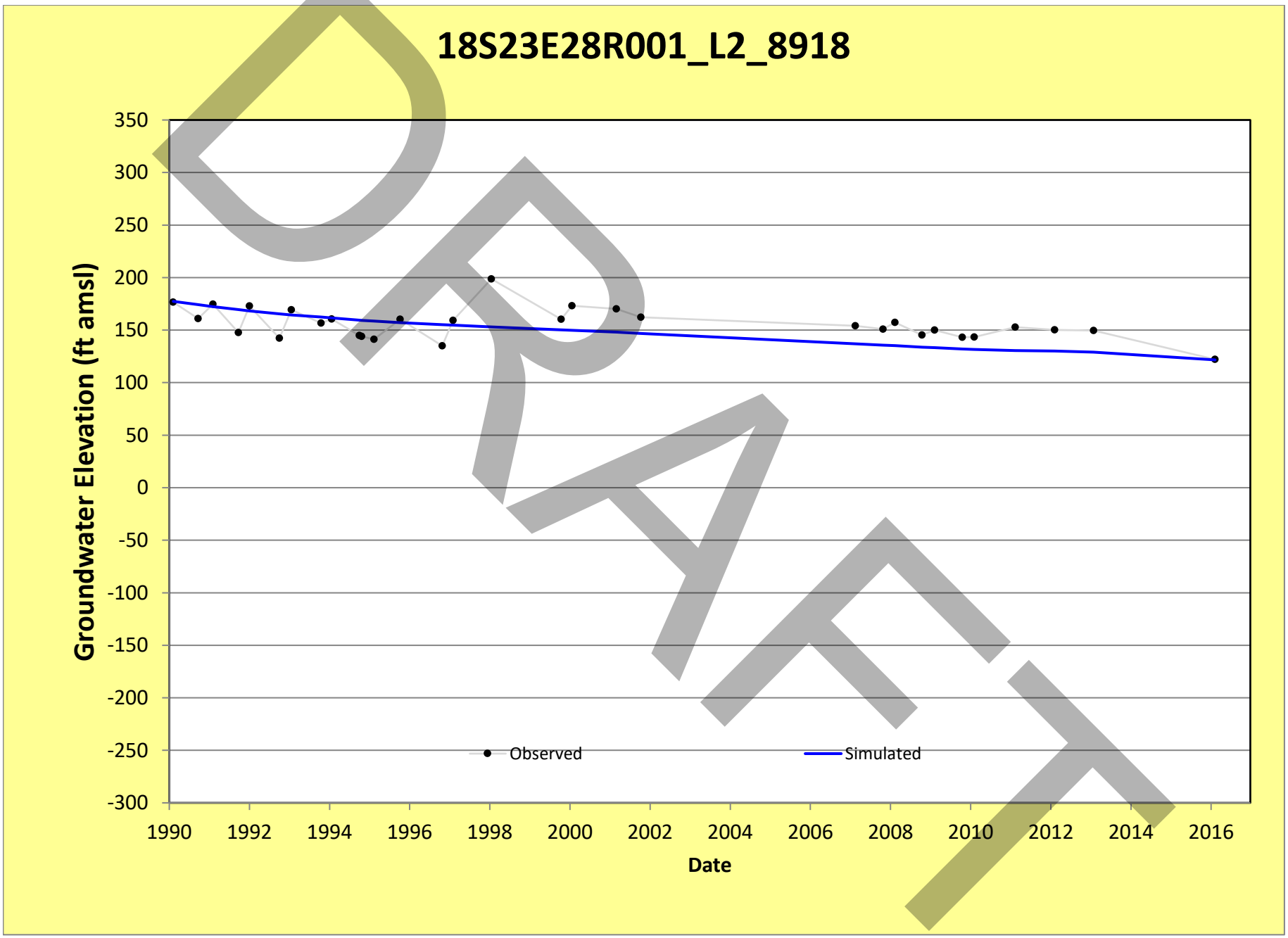
18S23E28R001_L2_8918
Groundwater Elevation (ft amsl)
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Observed
Simulated
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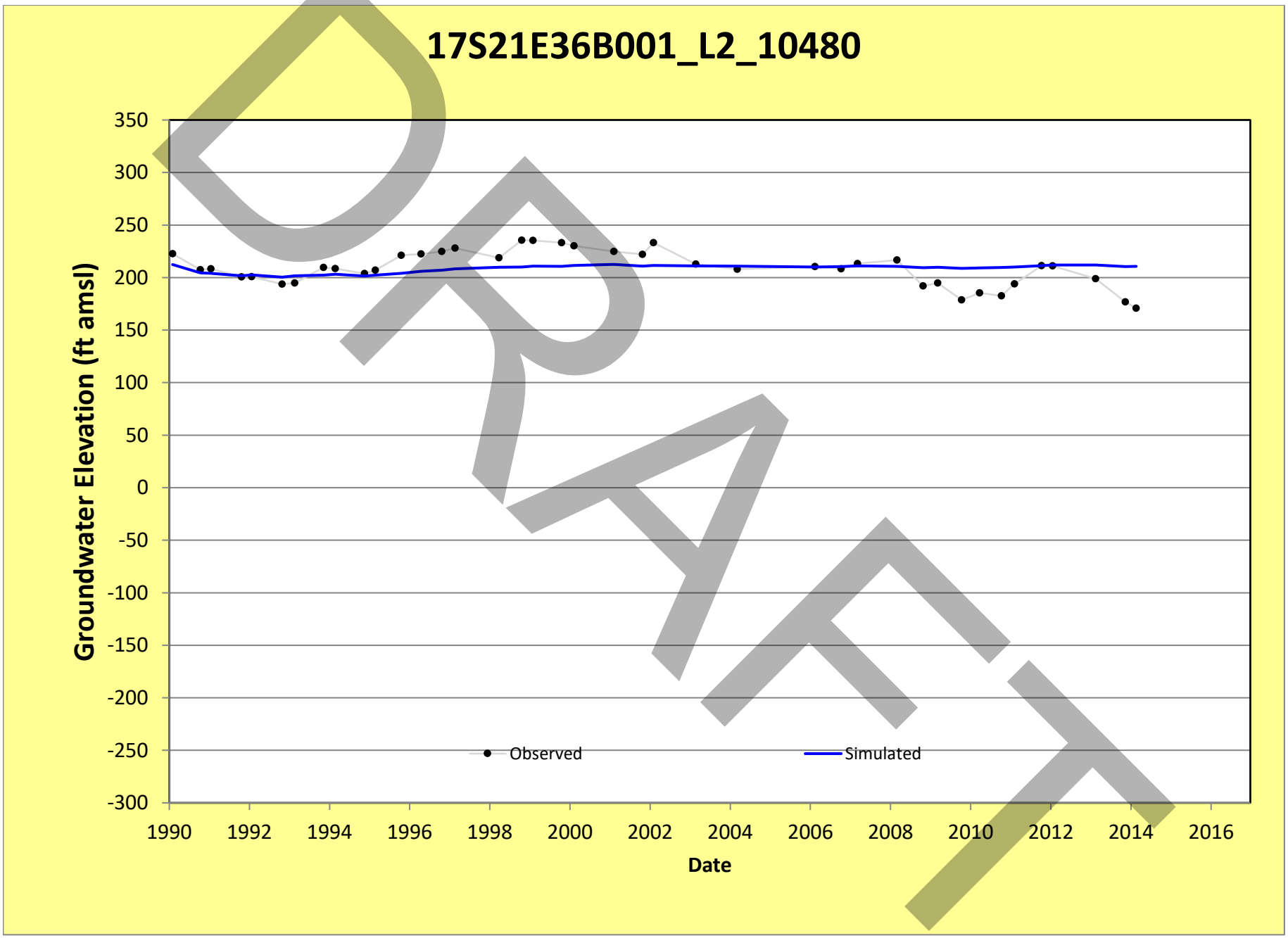
17S21E36B001_L2_10480
Groundwater Elevation (ft amsl)
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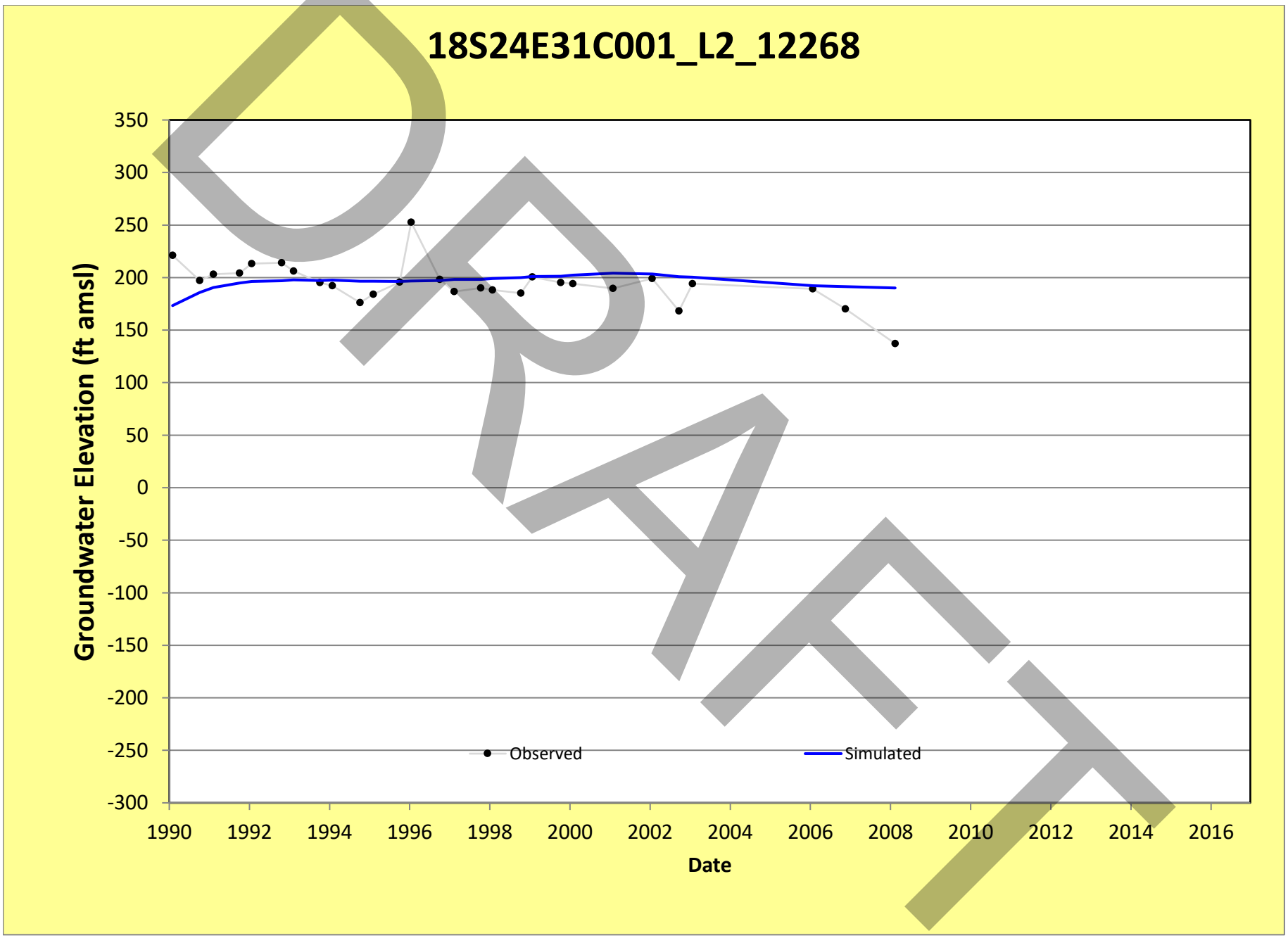
Simulated
DRAFT


18S24E31C001_L2_12268
Groundwater Elevation (ft amsl)
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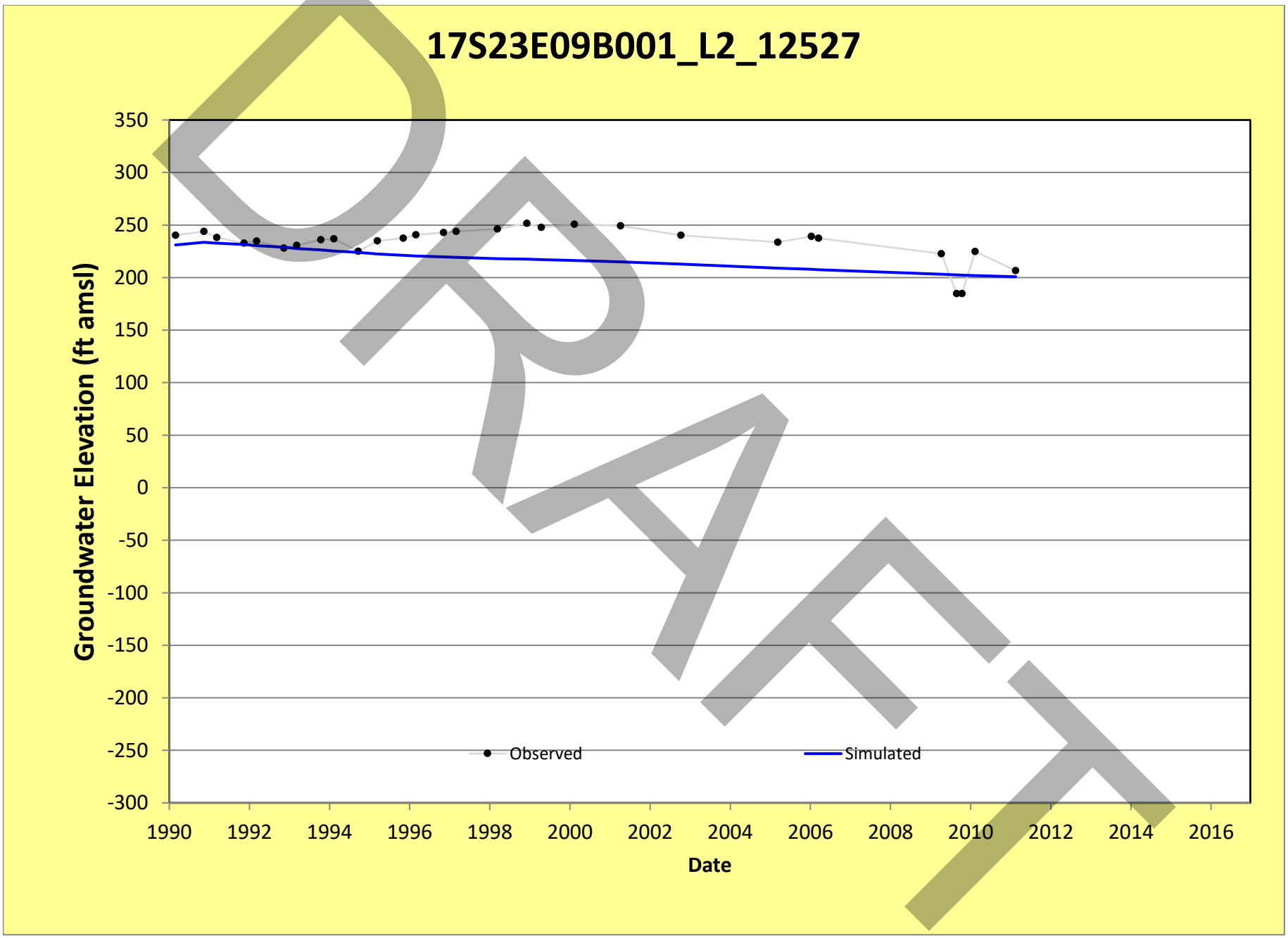
Date
Observed
Simulated
DRAFT


17S23E09B001_L2_12527
Groundwater Elevation (ft amsl)
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Date
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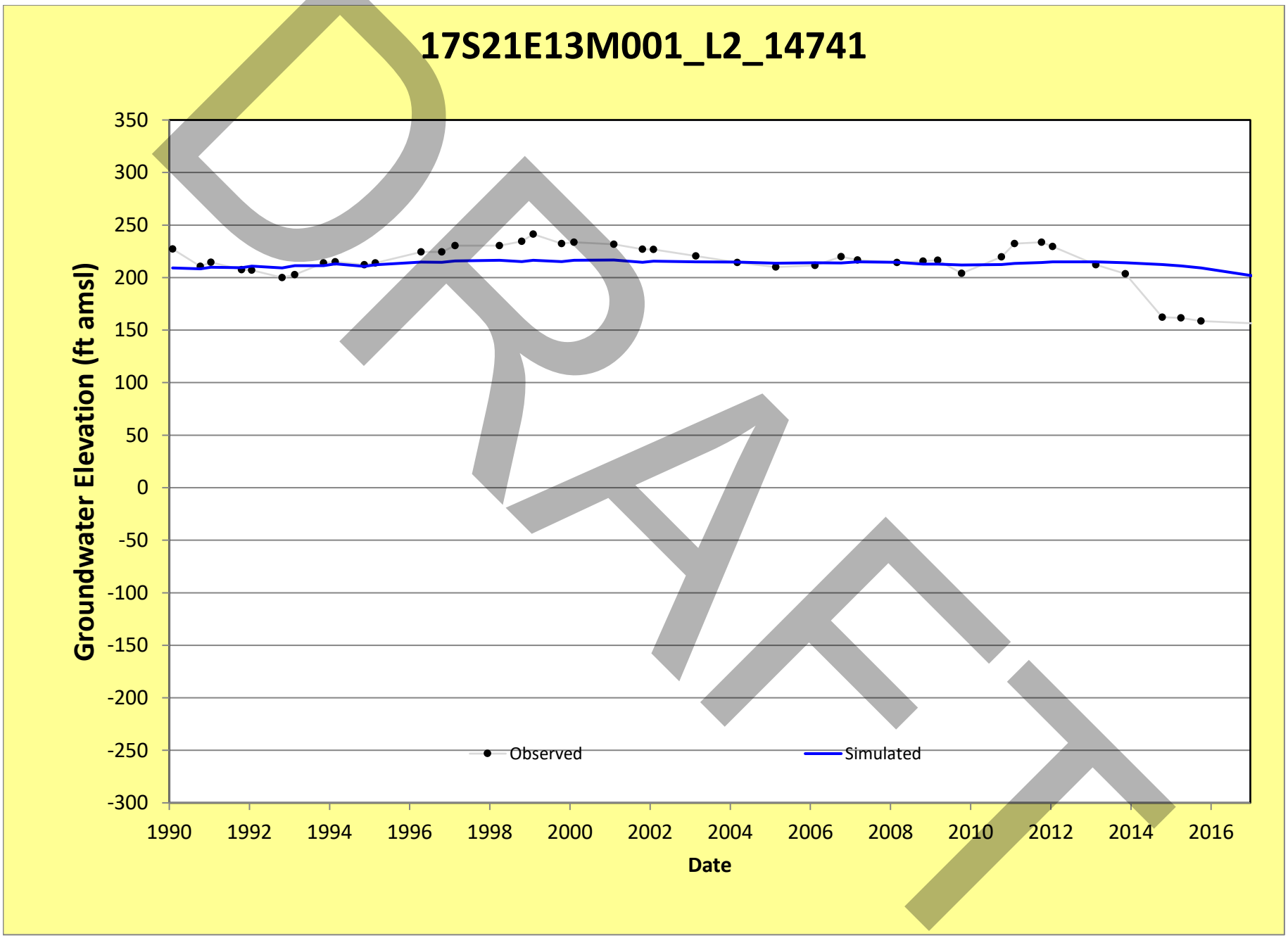
17S21E13M001_L2_14741
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Observed
Simulated
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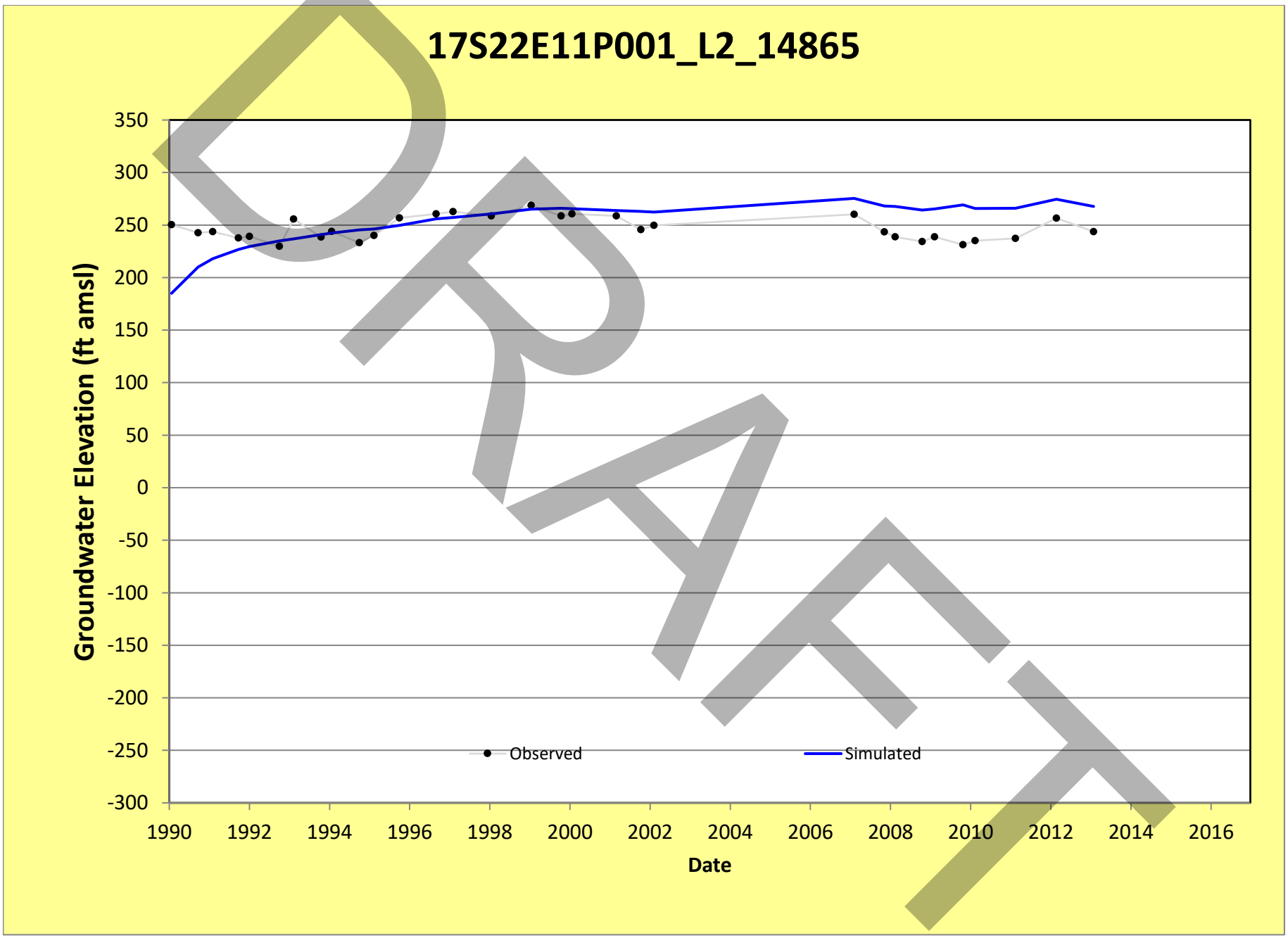
17S22E11P001_L2_14865
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
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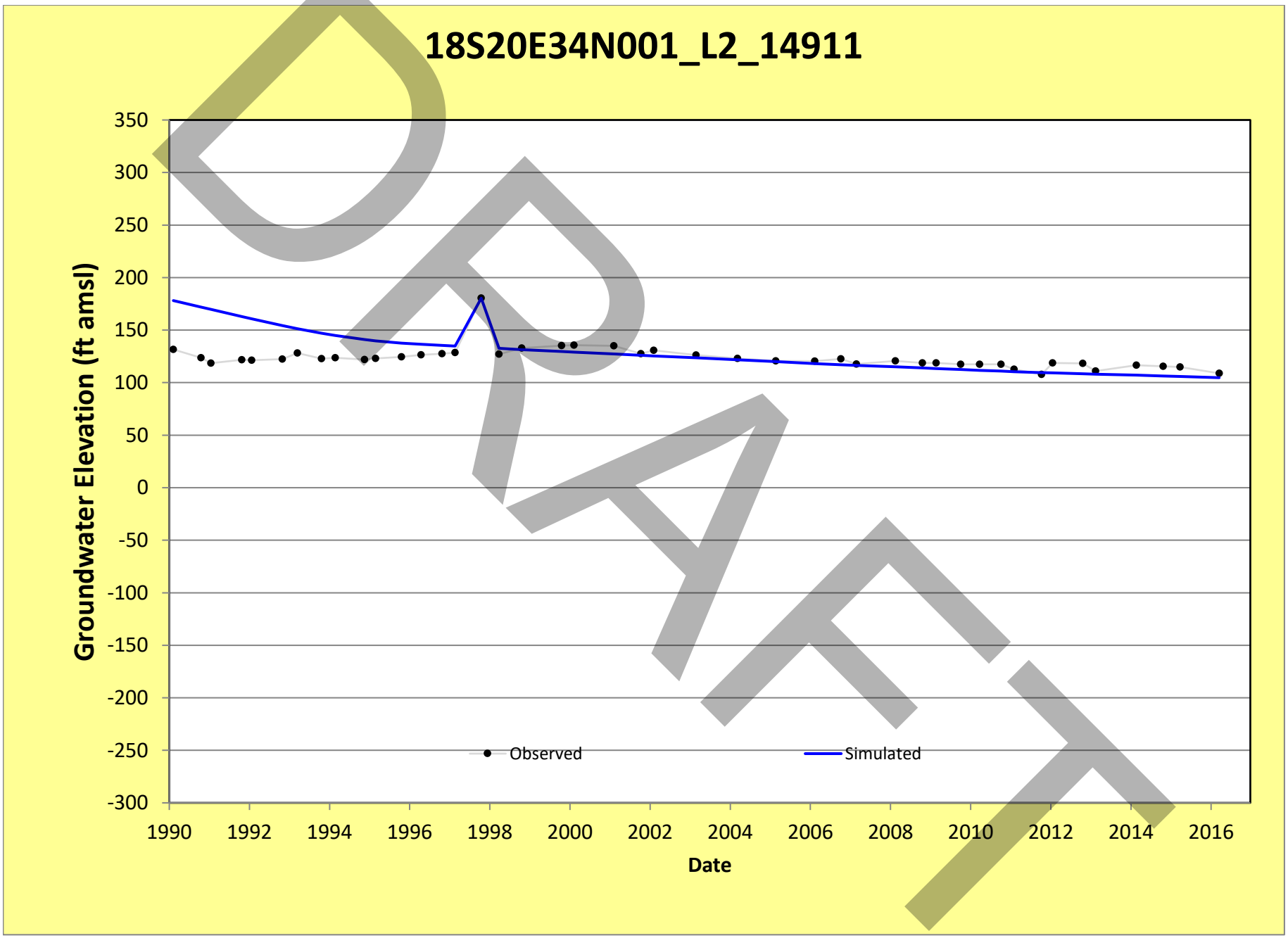
18S20E34N001_L2_14911
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
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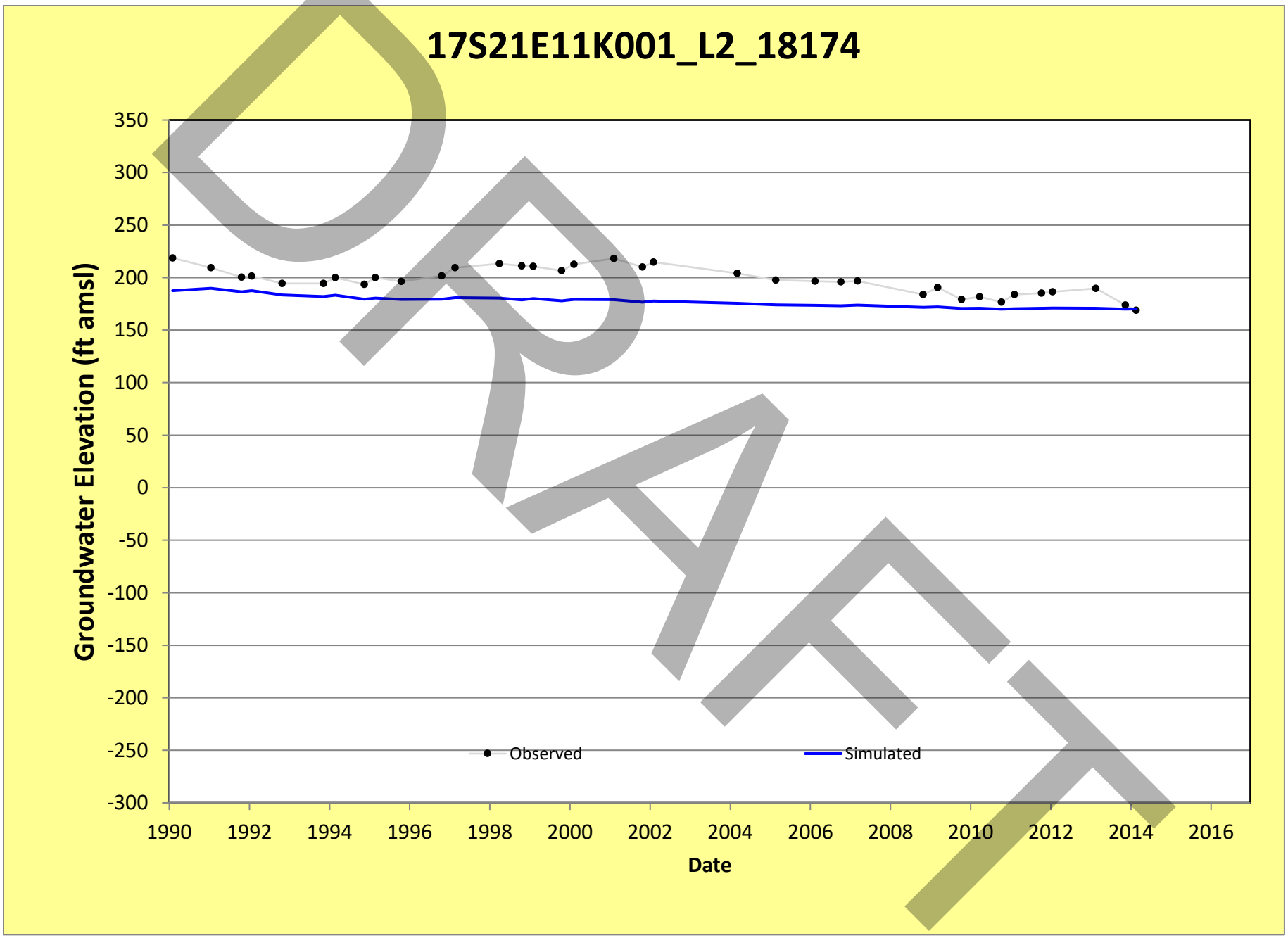
DRAFT


17S21E11K001_L2_18174
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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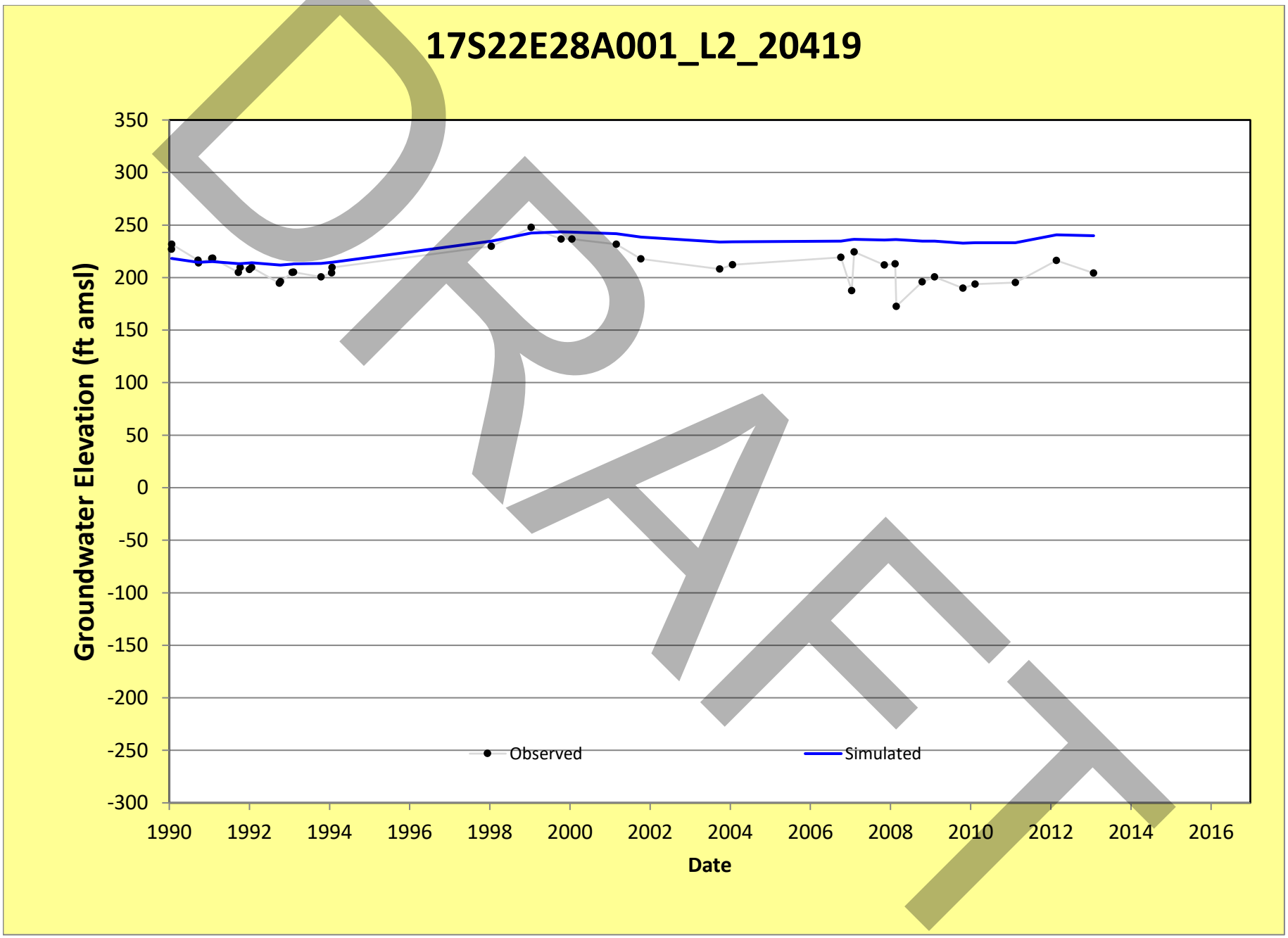
Date
Observed
Simulated
DRAFT


17S22E28A001_L2_20419
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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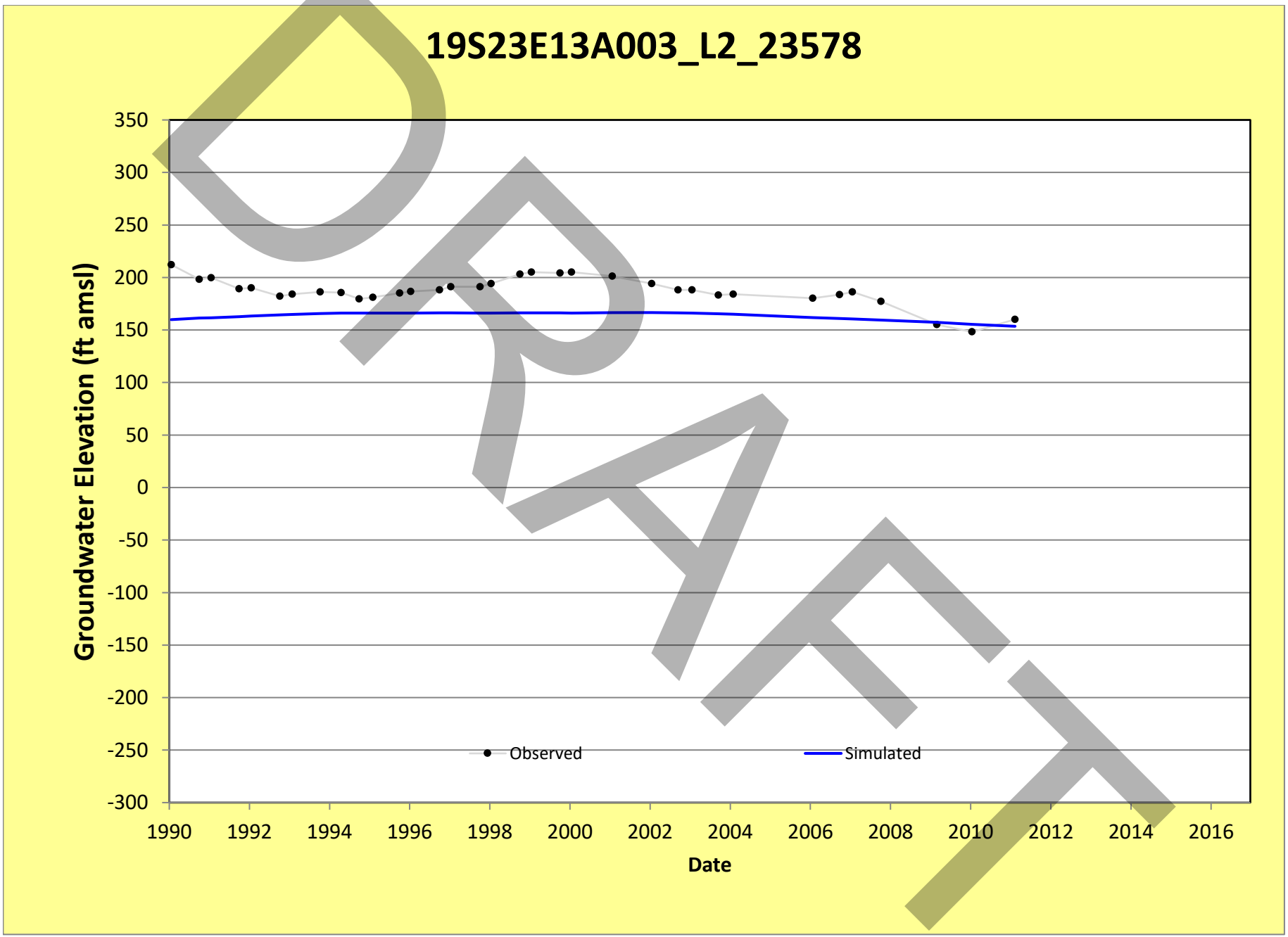
Date
Observed
Simulated
DRAFT


19S23E13A003_L2_23578
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Observed
Simulated
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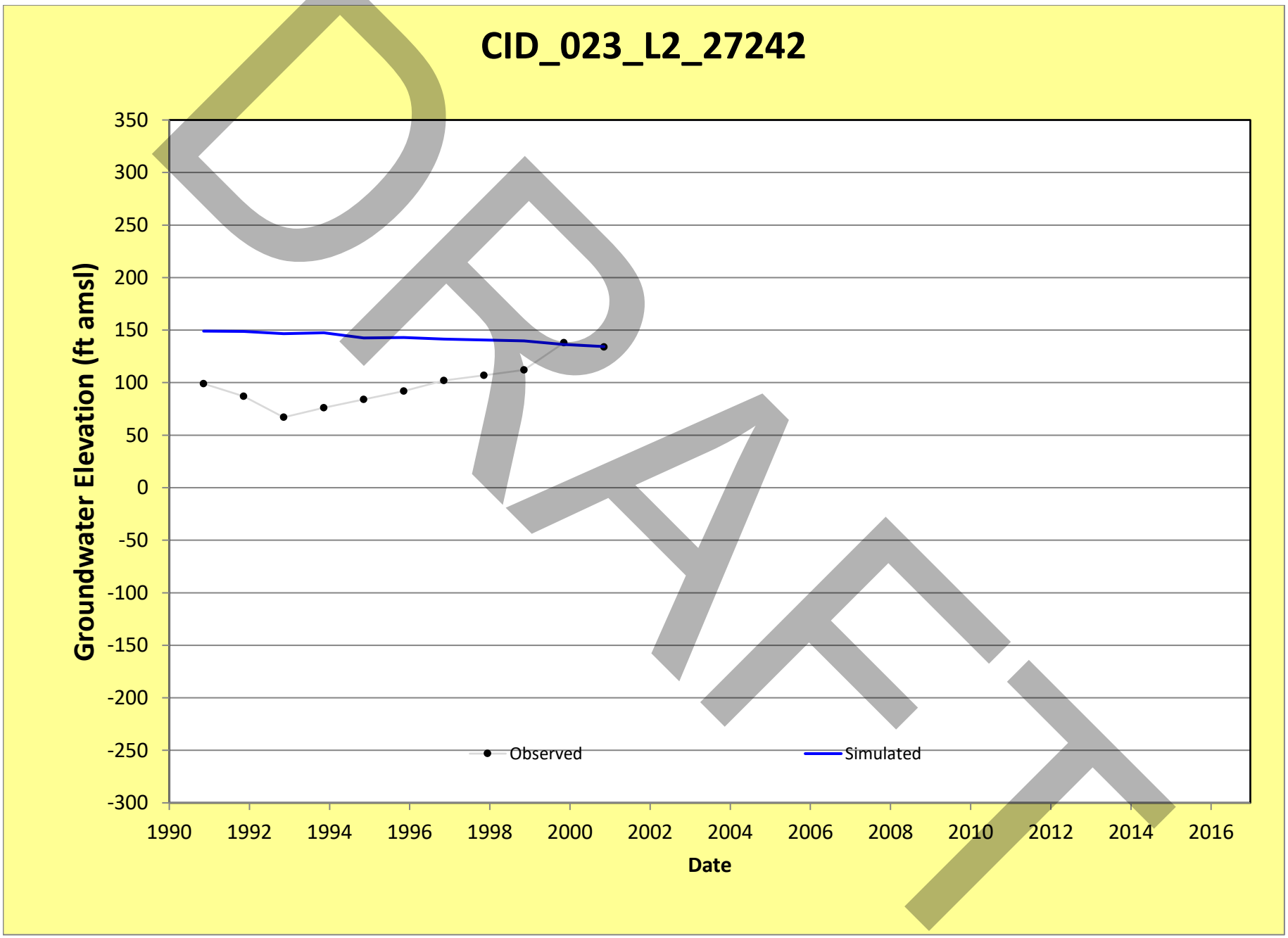
CID_023_L2_27242
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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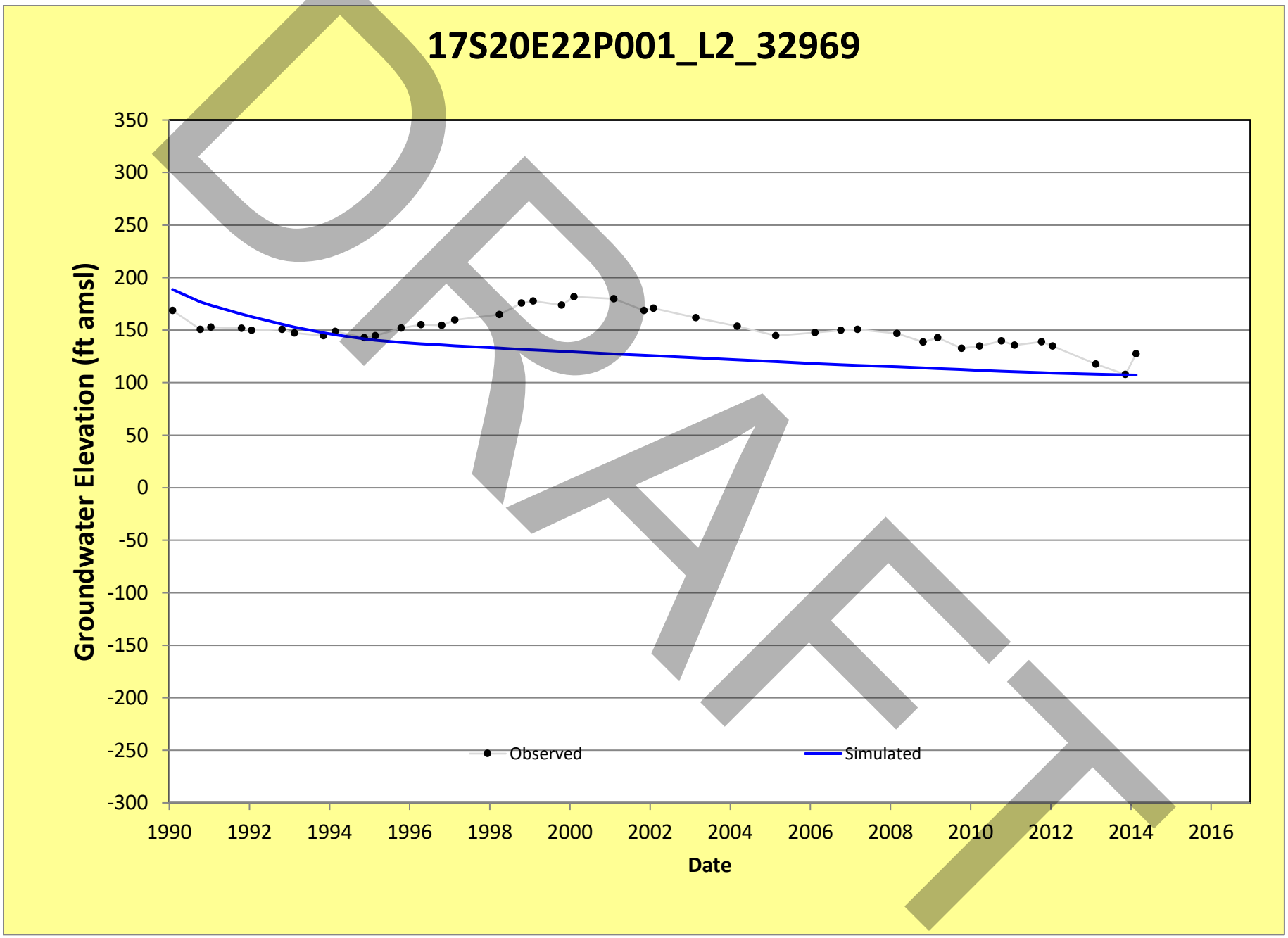
Date
Observed
Simulated
DRAFT


17S20E22P001_L2_32969
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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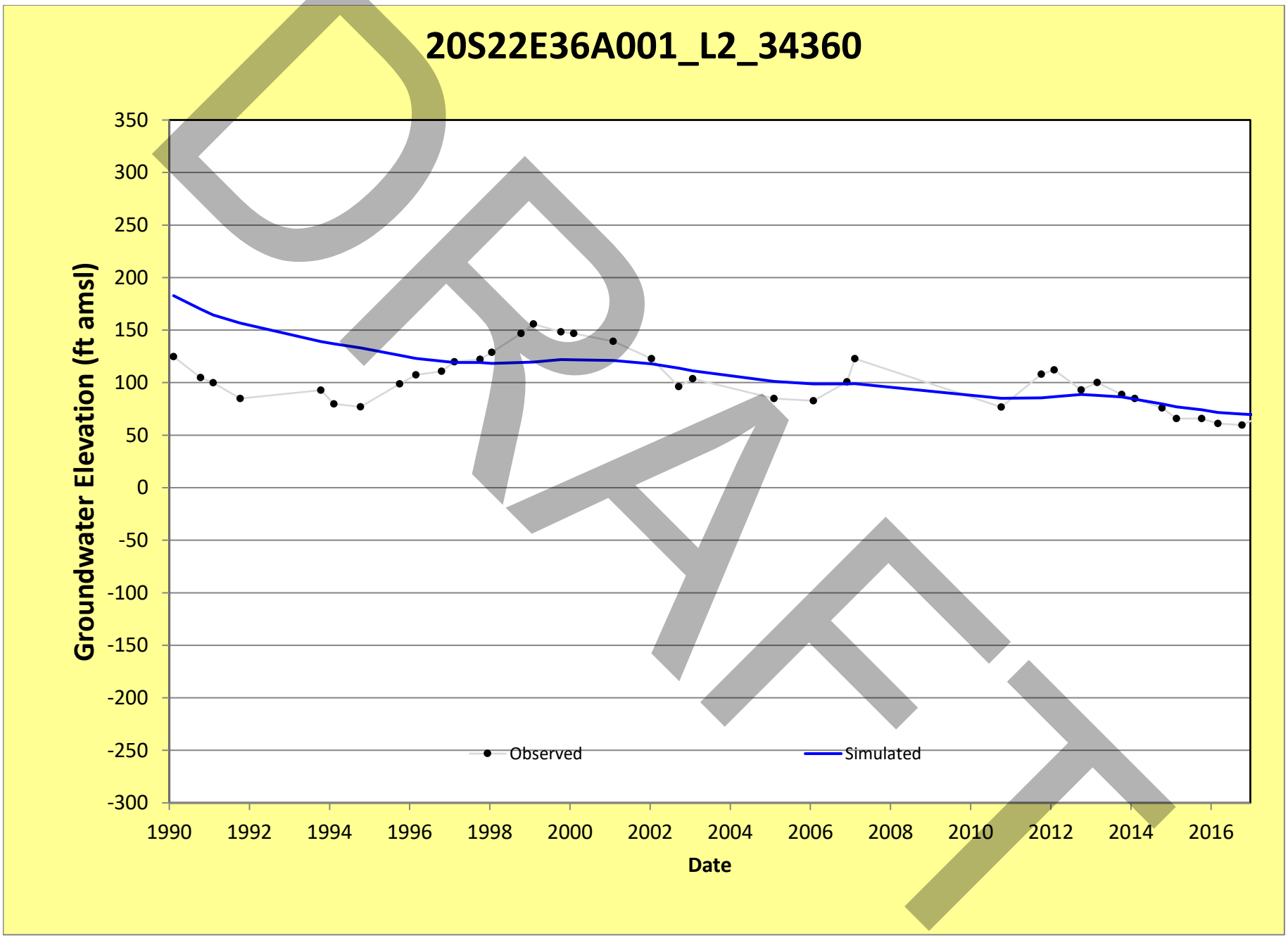
Date
Observed
Simulated
DRAFT


20S22E36A001_L2_34360
Groundwater Elevation (ft amsl)
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300
250
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100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated
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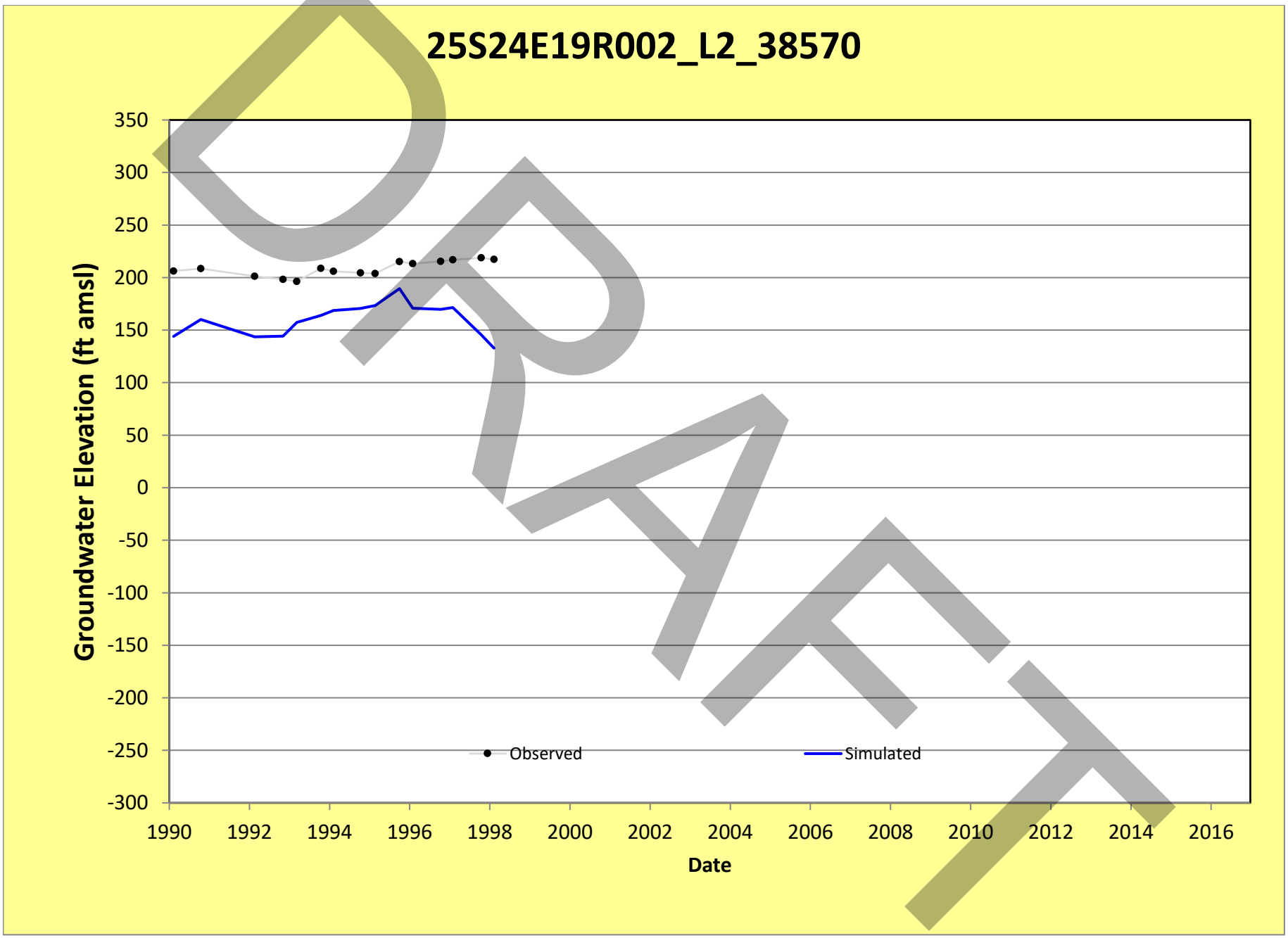
25S24E19R002_L2_38570
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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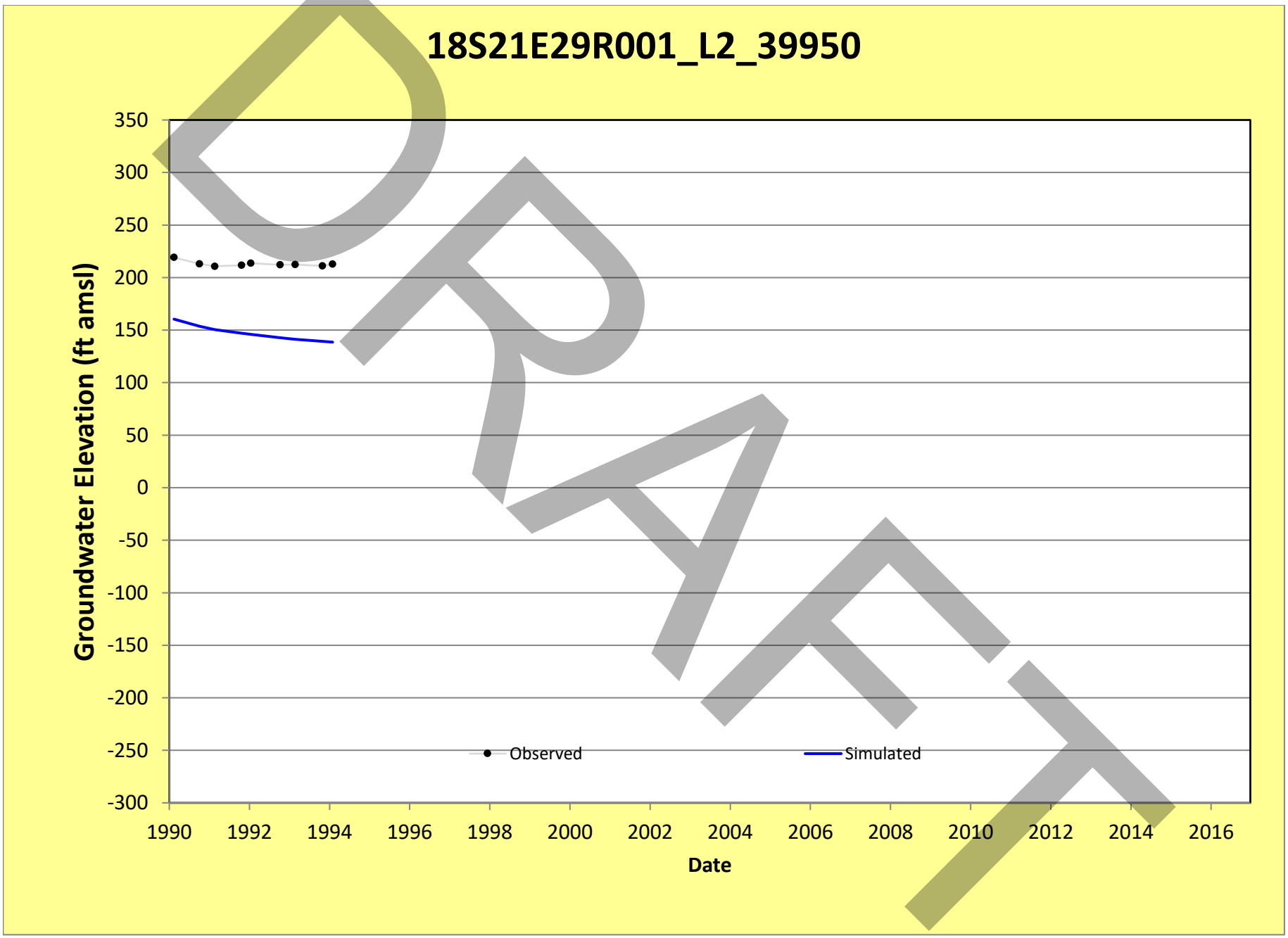
18S21E29R001_L2_39950
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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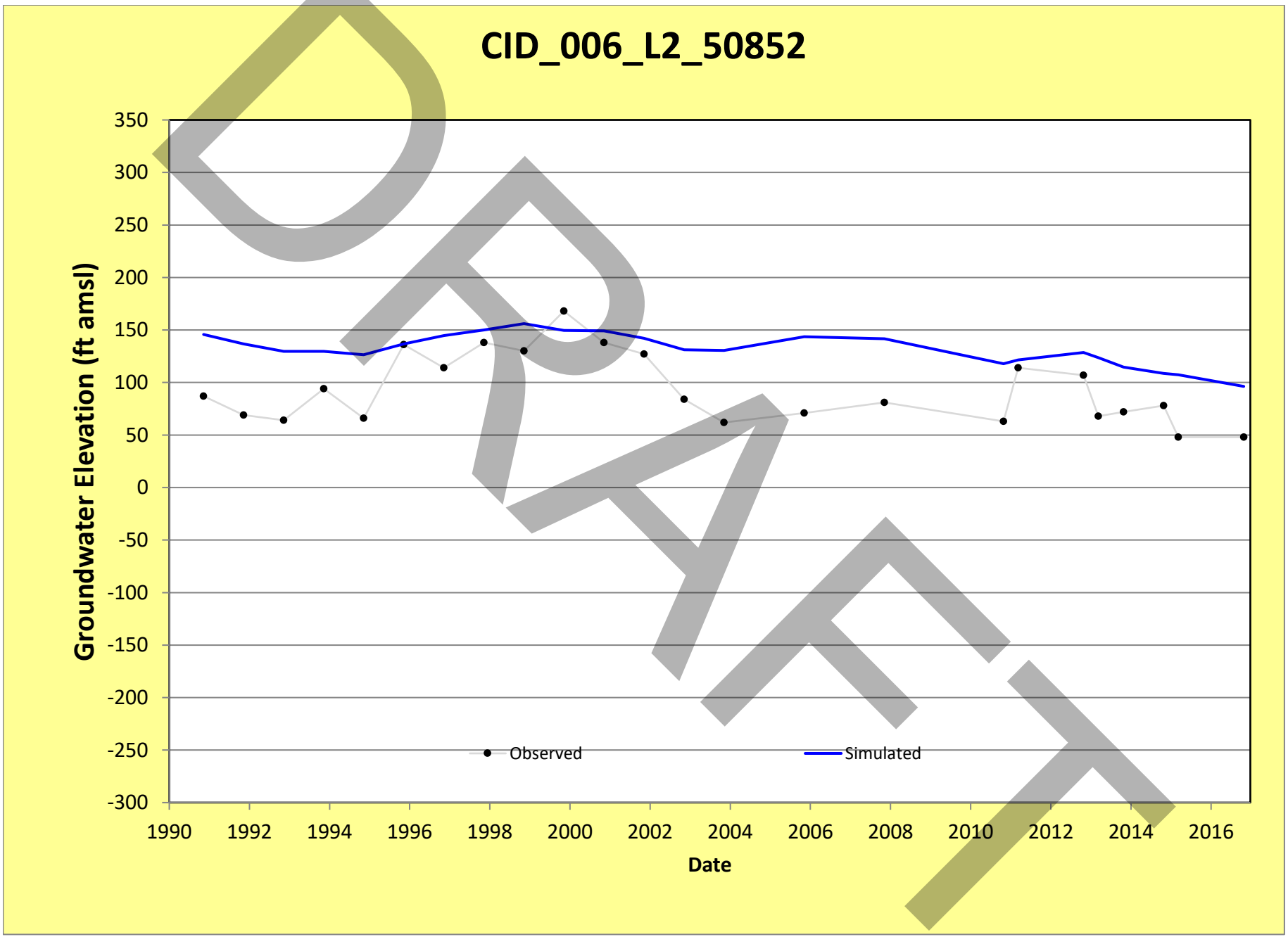
Date
Observed
Simulated
DRAFT


CID_006_L2_50852
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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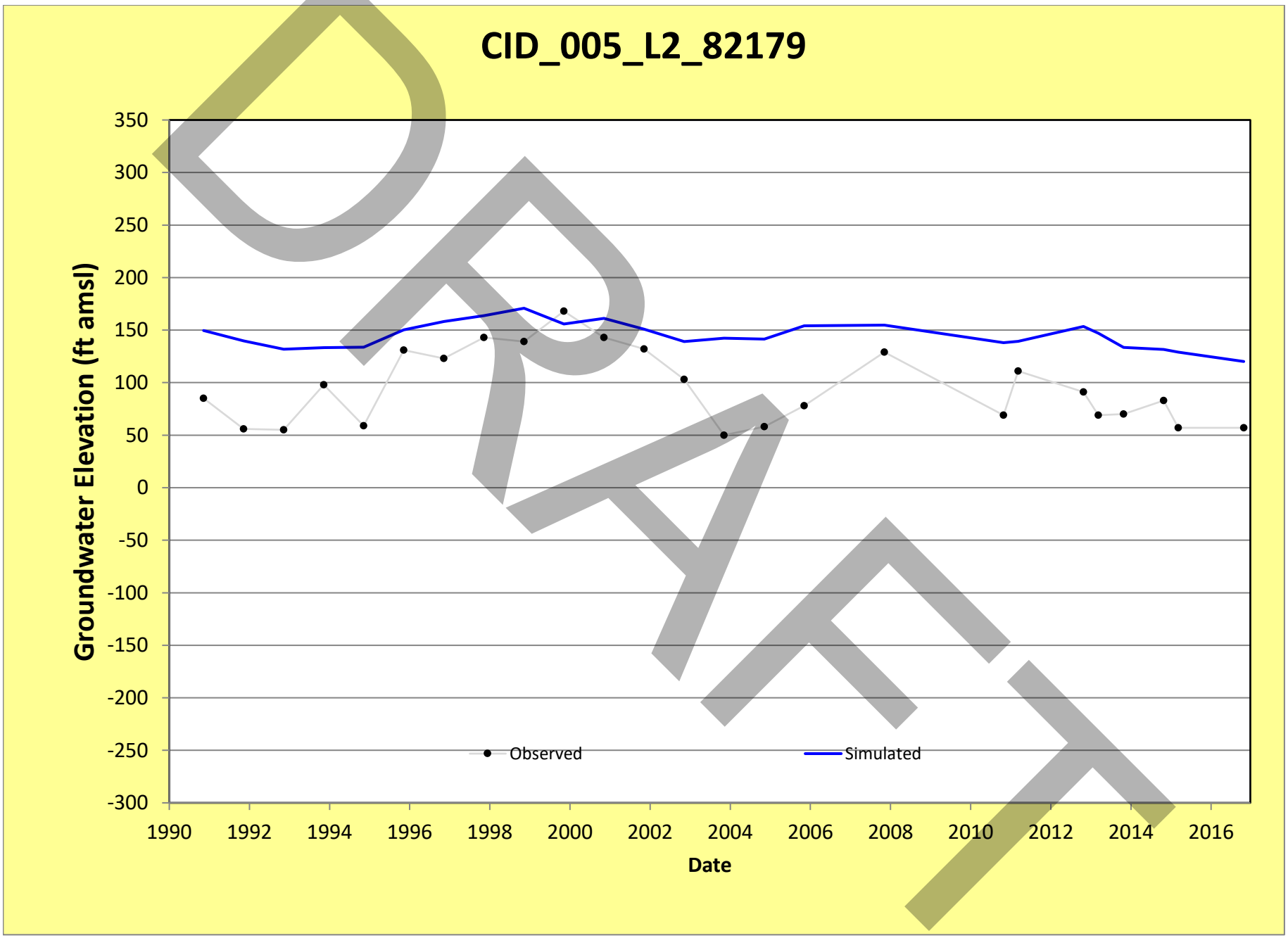
Date
Observed
Simulated
DRAFT


CID_005_L2_82179
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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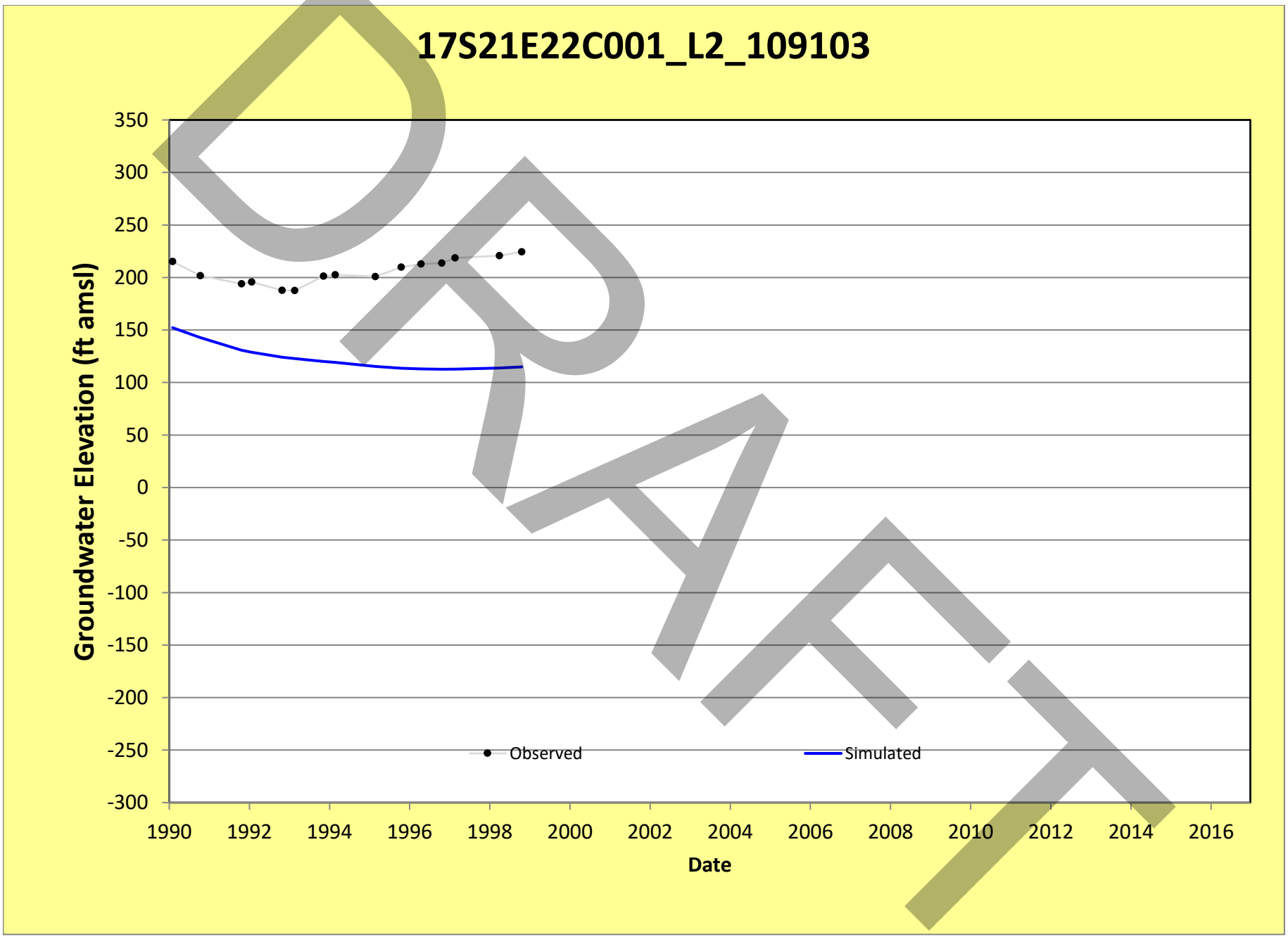
Date
Observed
Simulated
DRAFT


17S21E22C001_L2_109103
Groundwater Elevation (ft amsl)
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300
250
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150
100
50
0
-50
-100
-150
-200
-250
-300
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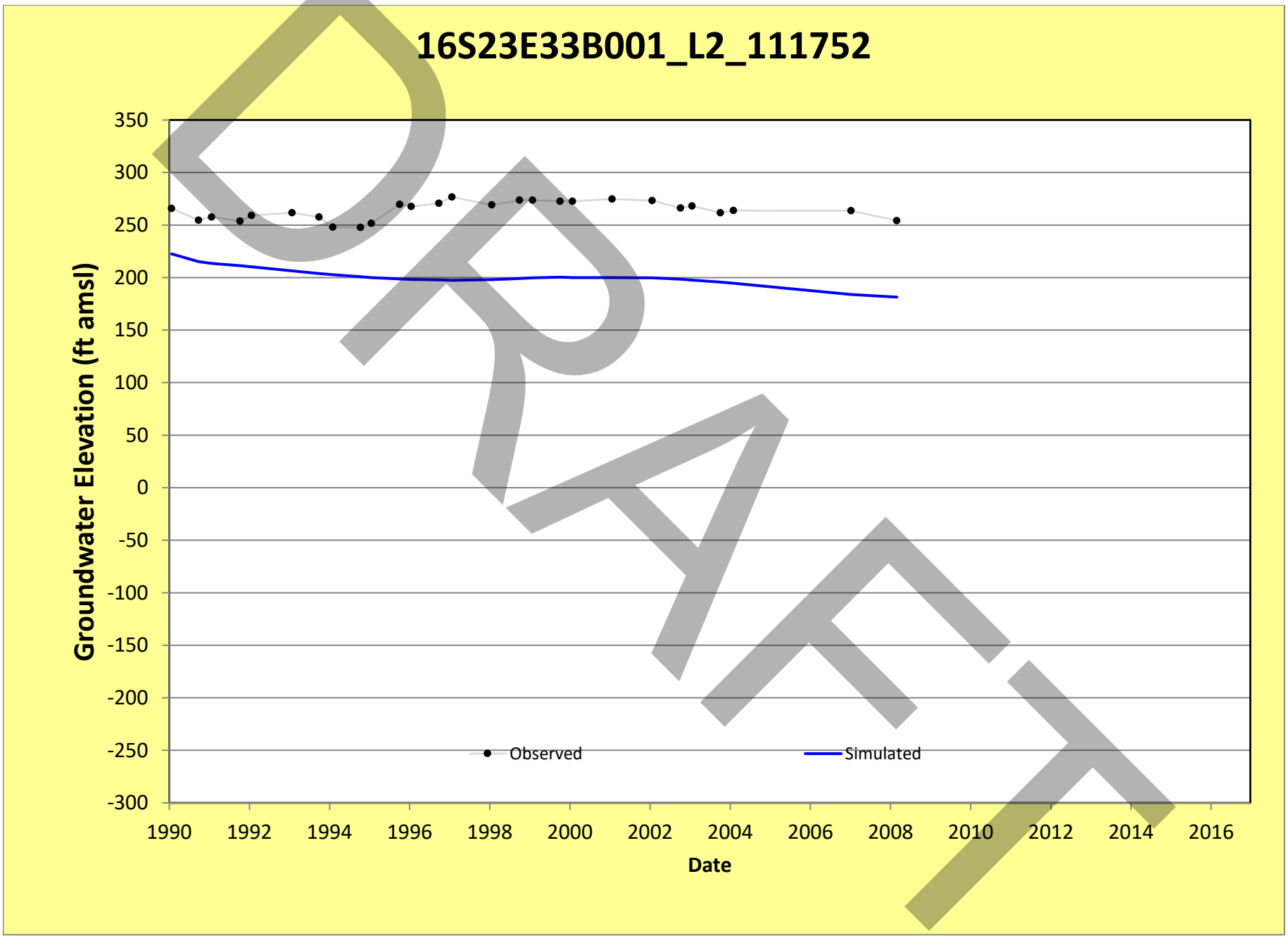
Date
Observed
Simulated
DRAFT


16S23E33B001_L2_111752
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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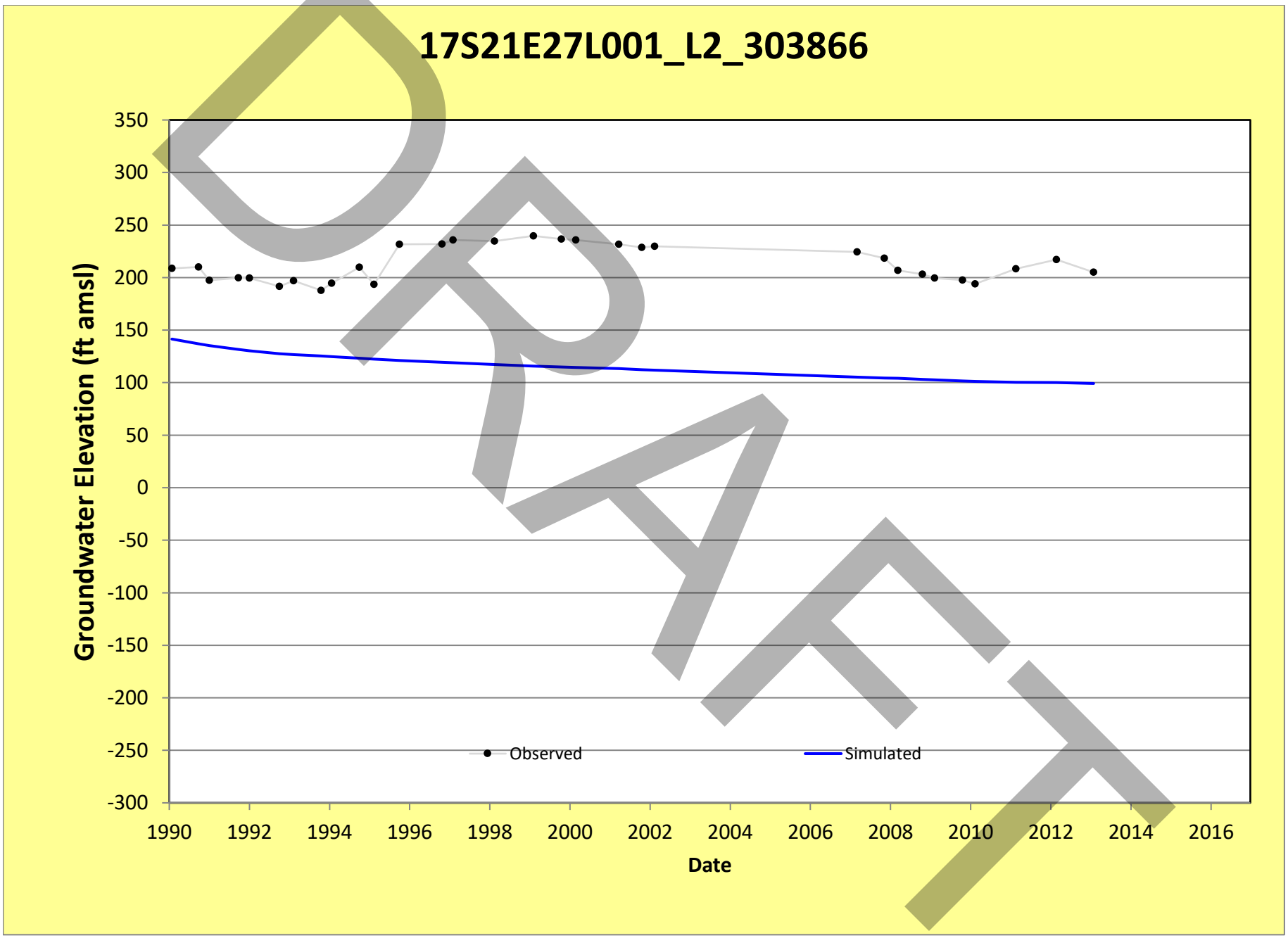
Date
Observed
Simulated
DRAFT


17S21E27L001_L2_303866
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
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-150
-200
-250
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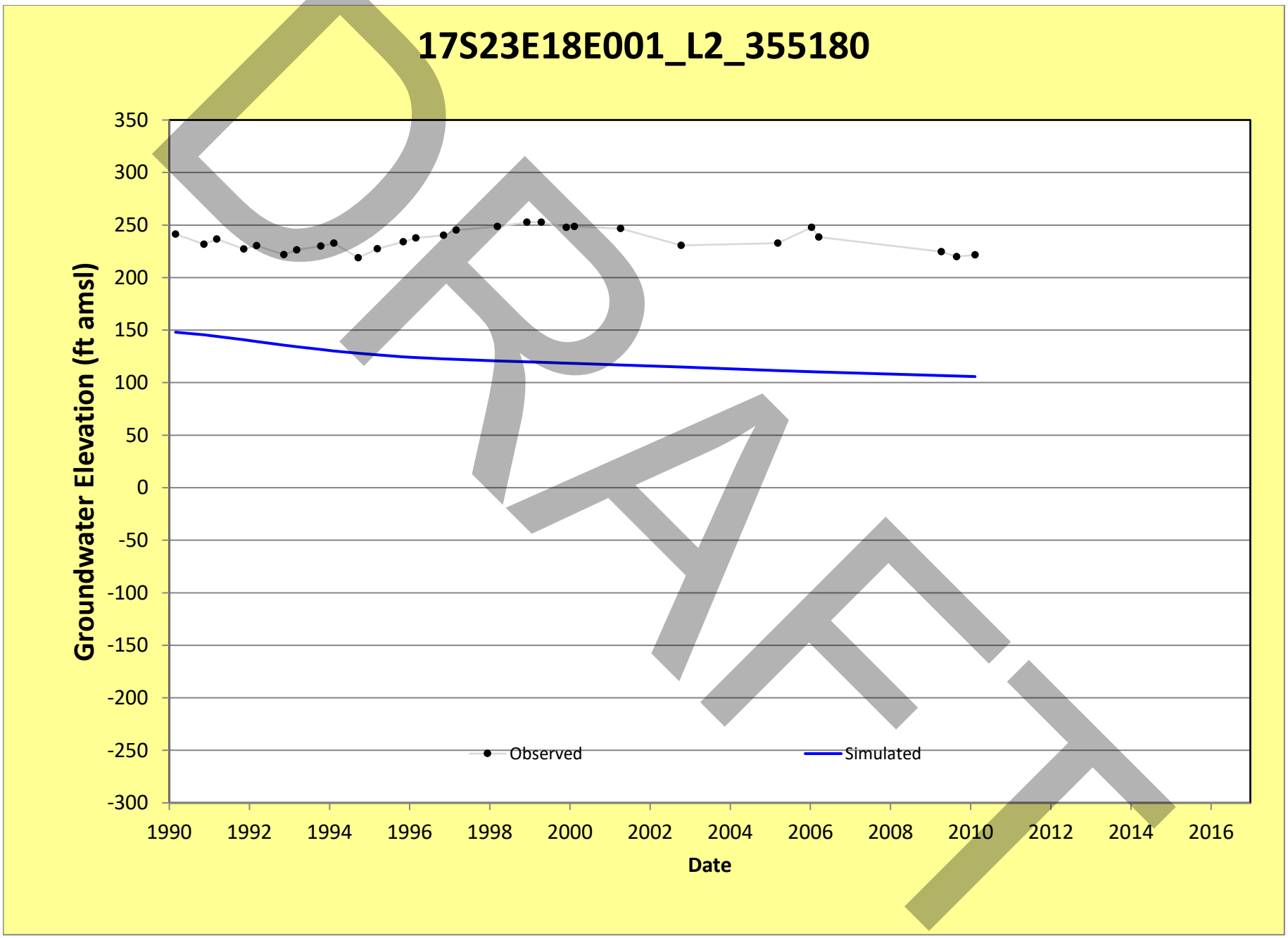
Date
Observed
Simulated
DRAFT


17S23E18E001_L2_355180
Groundwater Elevation (ft amsl)
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300
250
200
150
100
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0
-50
-100
-150
-200
-250
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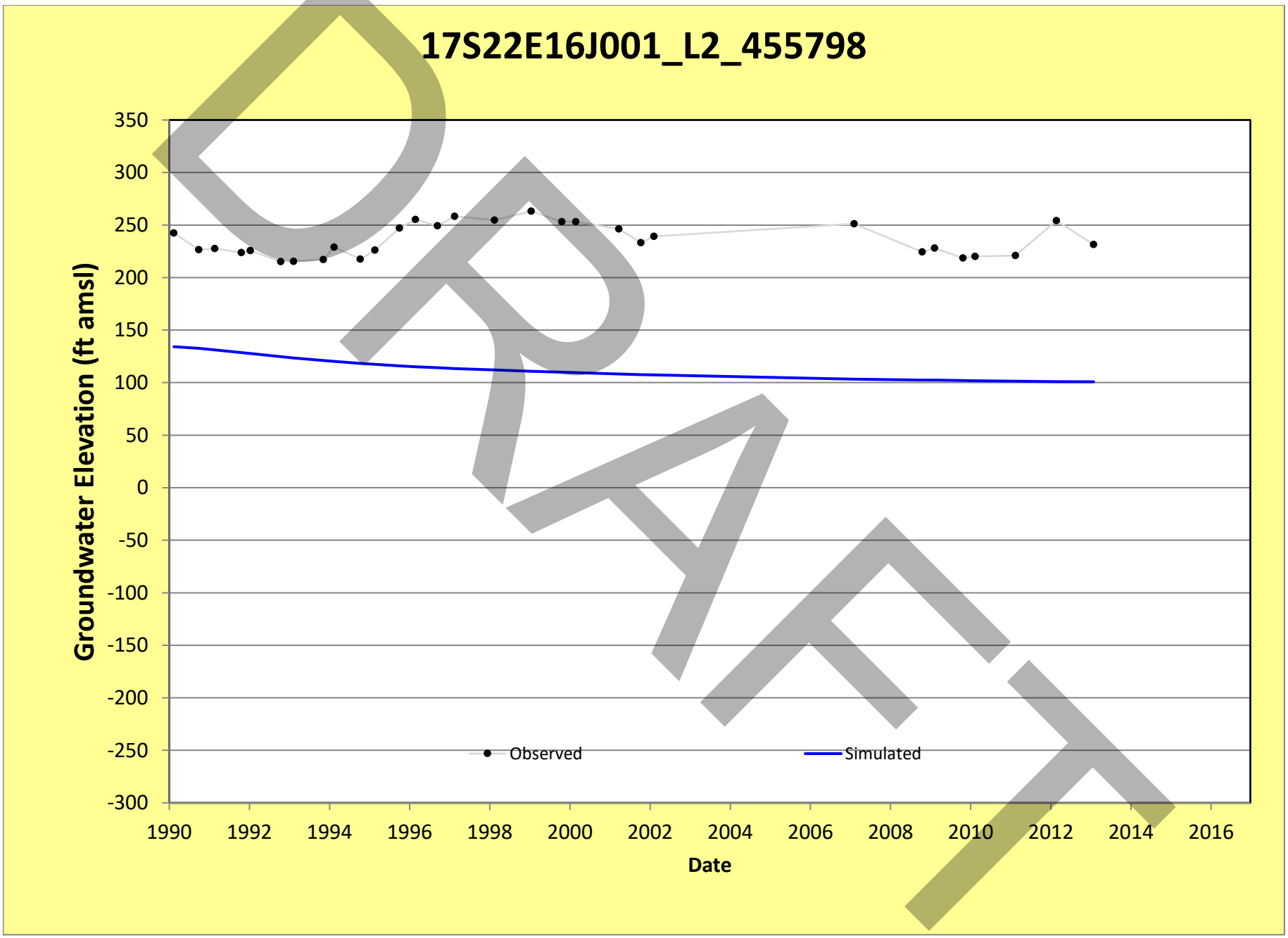
Date
Observed
Simulated
DRAFT


17S22E16J001_L2_455798
Groundwater Elevation (ft amsl)
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250
200
150
100
50
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-50
-100
-150
-200
-250
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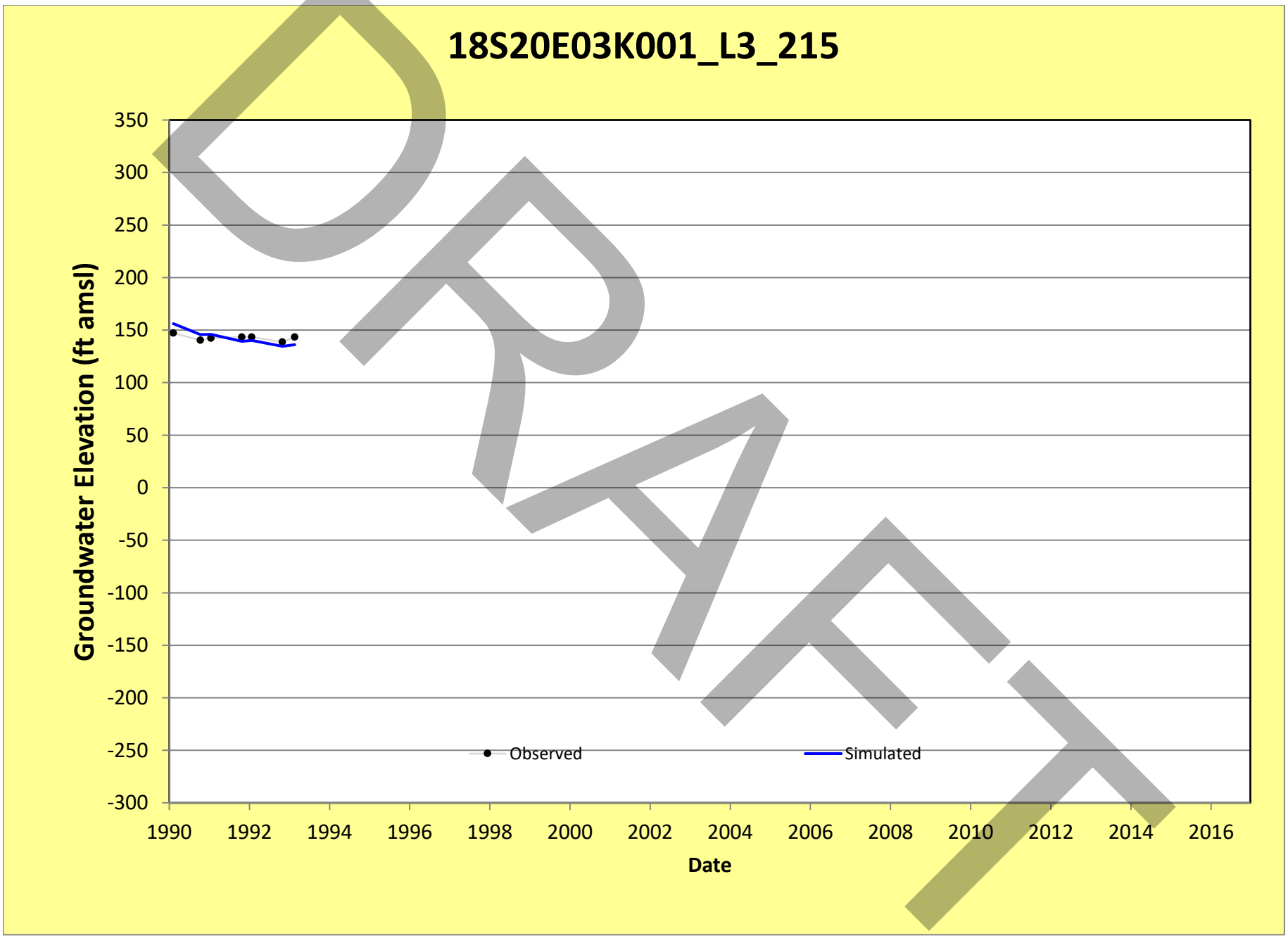
Date
Observed
Simulated
DRAFT


18S20E03K001_L3_215
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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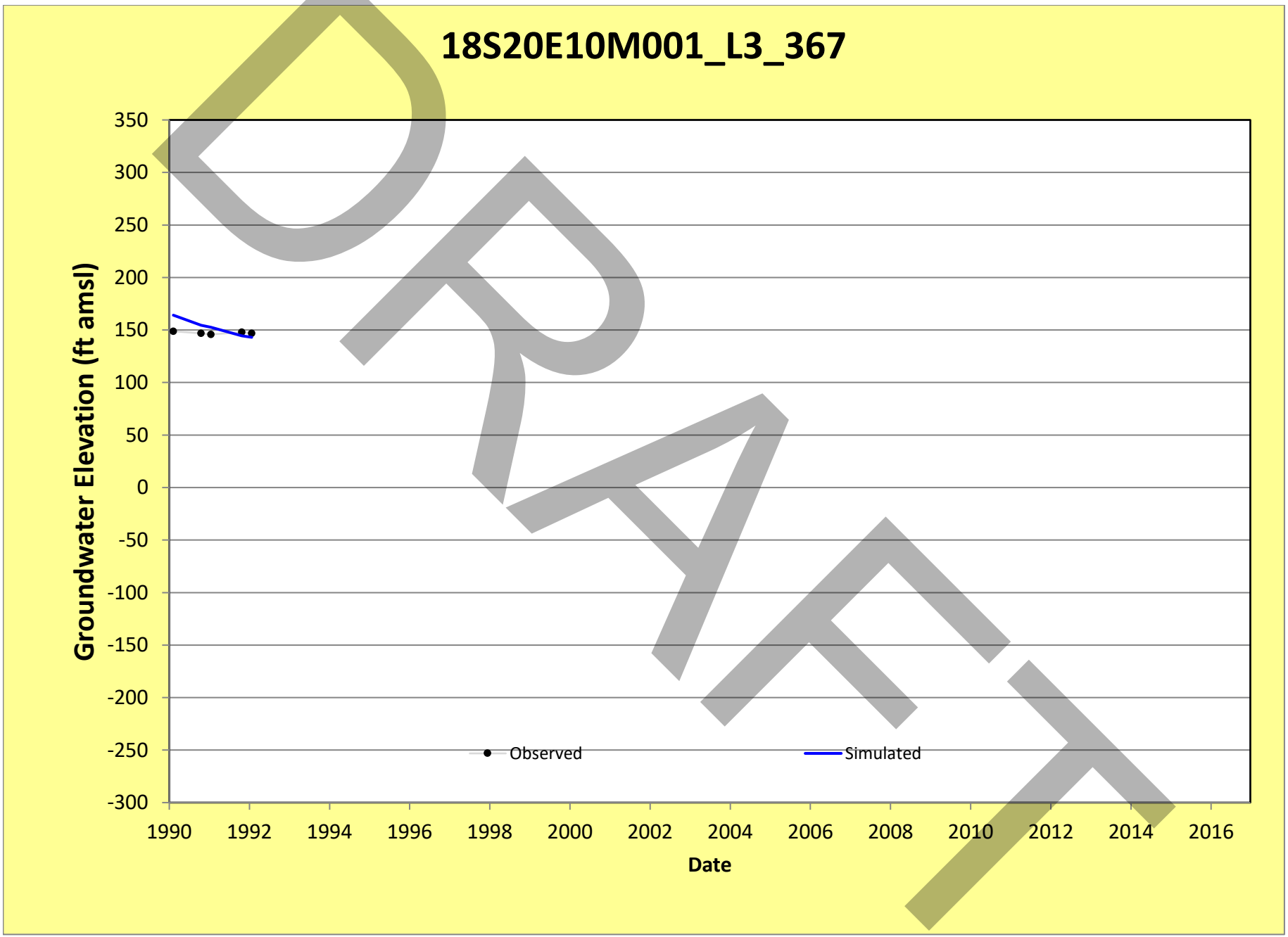
Date
Observed
Simulated
DRAFT


18S20E10M001_L3_367
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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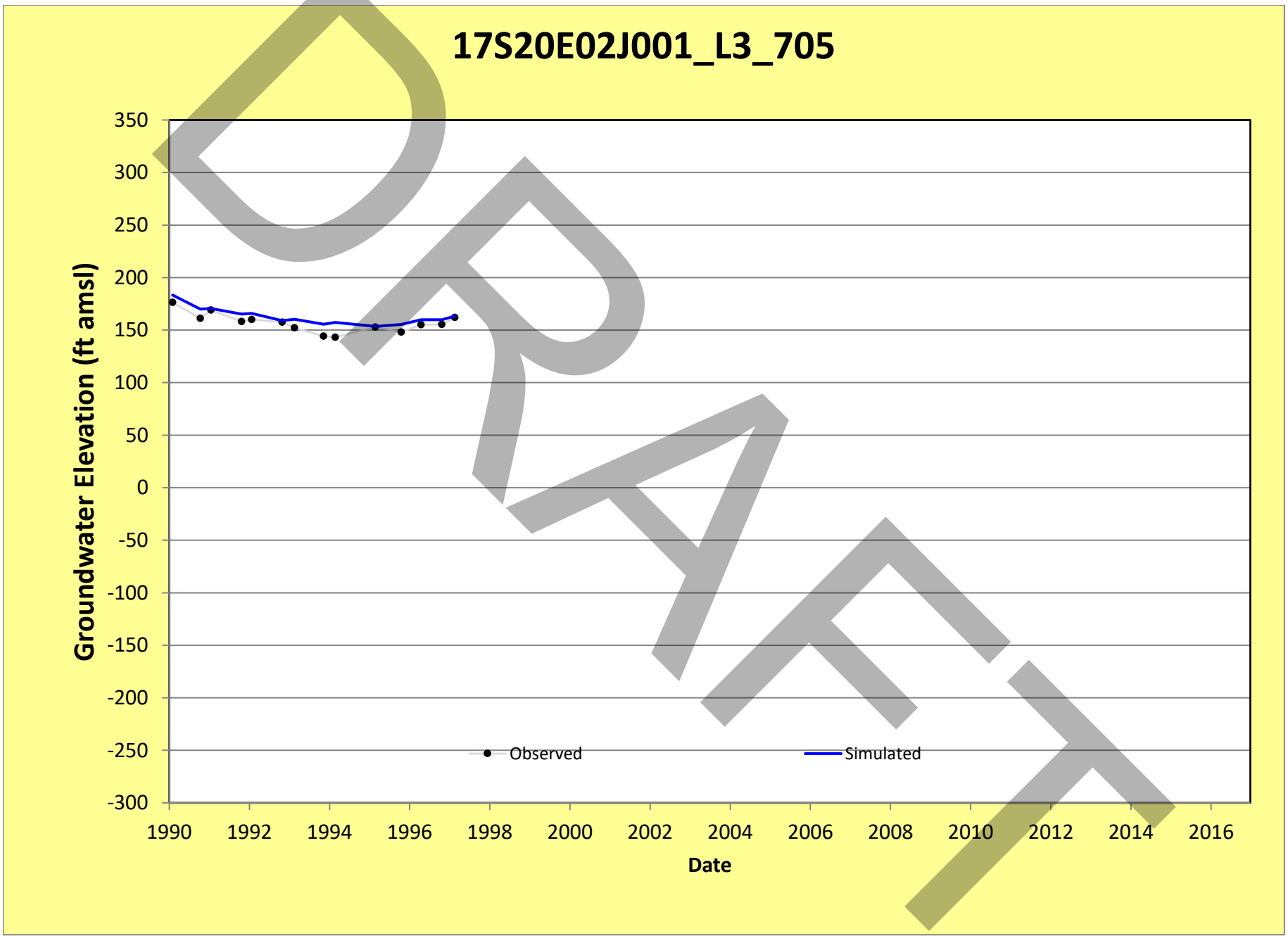
Date
Observed
Simulated
DRAFT


17S20E02J001_L3_705
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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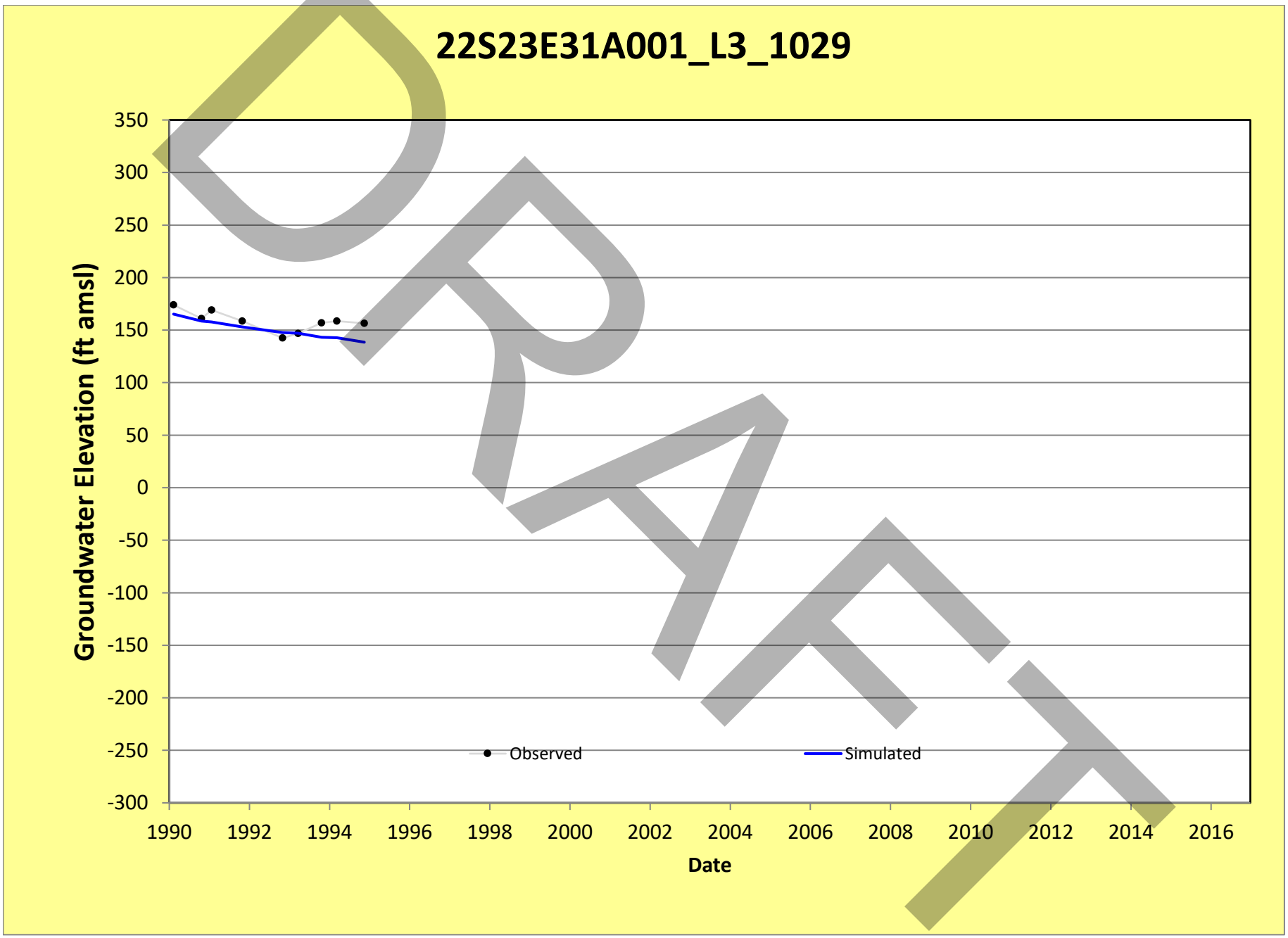
Date
Observed
Simulated
DRAFT


22S23E31A001_L3_1029
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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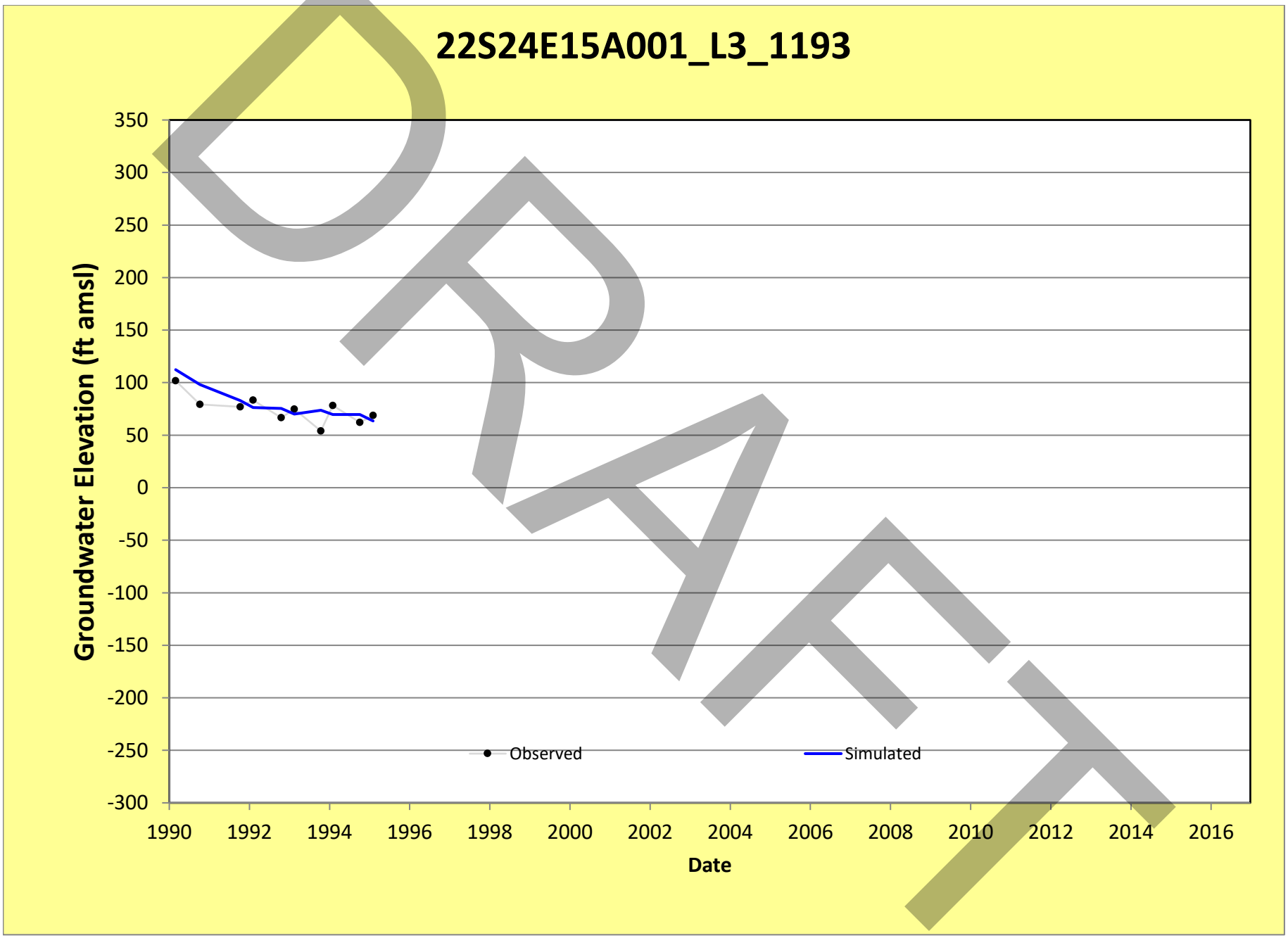
Date
Observed
Simulated
DRAFT


22S24E15A001_L3_1193
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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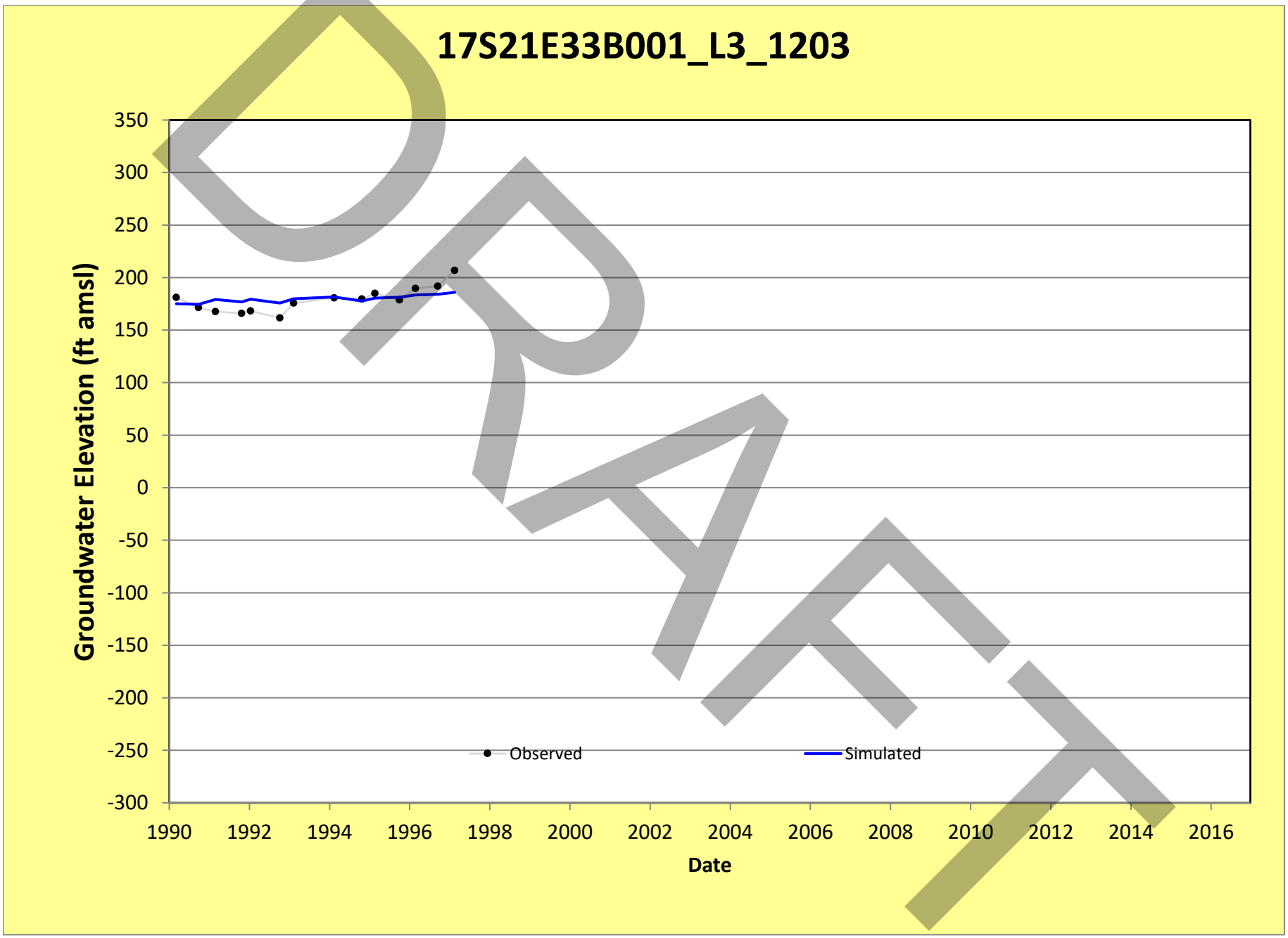
Date
Observed
Simulated
DRAFT


17S21E33B001_L3_1203
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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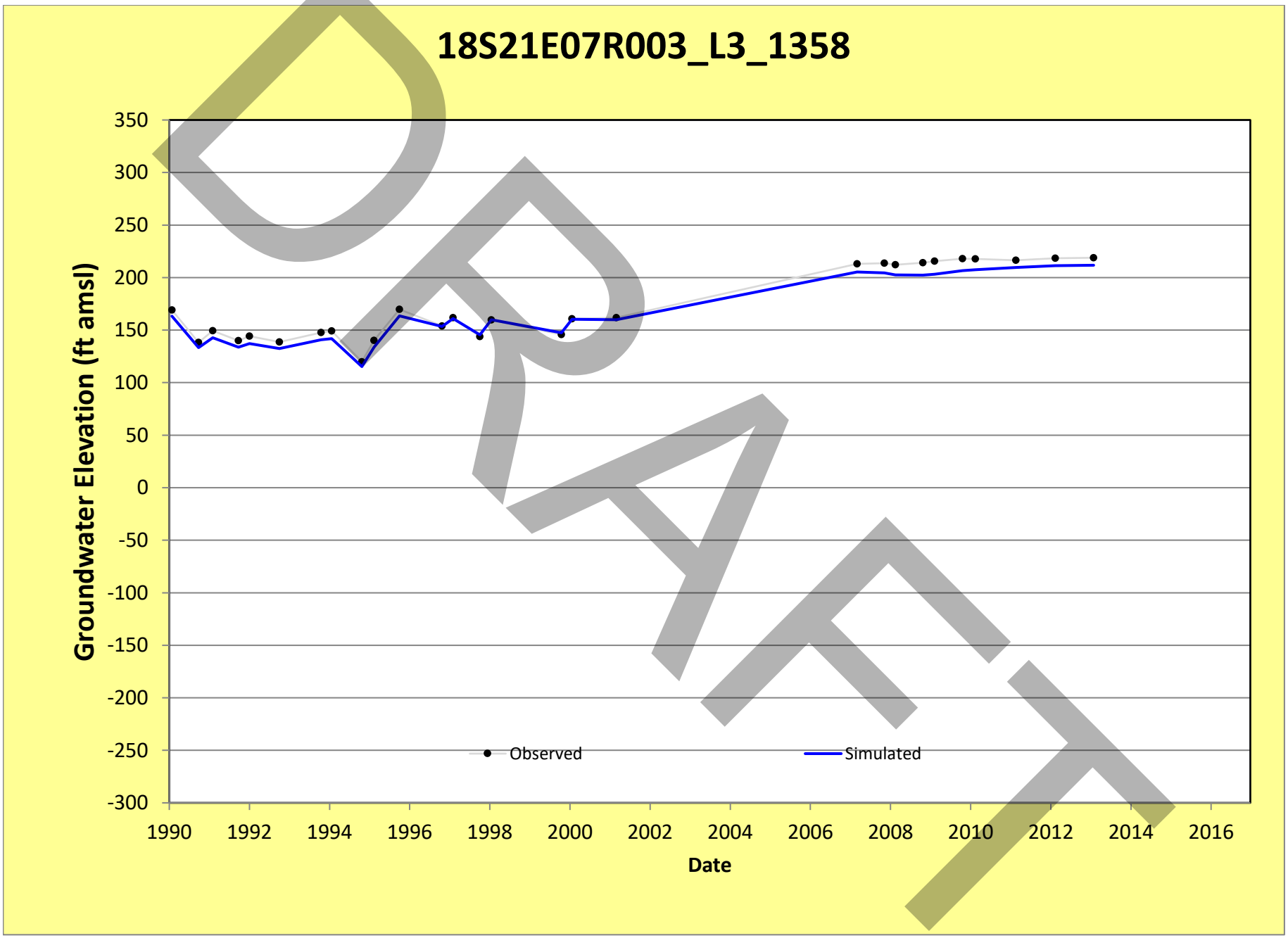
Date
Observed
Simulated
DRAFT


18S21E07R003_L3_1358
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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2012
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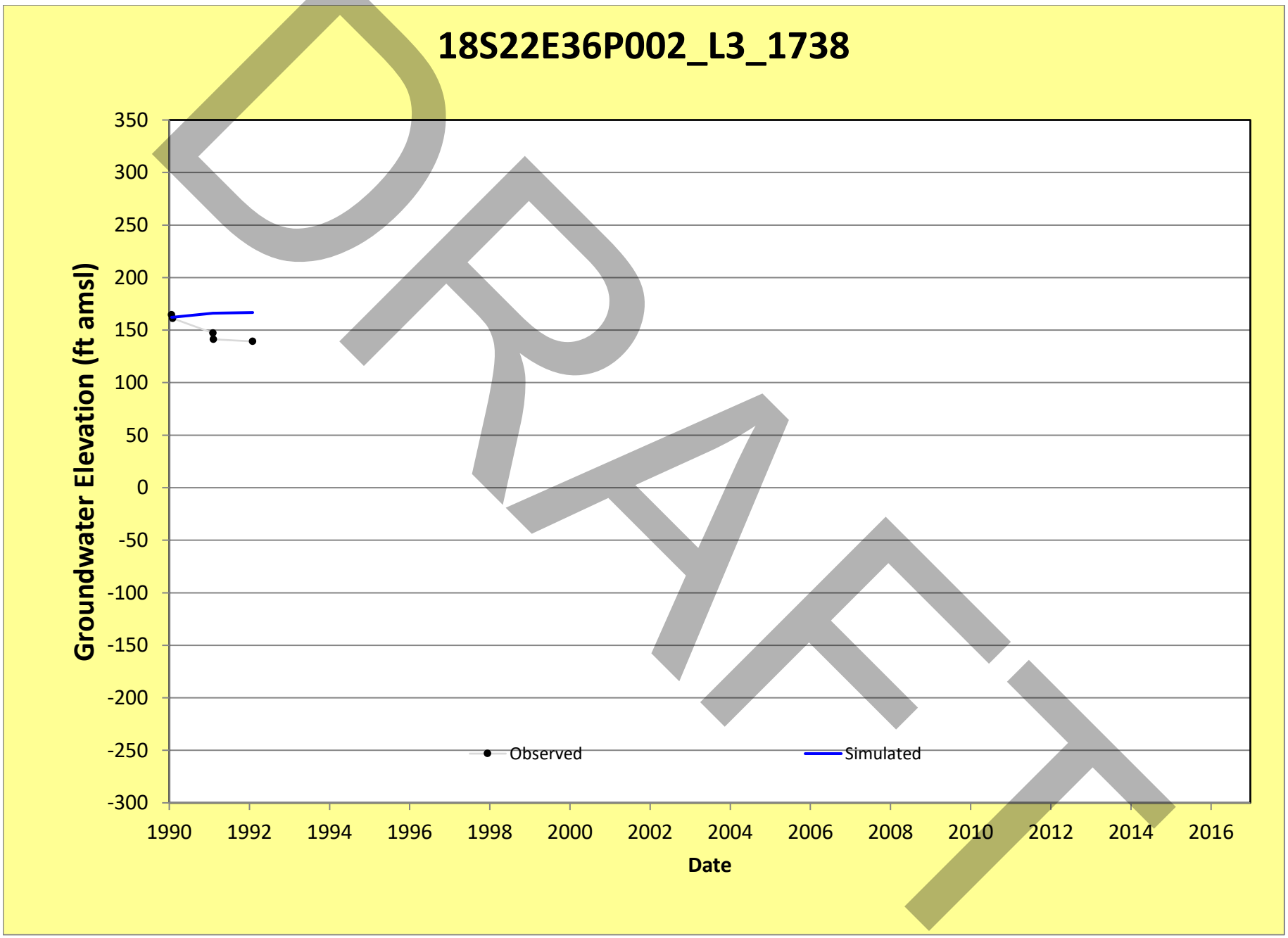
2016
Date
Observed
Simulated
DRAFT


18S22E36P002_L3_1738
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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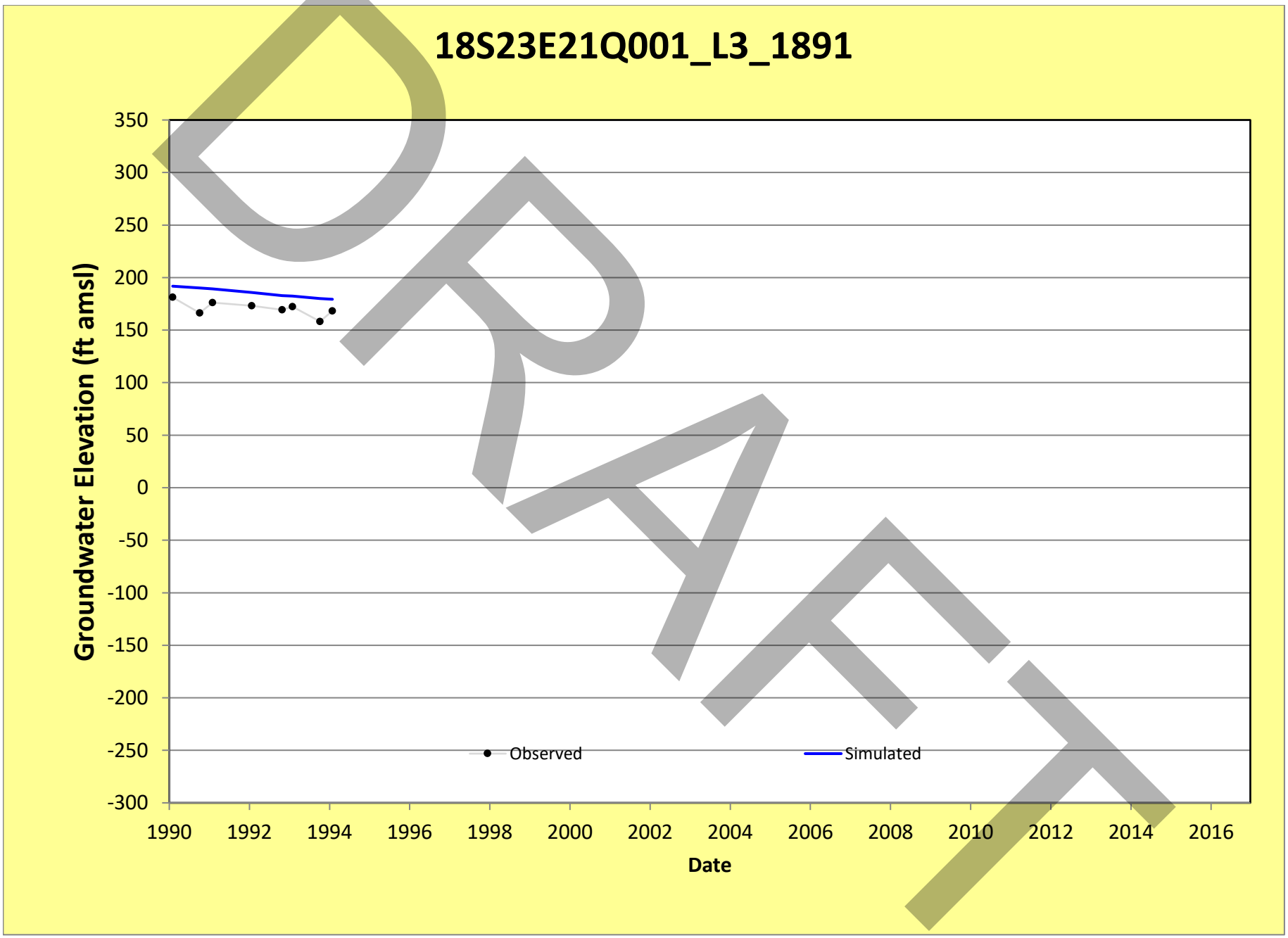
2016
Date
Observed
Simulated
DRAFT


18S23E21Q001_L3_1891
Groundwater Elevation (ft amsl)
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250
200
150
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-50
-100
-150
-200
-250
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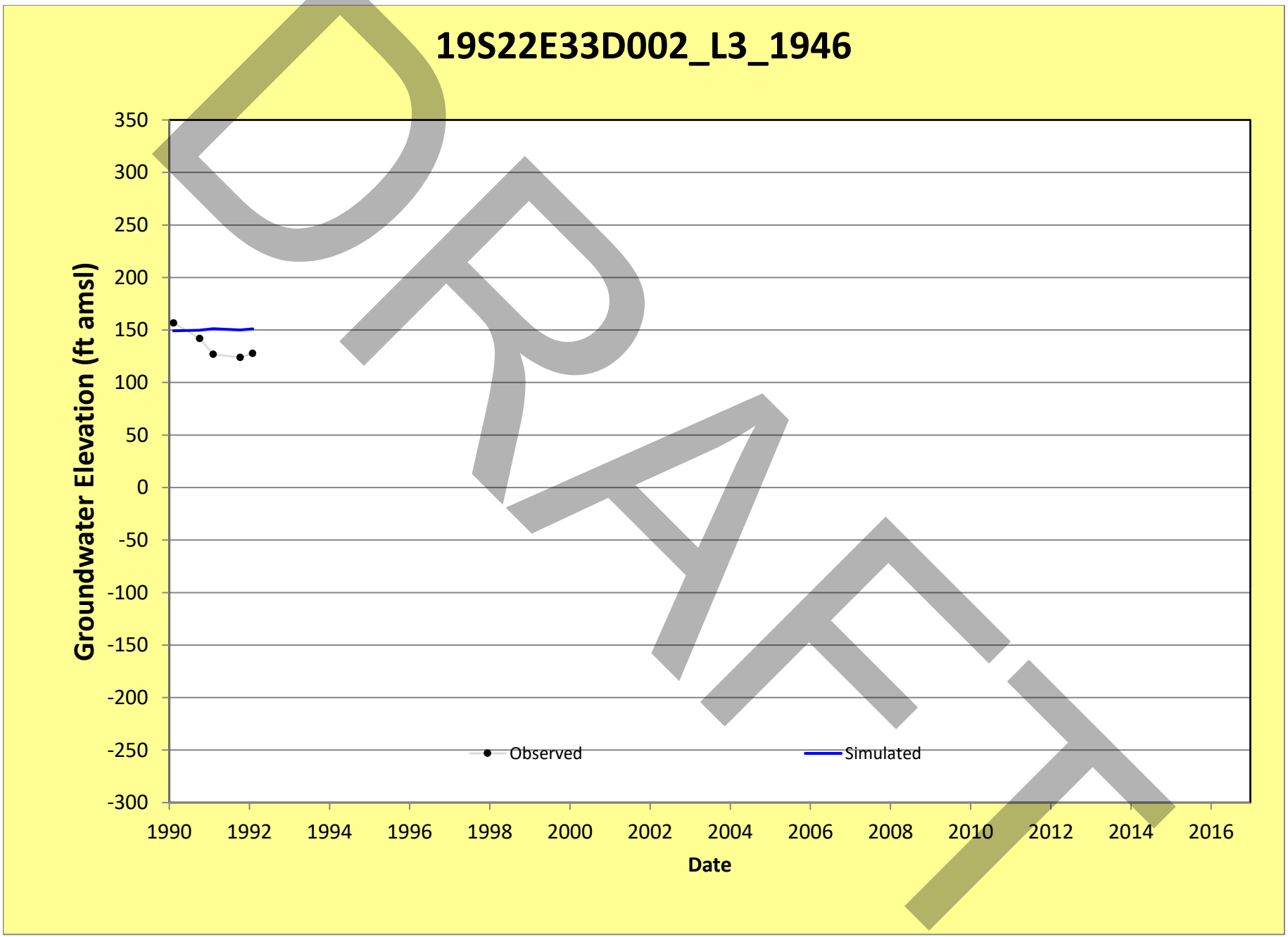
Date
Observed
Simulated
DRAFT


19S22E33D002_L3_1946
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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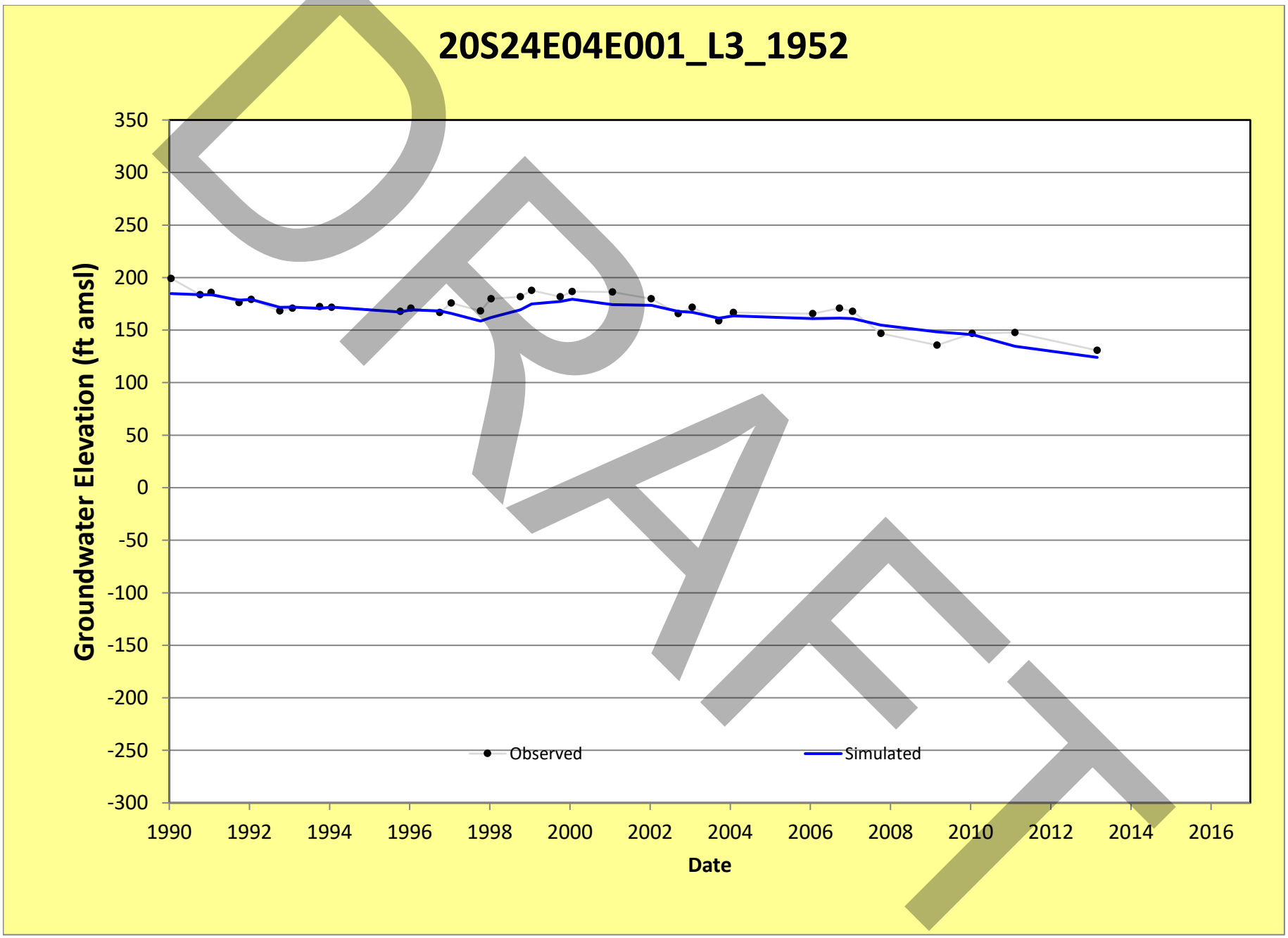
Date
Observed
Simulated
DRAFT


20S24E04E001_L3_1952
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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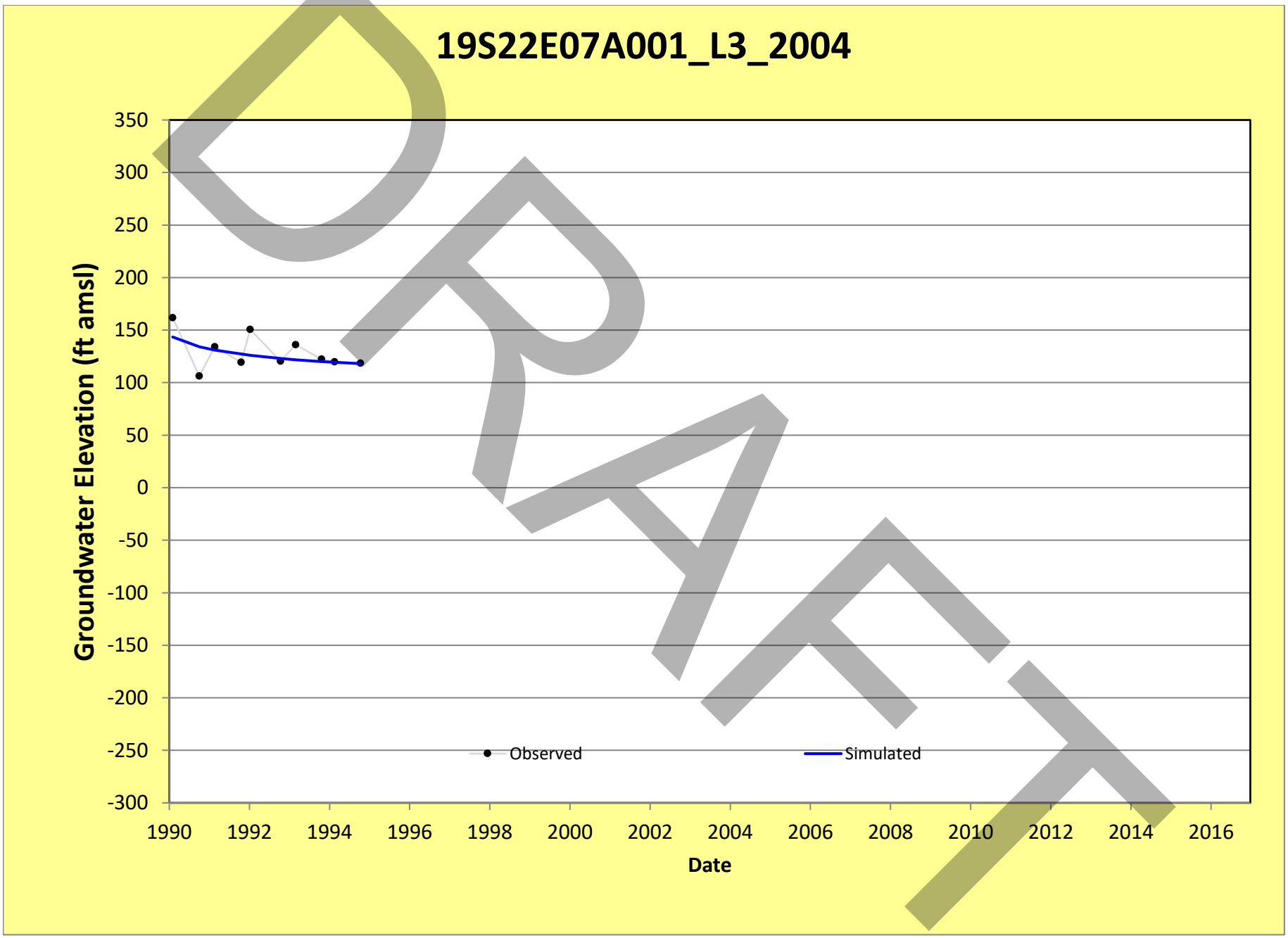
Date
Observed
Simulated
DRAFT


19S22E07A001_L3_2004
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
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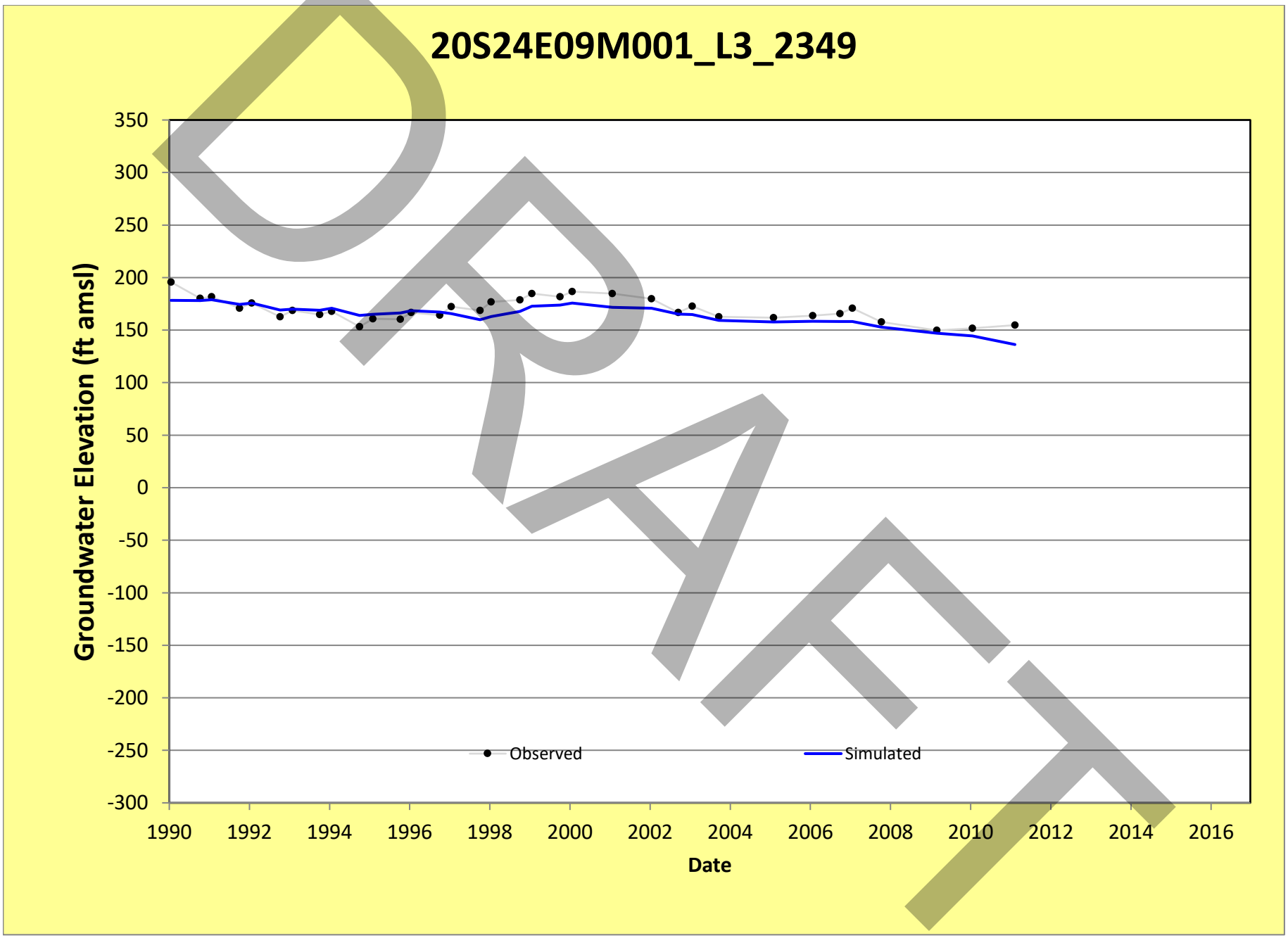
20S24E09M001_L3_2349
Groundwater Elevation (ft amsl)
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300
250
200
150
100
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0
-50
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-150
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Observed
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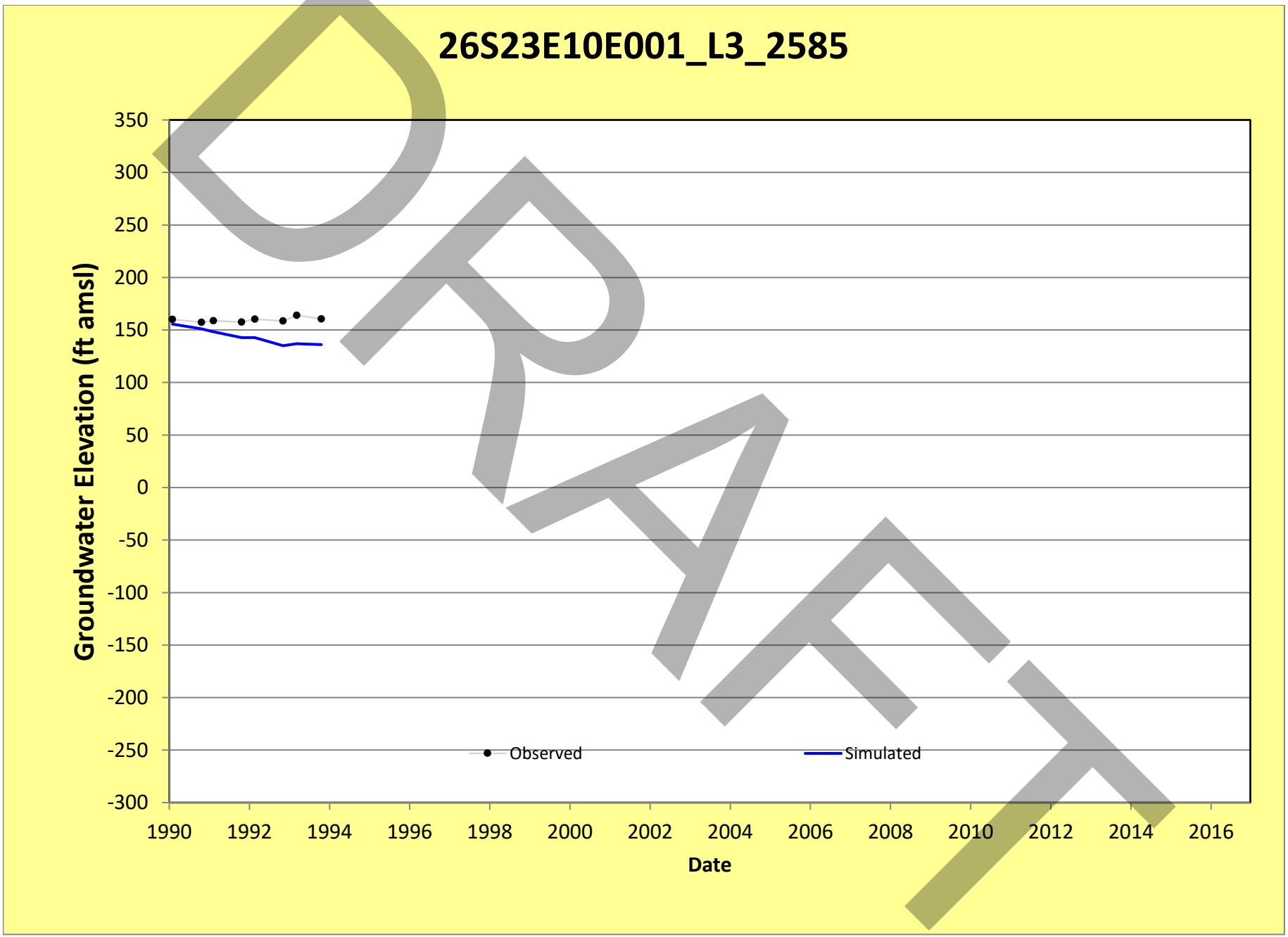
26S23E10E001_L3_2585
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
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-250
-300
1990
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Date
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Simulated
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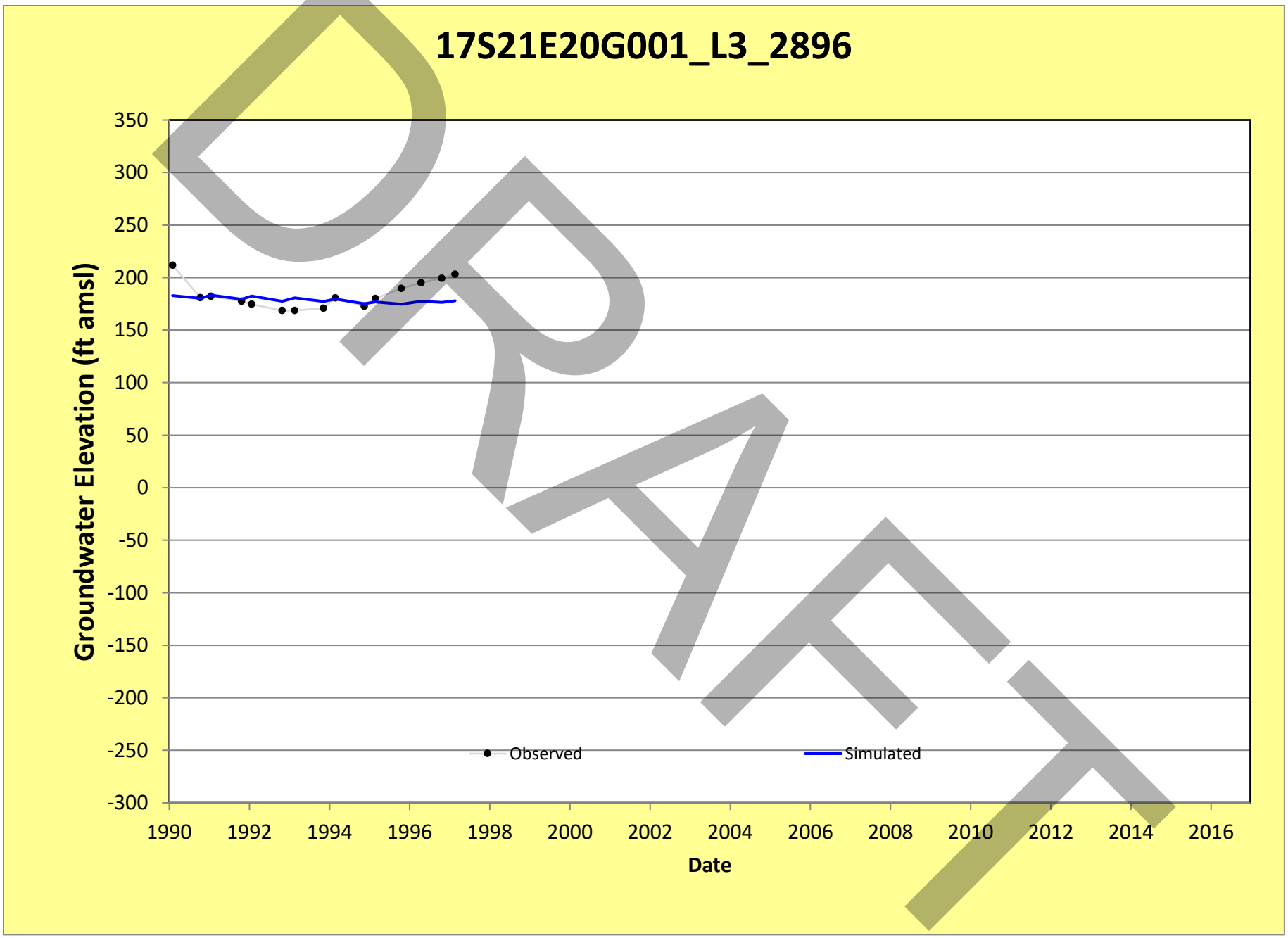
17S21E20G001_L3_2896
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
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1990
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Observed
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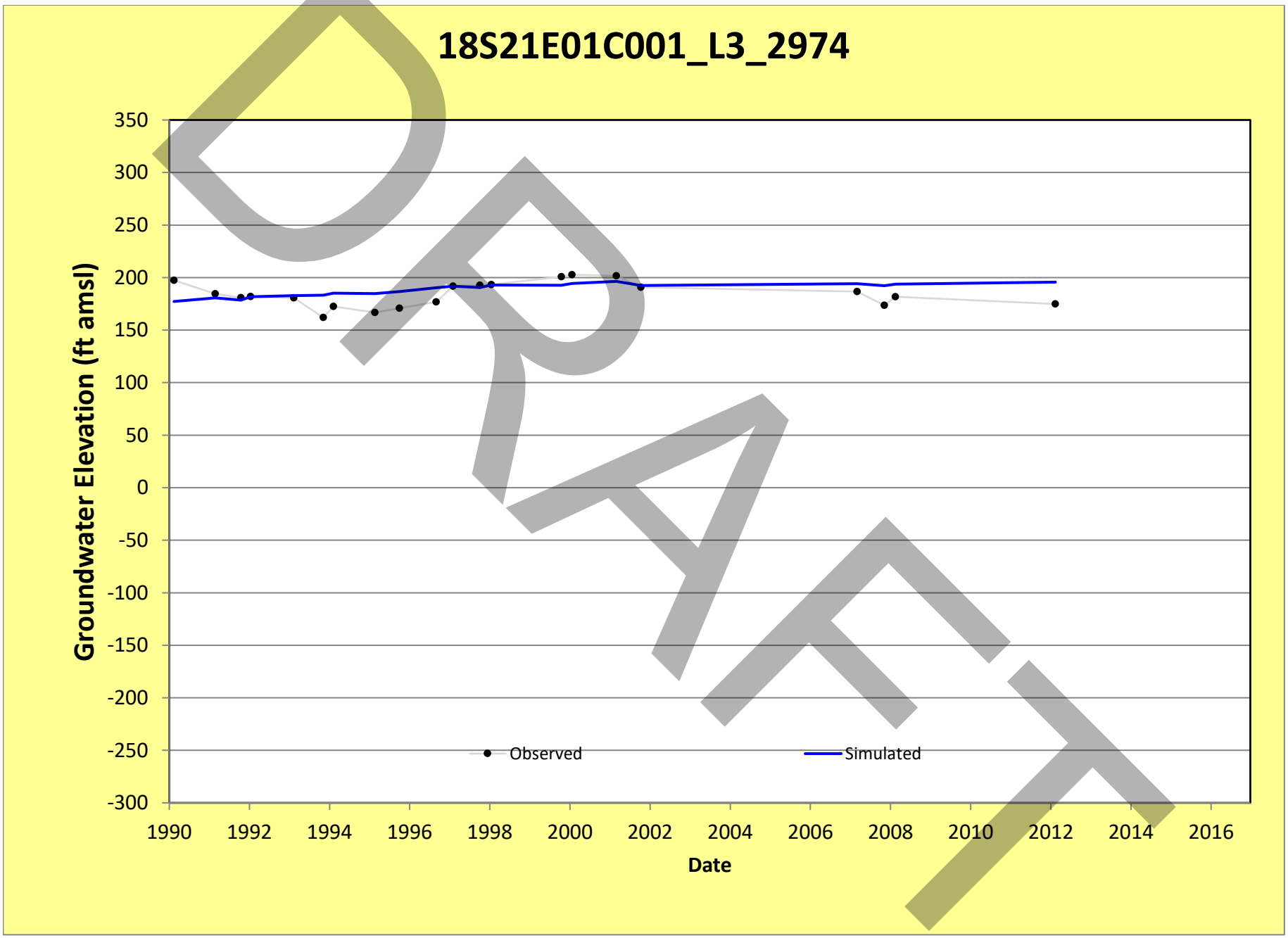
18S21E01C001_L3_2974
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated
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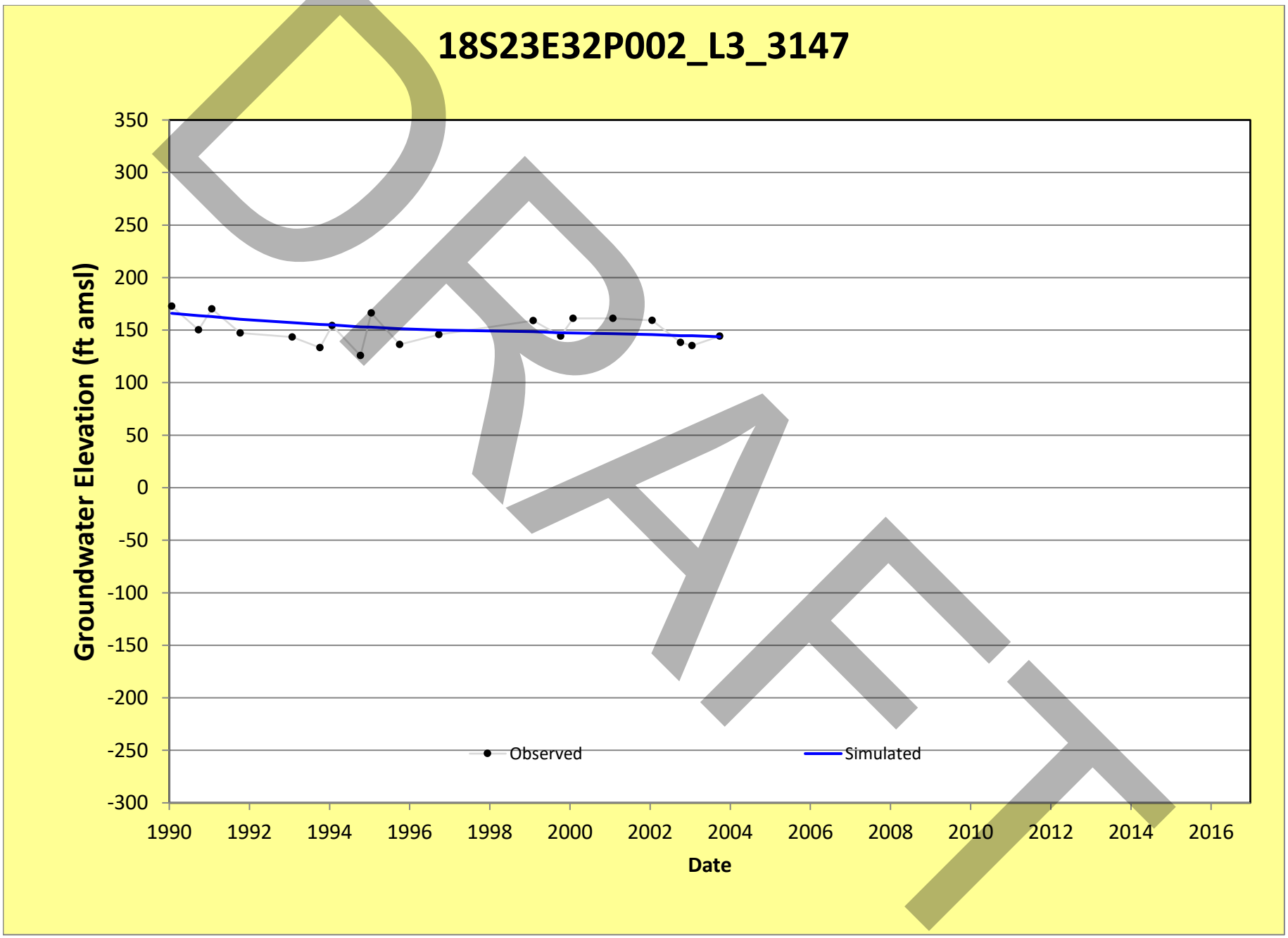
18S23E32P002_L3_3147
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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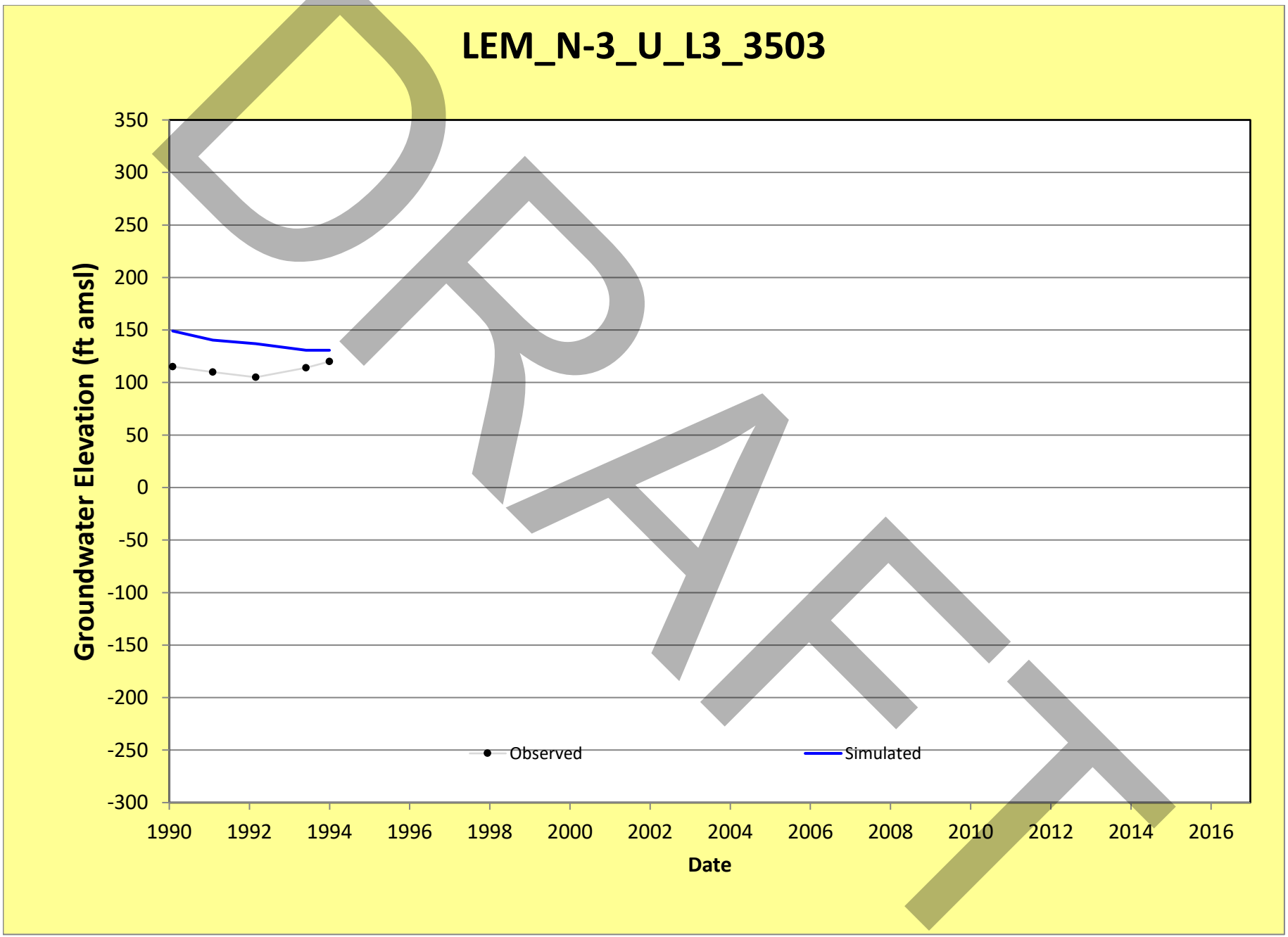
Date
Observed
Simulated
DRAFT


LEM_N-3_U_L3_3503
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
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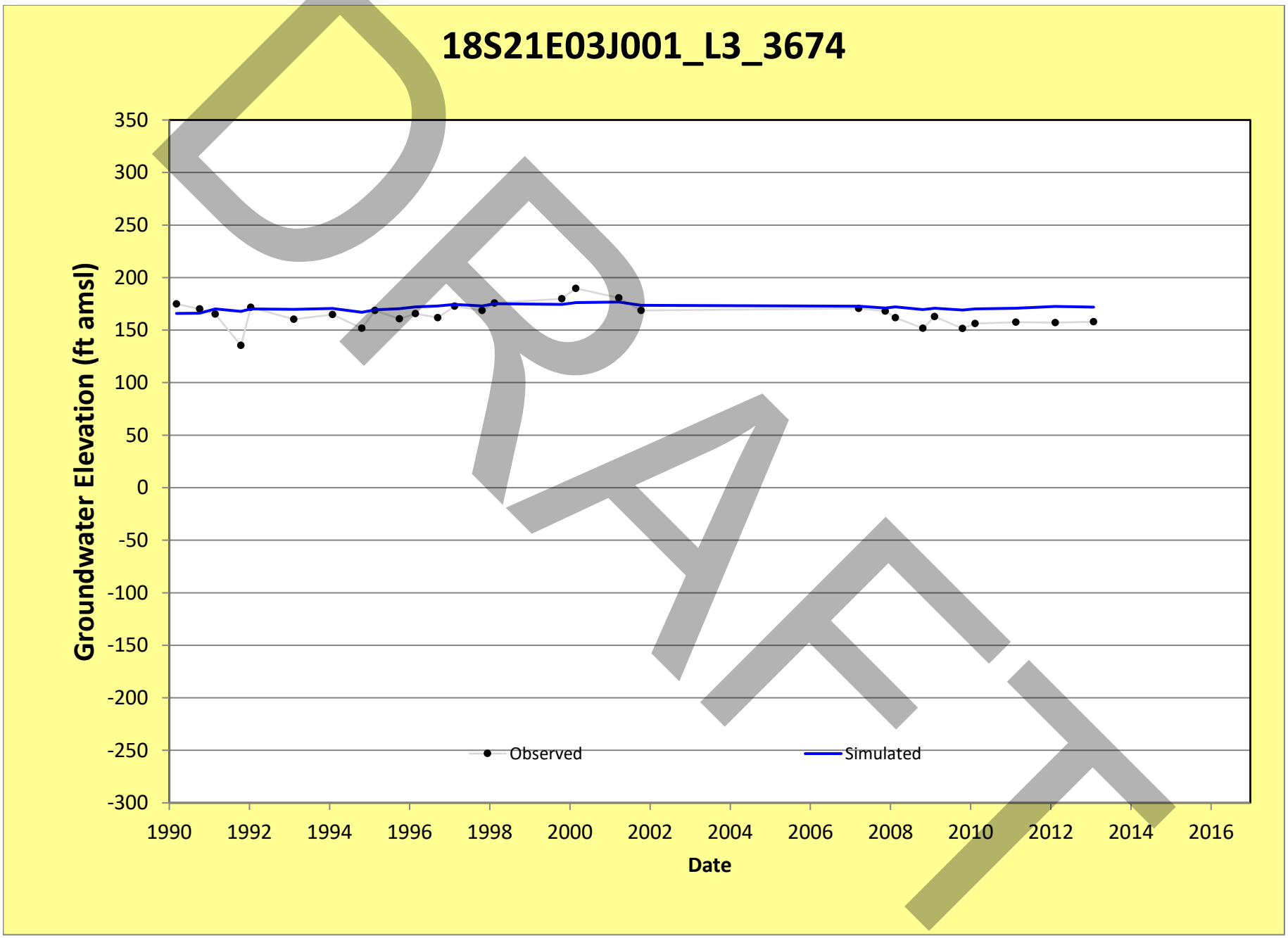
18S21E03J001_L3_3674
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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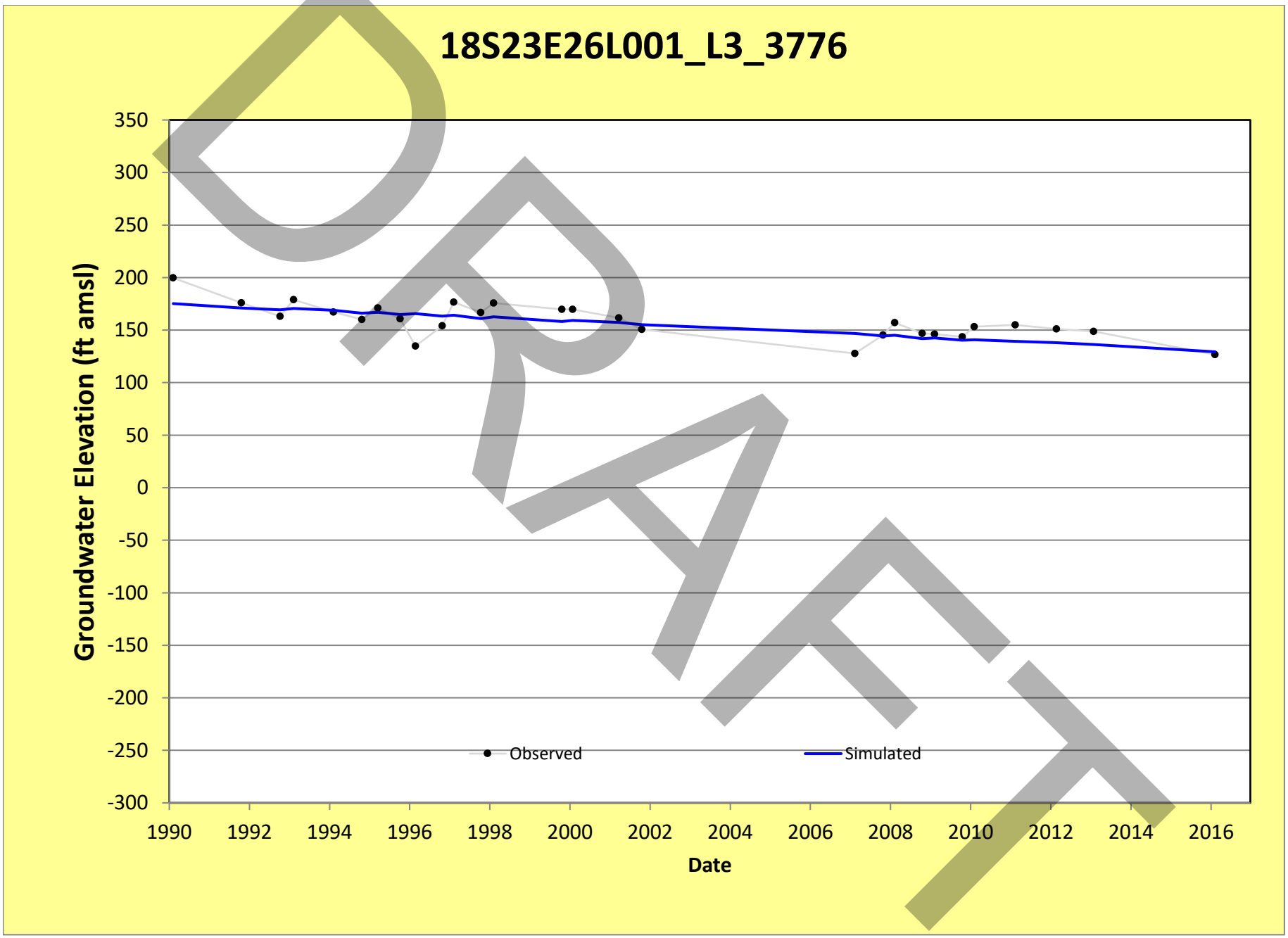
18S23E26L001_L3_3776
Groundwater Elevation (ft amsl)
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300
250
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150
100
50
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-50
-100
-150
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-250
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Date
Observed
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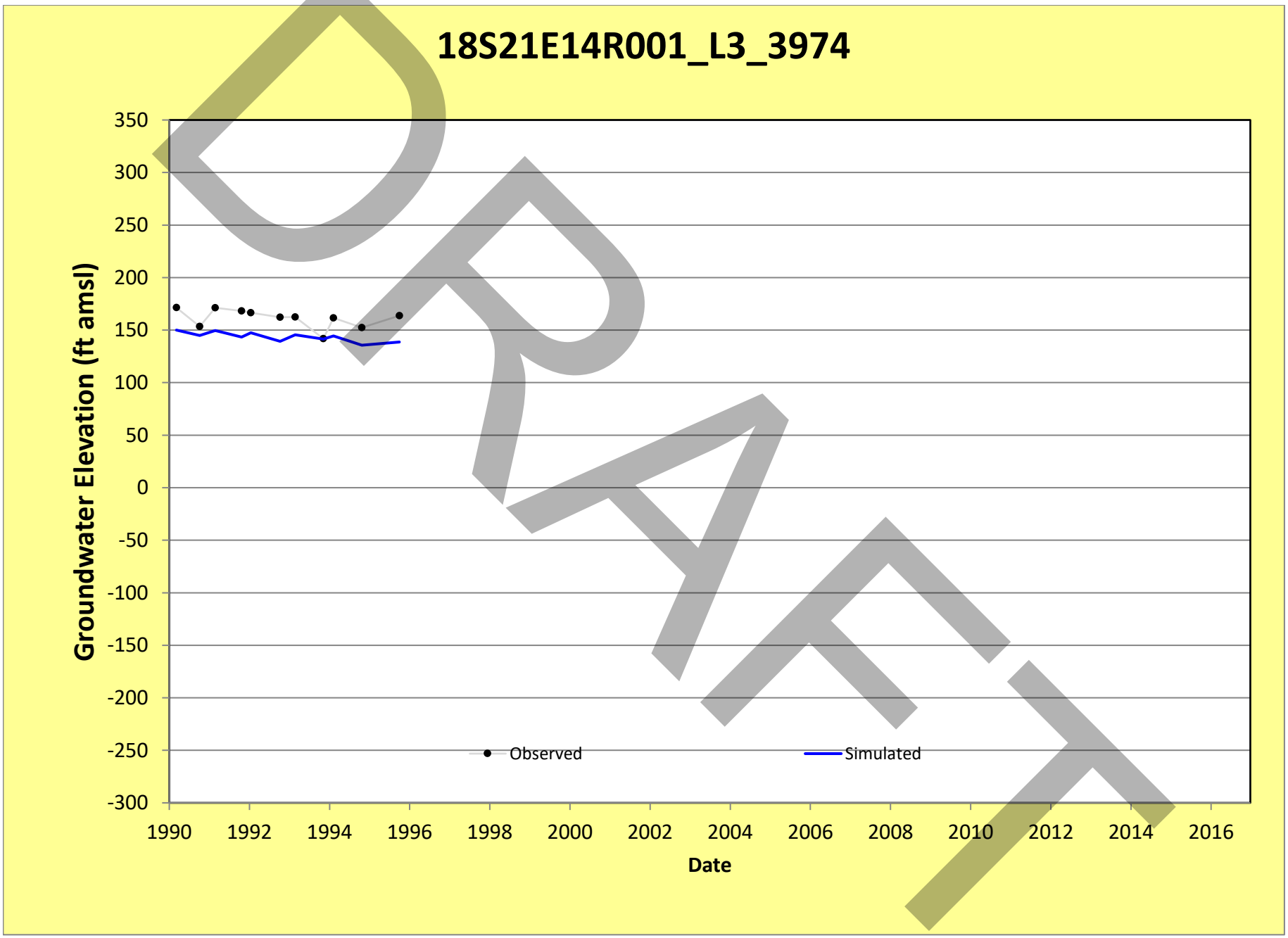
18S21E14R001_L3_3974
Groundwater Elevation (ft amsl)
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-50
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-150
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Date
Observed
Simulated
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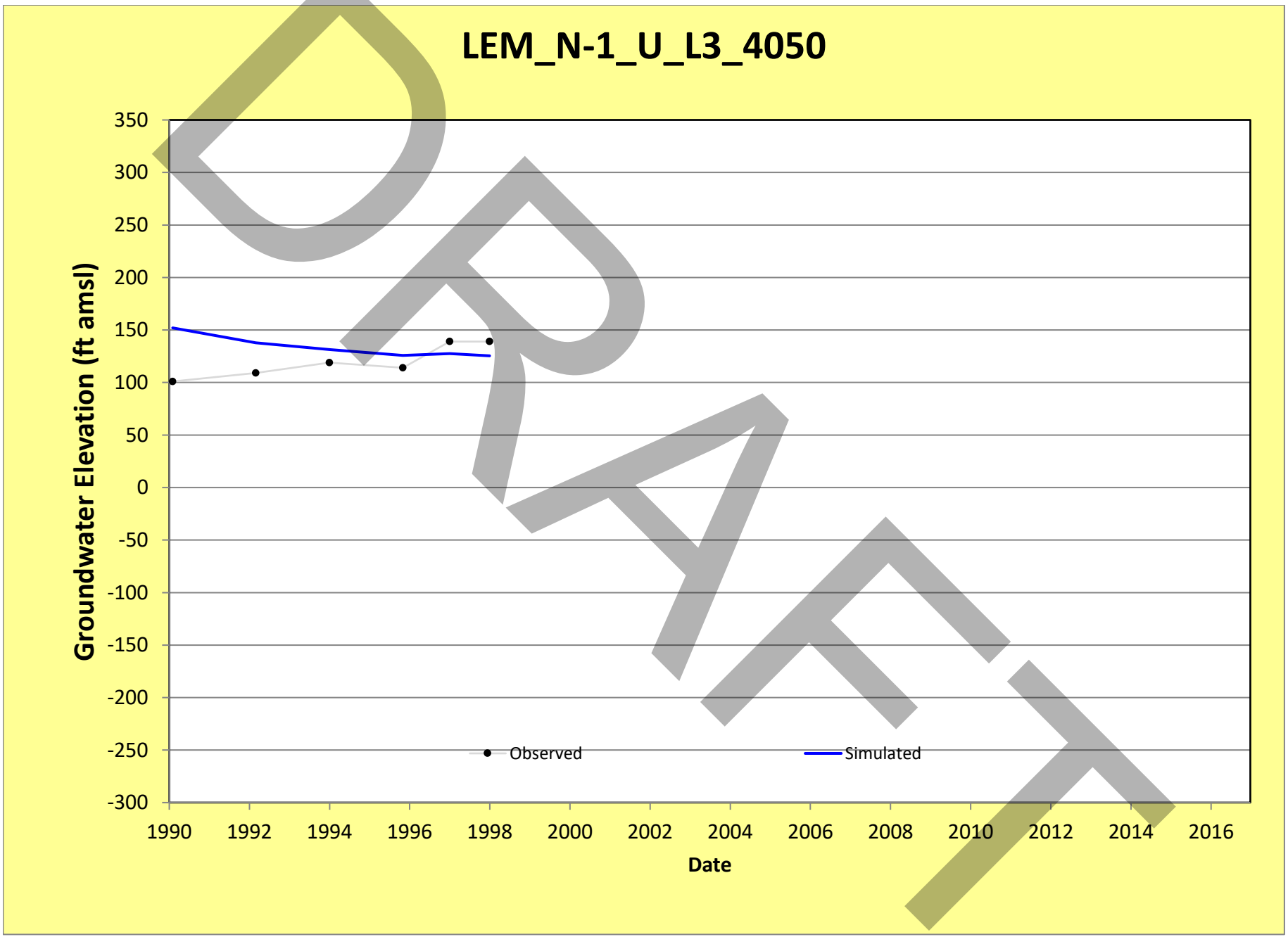
LEM_N-1_U_L3_4050
Groundwater Elevation (ft amsl)
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300
250
200
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100
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0
-50
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-150
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Date
Observed
Simulated

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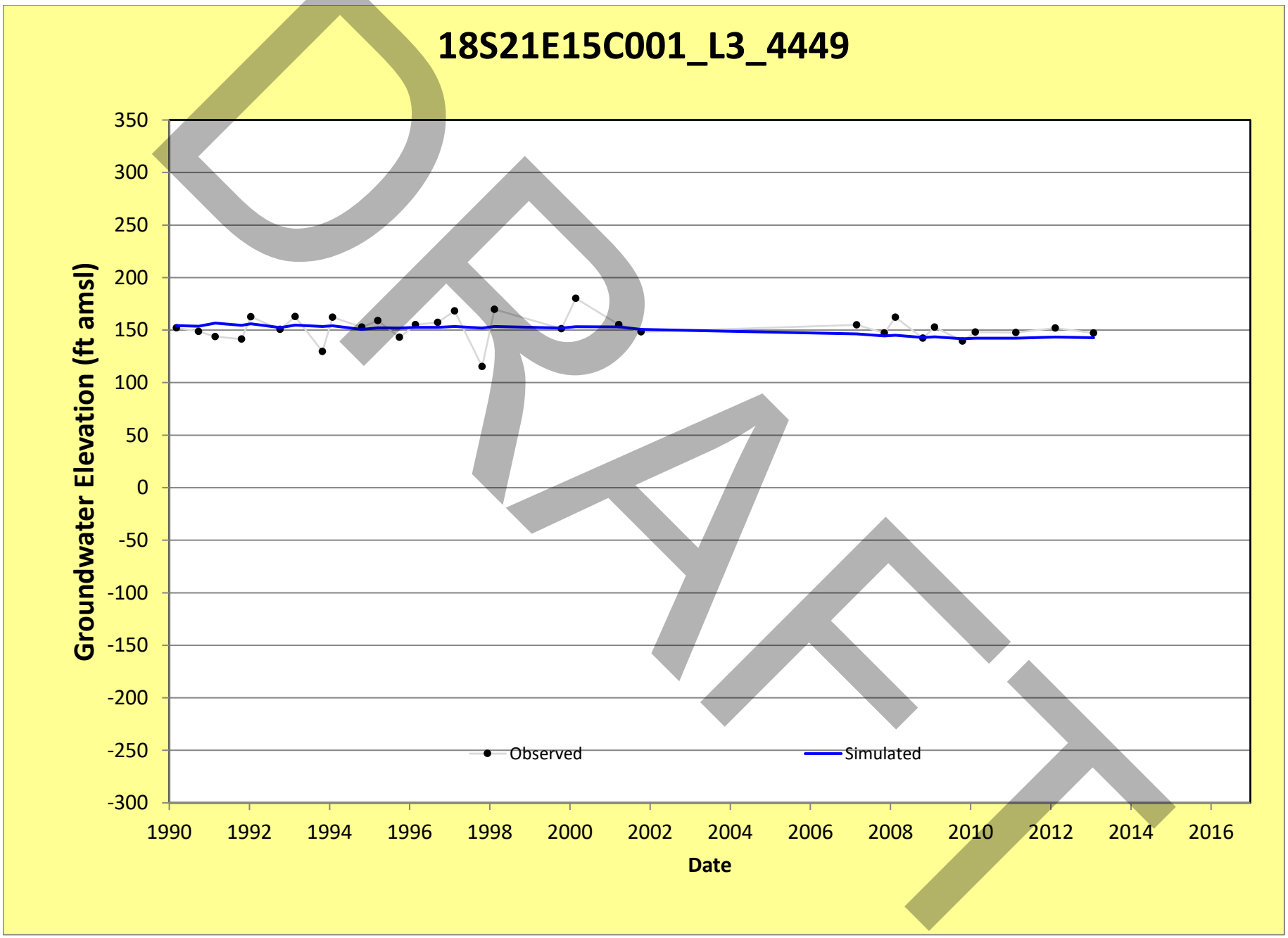
18S21E15C001_L3_4449
Groundwater Elevation (ft amsl)
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Observed
Simulated
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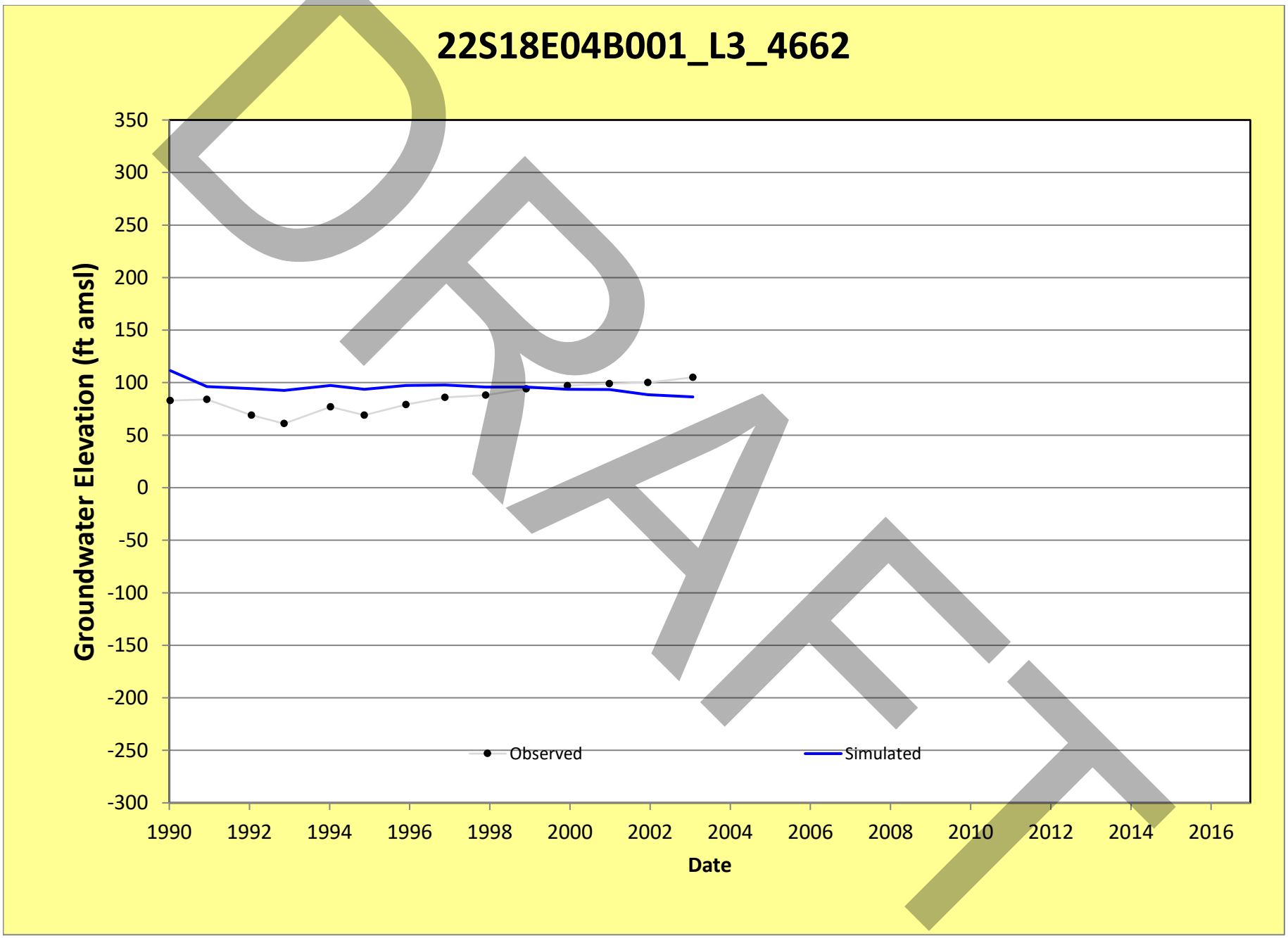
22S18E04B001_L3_4662
Groundwater Elevation (ft amsl)
350
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Date
Observed
Simulated
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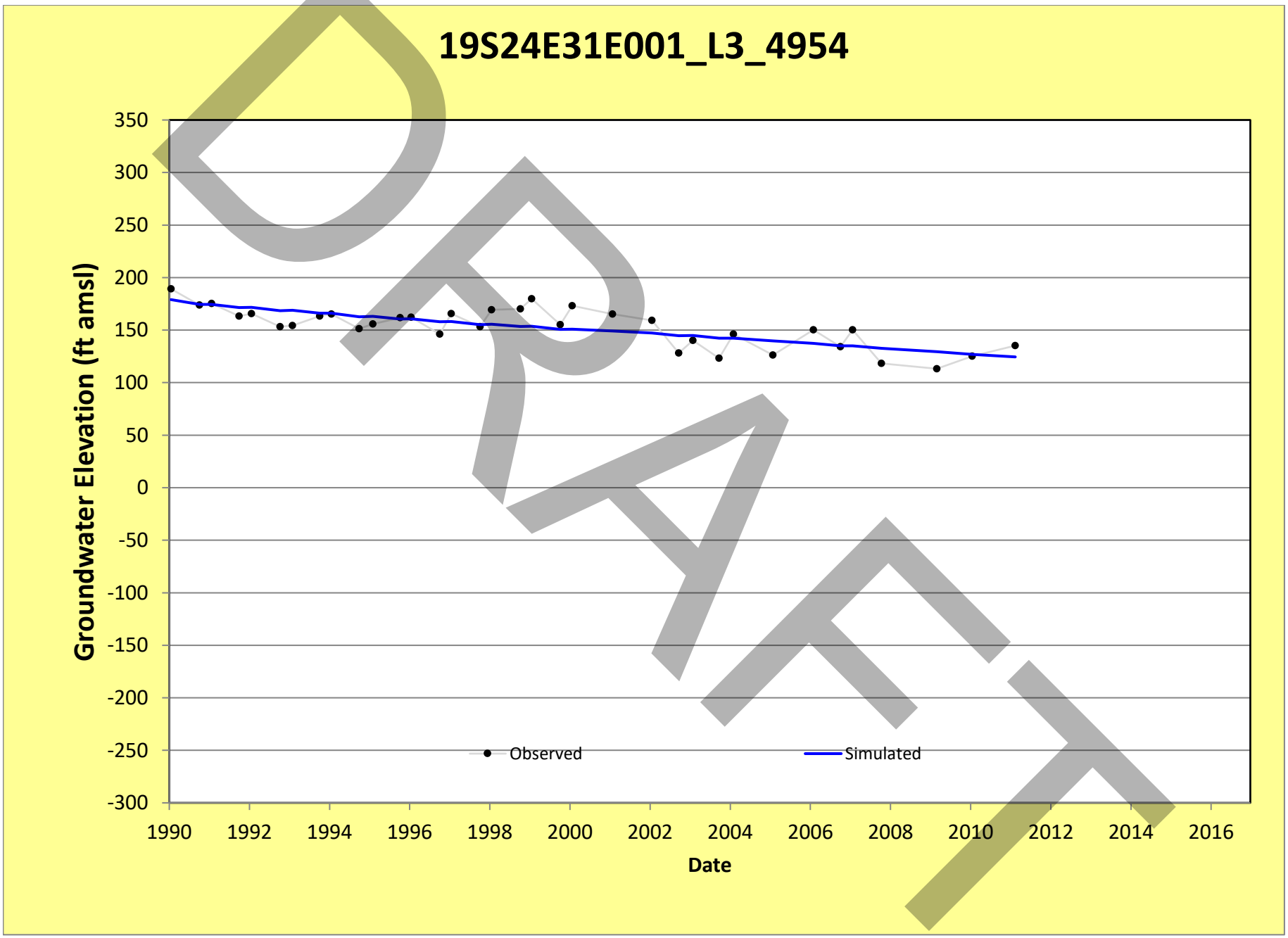
19S24E31E001_L3_4954
Groundwater Elevation (ft amsl)
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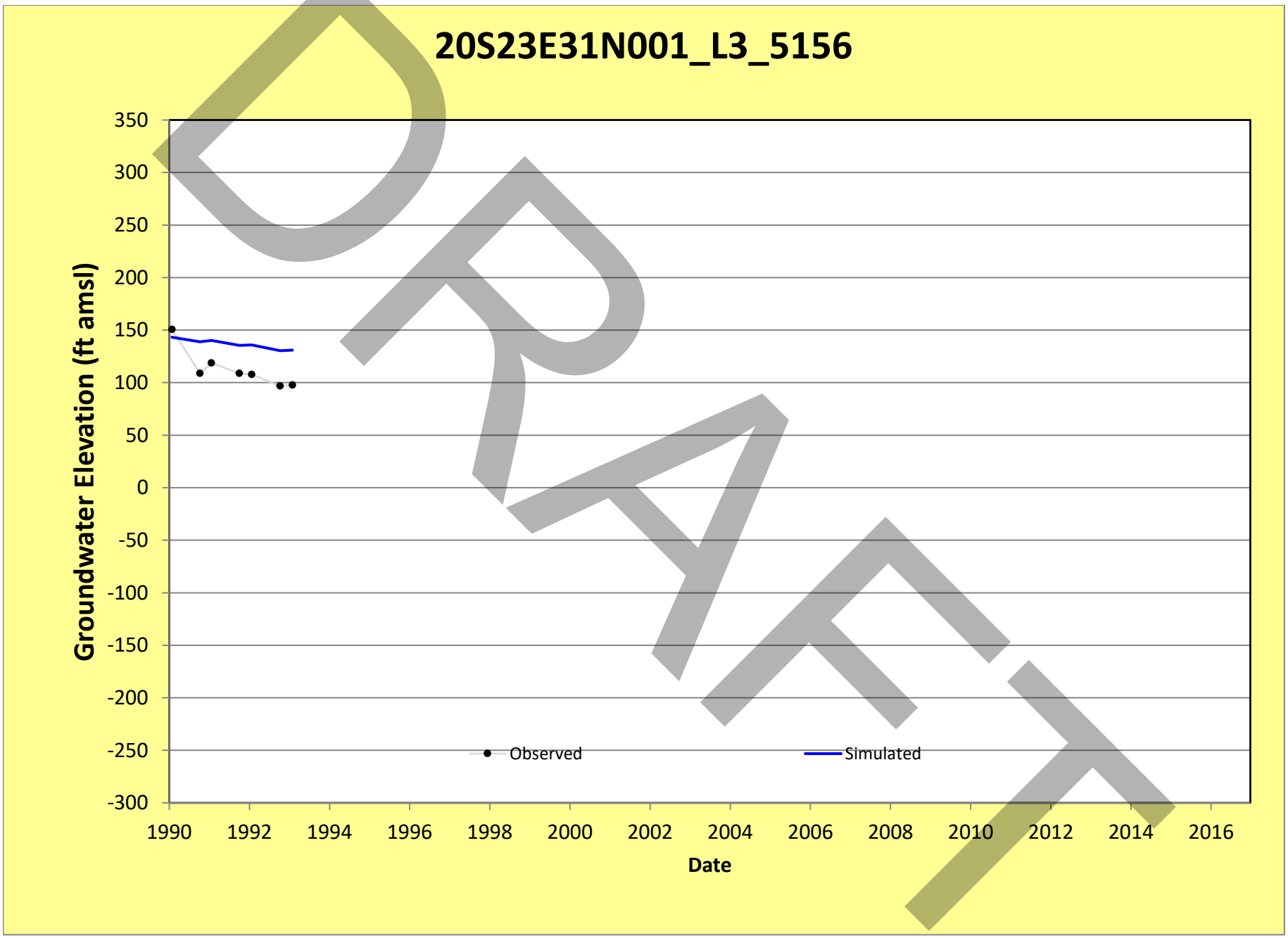
Date
Observed
Simulated
DRAFT


20S23E31N001_L3_5156
Groundwater Elevation (ft amsl)
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-50
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-150
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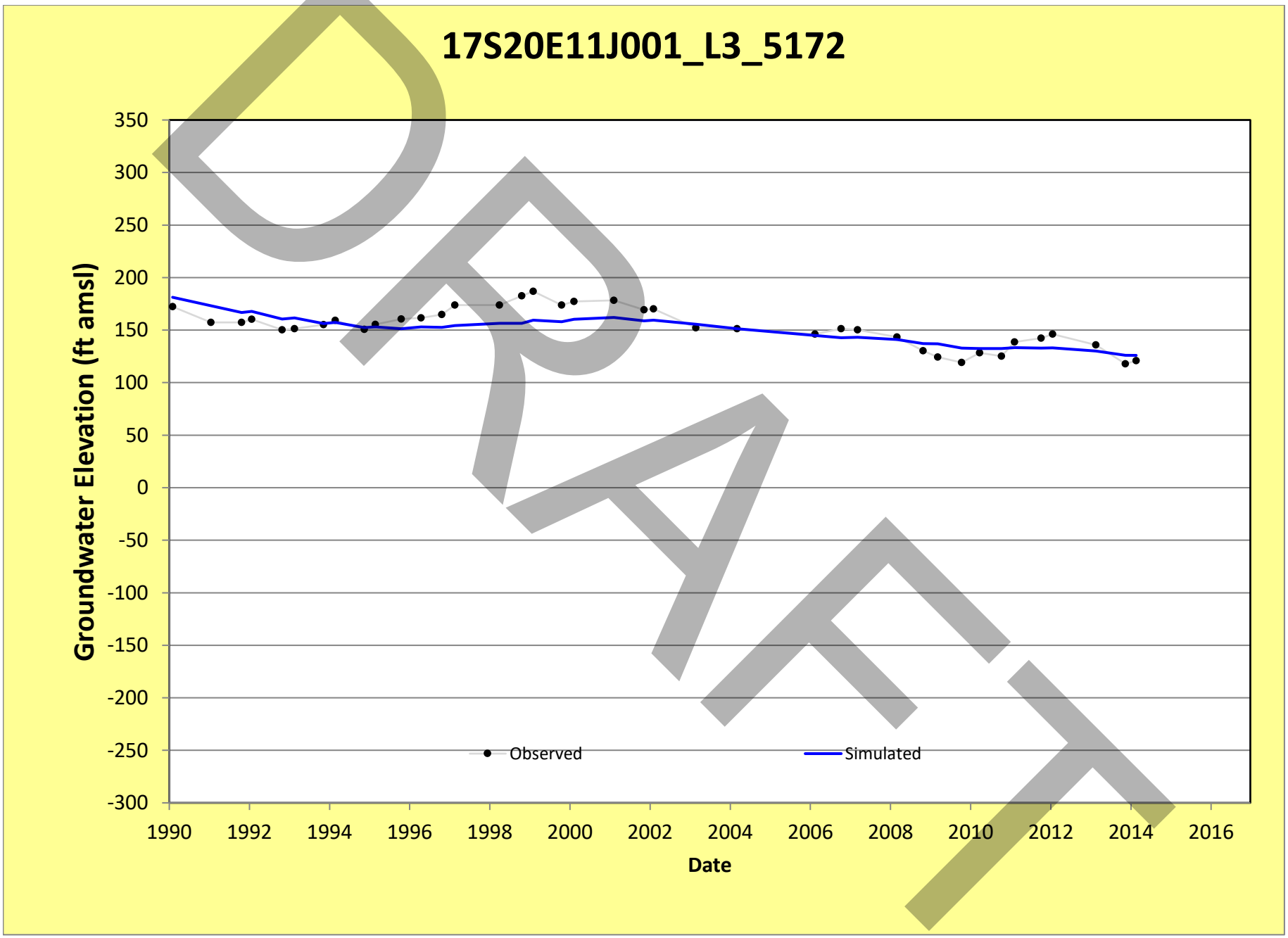
Date
Observed
Simulated
DRAFT


17S20E11J001_L3_5172
Groundwater Elevation (ft amsl)
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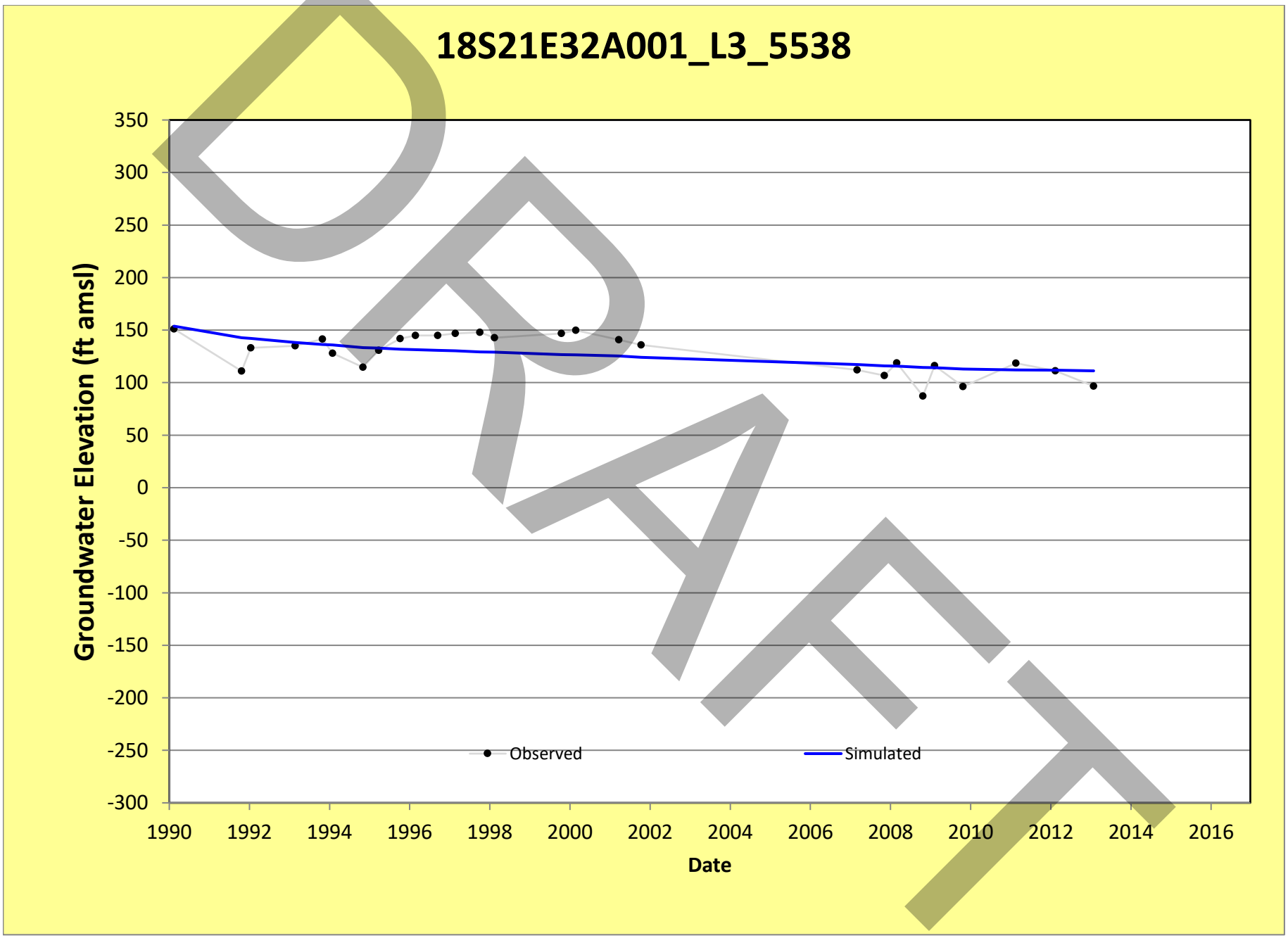
Date
Observed
Simulated
DRAFT


18S21E32A001_L3_5538
Groundwater Elevation (ft amsl)
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Date
Observed
Simulated
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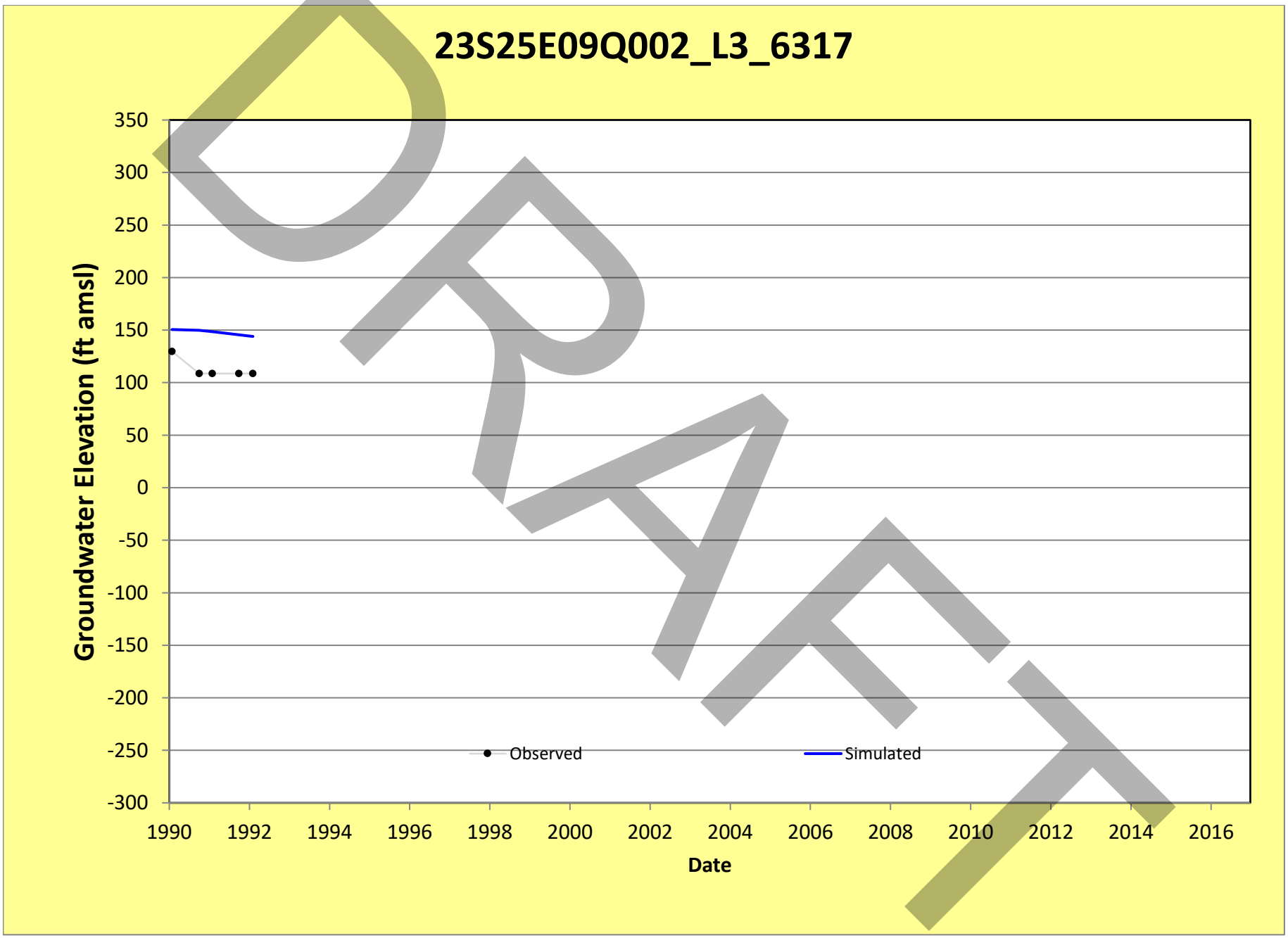
23S25E09Q002_L3_6317
Groundwater Elevation (ft amsl)
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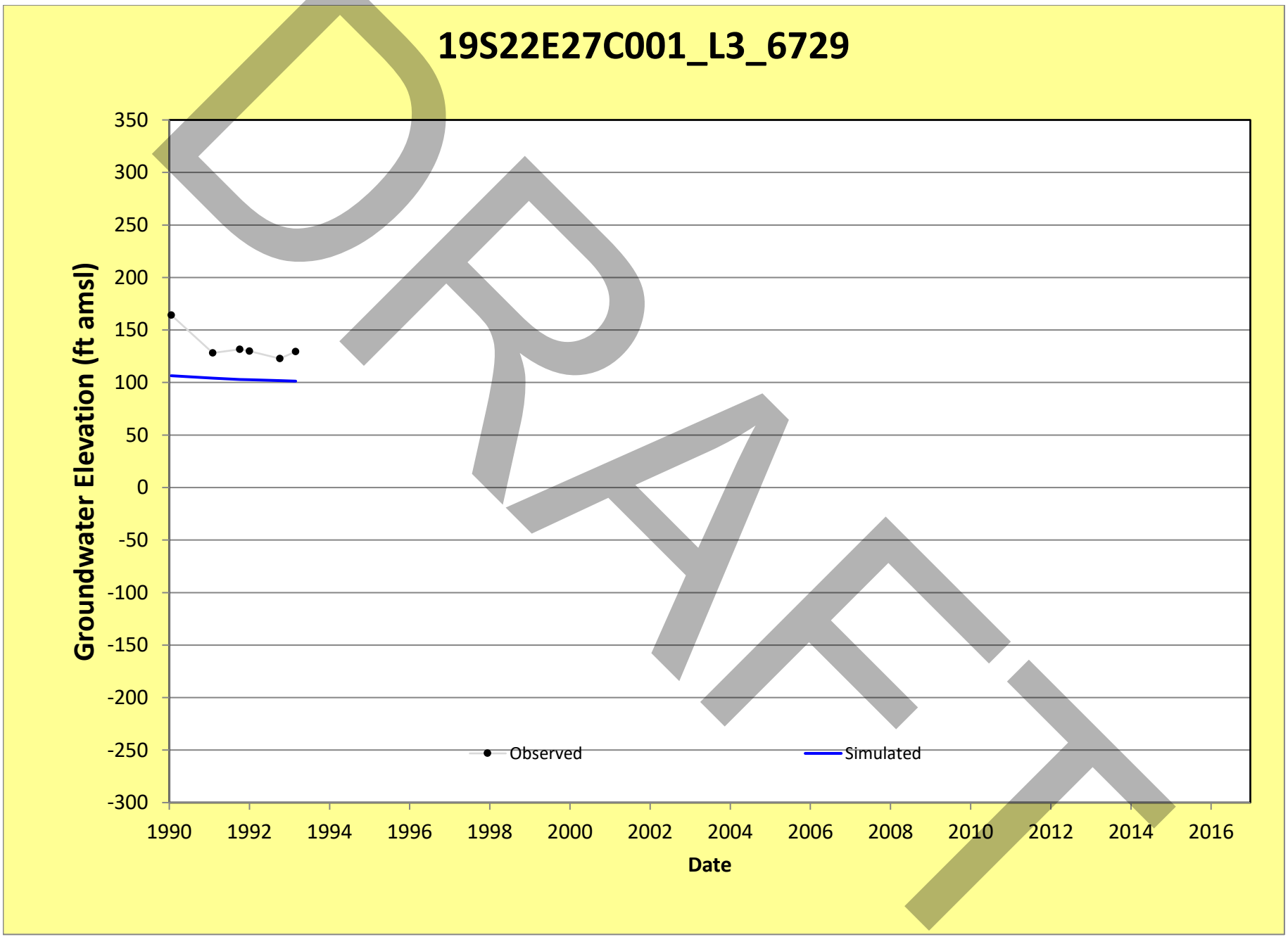
Observed
Simulated
DRAFT


19S22E27C001_L3_6729
Groundwater Elevation (ft amsl)
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Date
Observed
Simulated
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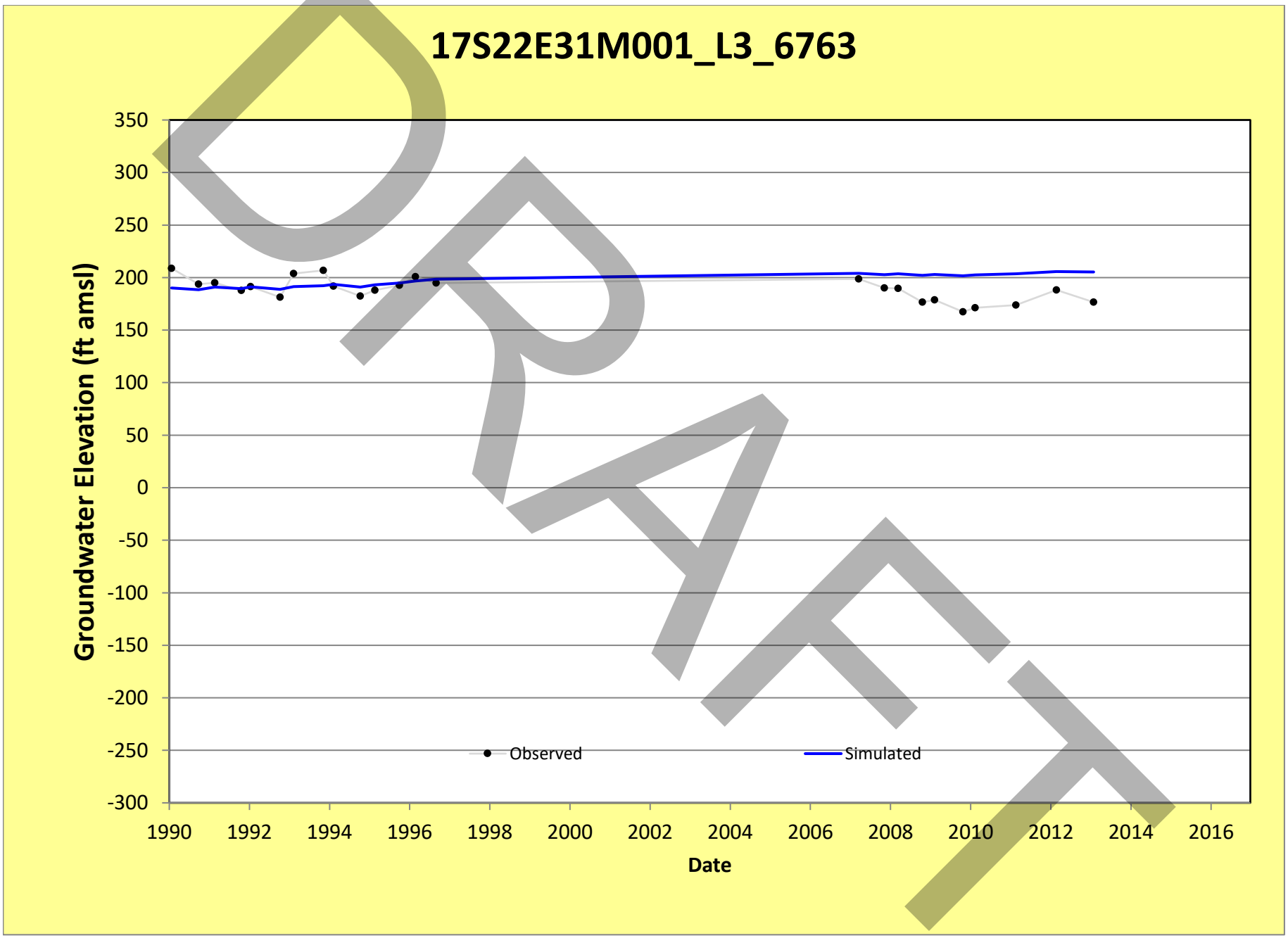
17S22E31M001_L3_6763
Groundwater Elevation (ft amsl)
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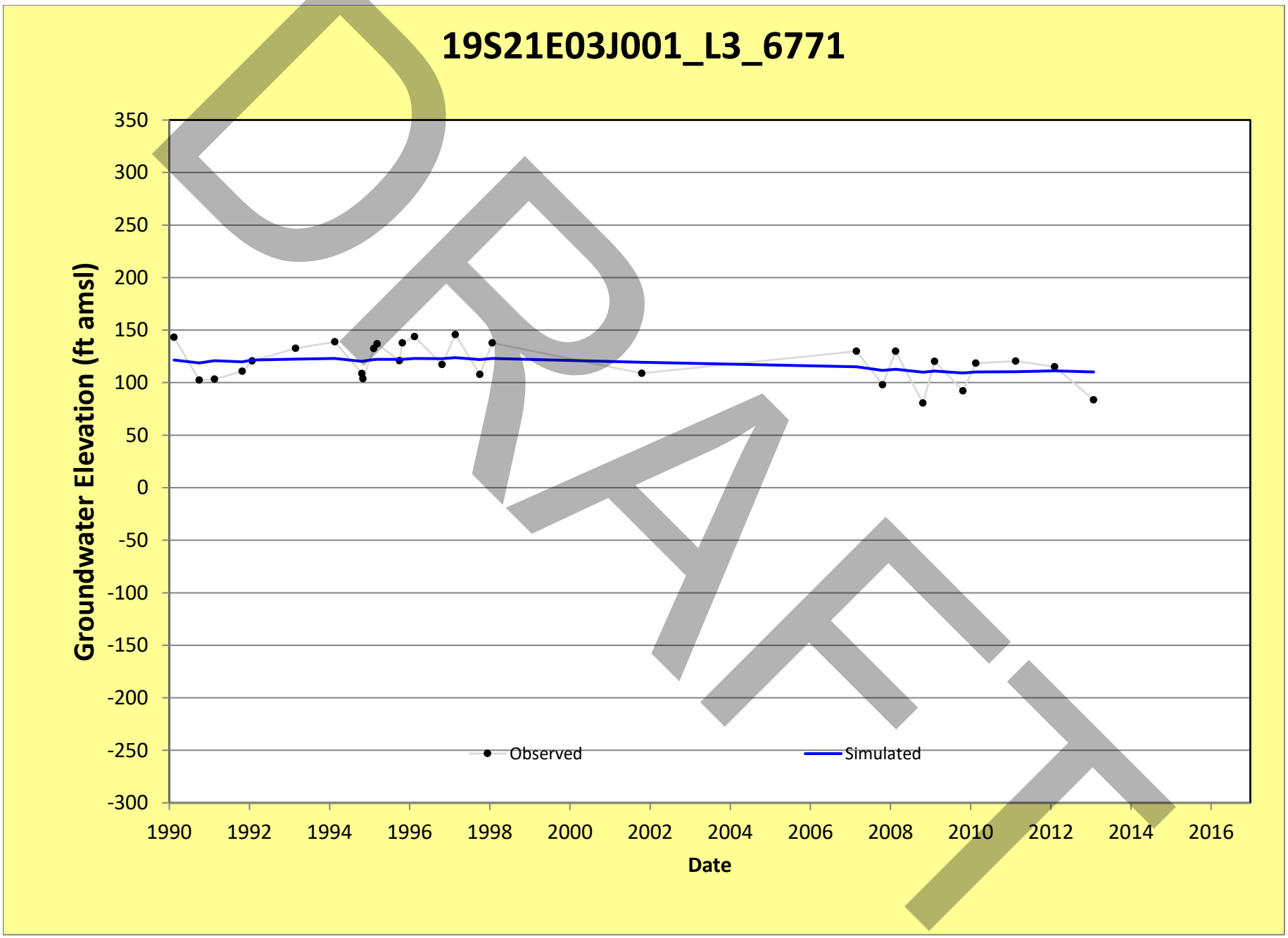
Observed
Simulated
DRAFT


19S21E03J001_L3_6771
Groundwater Elevation (ft amsl)
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100
50
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-50
-100
-150
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Date
Observed
Simulated
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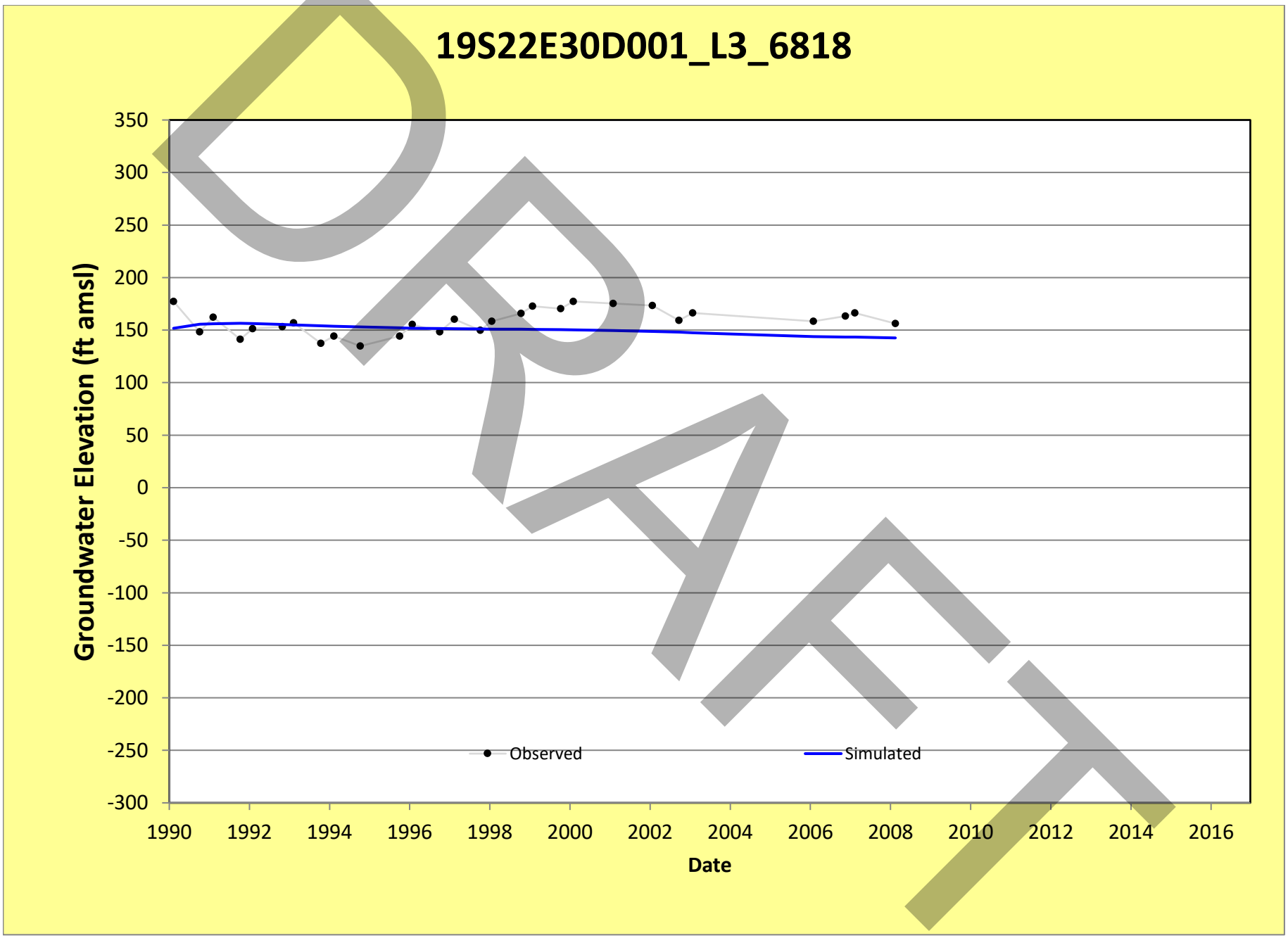
19S22E30D001_L3_6818
Groundwater Elevation (ft amsl)
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250
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50
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-50
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-200
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Date
Observed
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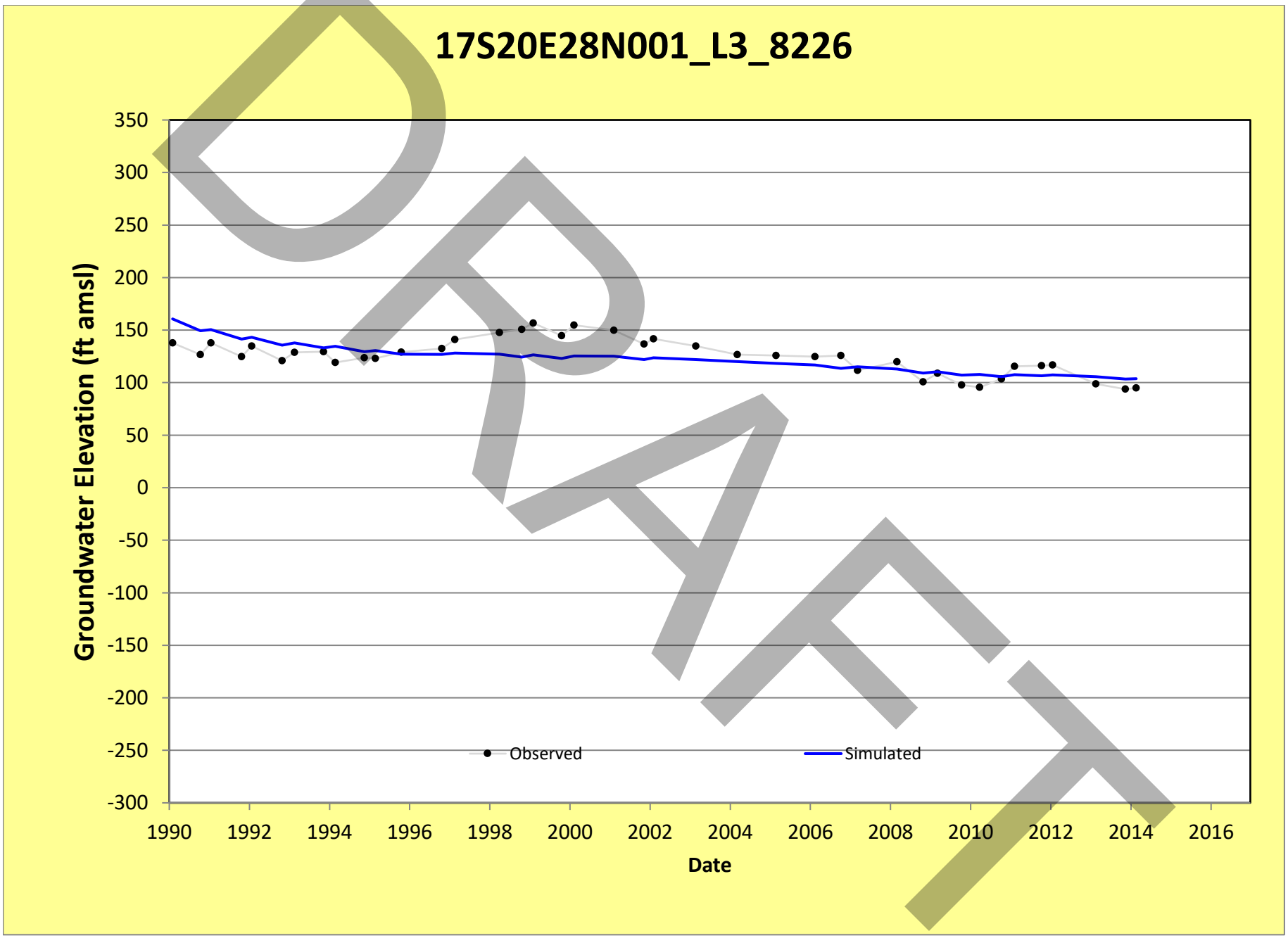
17S20E28N001_L3_8226
Groundwater Elevation (ft amsl)
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100
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-200
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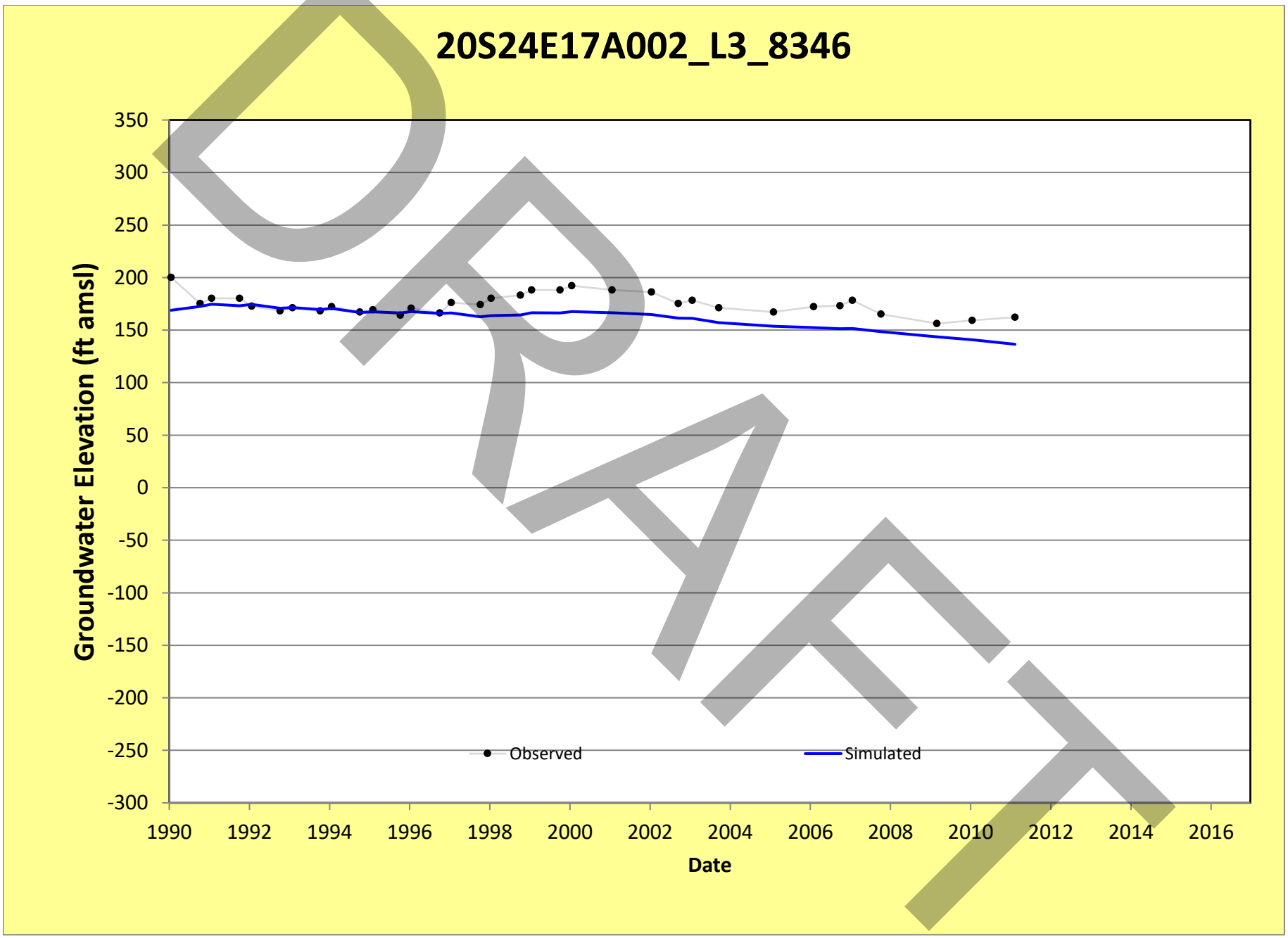
Date
Observed
Simulated
DRAFT


20S24E17A002_L3_8346
Groundwater Elevation (ft amsl)
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250
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100
50
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-50
-100
-150
-200
-250
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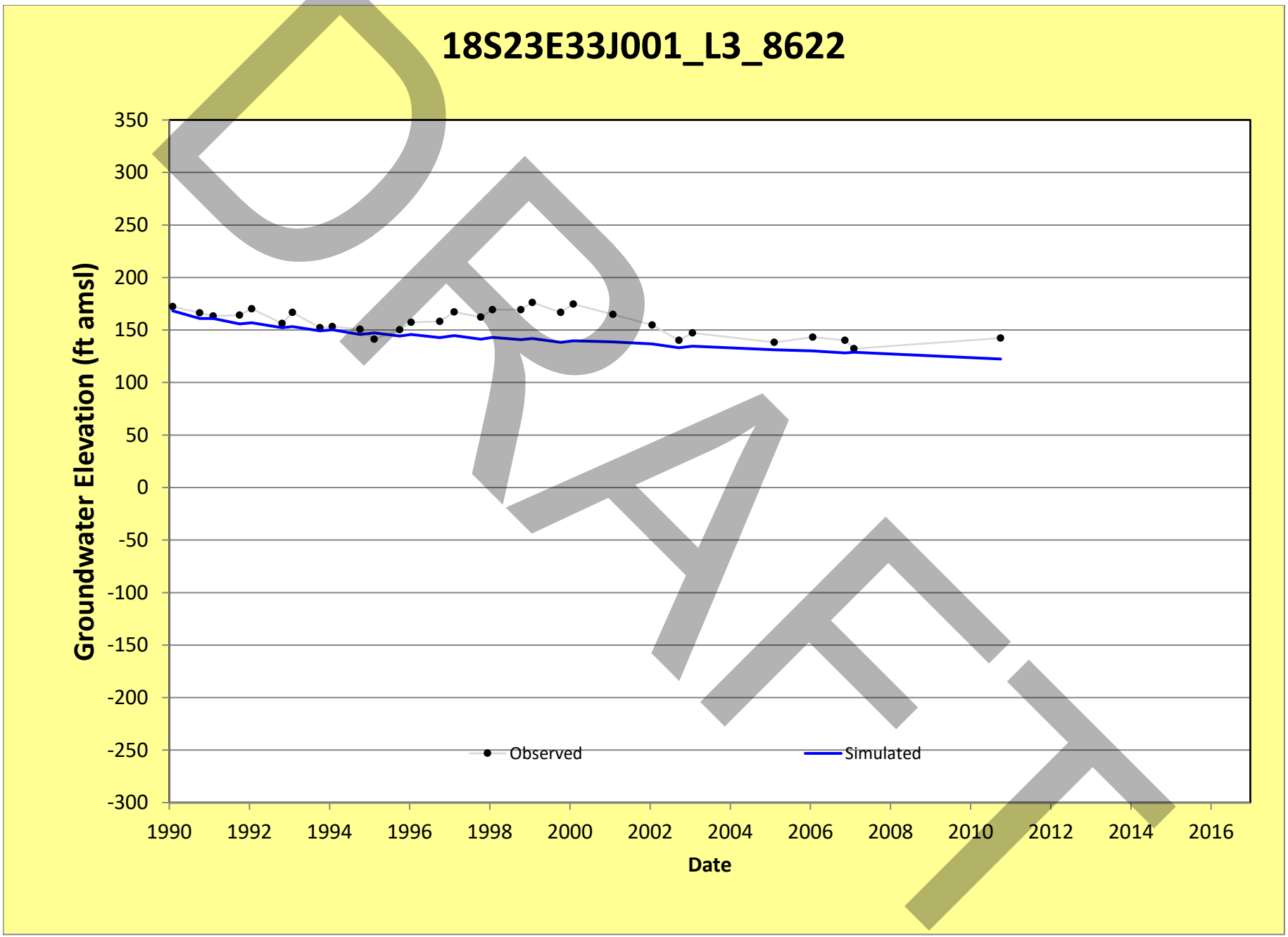
Date
Observed
Simulated
DRAFT


18S23E33J001_L3_8622
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
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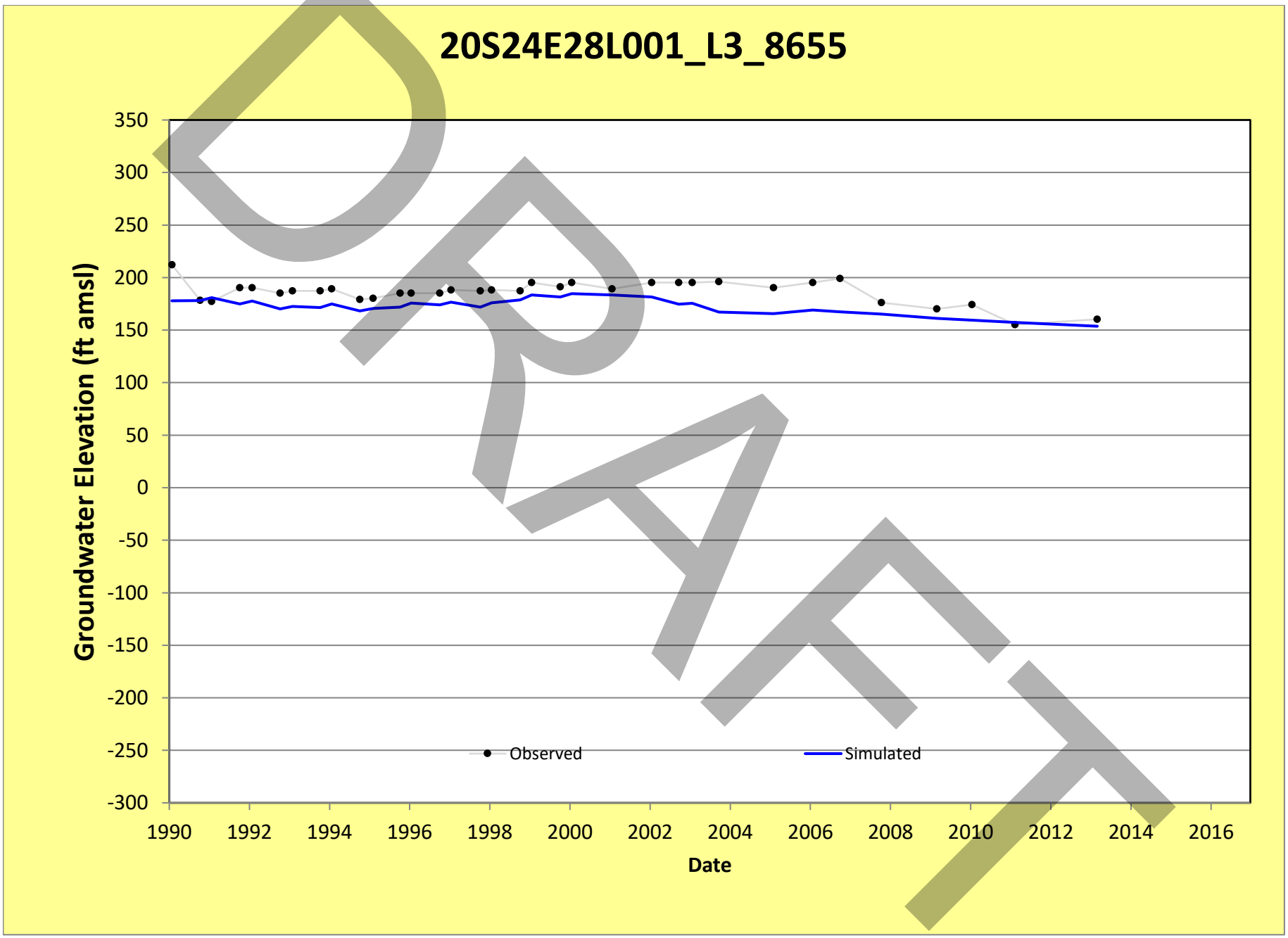
Date
Observed
Simulated
DRAFT


20S24E28L001_L3_8655
Groundwater Elevation (ft amsl)
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100
50
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-50
-100
-150
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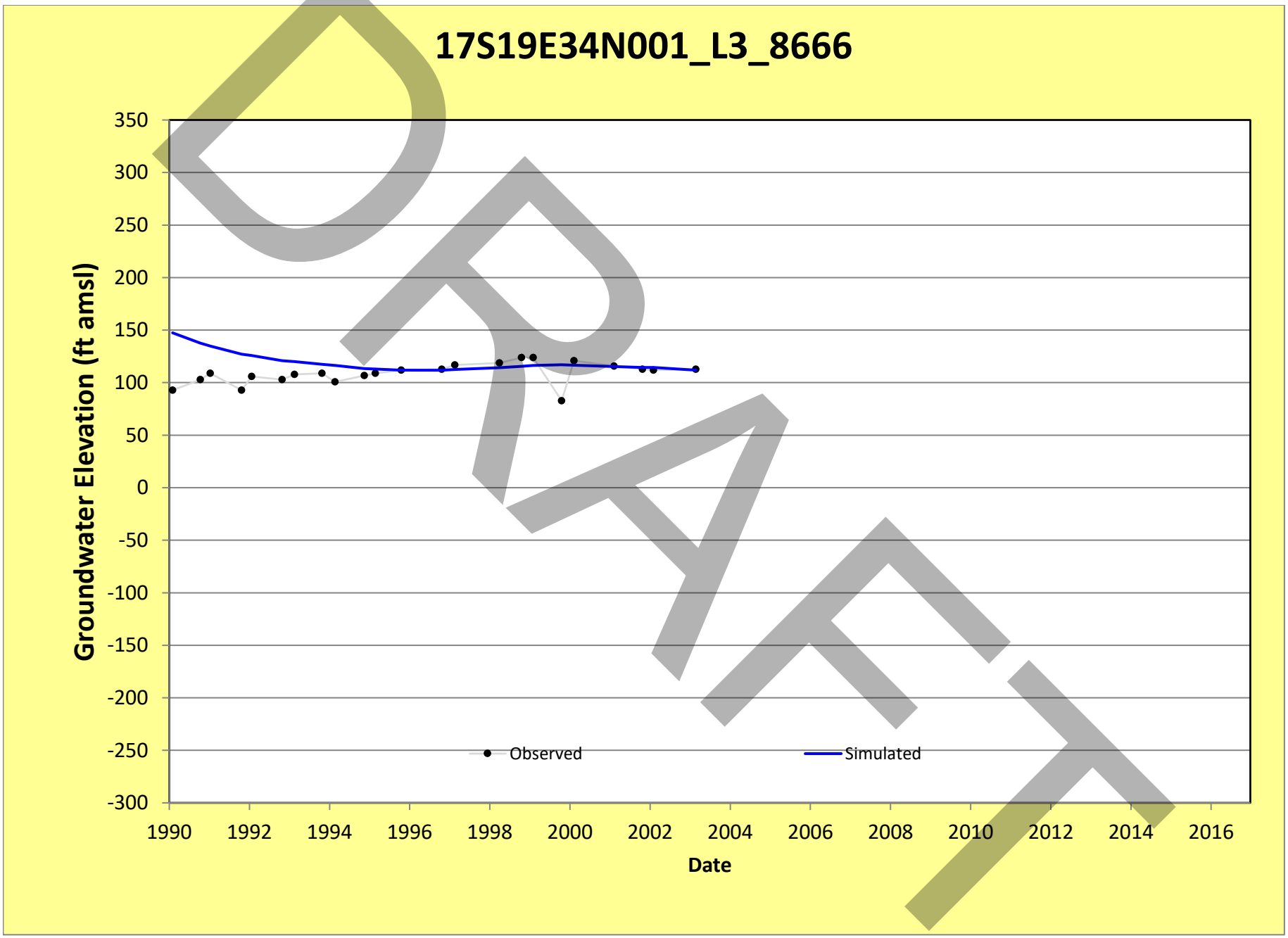
Date
Observed
Simulated
DRAFT


17S19E34N001_L3_8666
Groundwater Elevation (ft amsl)
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-50
-100
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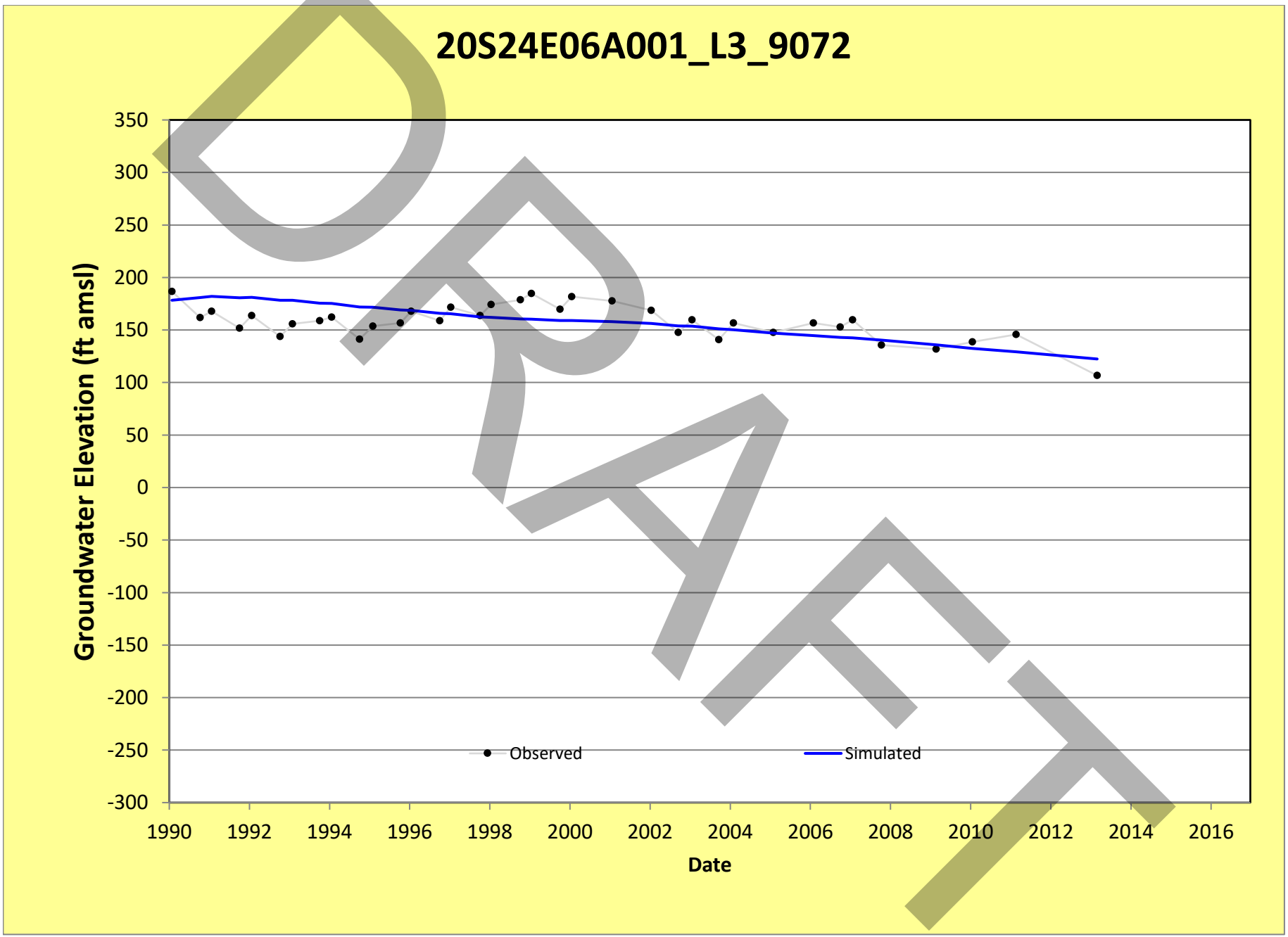
Date
Observed
Simulated
DRAFT


20S24E06A001_L3_9072
Groundwater Elevation (ft amsl)
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-150
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Date
Observed
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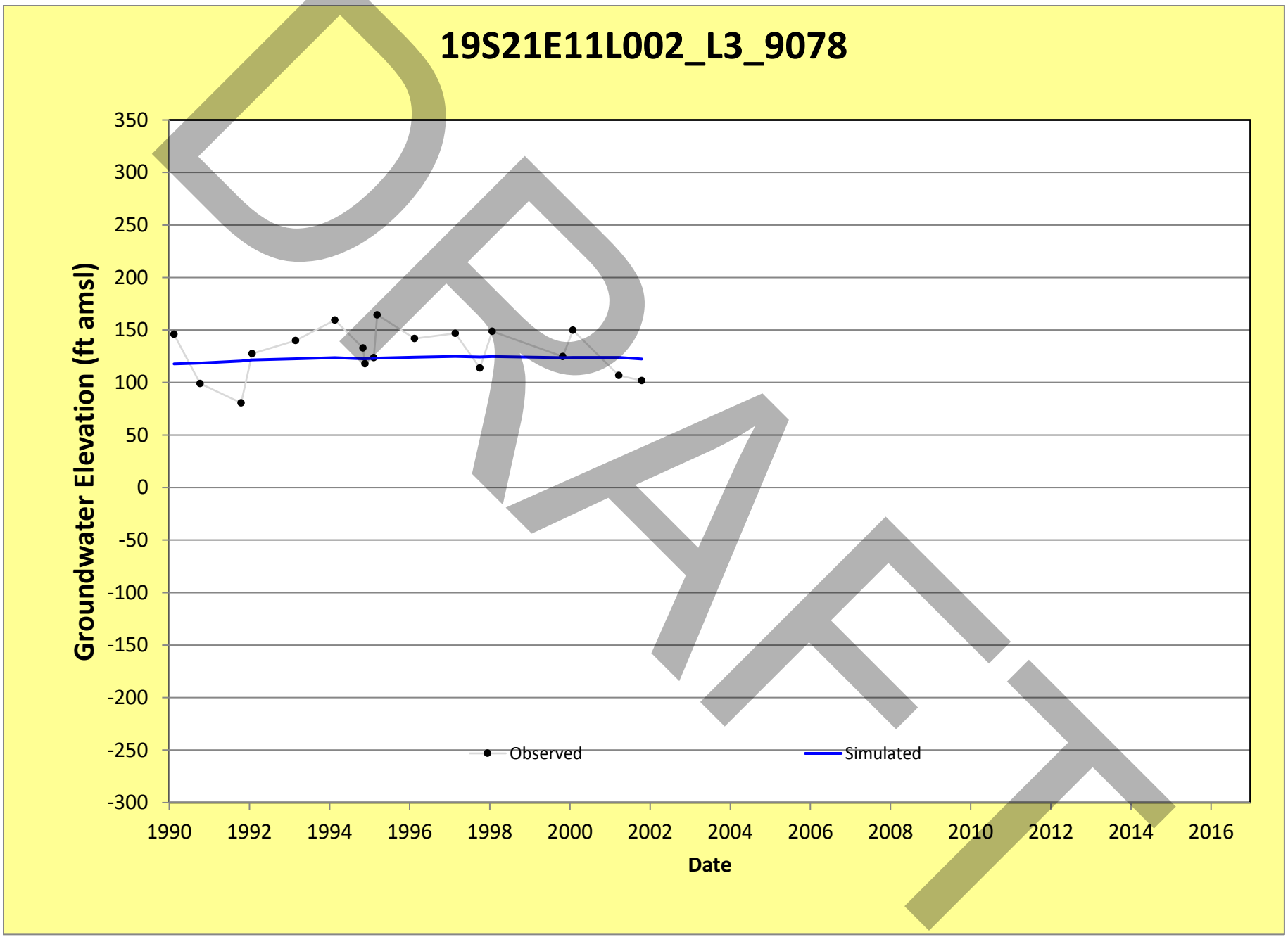
19S21E11L002_L3_9078
Groundwater Elevation (ft amsl)
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100
50
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-50
-100
-150
-200
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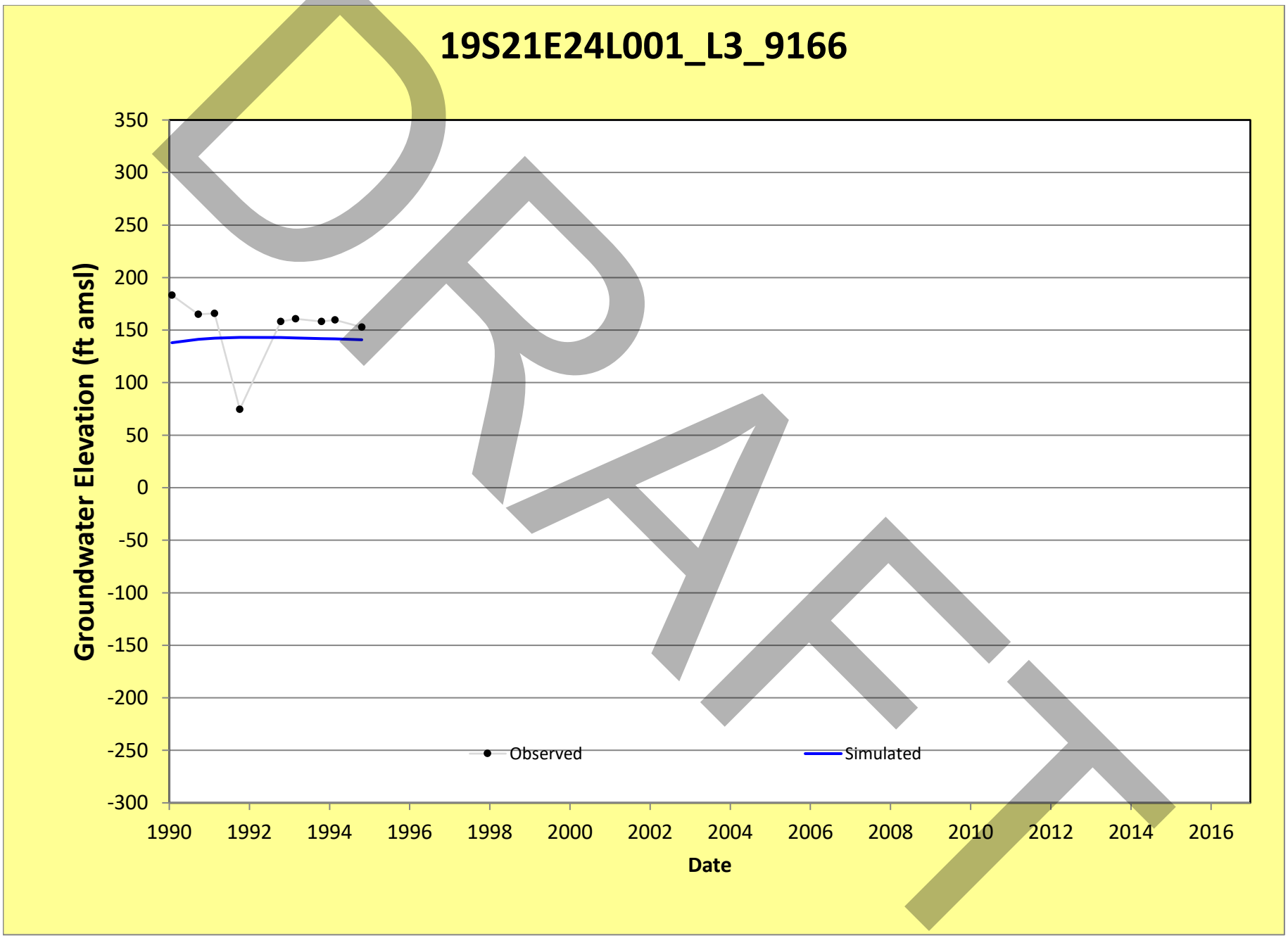
Date
Observed
Simulated
DRAFT


19S21E24L001_L3_9166
Groundwater Elevation (ft amsl)
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300
250
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150
100
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-50
-100
-150
-200
-250
-300
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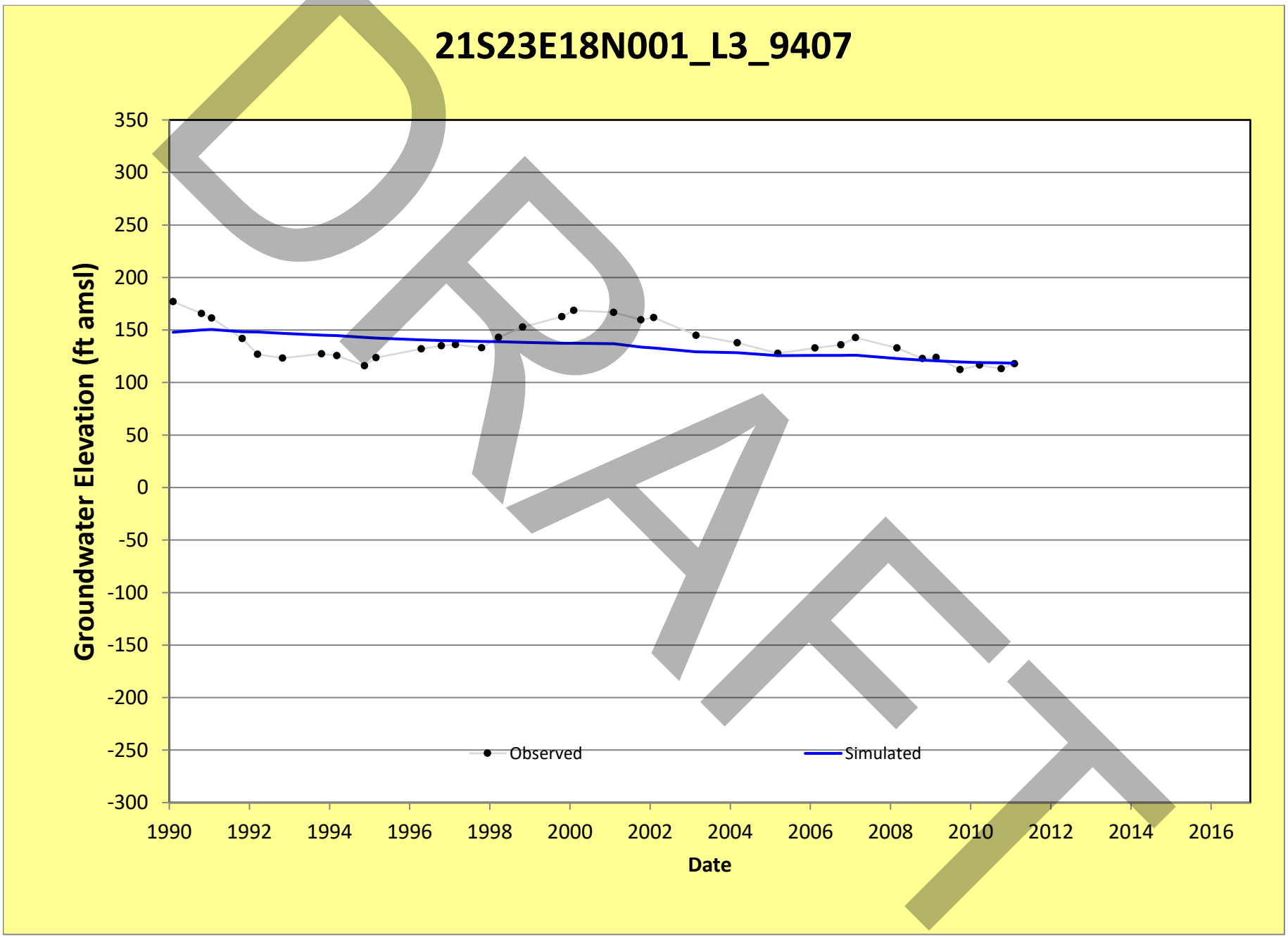
Date
Observed
Simulated
DRAFT


21S23E18N001_L3_9407
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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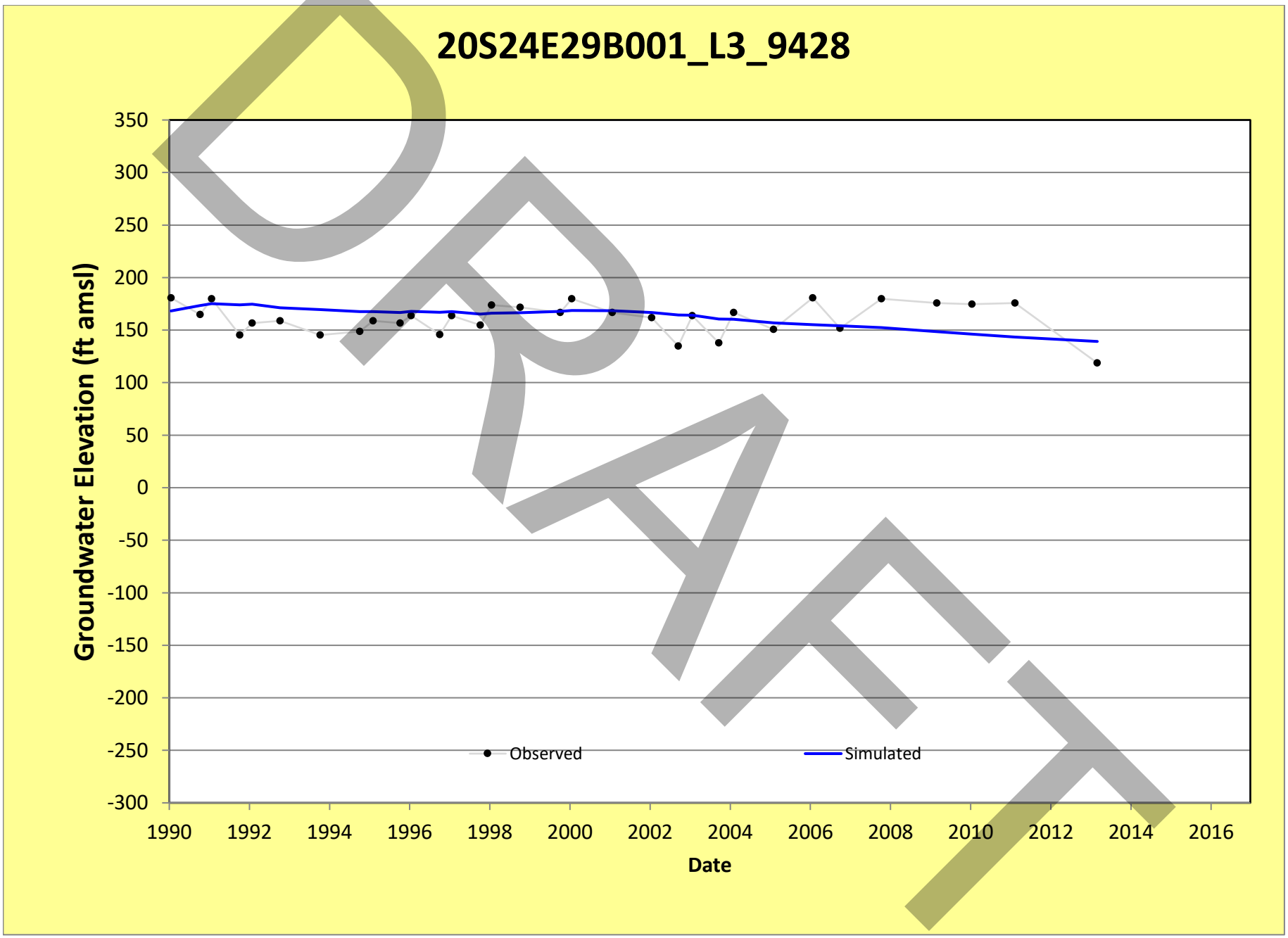
Date
Observed
Simulated
DRAFT


20S24E29B001_L3_9428
Groundwater Elevation (ft amsl)
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200
150
100
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0
-50
-100
-150
-200
-250
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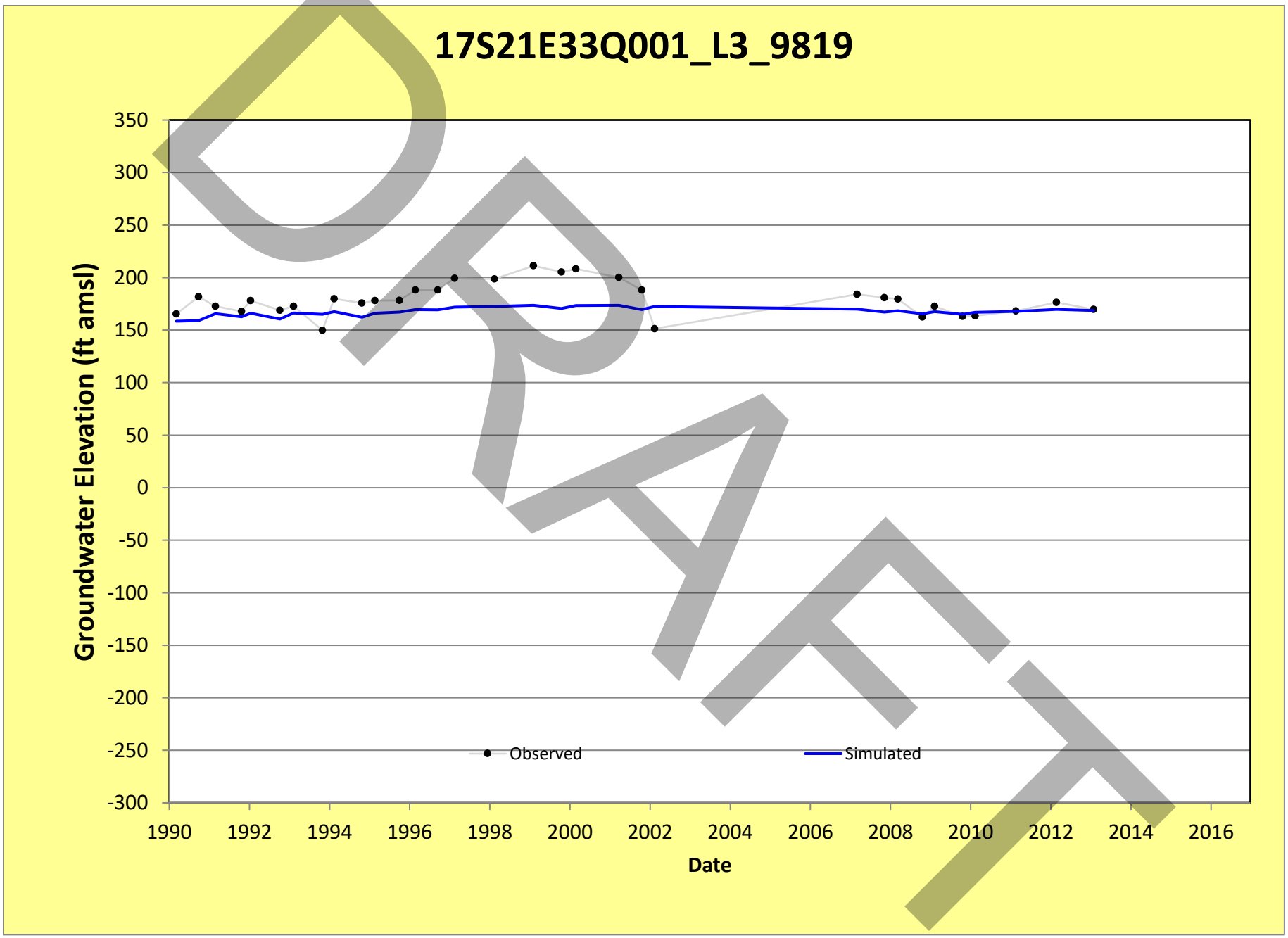
Date
Observed
Simulated
DRAFT


17S21E33Q001_L3_9819
Groundwater Elevation (ft amsl)
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300
250
200
150
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50
0
-50
-100
-150
-200
-250
-300
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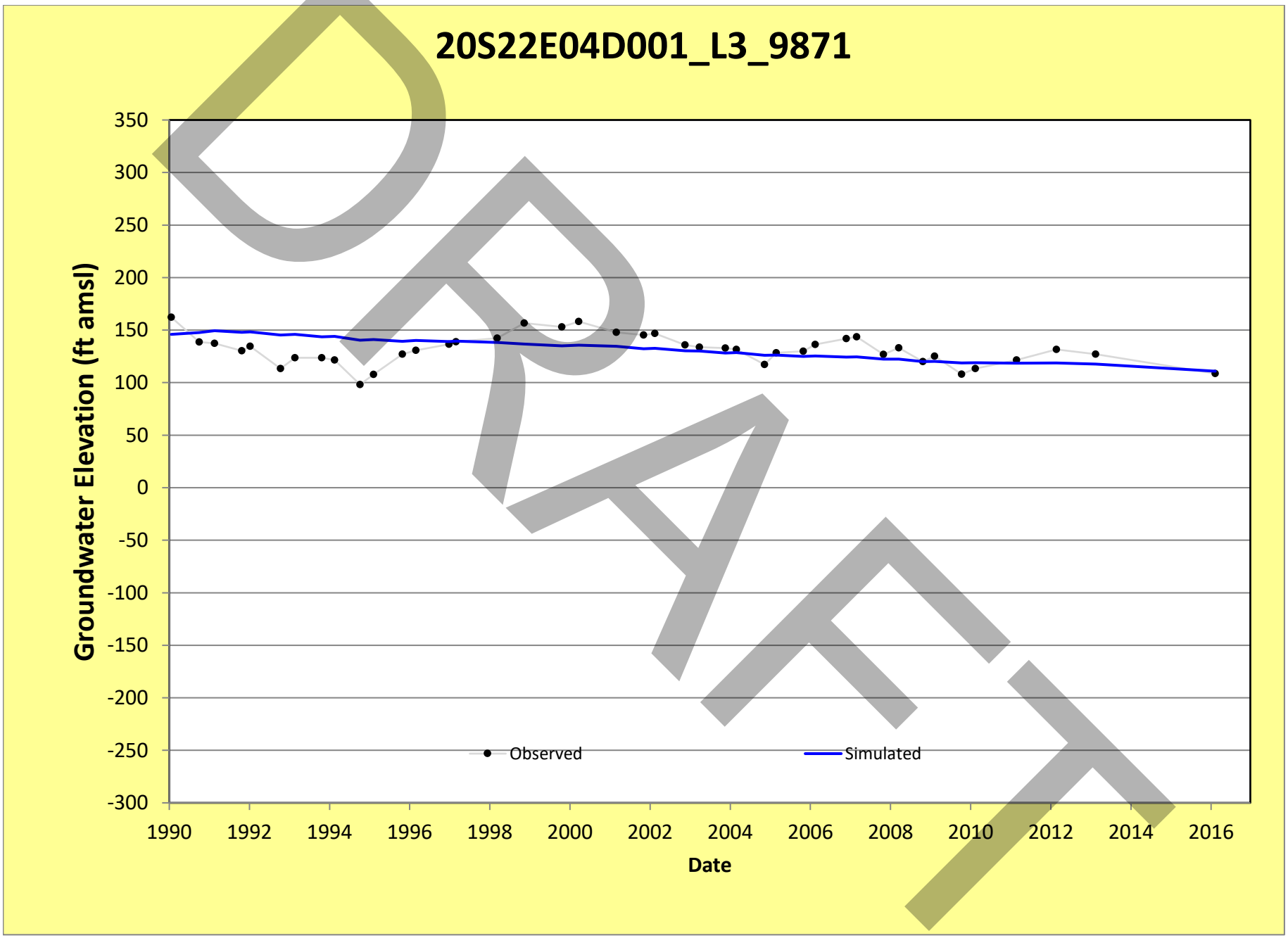
Date
Observed
Simulated
DRAFT


20S22E04D001_L3_9871
Groundwater Elevation (ft amsl)
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250
200
150
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50
0
-50
-100
-150
-200
-250
-300
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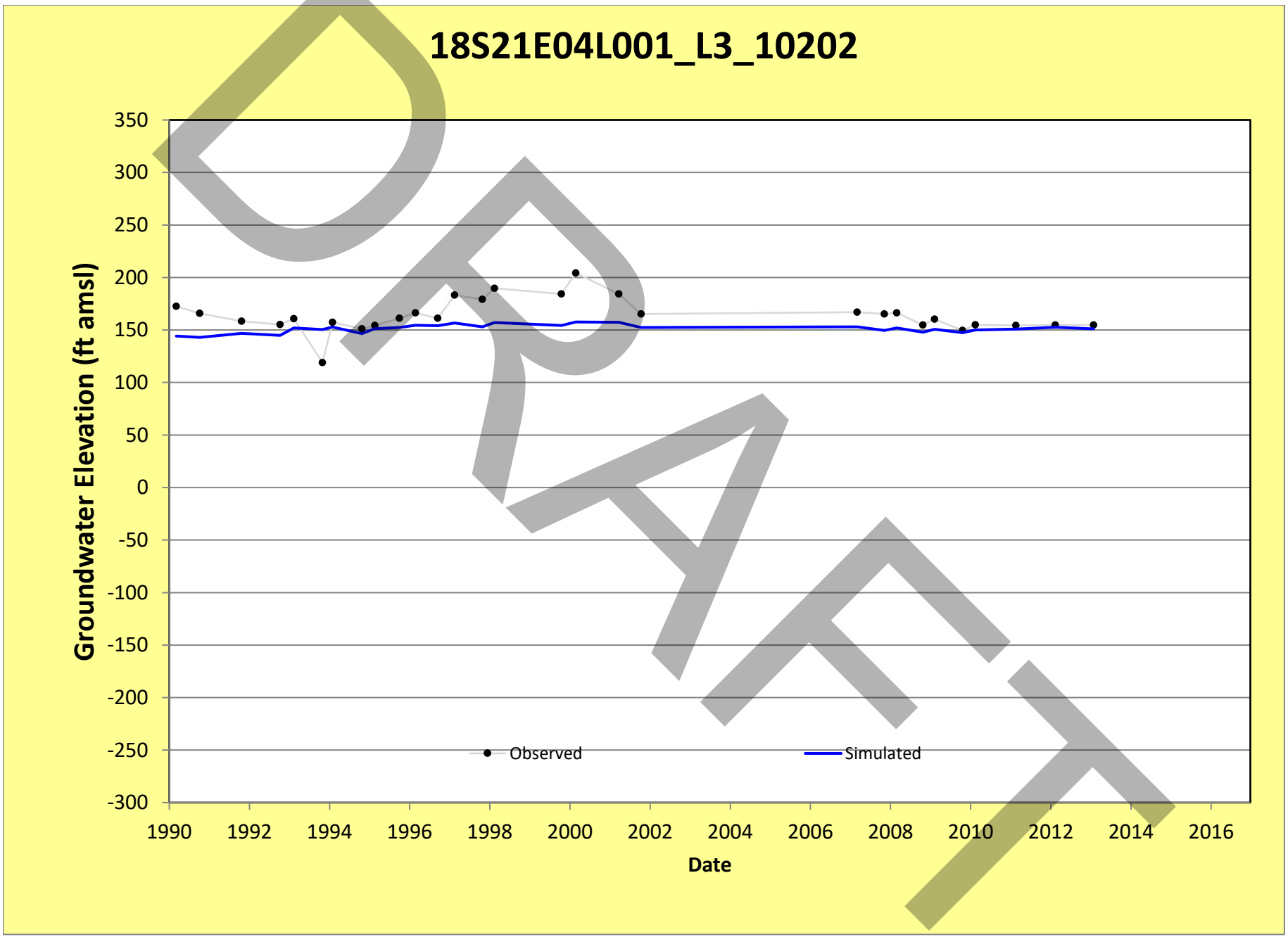
Date
Observed
Simulated
DRAFT


18S21E04L001_L3_10202
Groundwater Elevation (ft amsl)
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150
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-50
-100
-150
-200
-250
-300
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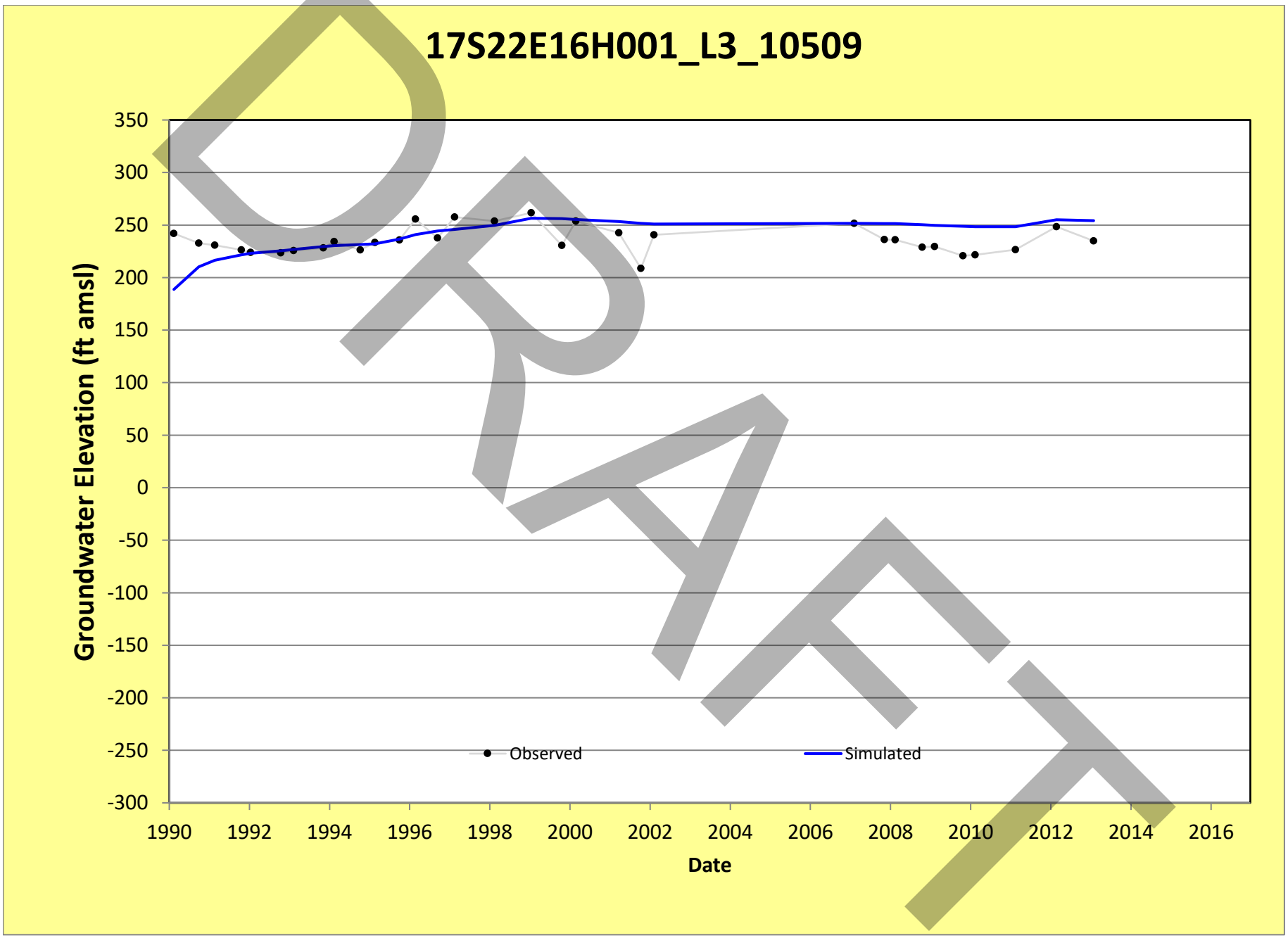
Date
Observed
Simulated
DRAFT


17S22E16H001_L3_10509
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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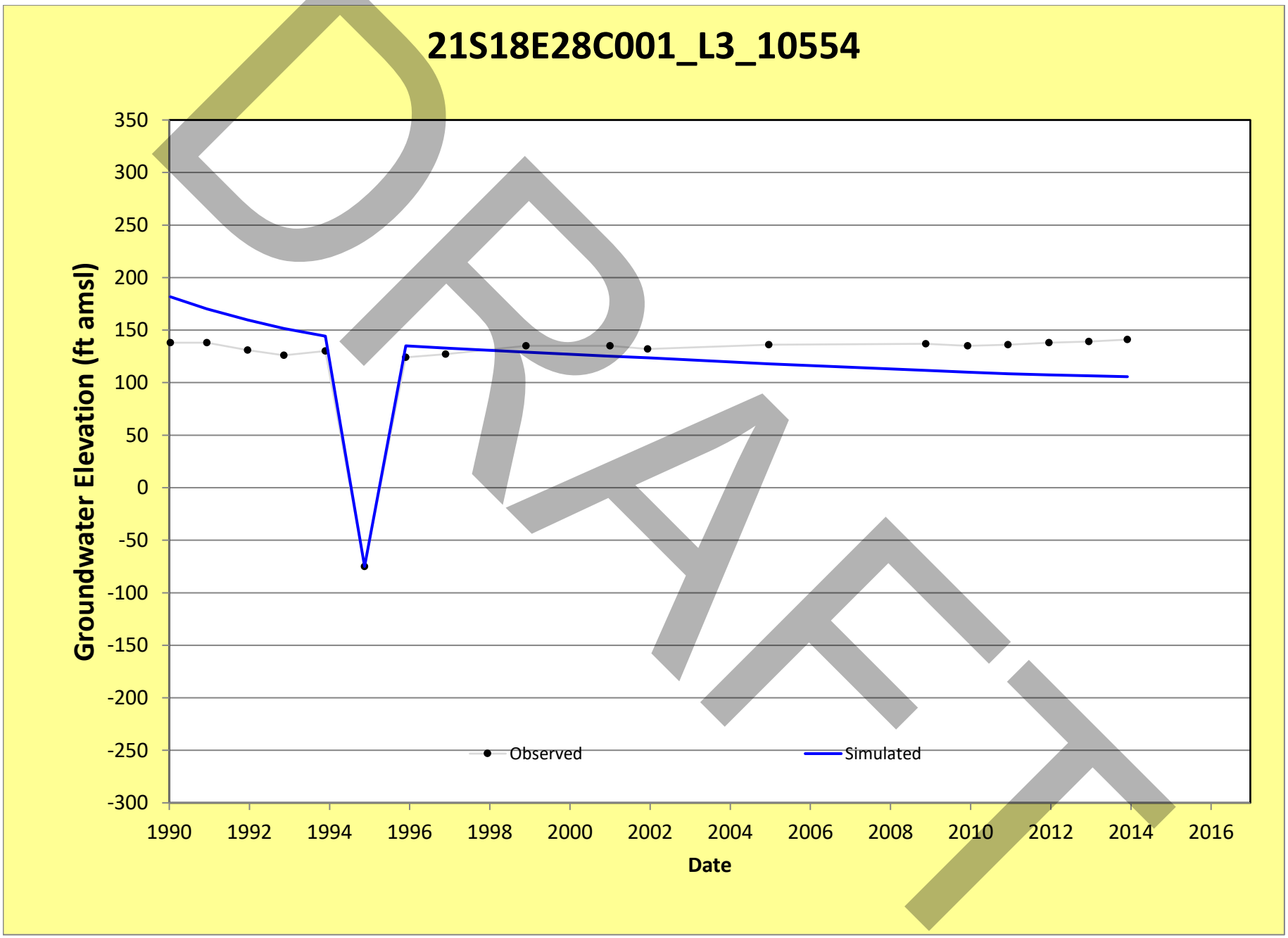
Date
Observed
Simulated
DRAFT


21S18E28C001_L3_10554
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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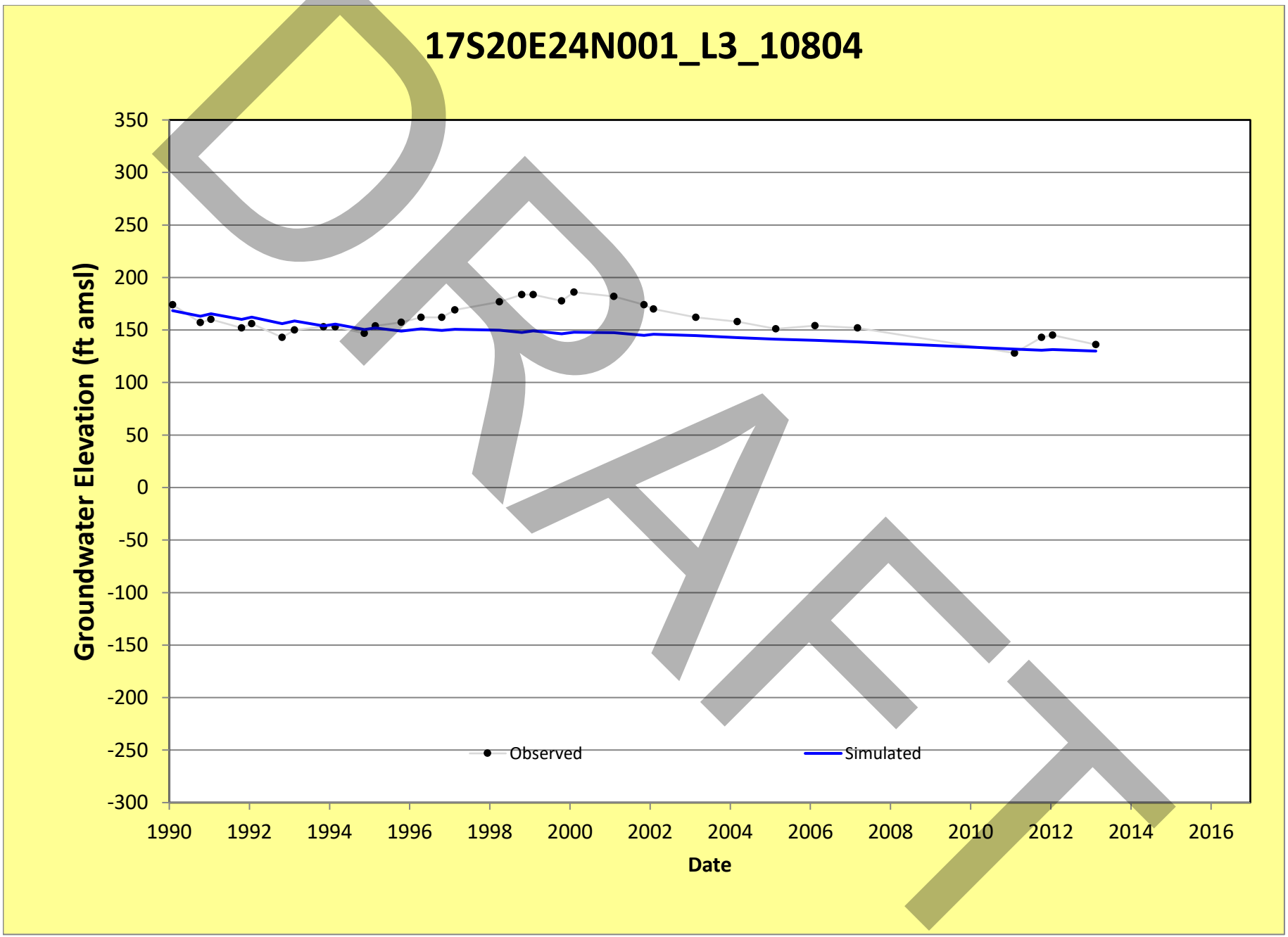
Date
Observed
Simulated
DRAFT


17S20E24N001_L3_10804
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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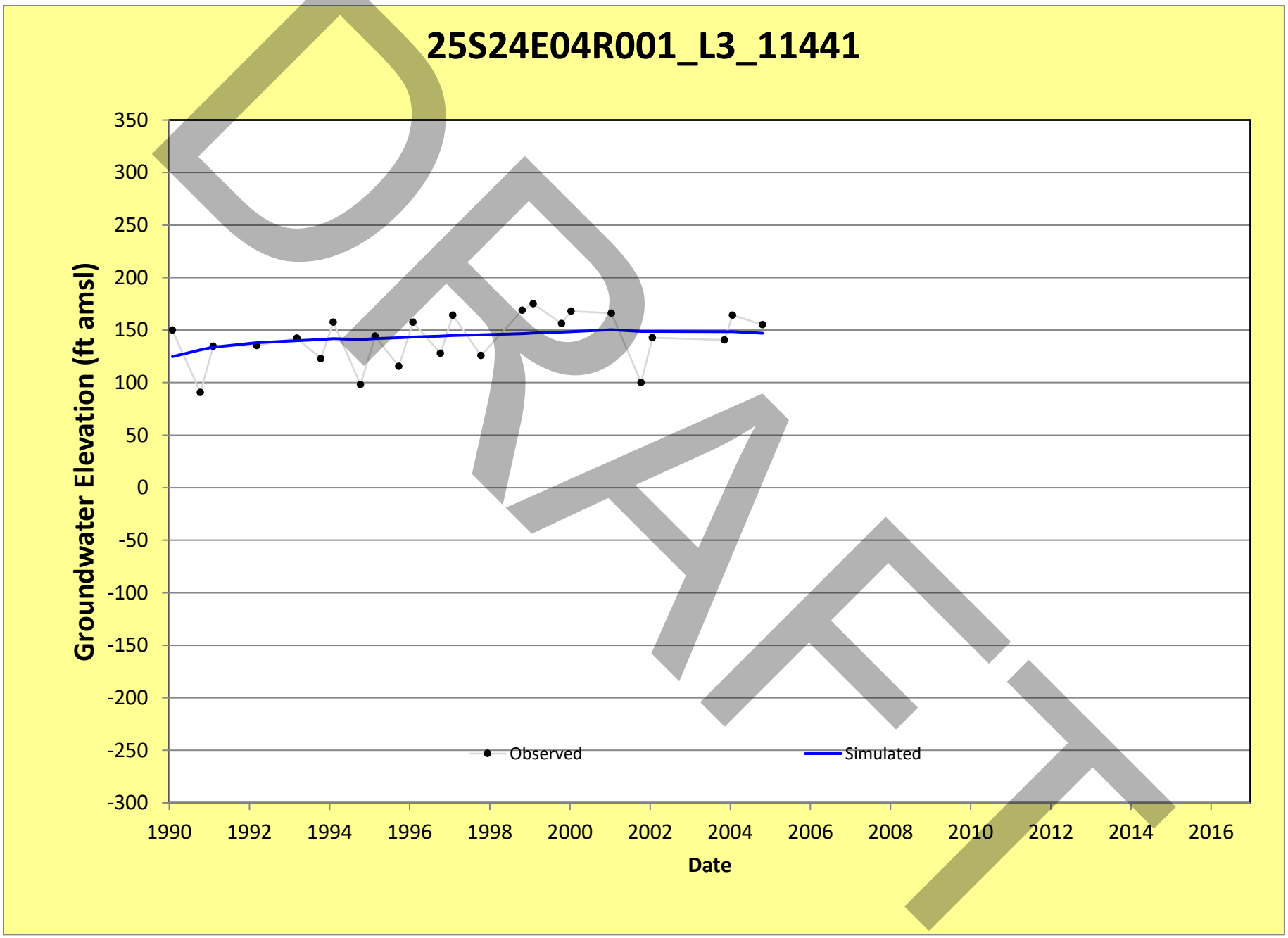
Date
Observed
Simulated
DRAFT


25S24E04R001_L3_11441
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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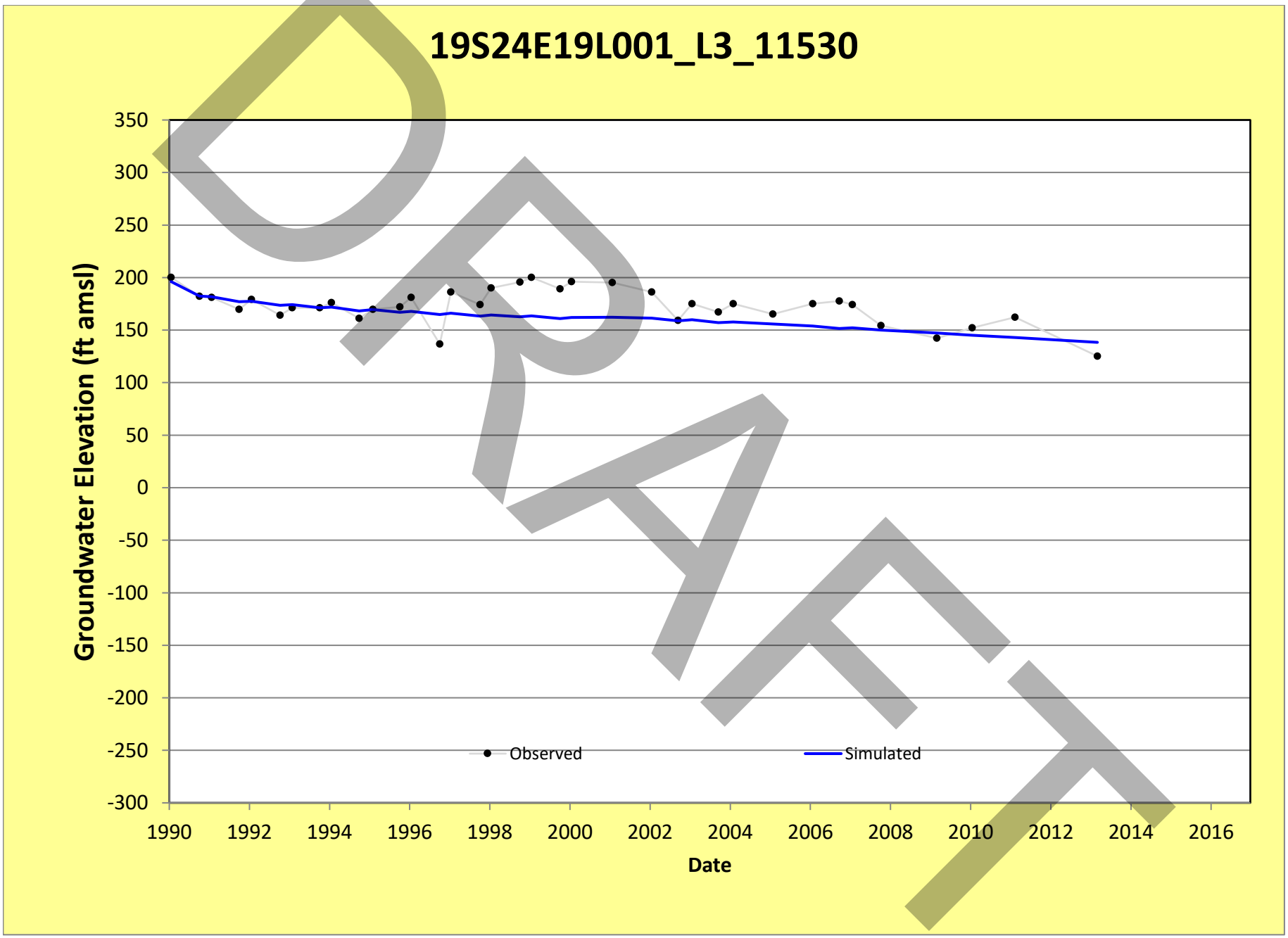
Date
Observed
Simulated
DRAFT


19S24E19L001_L3_11530
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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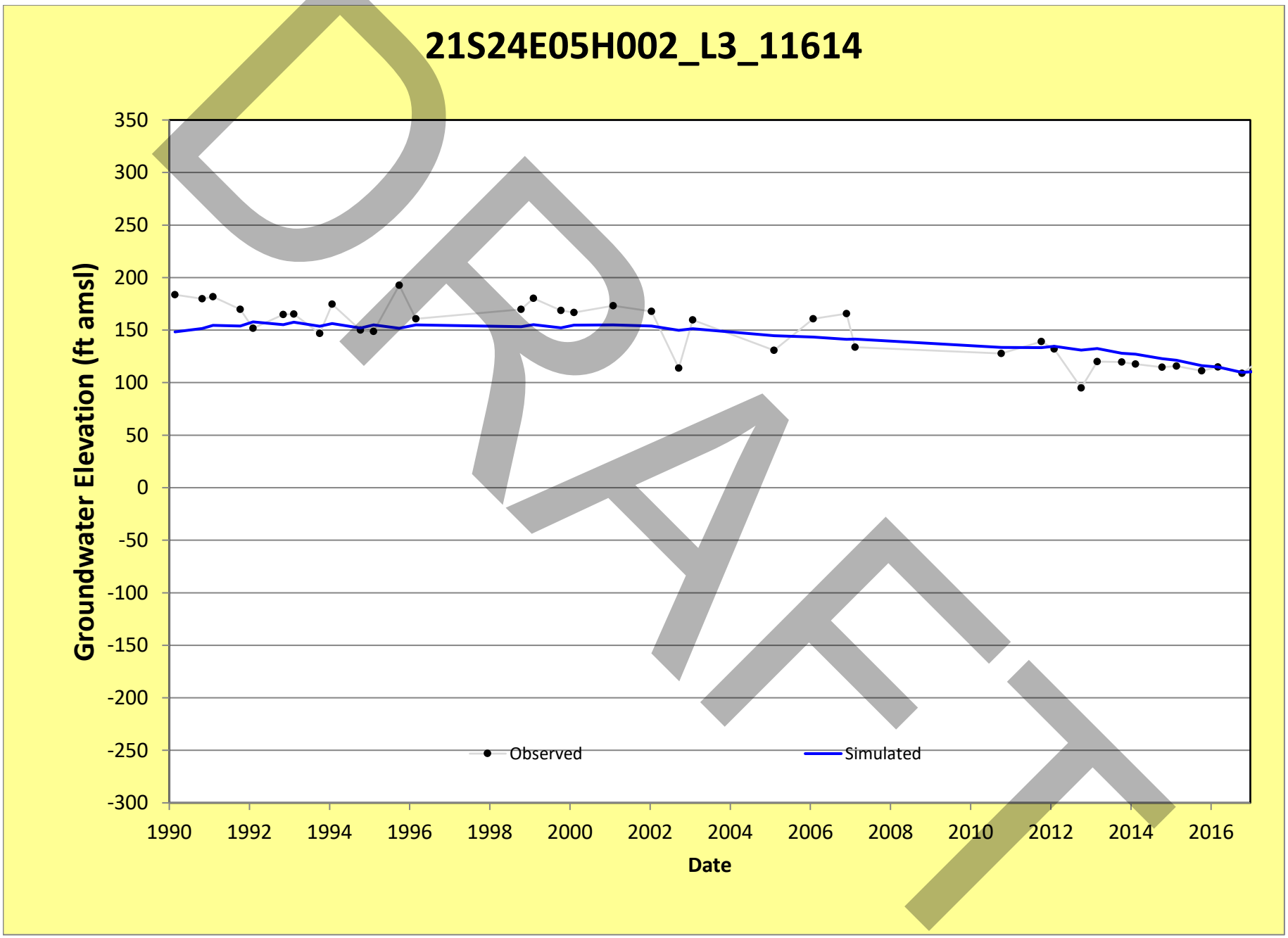
Date
Observed
Simulated
DRAFT


21S24E05H002_L3_11614
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
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-250
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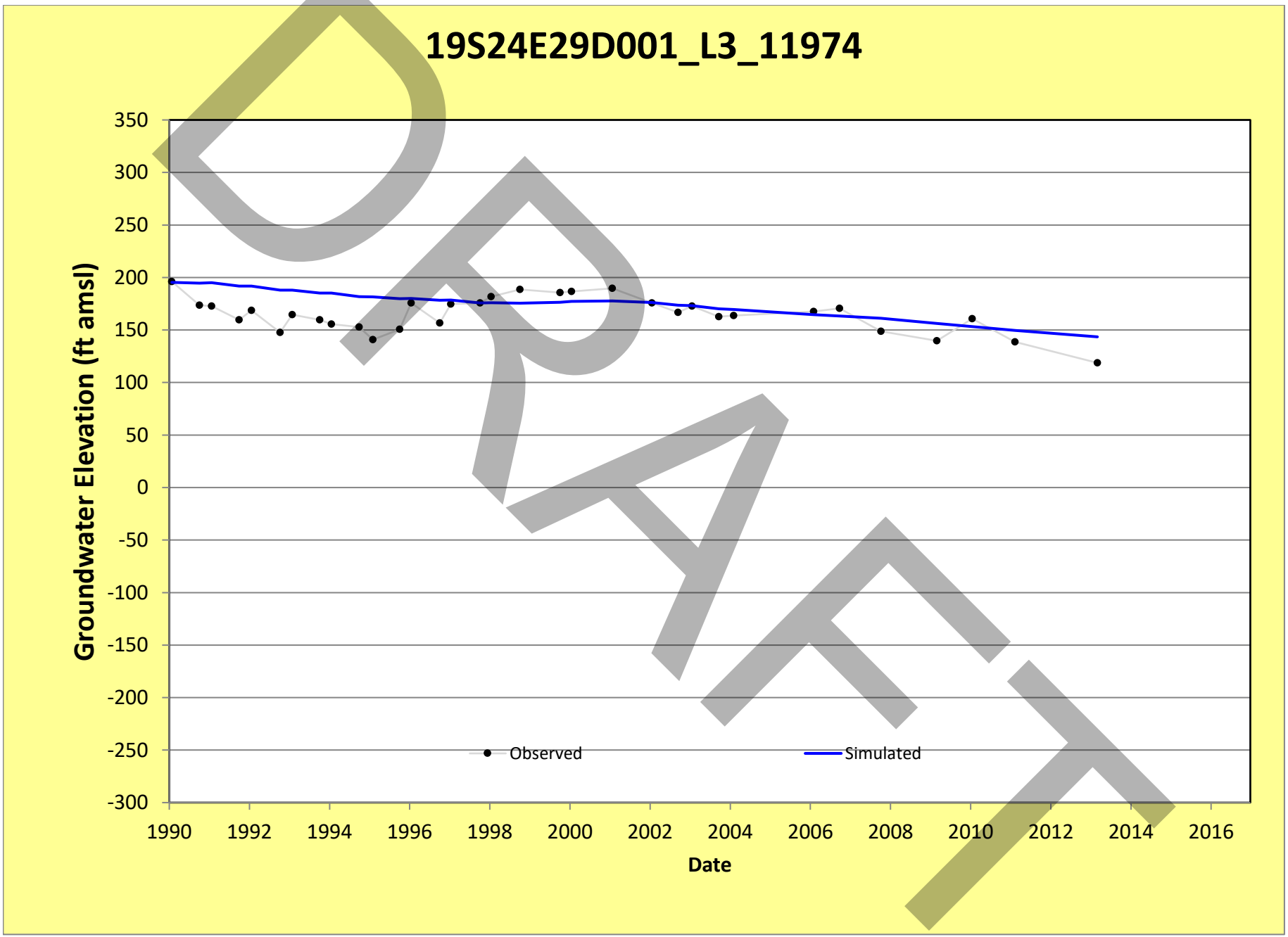
Date
Observed
Simulated
DRAFT


19S24E29D001_L3_11974
Groundwater Elevation (ft amsl)
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-50
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-150
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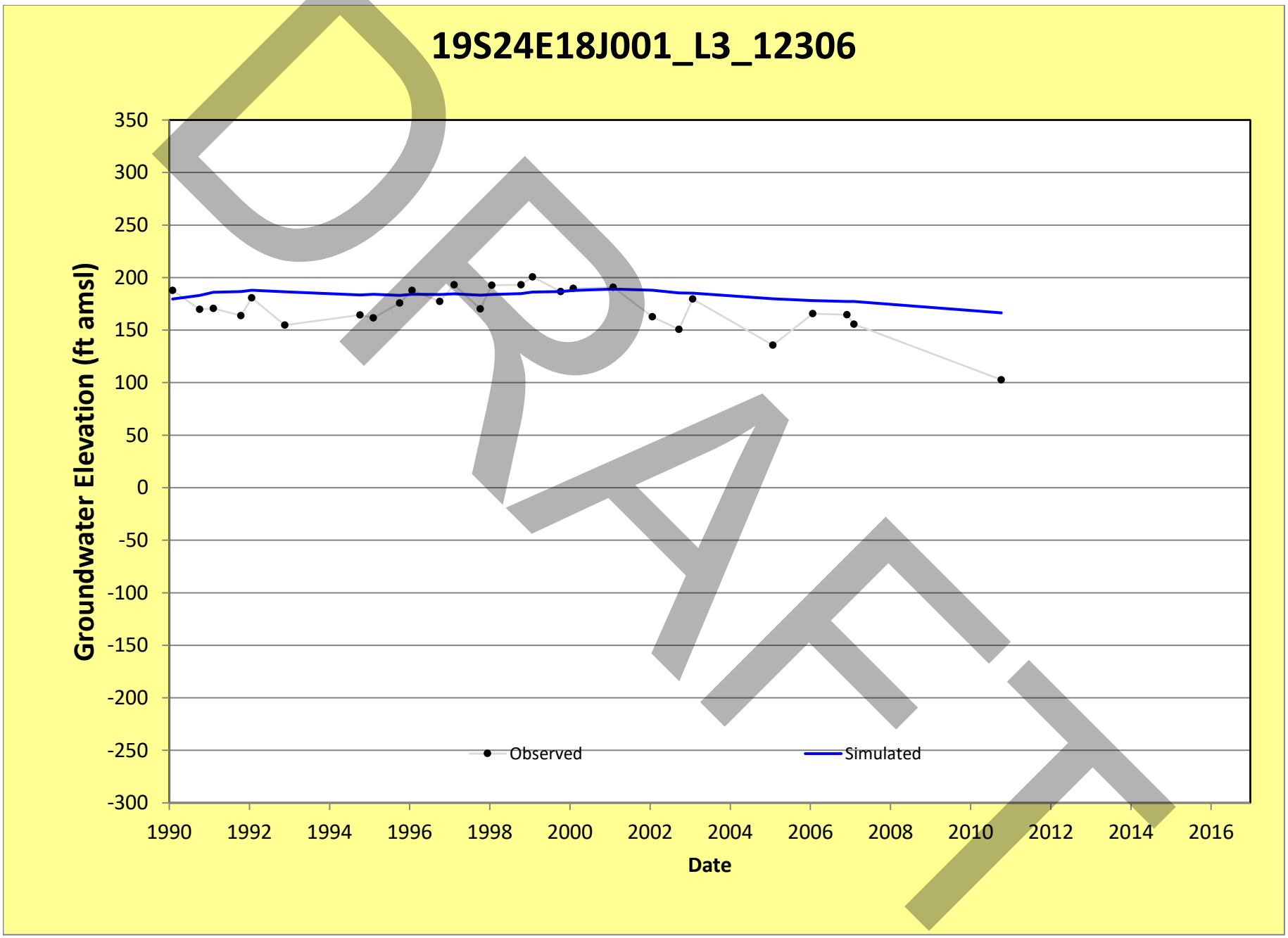
Date
Observed
Simulated
DRAFT


19S24E18J001_L3_12306
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
-100
-150
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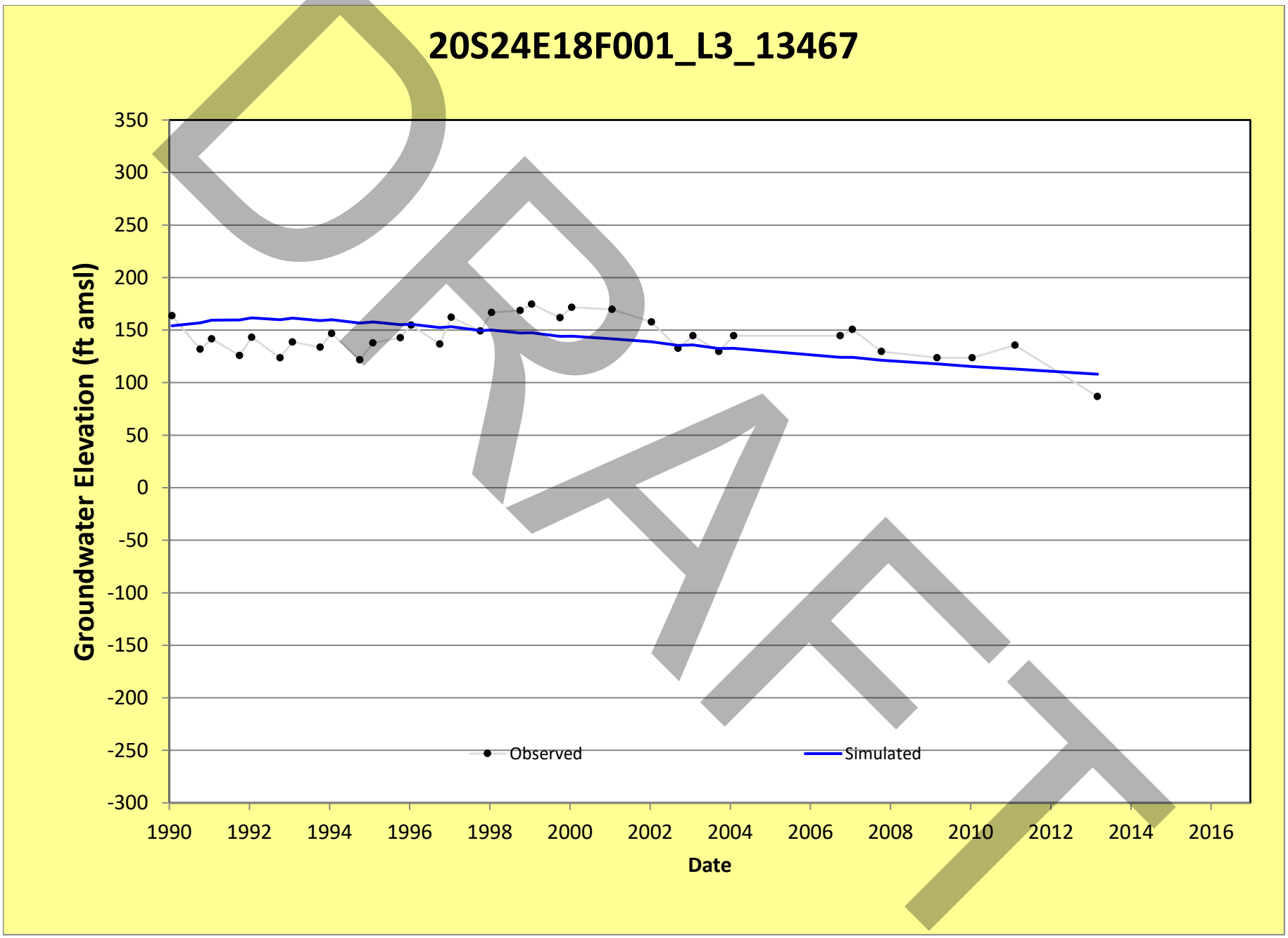
Date
Observed
Simulated
DRAFT


20S24E18F001_L3_13467
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
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-50
-100
-150
-200
-250
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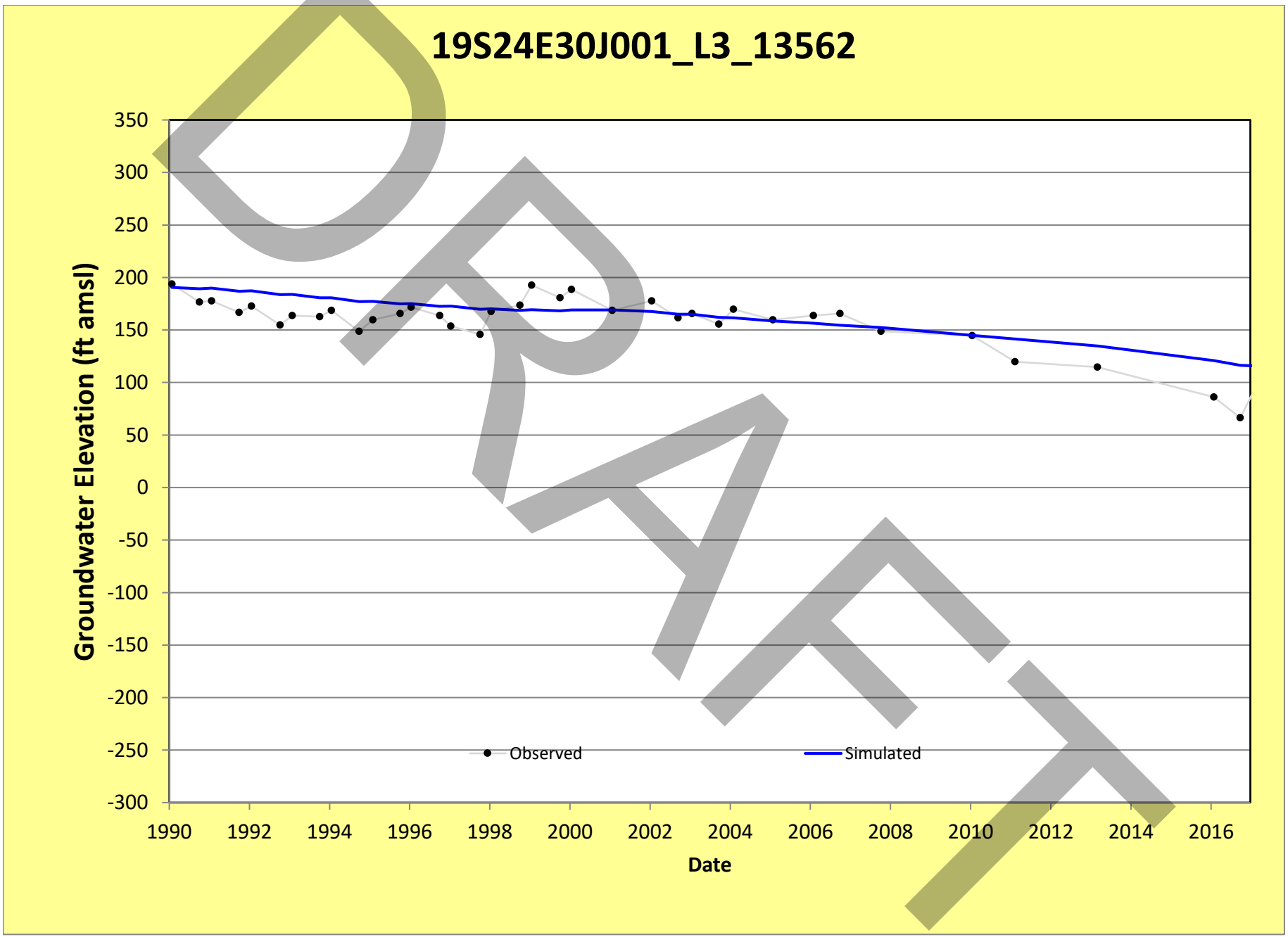
Date
Observed
Simulated
DRAFT


19S24E30J001_L3_13562
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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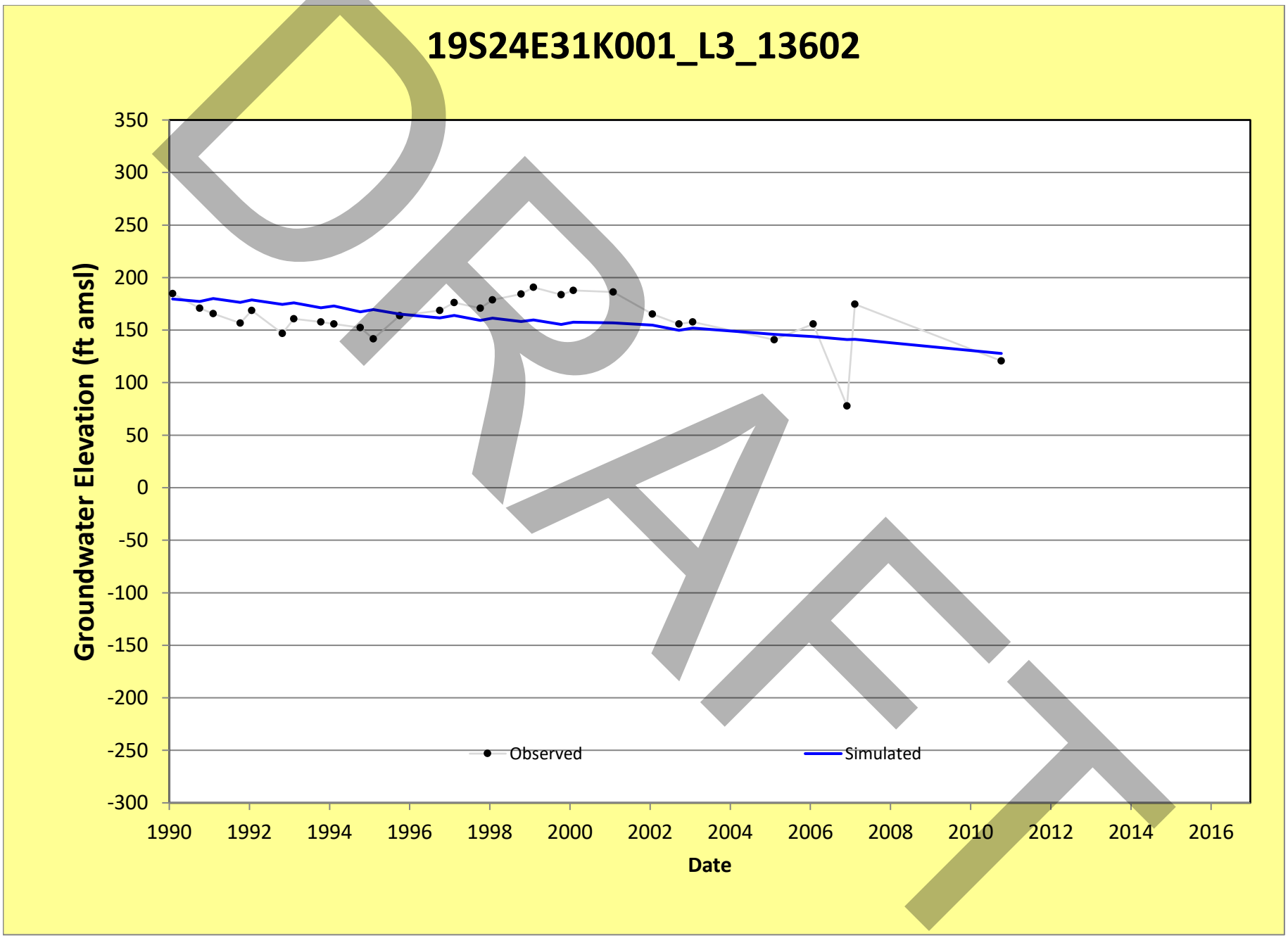
Date
Observed
Simulated
DRAFT


19S24E31K001_L3_13602
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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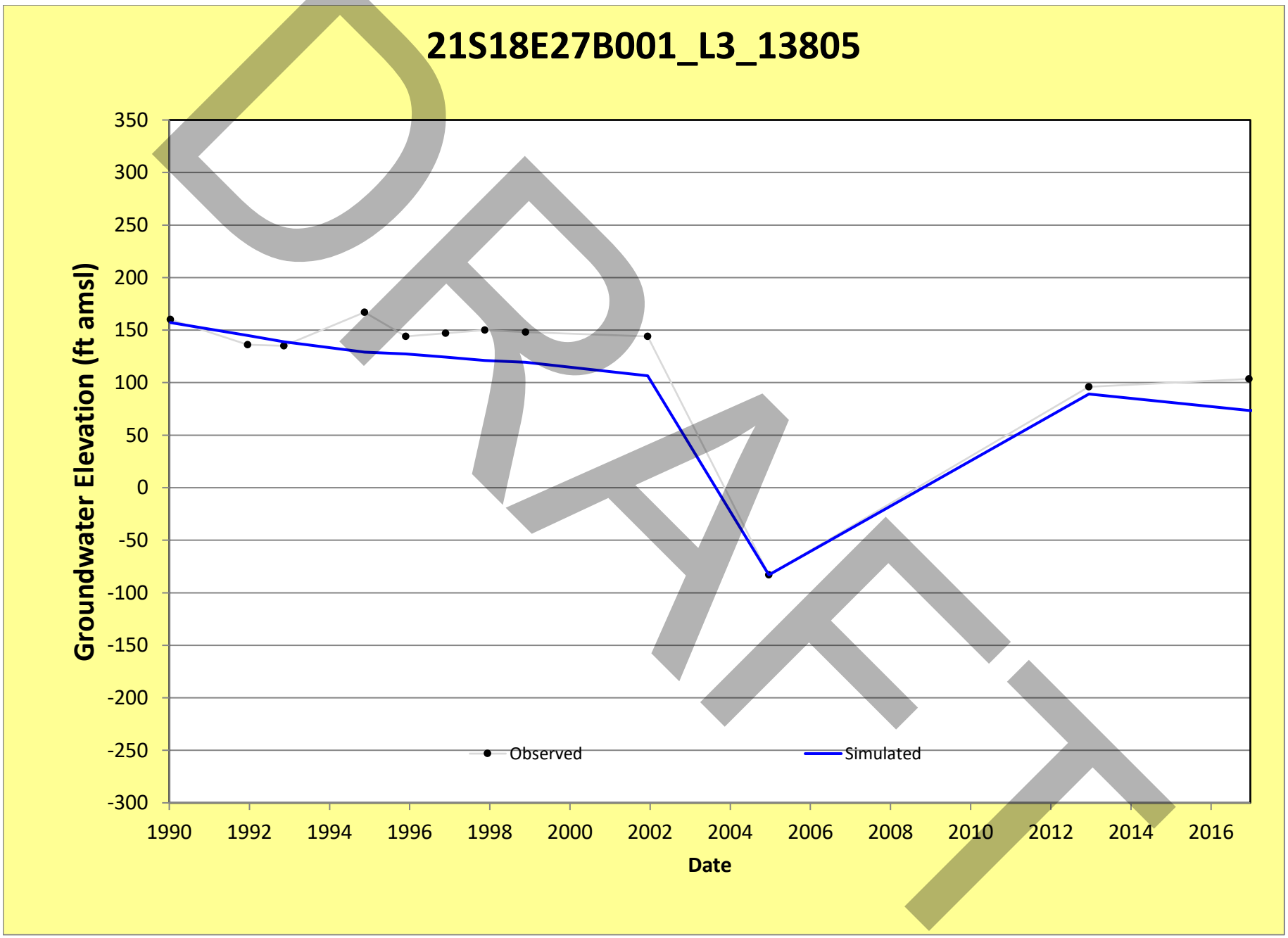
Date
Observed
Simulated
DRAFT


21S18E27B001_L3_13805
Groundwater Elevation (ft amsl)
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150
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-200
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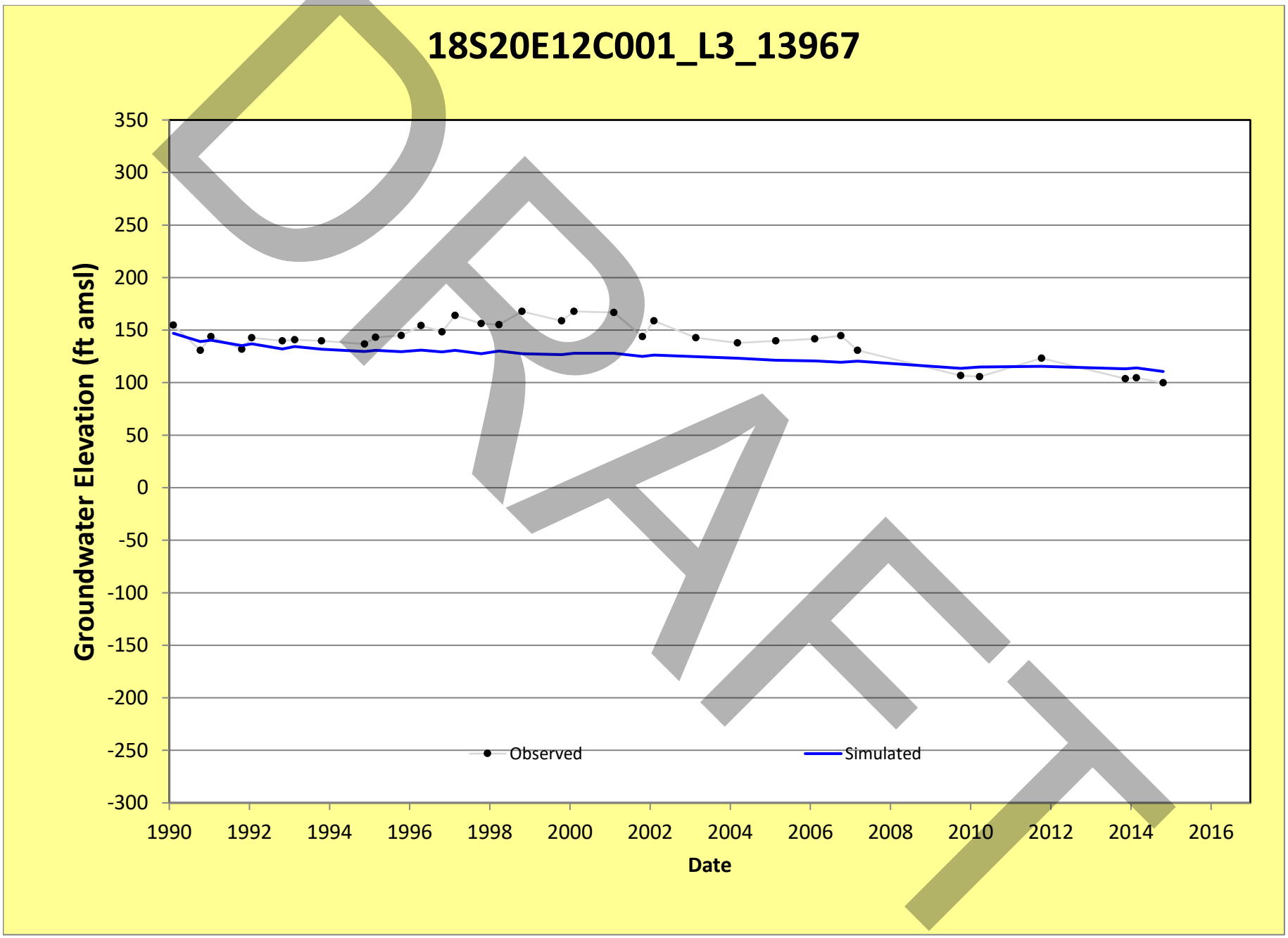
Date
Observed
Simulated
DRAFT


18S20E12C001_L3_13967
Groundwater Elevation (ft amsl)
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200
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-200
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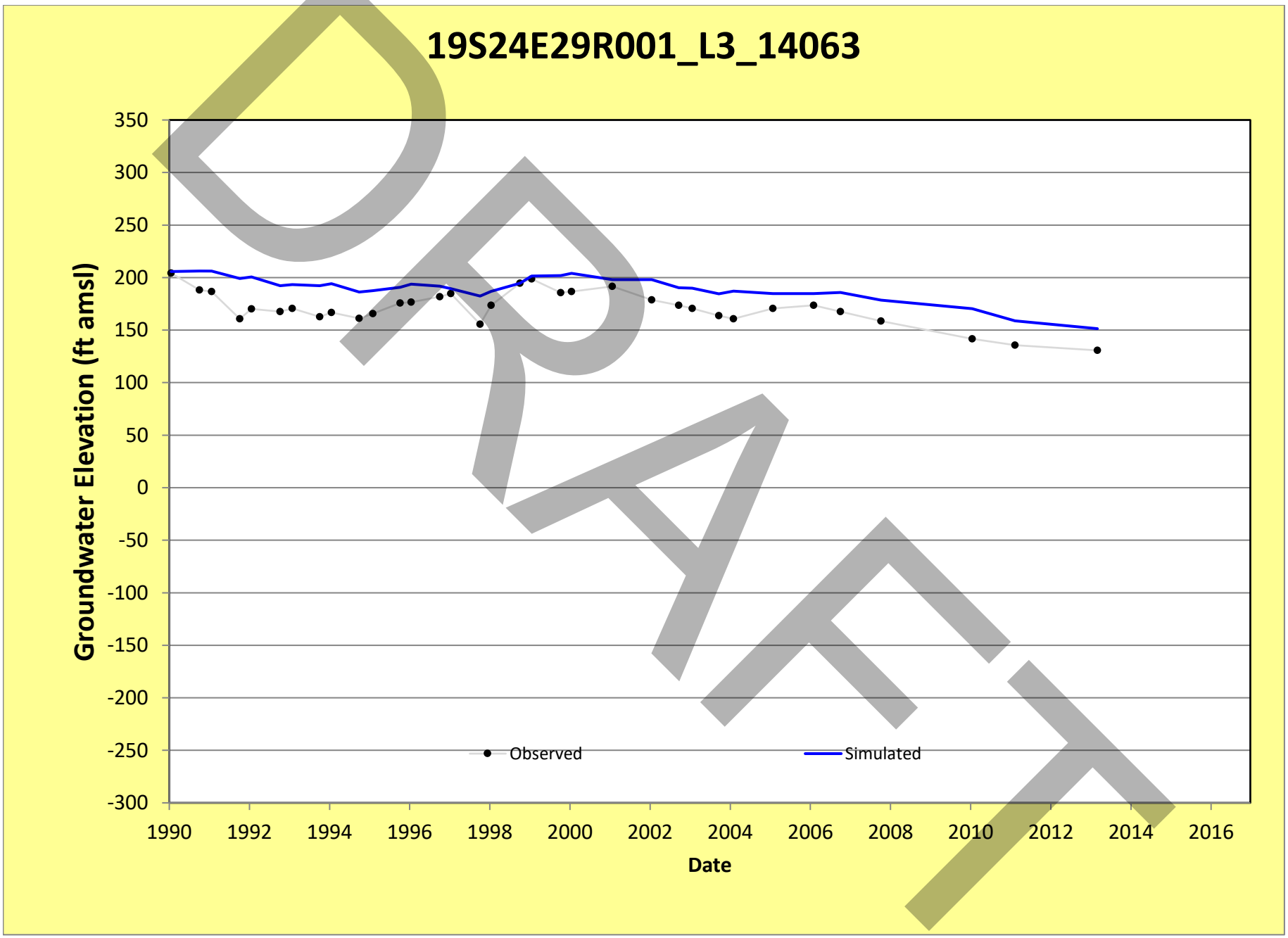
Date
Observed
Simulated
DRAFT


19S24E29R001_L3_14063
Groundwater Elevation (ft amsl)
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200
150
100
50
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-200
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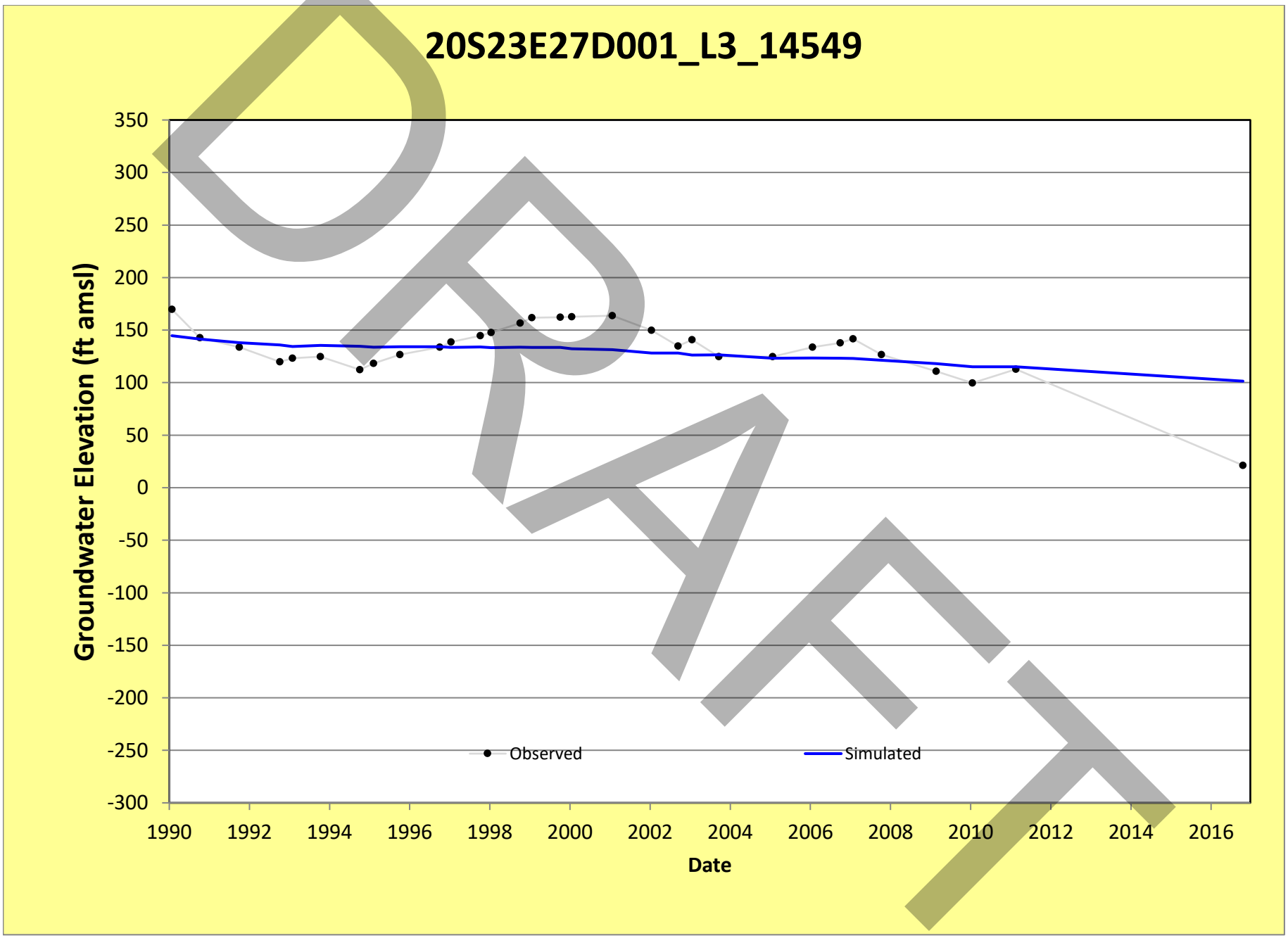
Date
Observed
Simulated
DRAFT


20S23E27D001_L3_14549
Groundwater Elevation (ft amsl)
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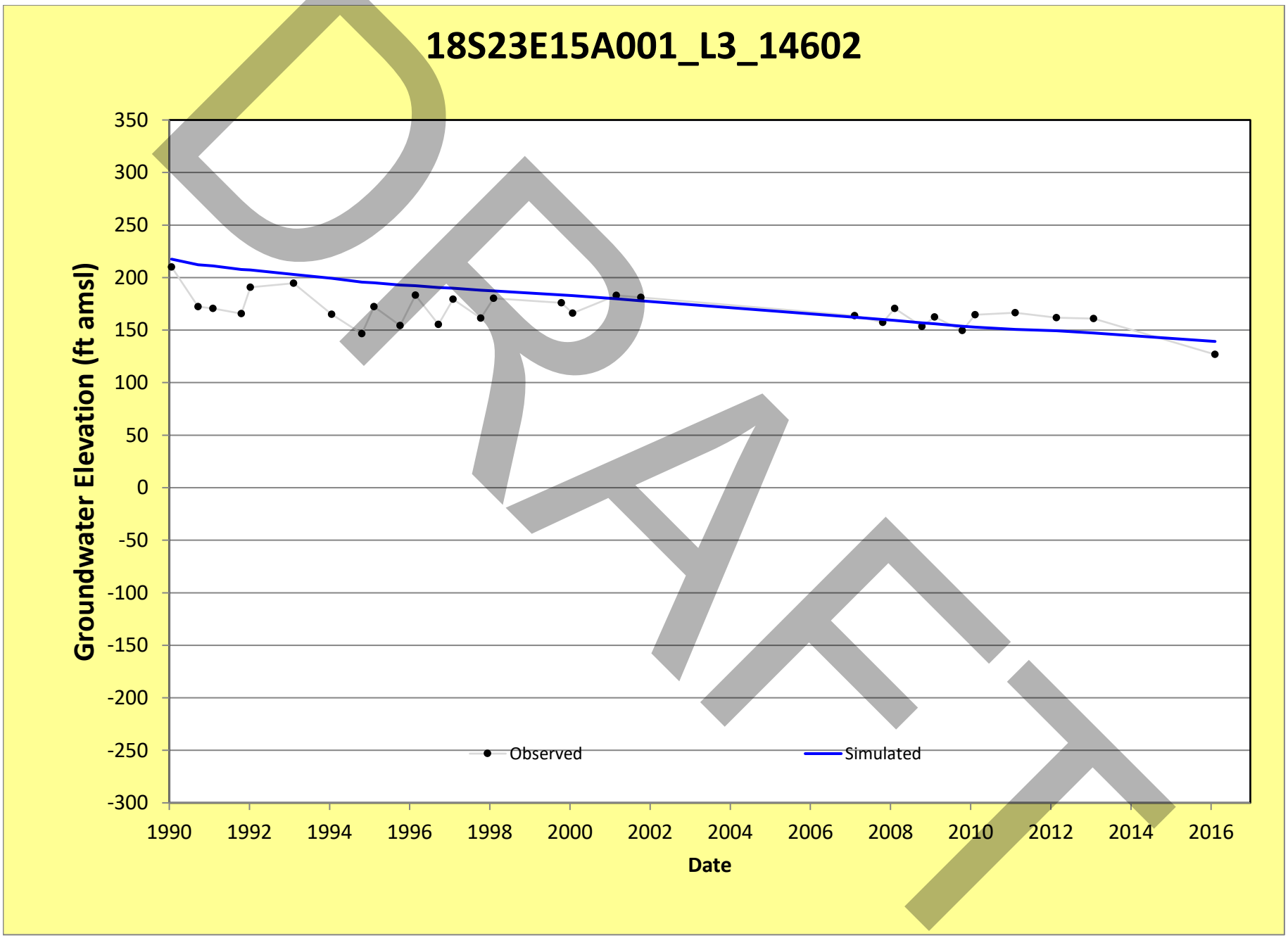
Observed
Simulated
DRAFT


18S23E15A001_L3_14602
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
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-200
-250
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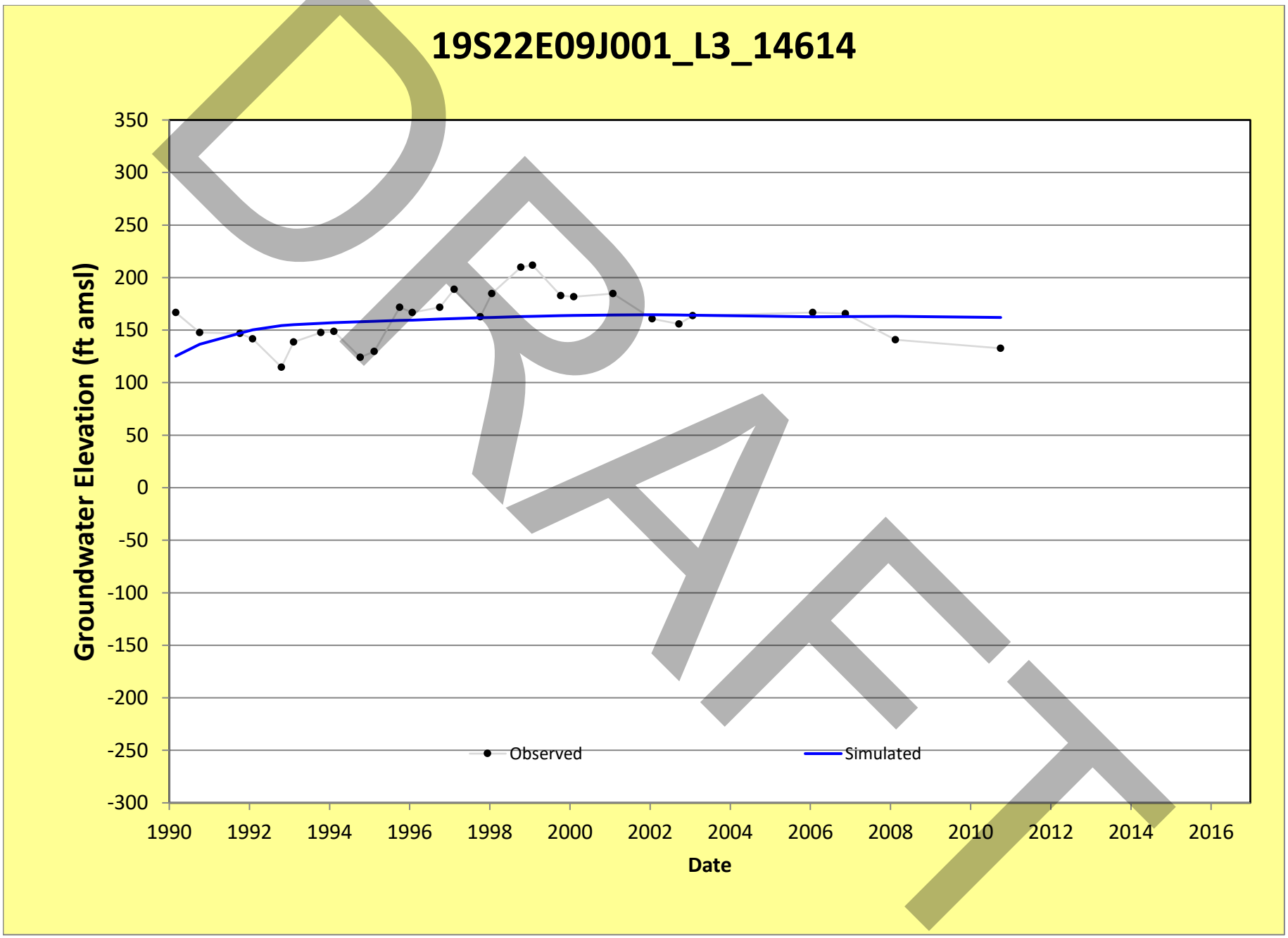
Date
Observed
Simulated
DRAFT


19S22E09J001_L3_14614
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
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-200
-250
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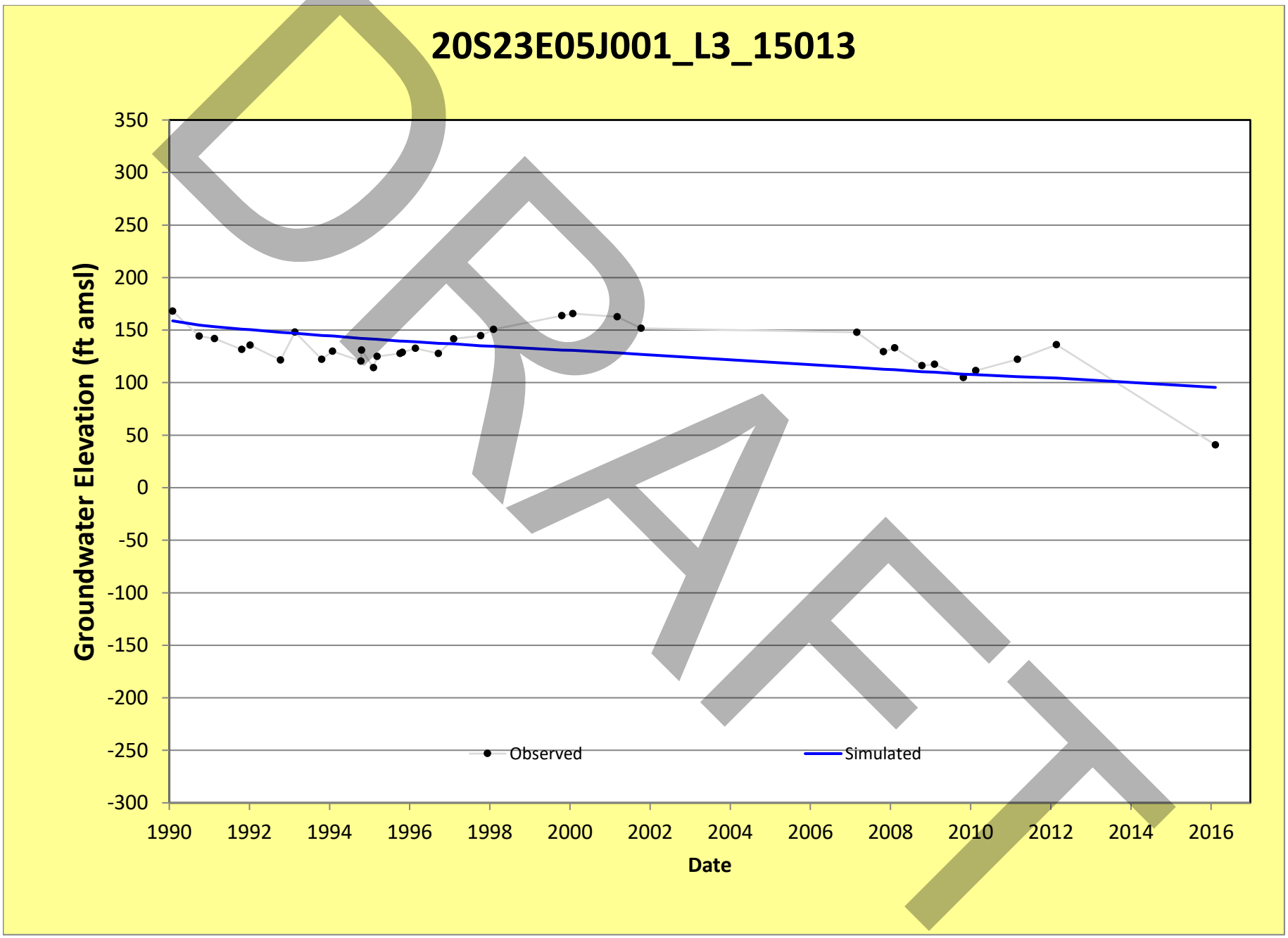
Date
Observed
Simulated
DRAFT


20S23E05J001_L3_15013
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
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-200
-250
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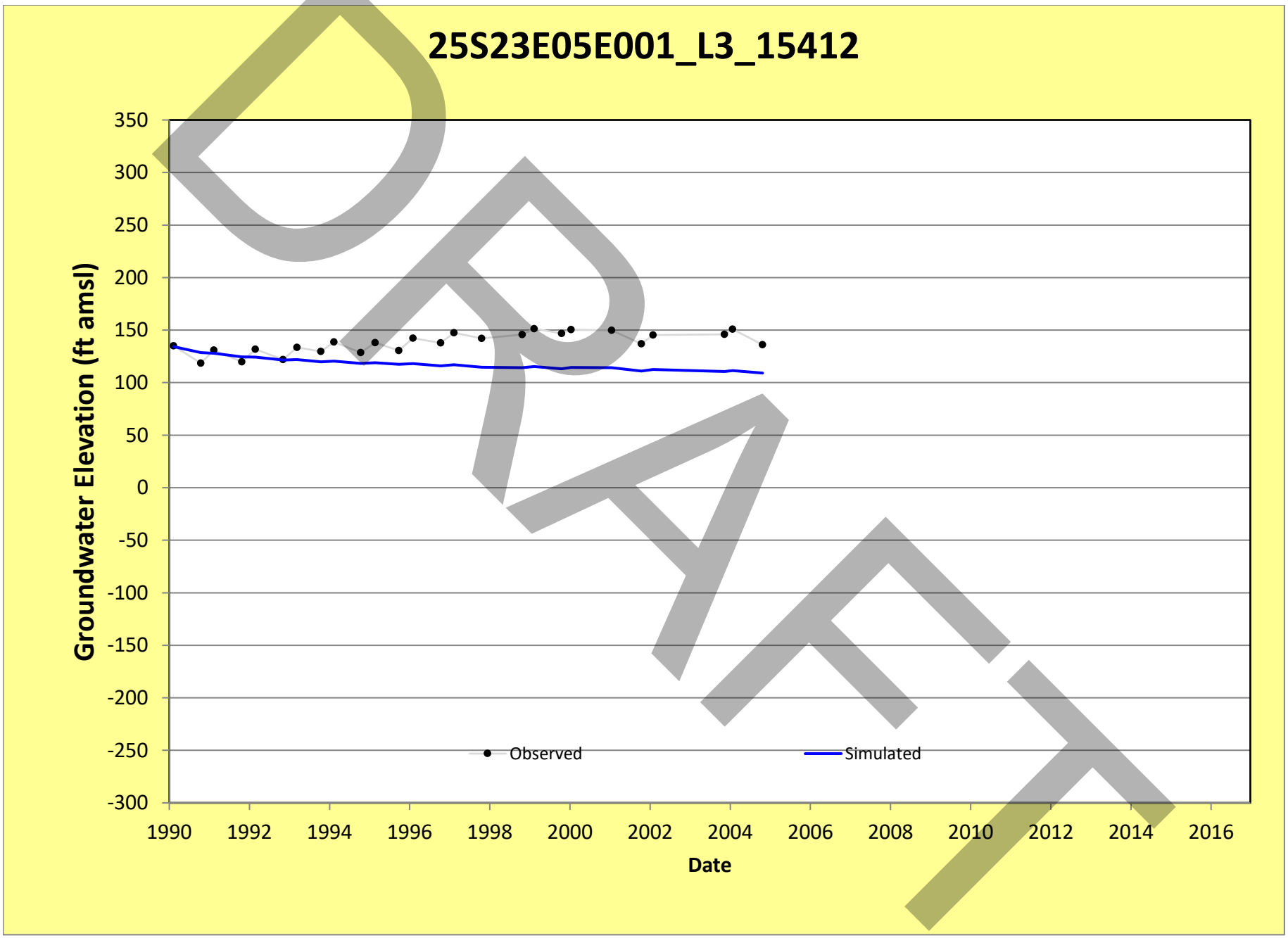
Date
Observed
Simulated
DRAFT


25S23E05E001_L3_15412
Groundwater Elevation (ft amsl)
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200
150
100
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0
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-100
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-200
-250
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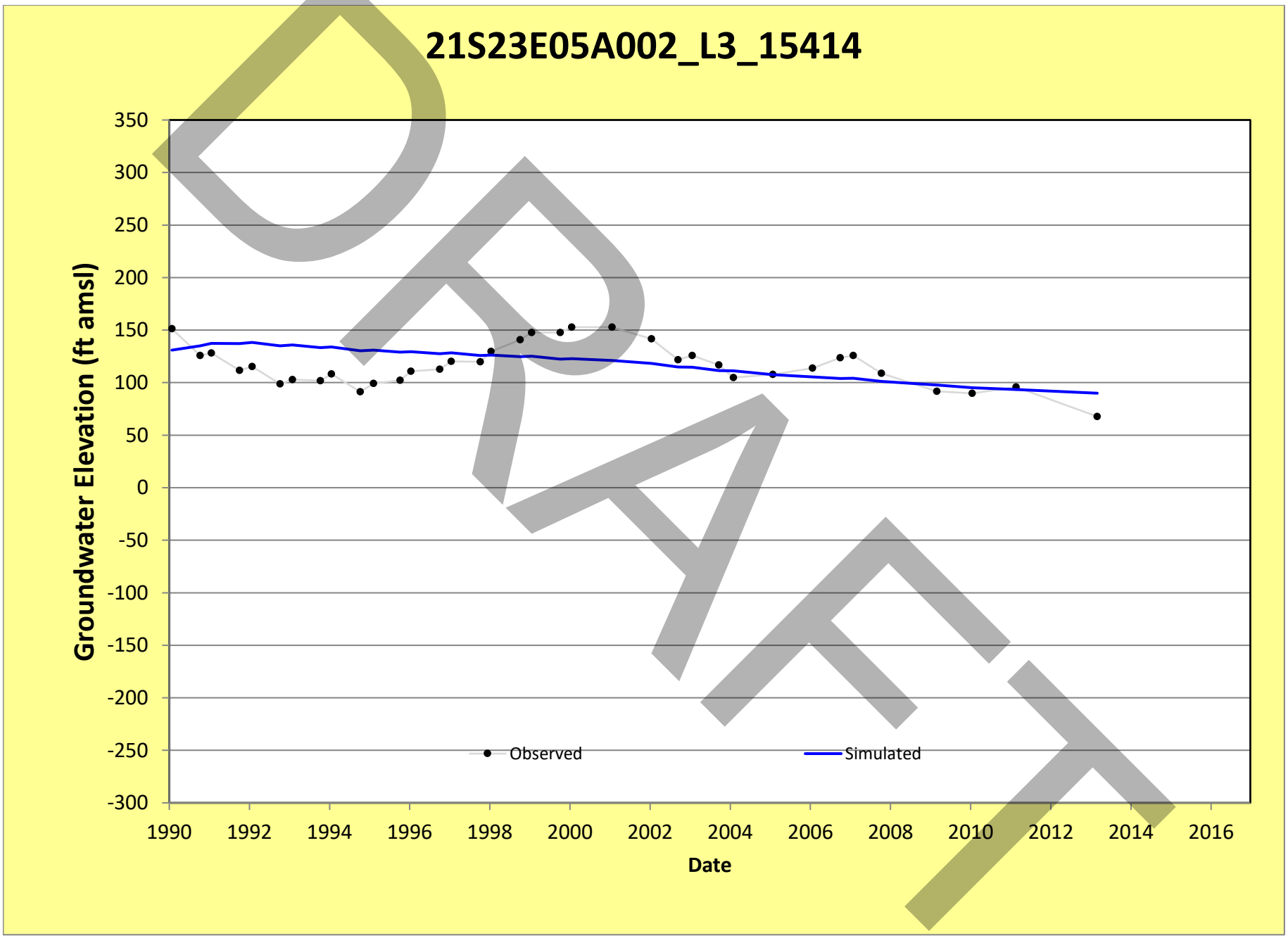
Date
Observed
Simulated
DRAFT


21S23E05A002_L3_15414
Groundwater Elevation (ft amsl)
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300
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200
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100
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-100
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-200
-250
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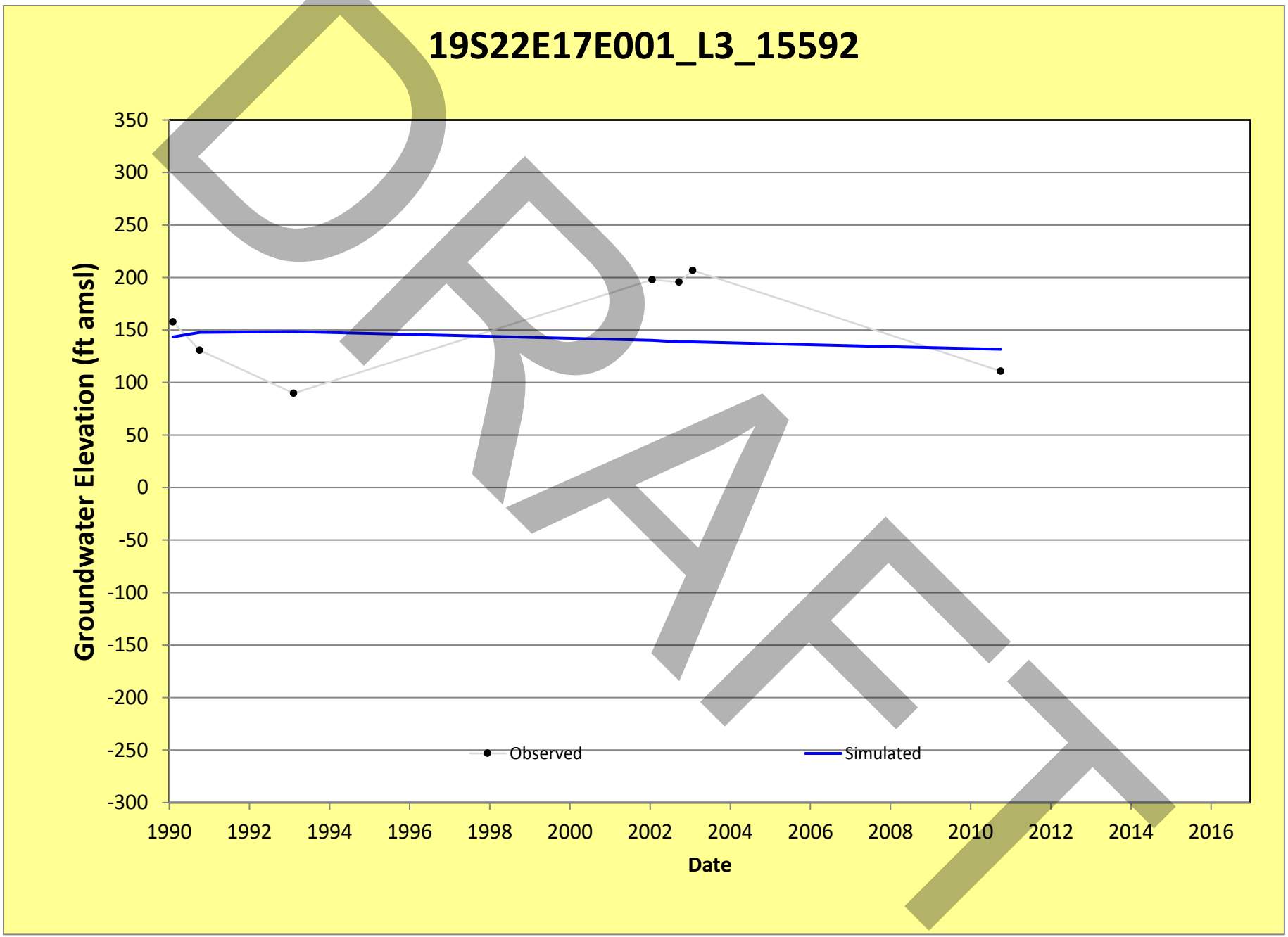
Date
Observed
Simulated
DRAFT


19S22E17E001_L3_15592
Groundwater Elevation (ft amsl)
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200
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0
-50
-100
-150
-200
-250
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1990
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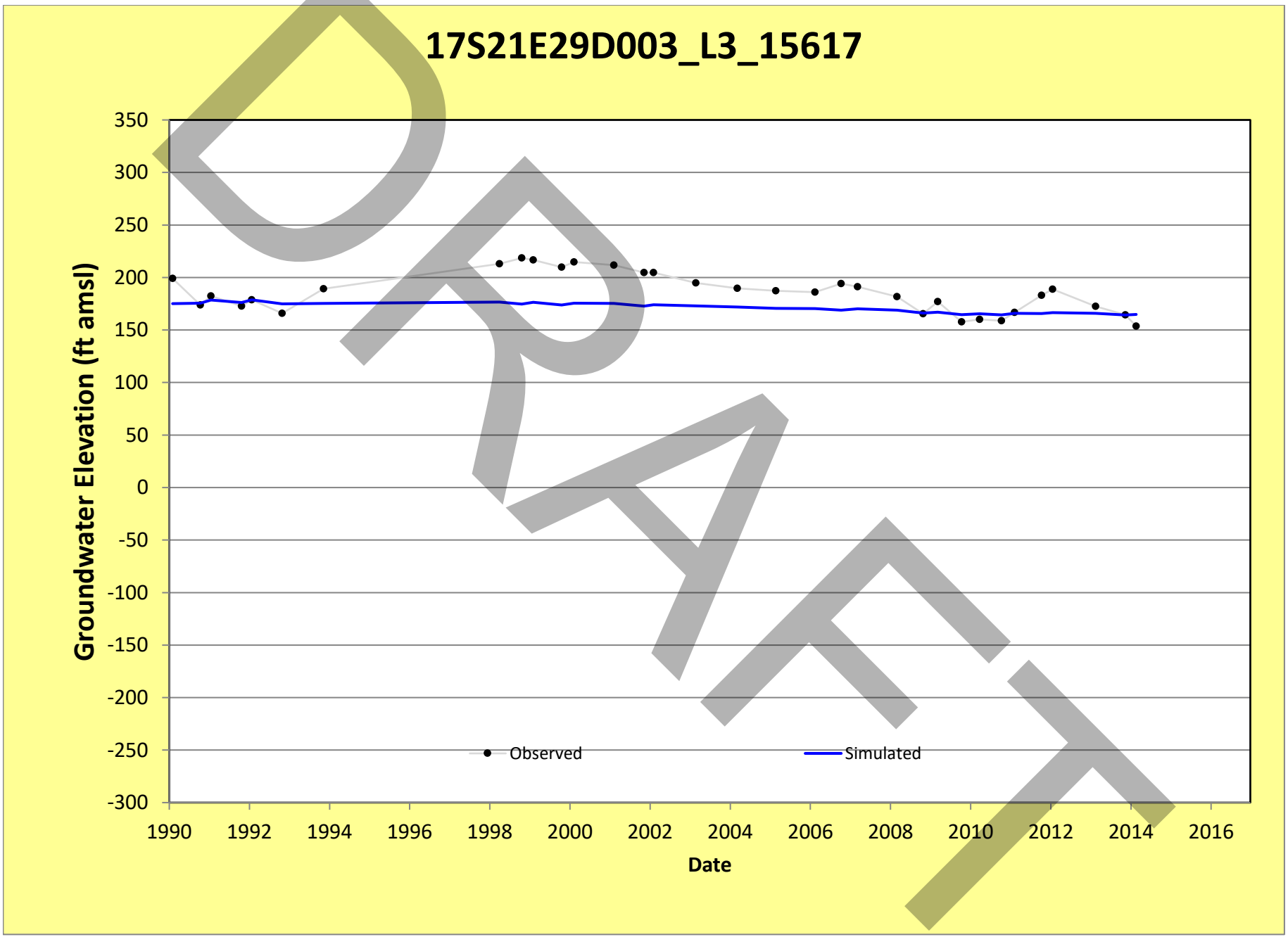
Date
Observed
Simulated
DRAFT


17S21E29D003_L3_15617
Groundwater Elevation (ft amsl)
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-150
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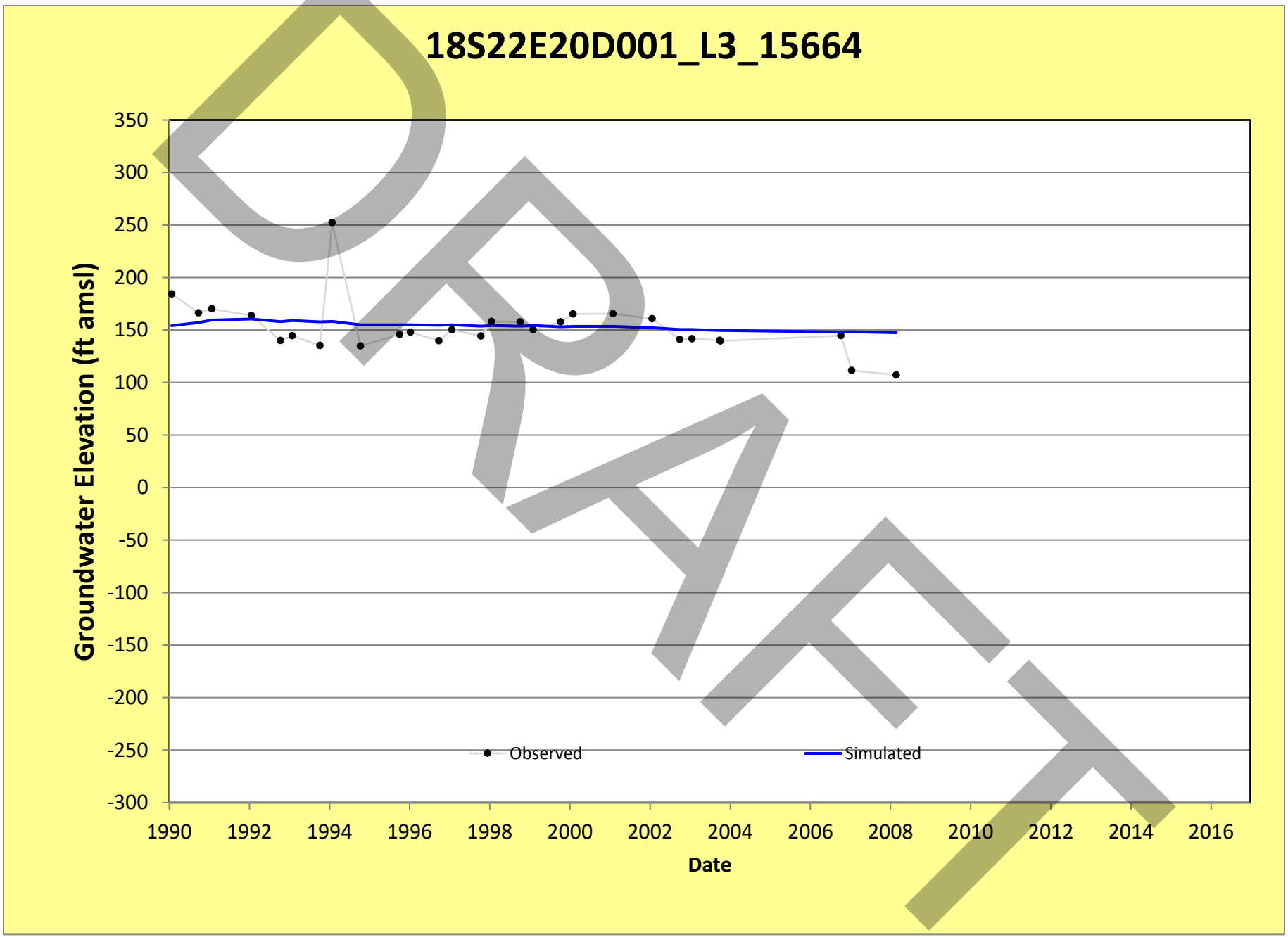
Date
Observed
Simulated
DRAFT


18S22E20D001_L3_15664
Groundwater Elevation (ft amsl)
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-200
-250
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1990
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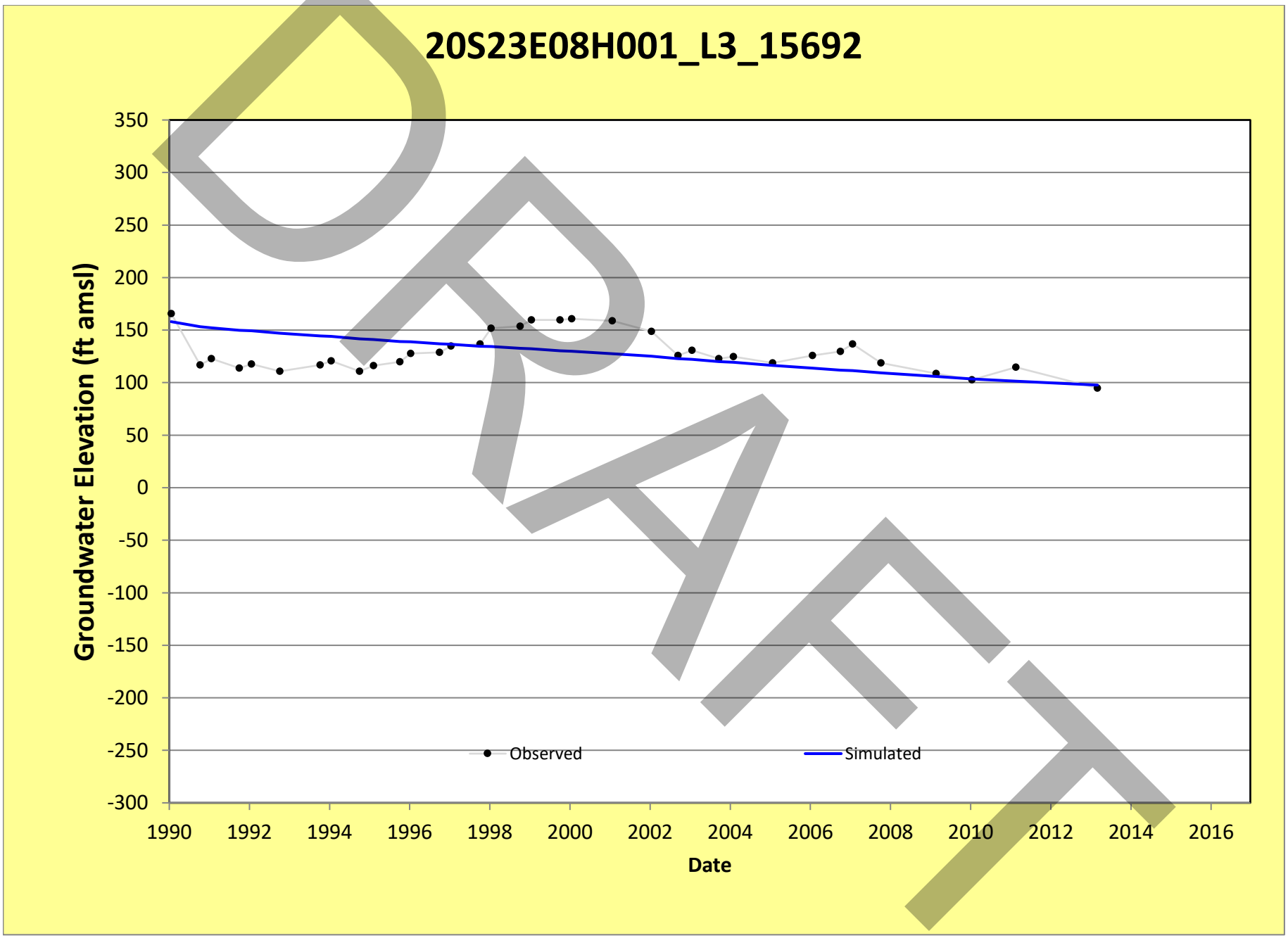
Date
Observed
Simulated
DRAFT


20S23E08H001_L3_15692
Groundwater Elevation (ft amsl)
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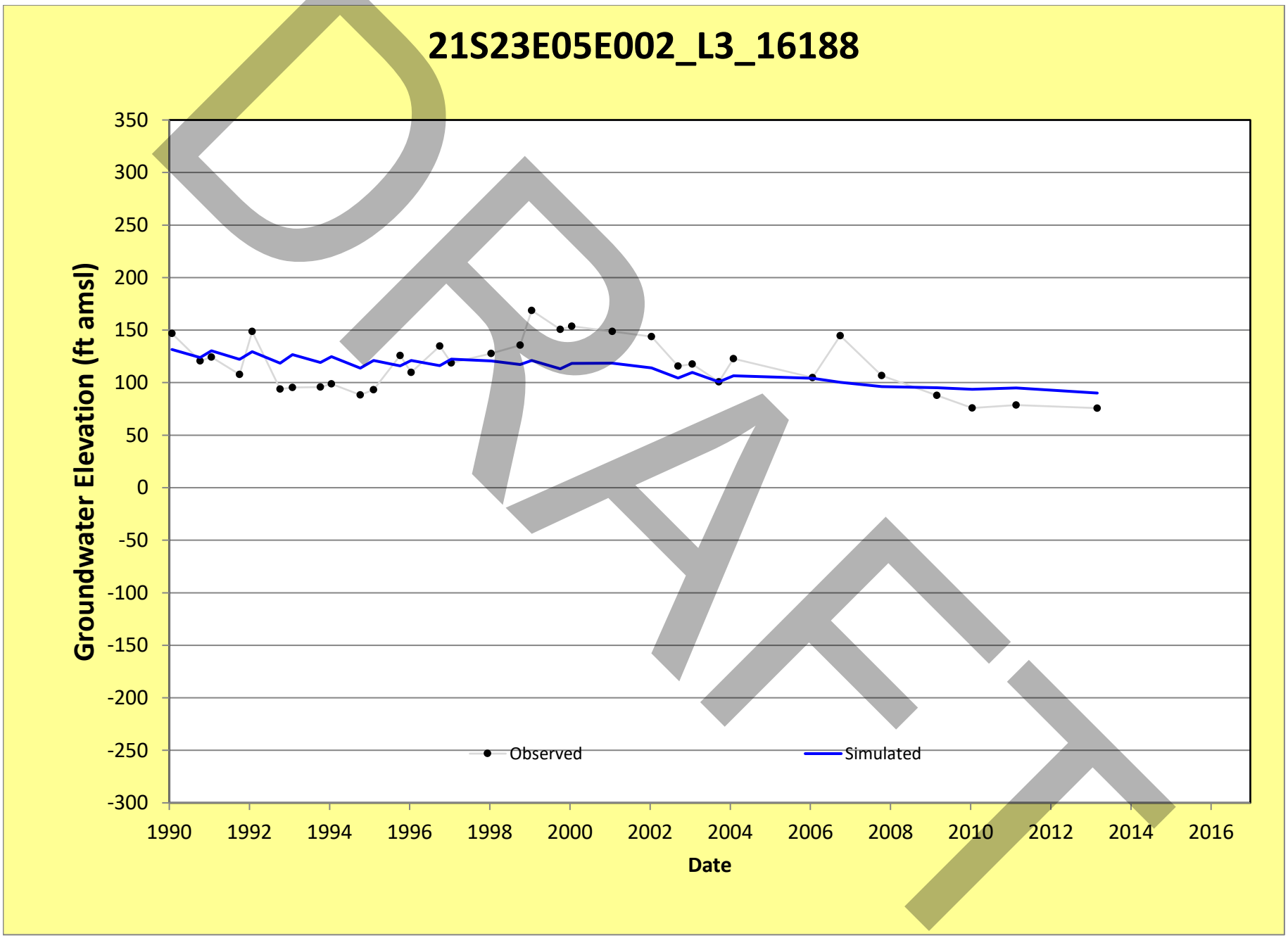
Date
Observed
Simulated
DRAFT


21S23E05E002_L3_16188
Groundwater Elevation (ft amsl)
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200
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-200
-250
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Observed
Simulated
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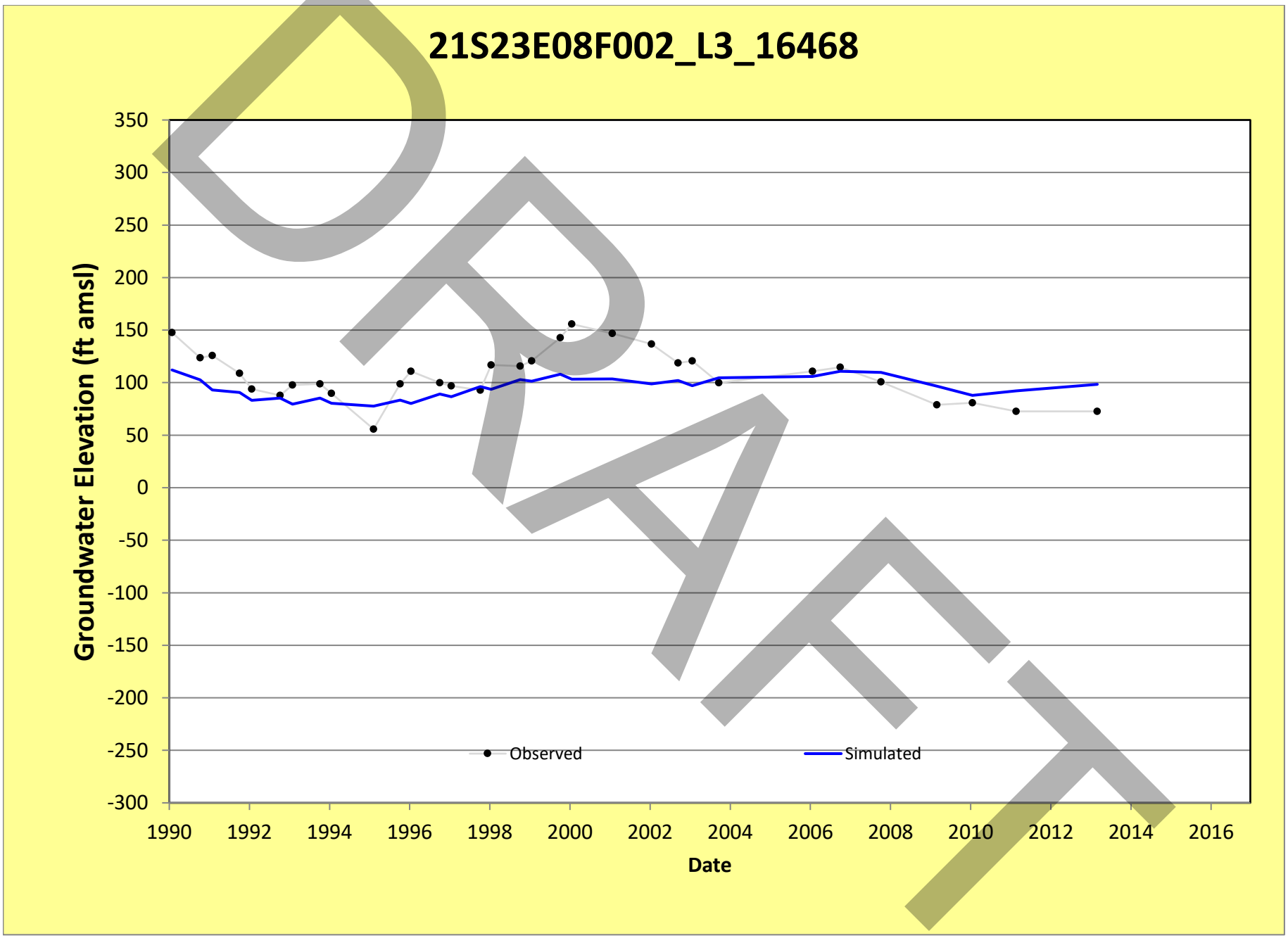
21S23E08F002_L3_16468
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Observed
Simulated
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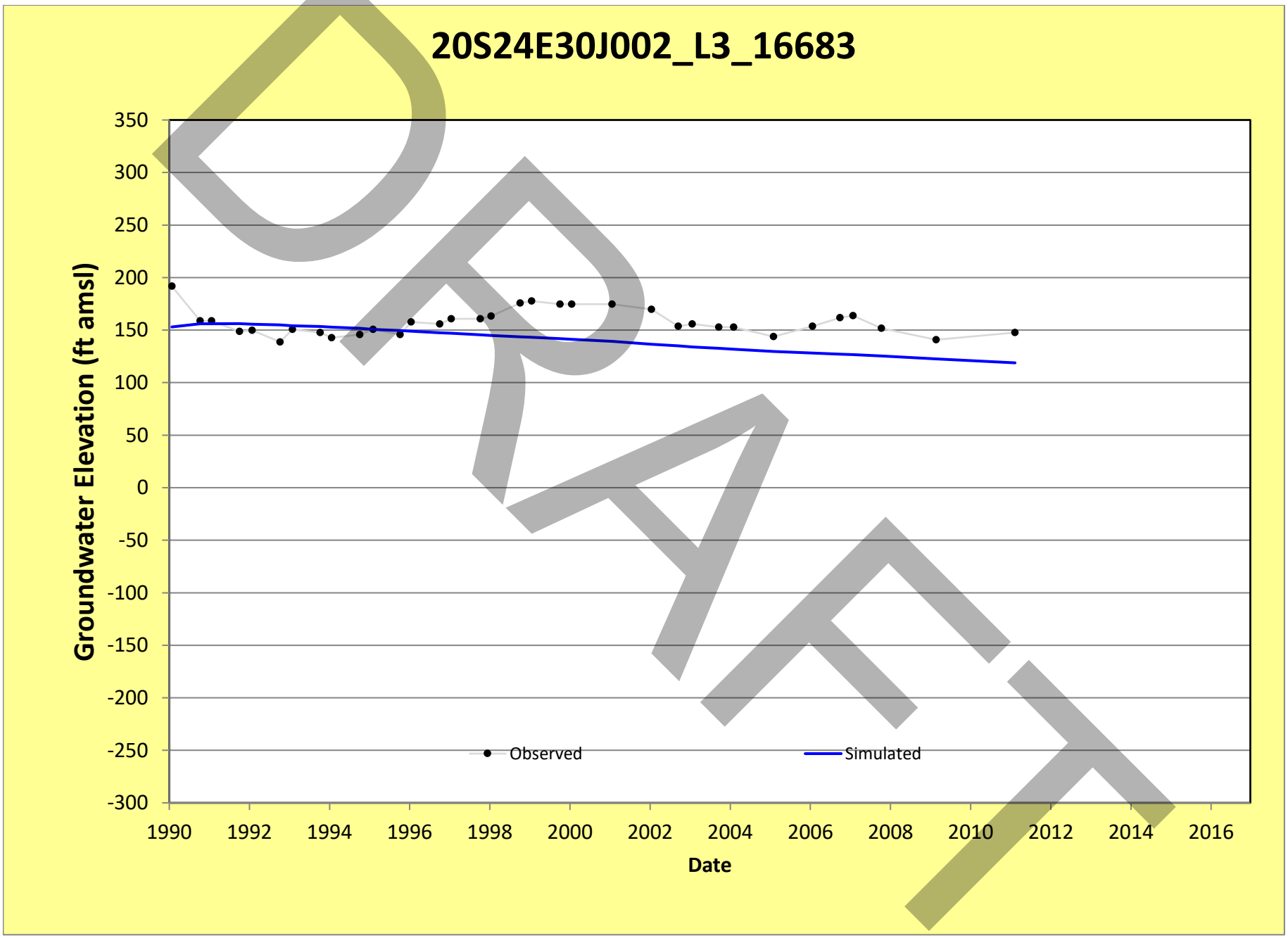
20S24E30J002_L3_16683
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated
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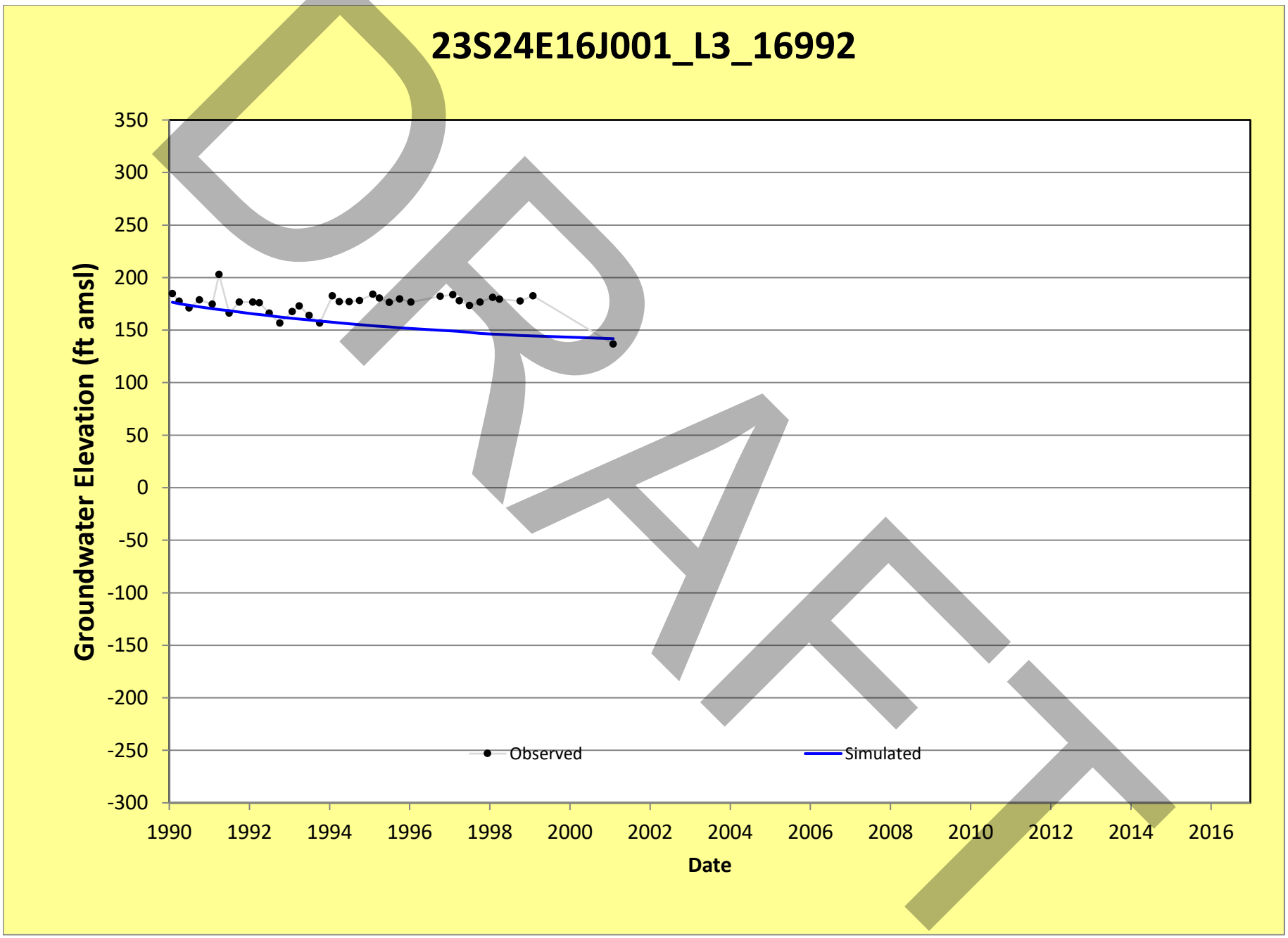
23S24E16J001_L3_16992
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
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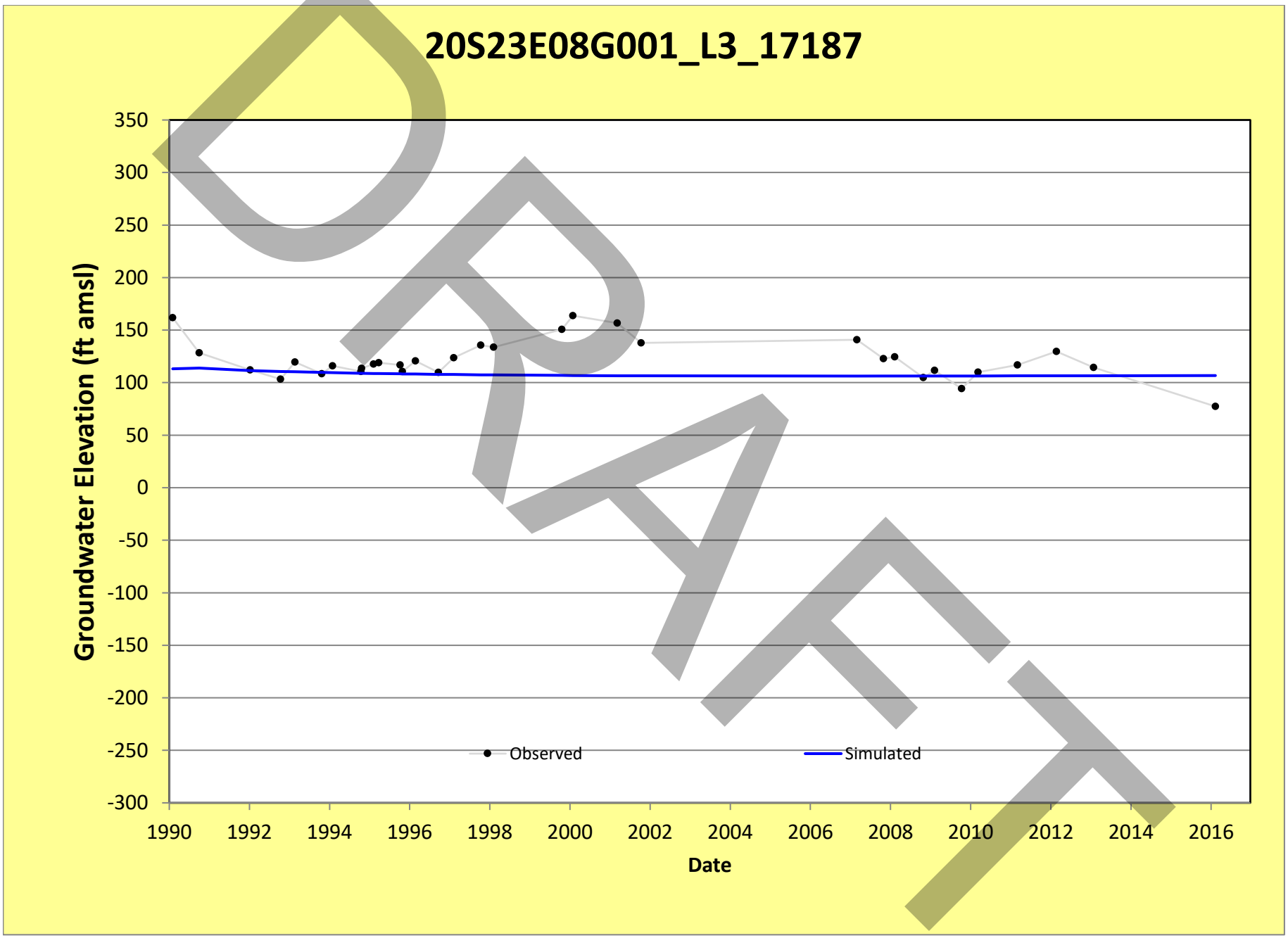
20S23E08G001_L3_17187
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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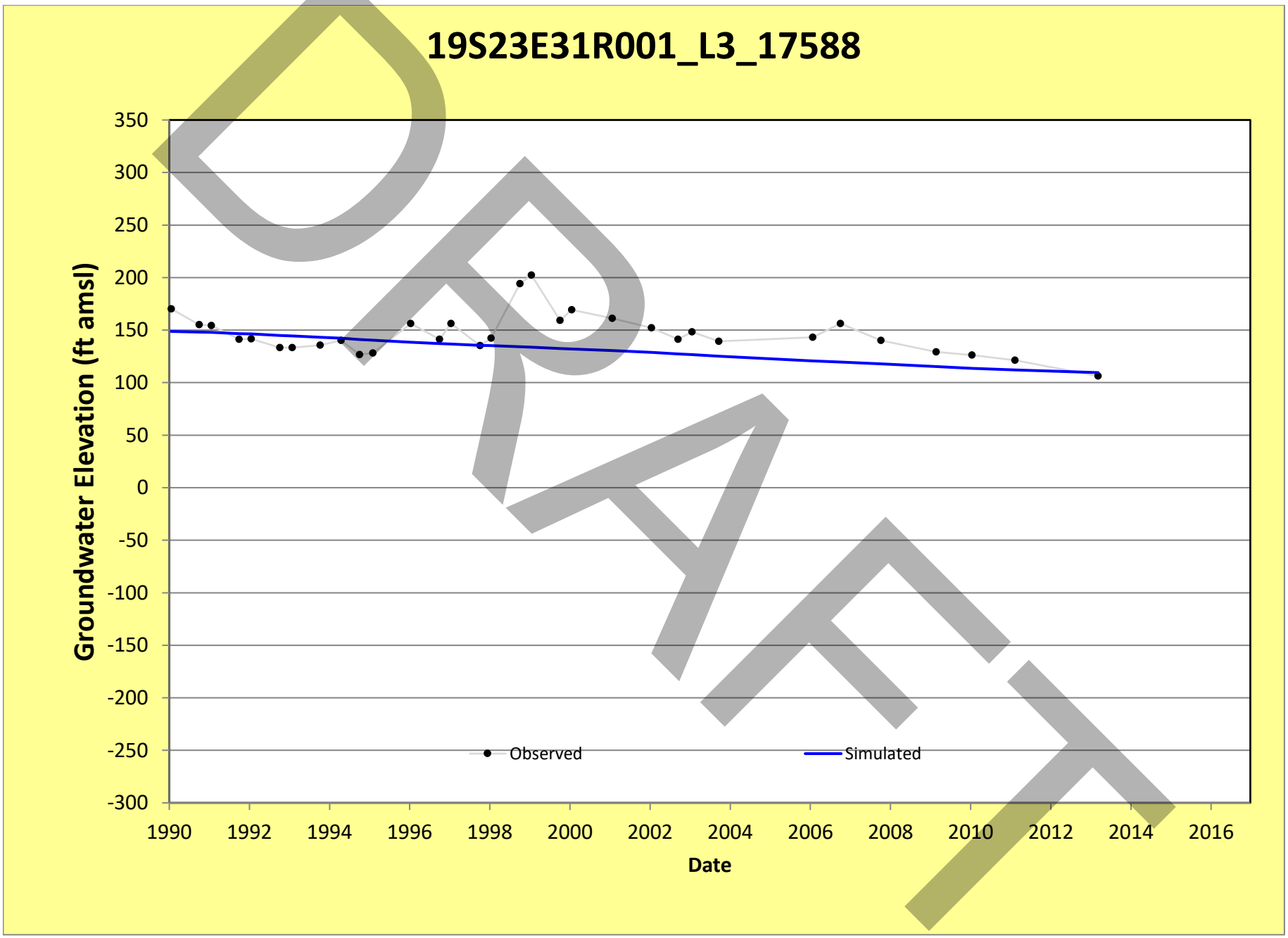
Date
Observed
Simulated
DRAFT


19S23E31R001_L3_17588
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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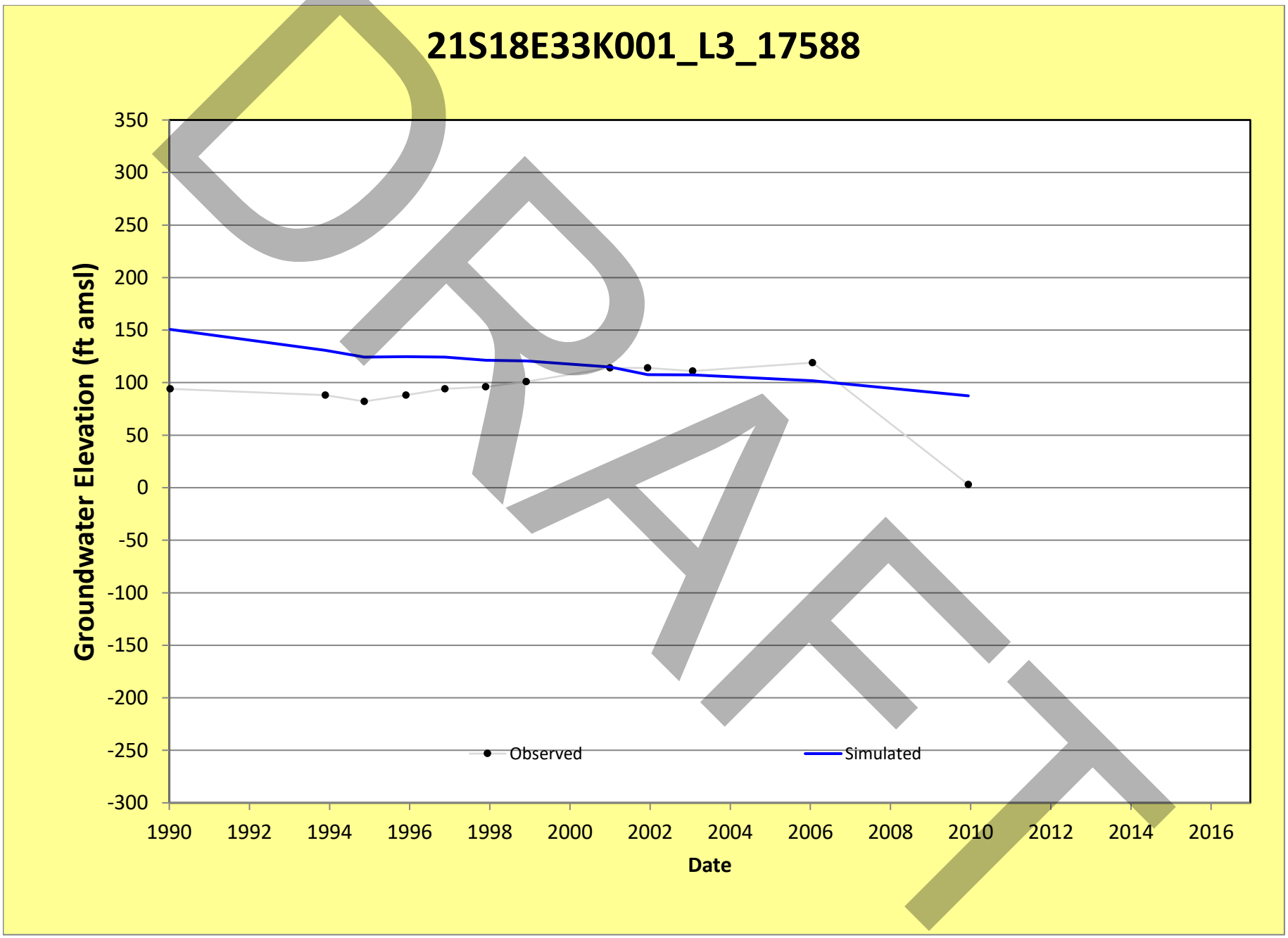
Date
Observed
Simulated
DRAFT


21S18E33K001_L3_17588
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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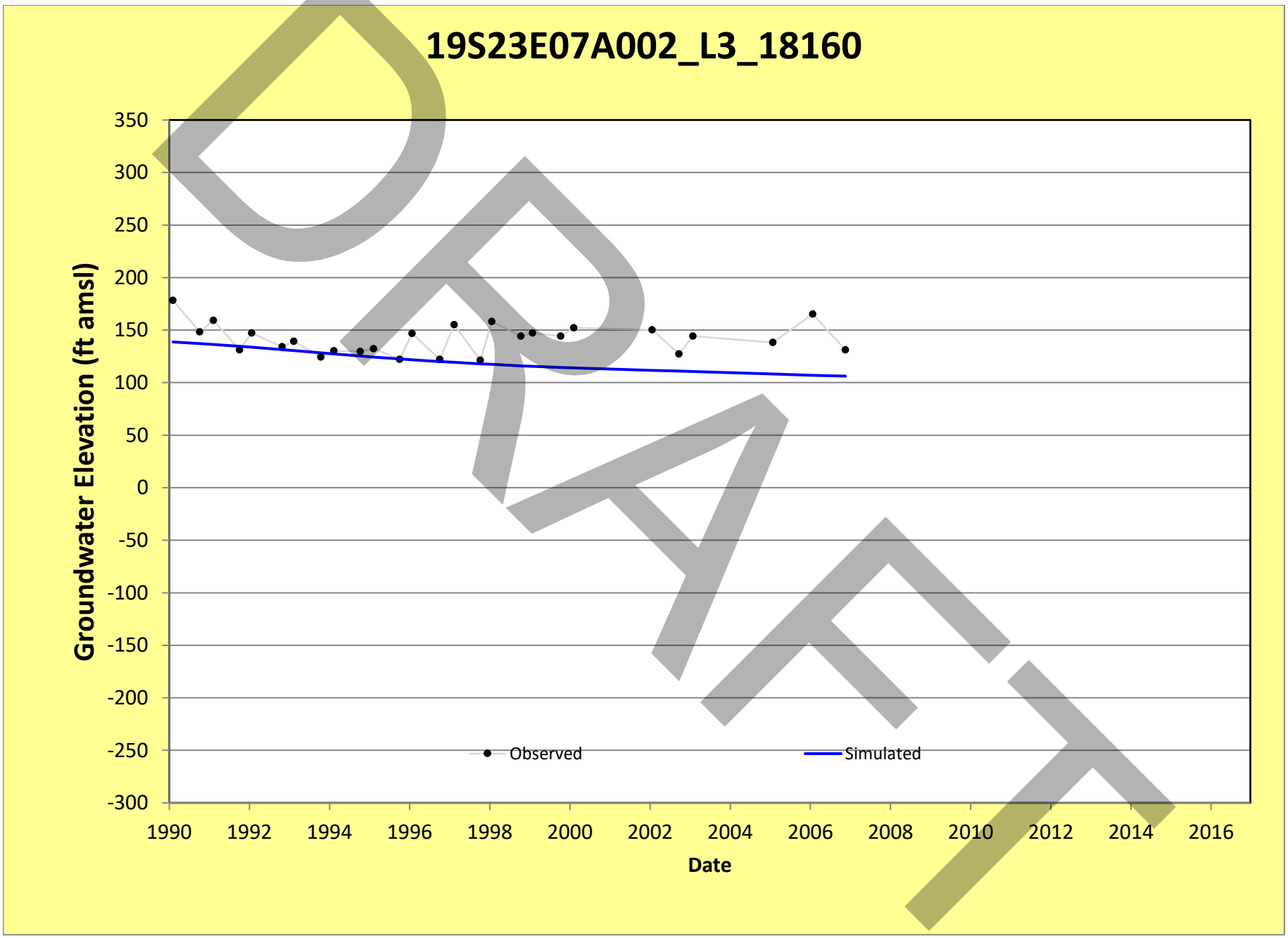
Date
Observed
Simulated
DRAFT


19S23E07A002_L3_18160
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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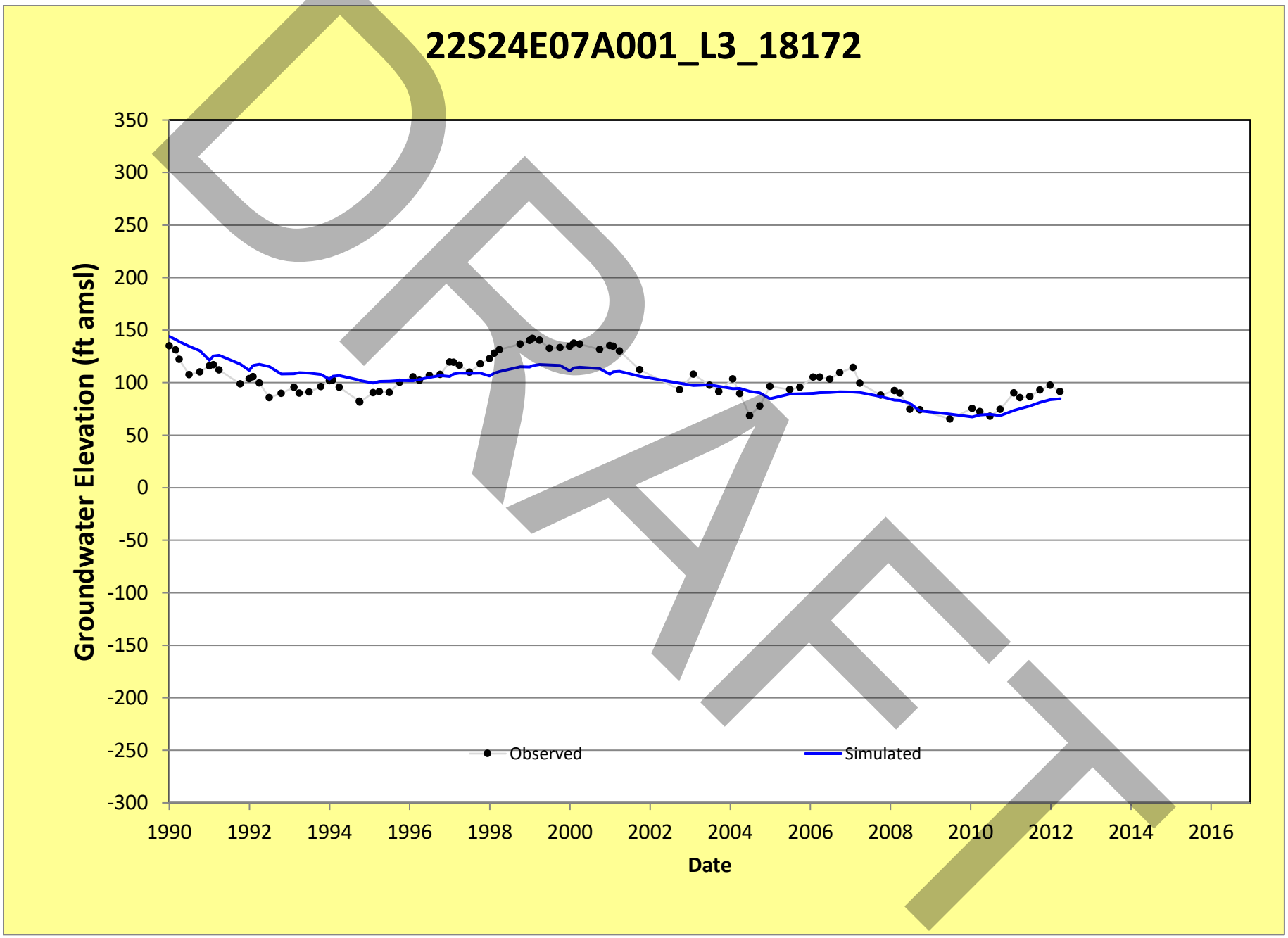
Date
Observed
Simulated
DRAFT


22S24E07A001_L3_18172
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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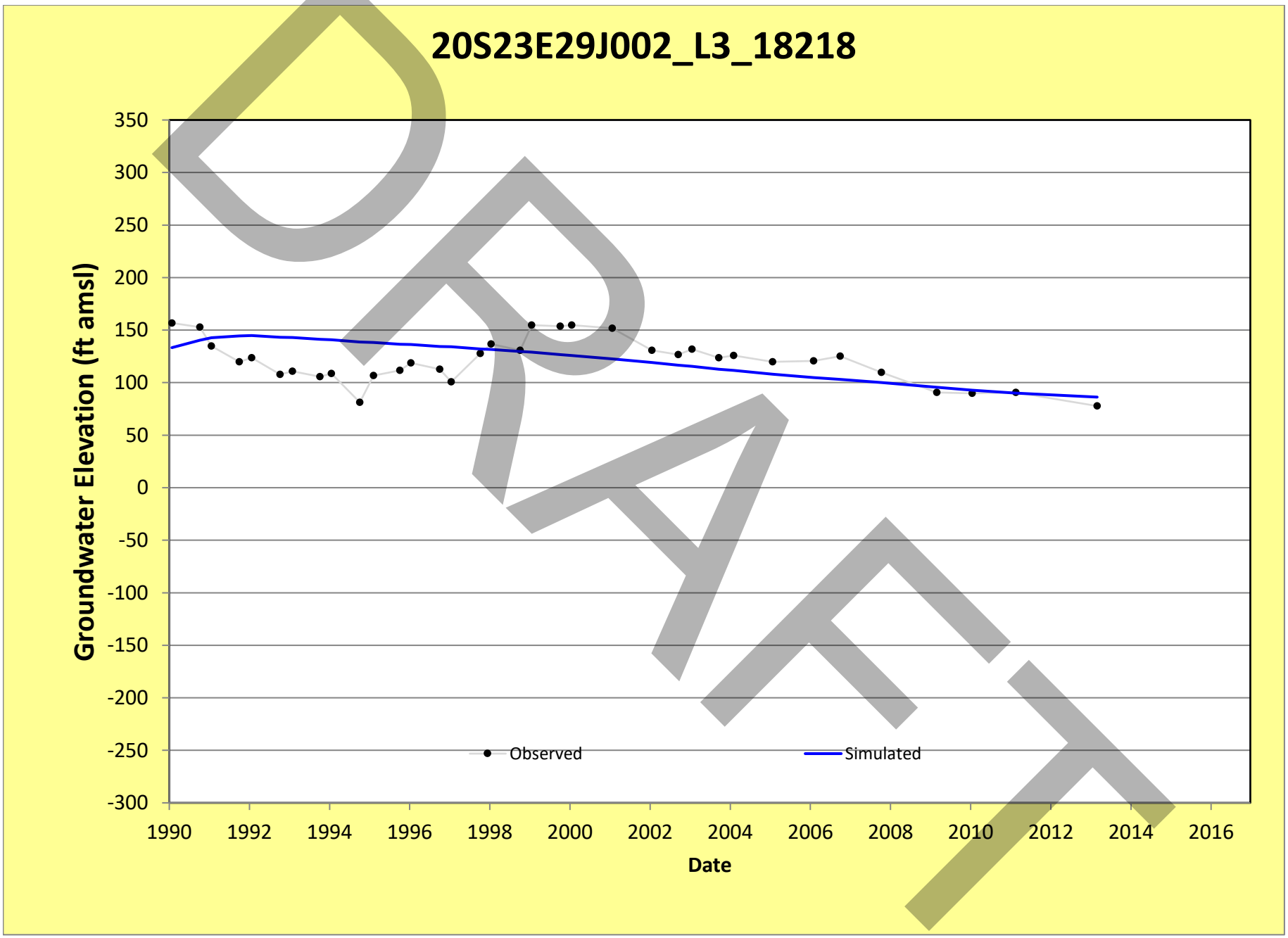
Date
Observed
Simulated
DRAFT


20S23E29J002_L3_18218
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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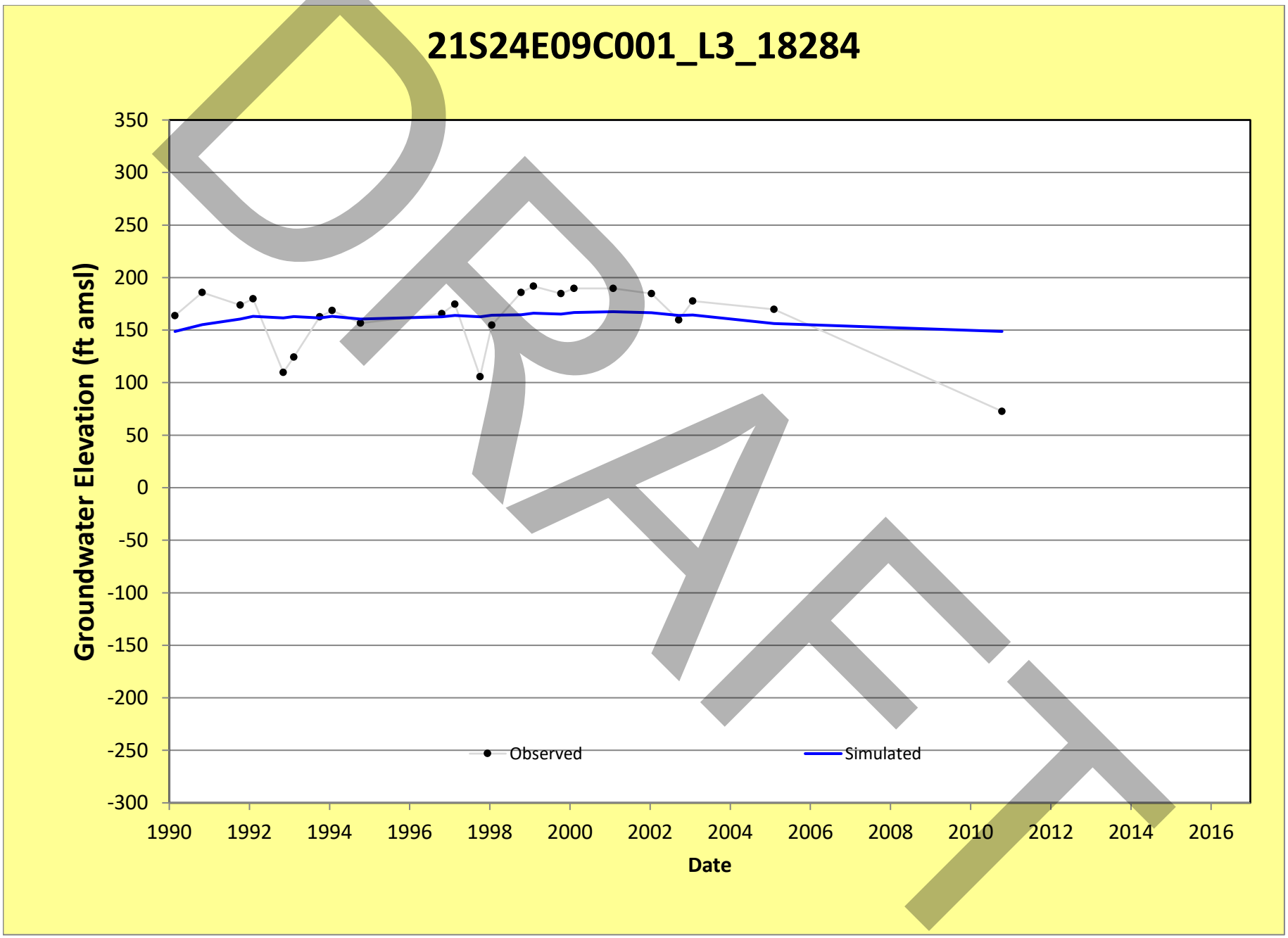
21S24E09C001_L3_18284
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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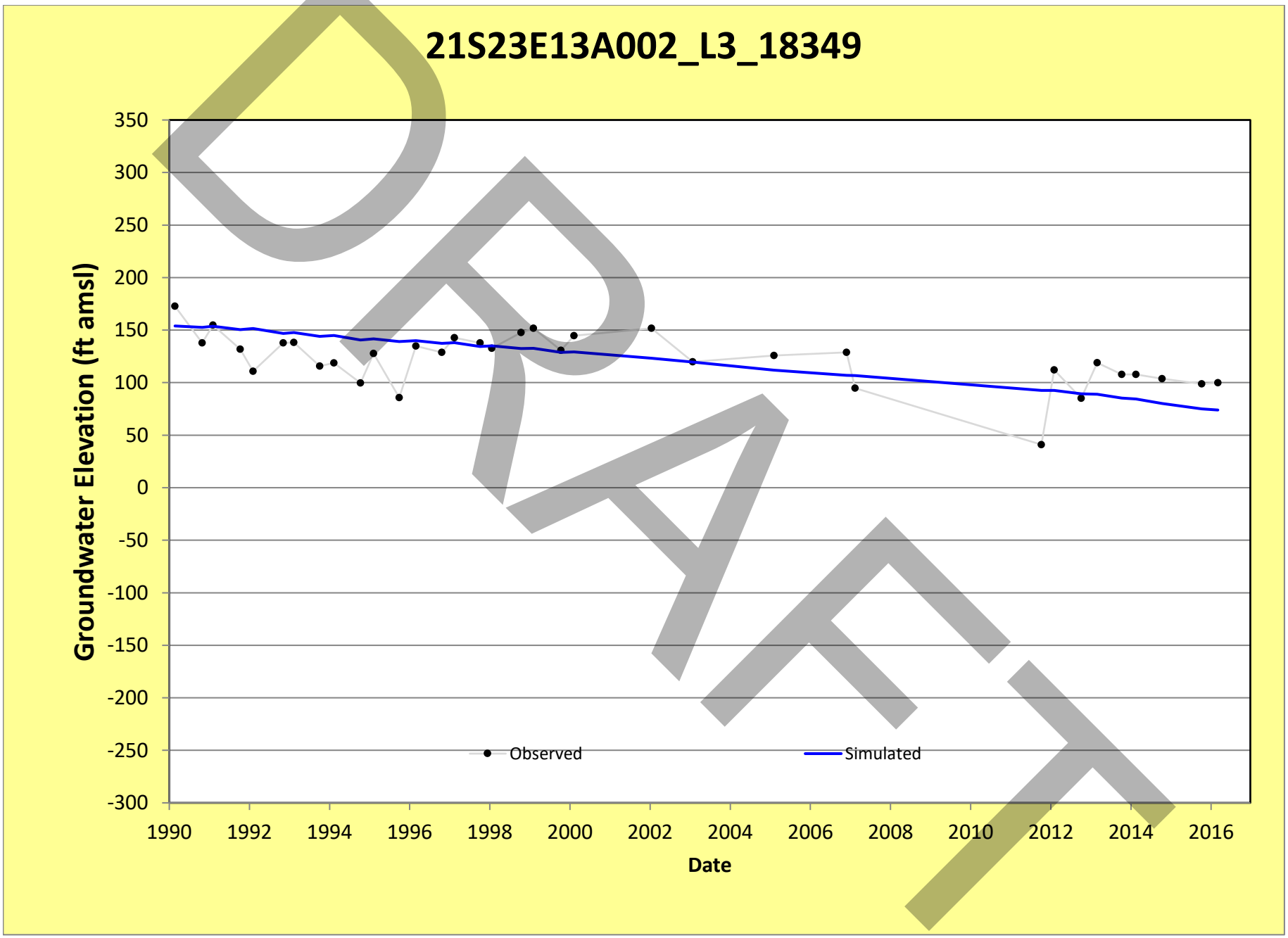
Date
Observed
Simulated
DRAFT


21S23E13A002_L3_18349
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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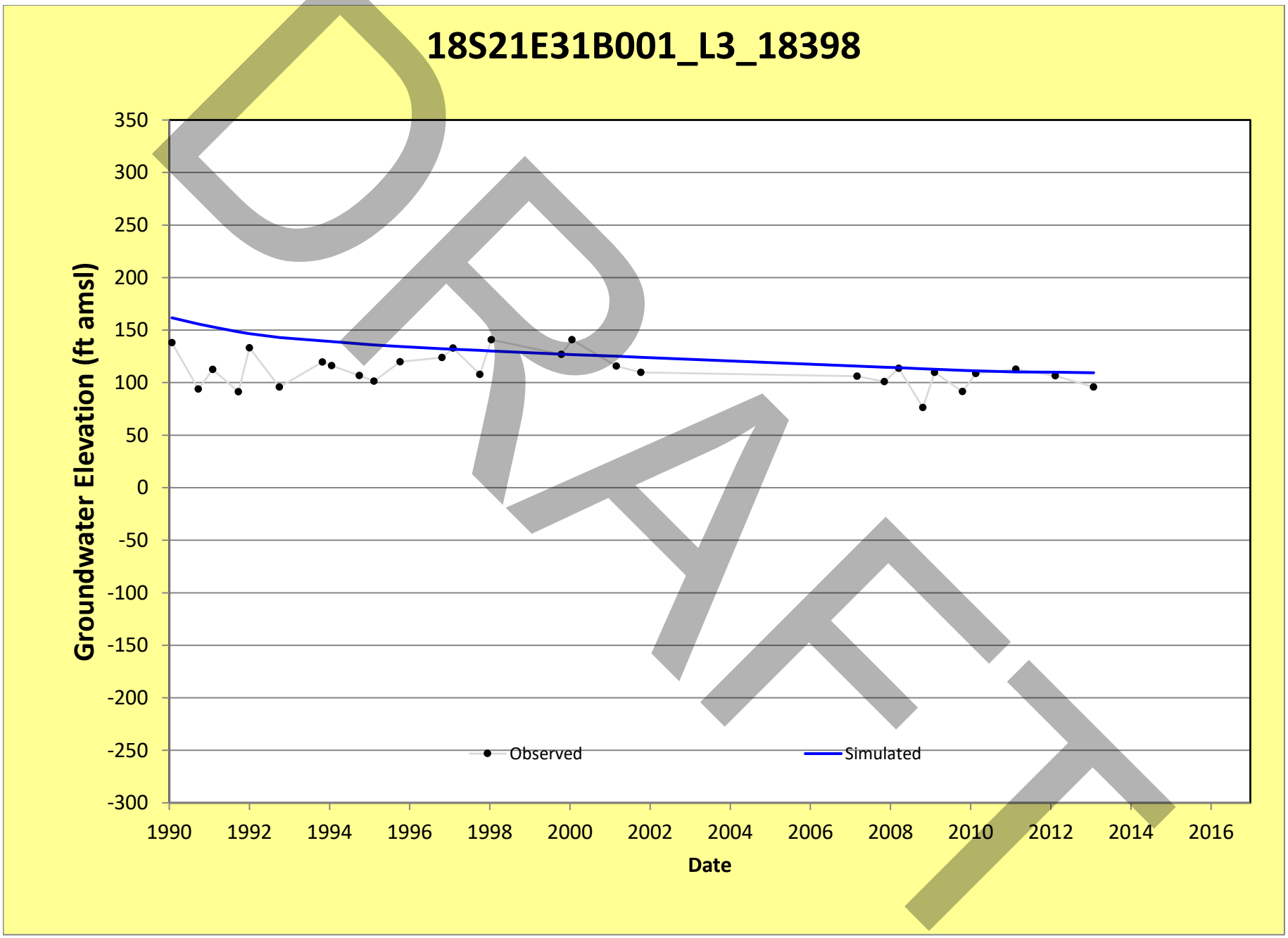
Date
Observed
Simulated
DRAFT


18S21E31B001_L3_18398
Groundwater Elevation (ft amsl)
350
300
250
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150
100
50
0
-50
-100
-150
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-250
-300
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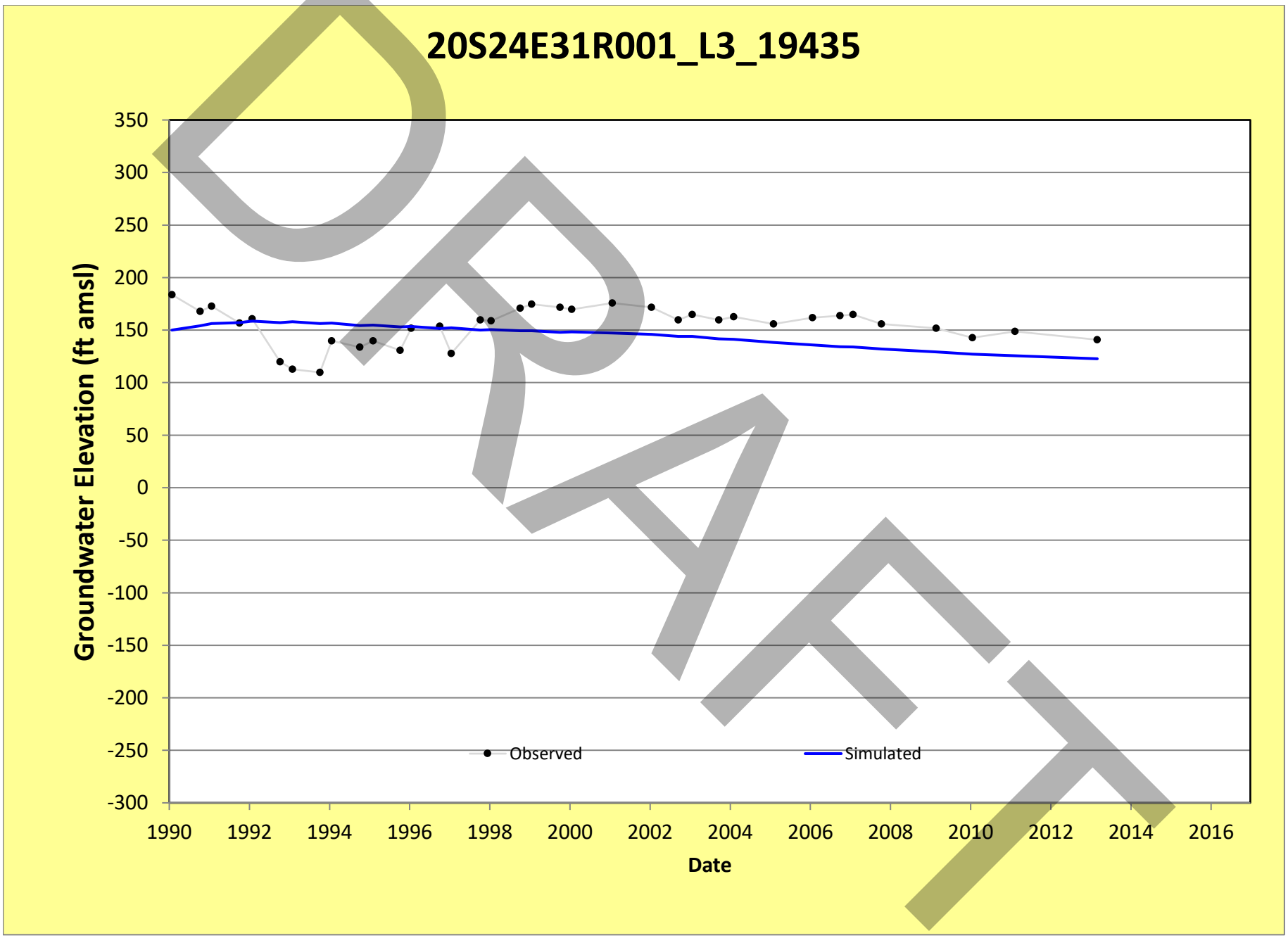
Date
Observed
Simulated
DRAFT


20S24E31R001_L3_19435
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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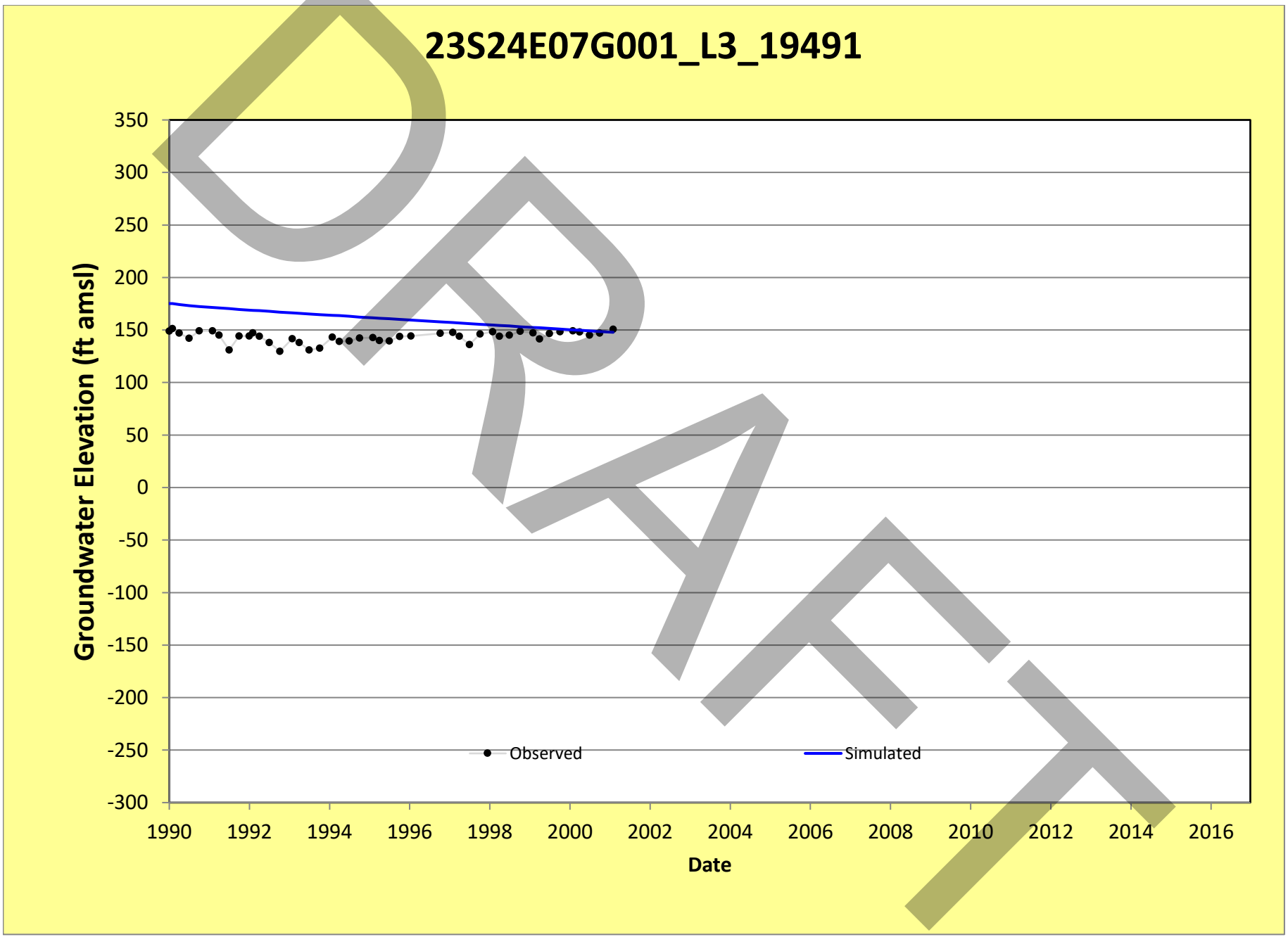
Date
Observed
Simulated
DRAFT


23S24E07G001_L3_19491
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
-100
-150
-200
-250
-300
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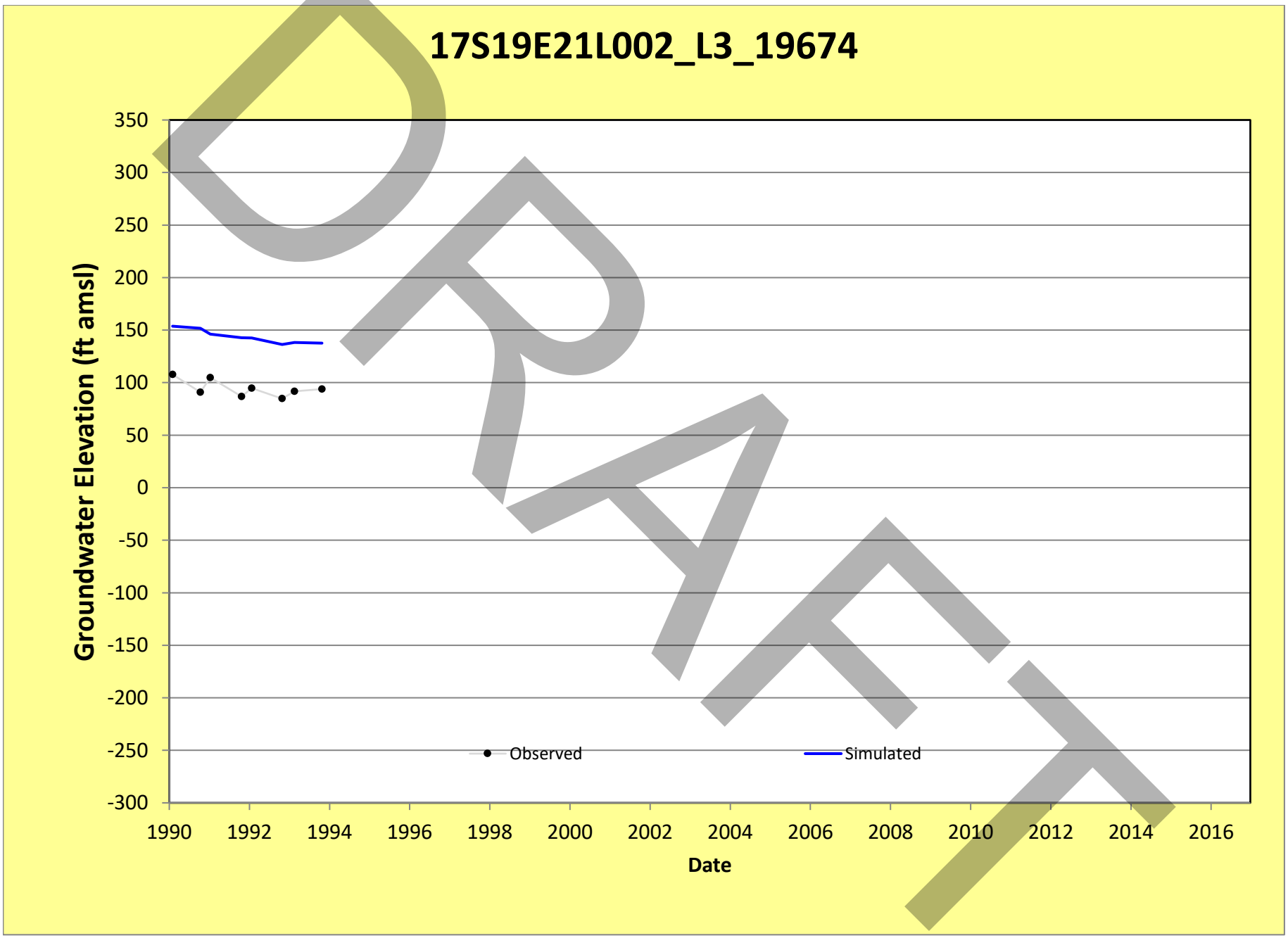
Date
Observed
Simulated
DRAFT


17S19E21L002_L3_19674
Groundwater Elevation (ft amsl)
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300
250
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100
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-50
-100
-150
-200
-250
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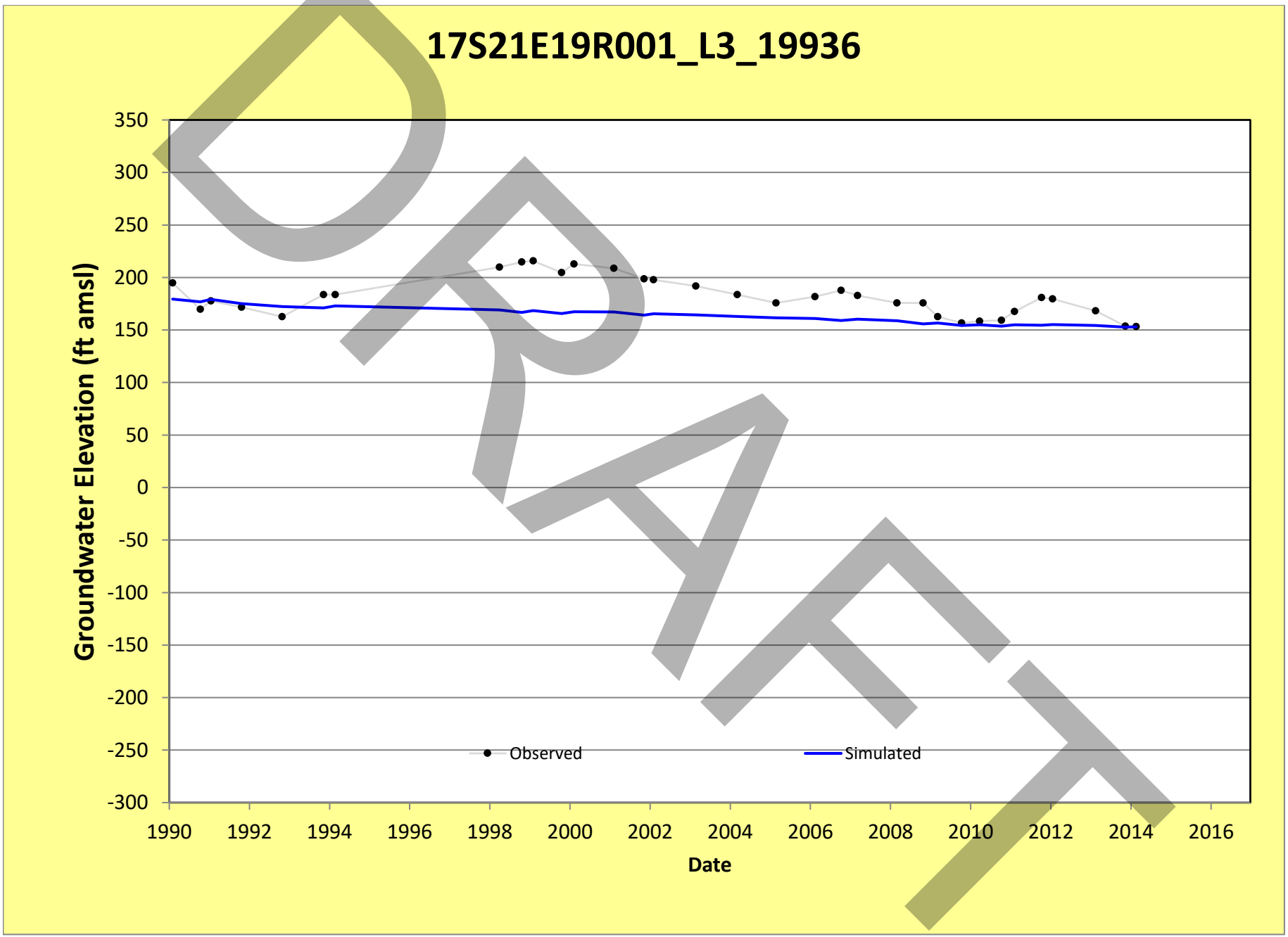
Date
Observed
Simulated
DRAFT


17S21E19R001_L3_19936
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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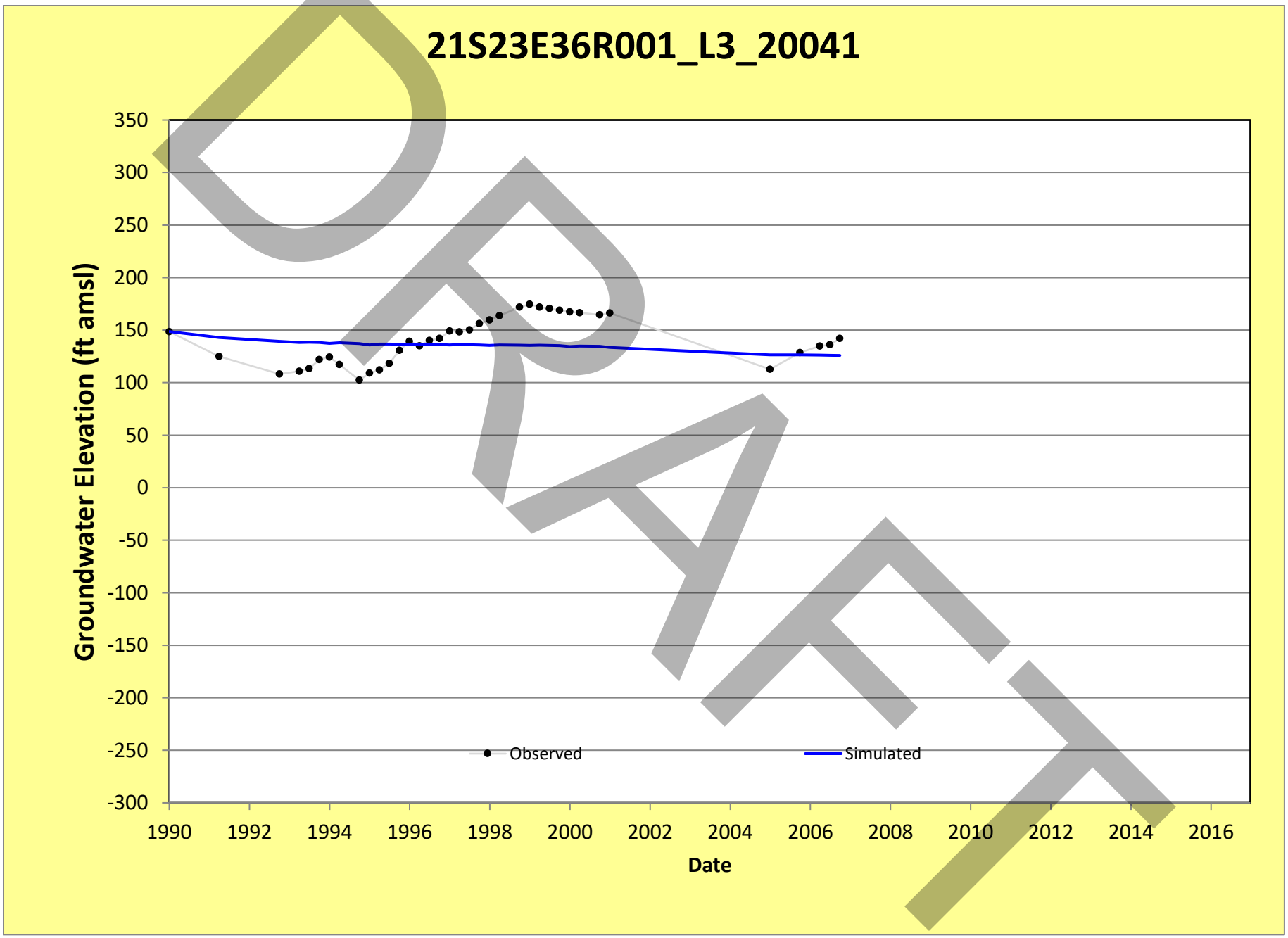
Date
Observed
Simulated
DRAFT


21S23E36R001_L3_20041
Groundwater Elevation (ft amsl)
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250
200
150
100
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0
-50
-100
-150
-200
-250
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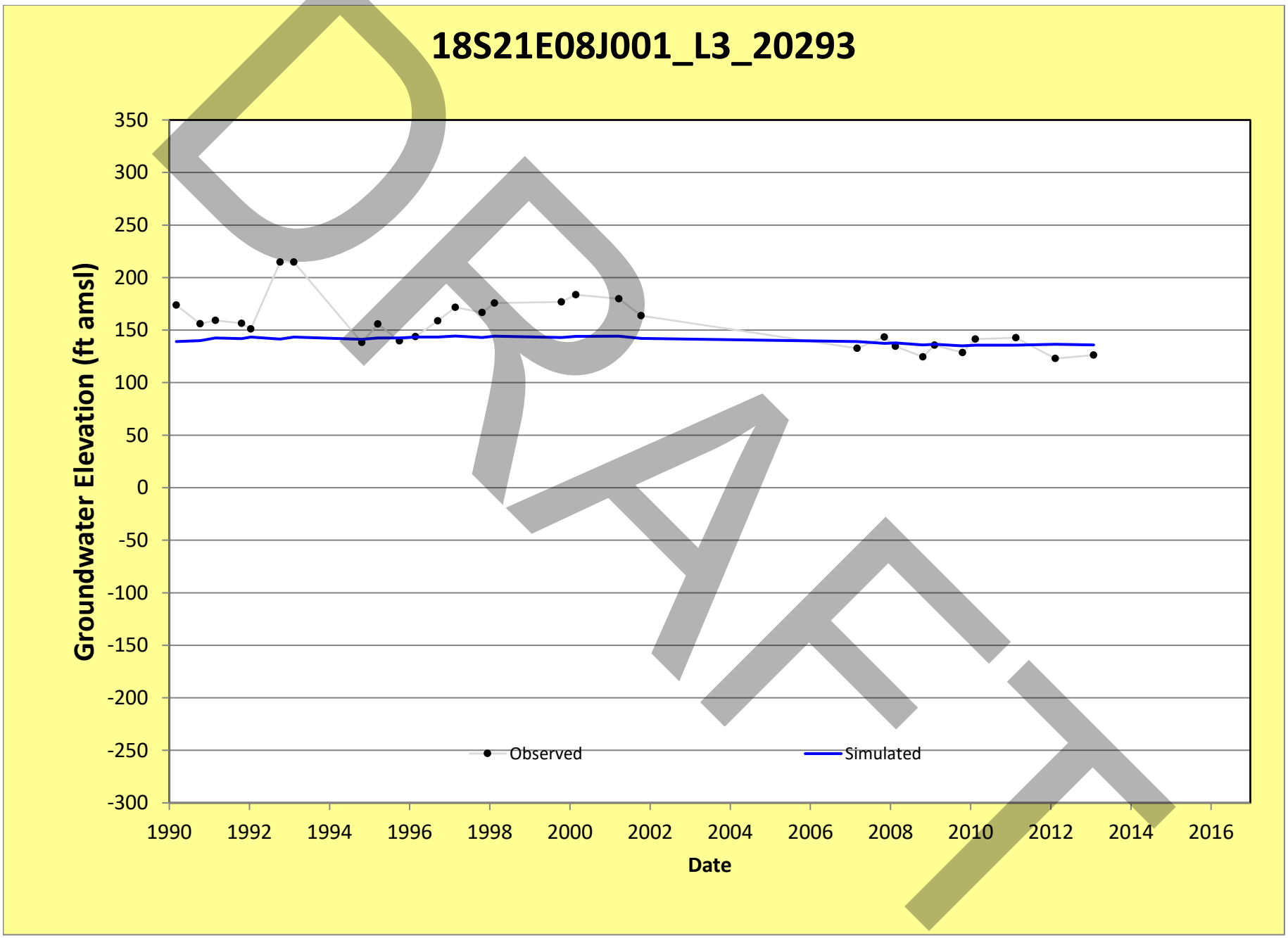
Date
Observed
Simulated
DRAFT


18S21E08J001_L3_20293
Groundwater Elevation (ft amsl)
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250
200
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100
50
0
-50
-100
-150
-200
-250
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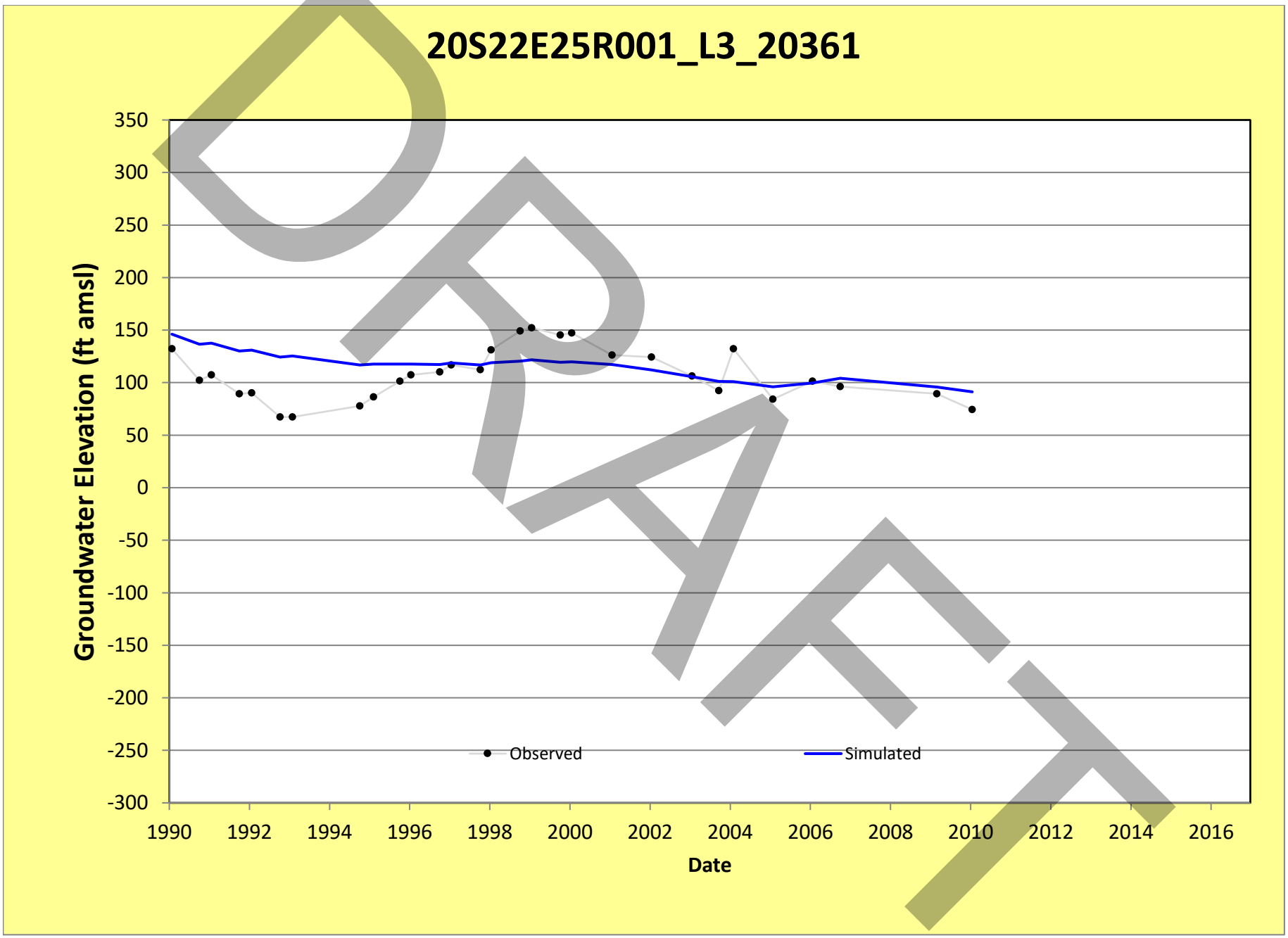
Date
Observed
Simulated
DRAFT


20S22E25R001_L3_20361
Groundwater Elevation (ft amsl)
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250
200
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100
50
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-50
-100
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-200
-250
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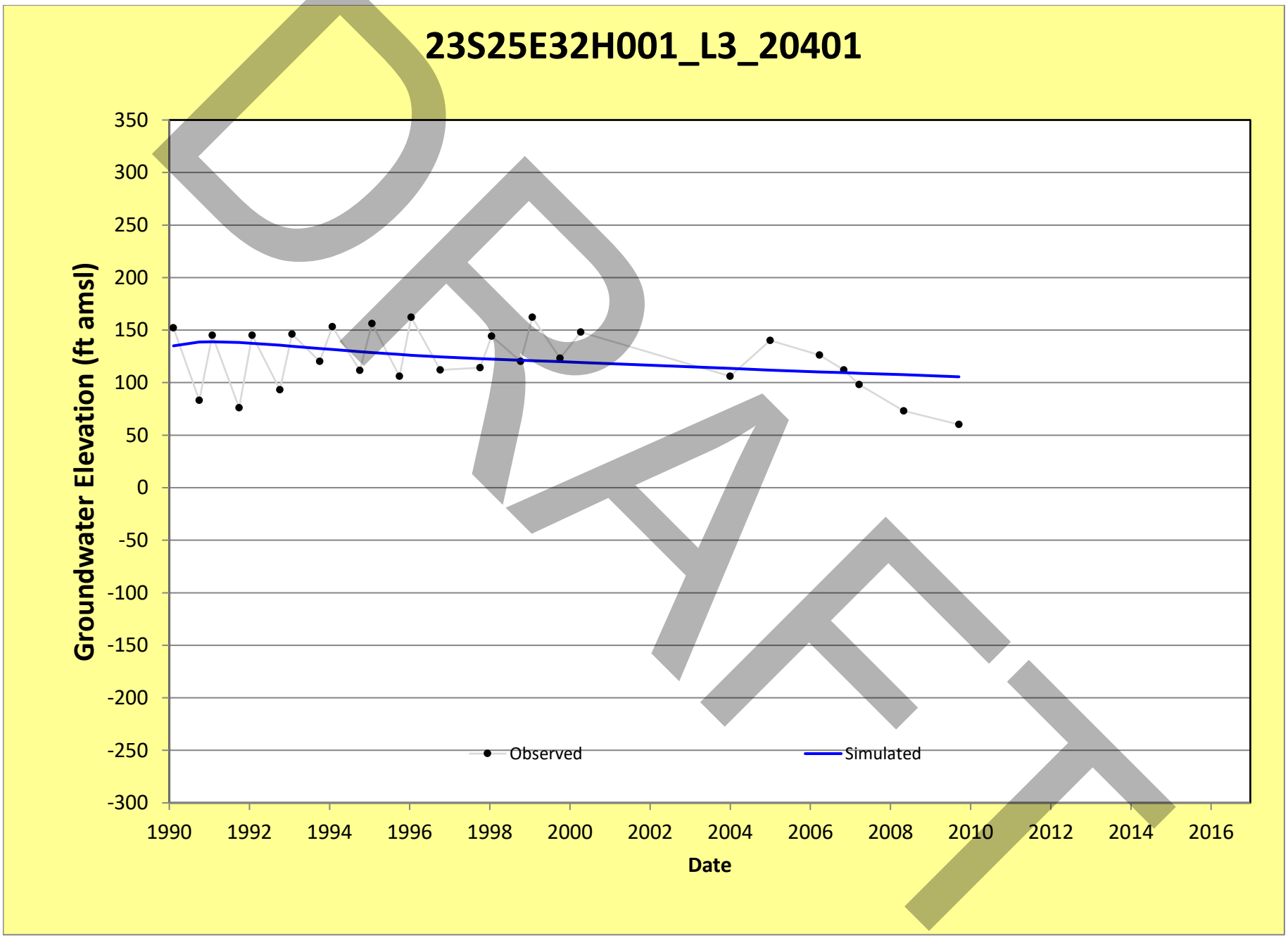
Date
Observed
Simulated
DRAFT


23S25E32H001_L3_20401
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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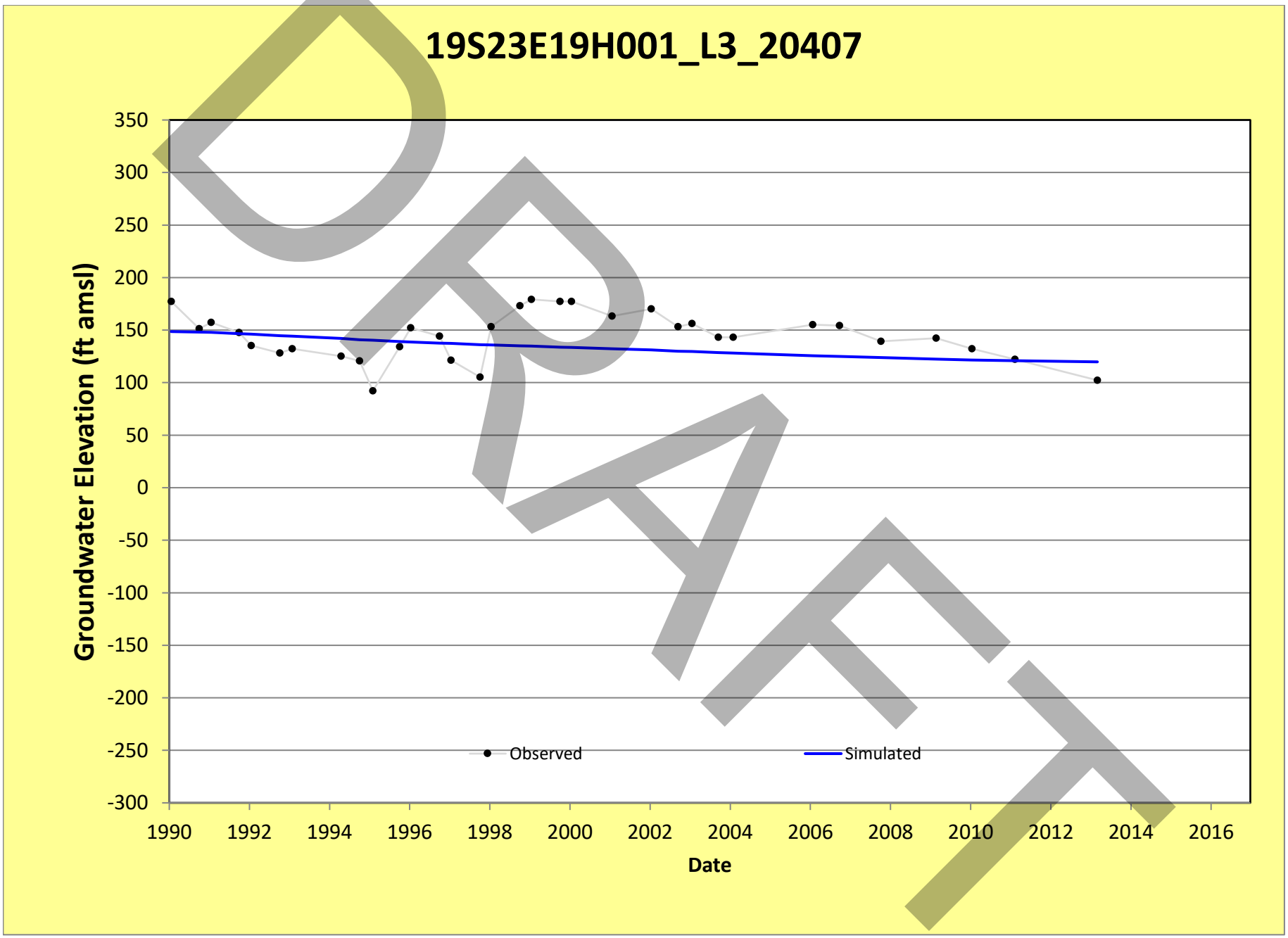
Date
Observed
Simulated
DRAFT


19S23E19H001_L3_20407
Groundwater Elevation (ft amsl)
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300
250
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150
100
50
0
-50
-100
-150
-200
-250
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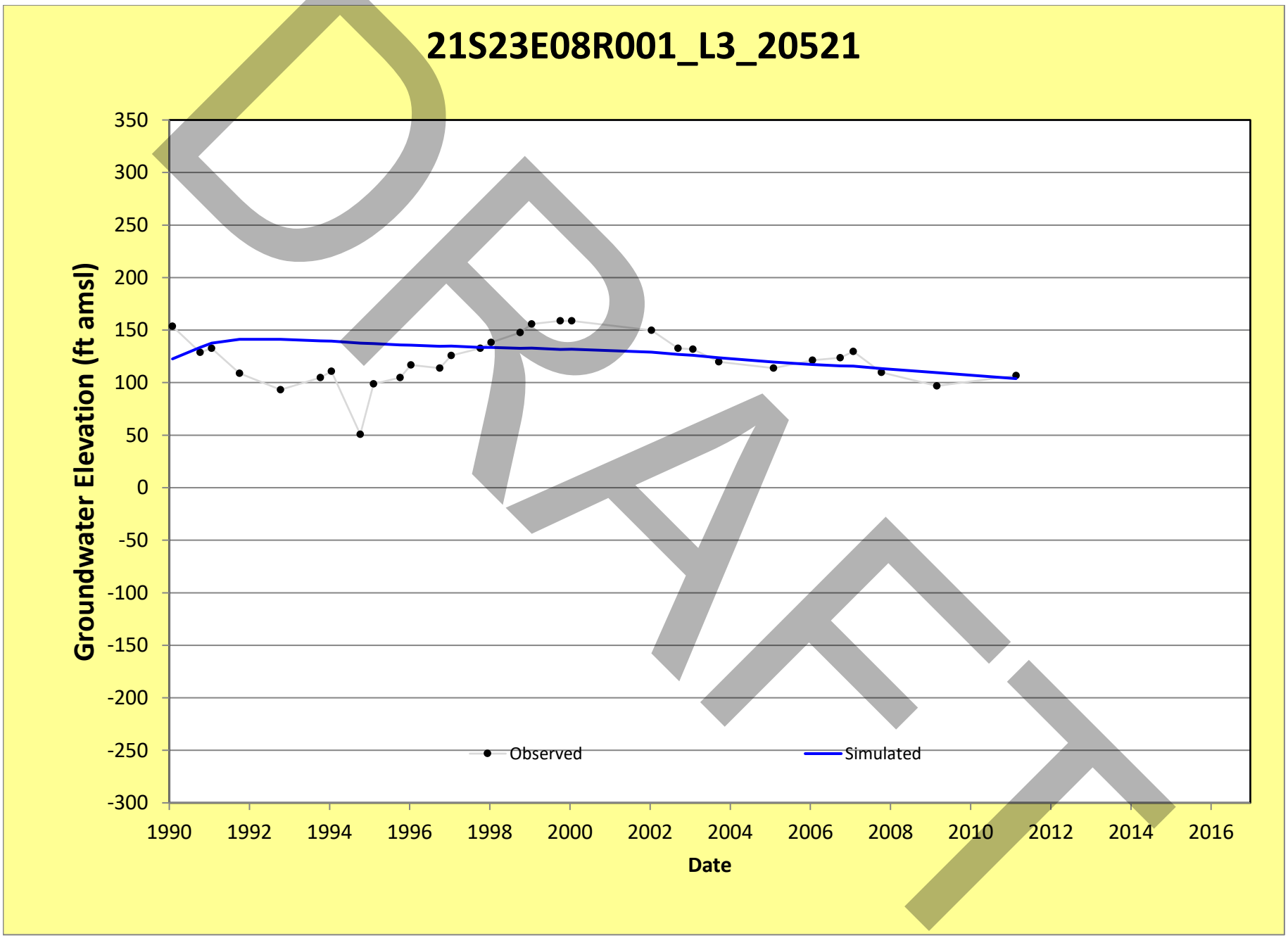
Date
Observed
Simulated
DRAFT


21S23E08R001_L3_20521
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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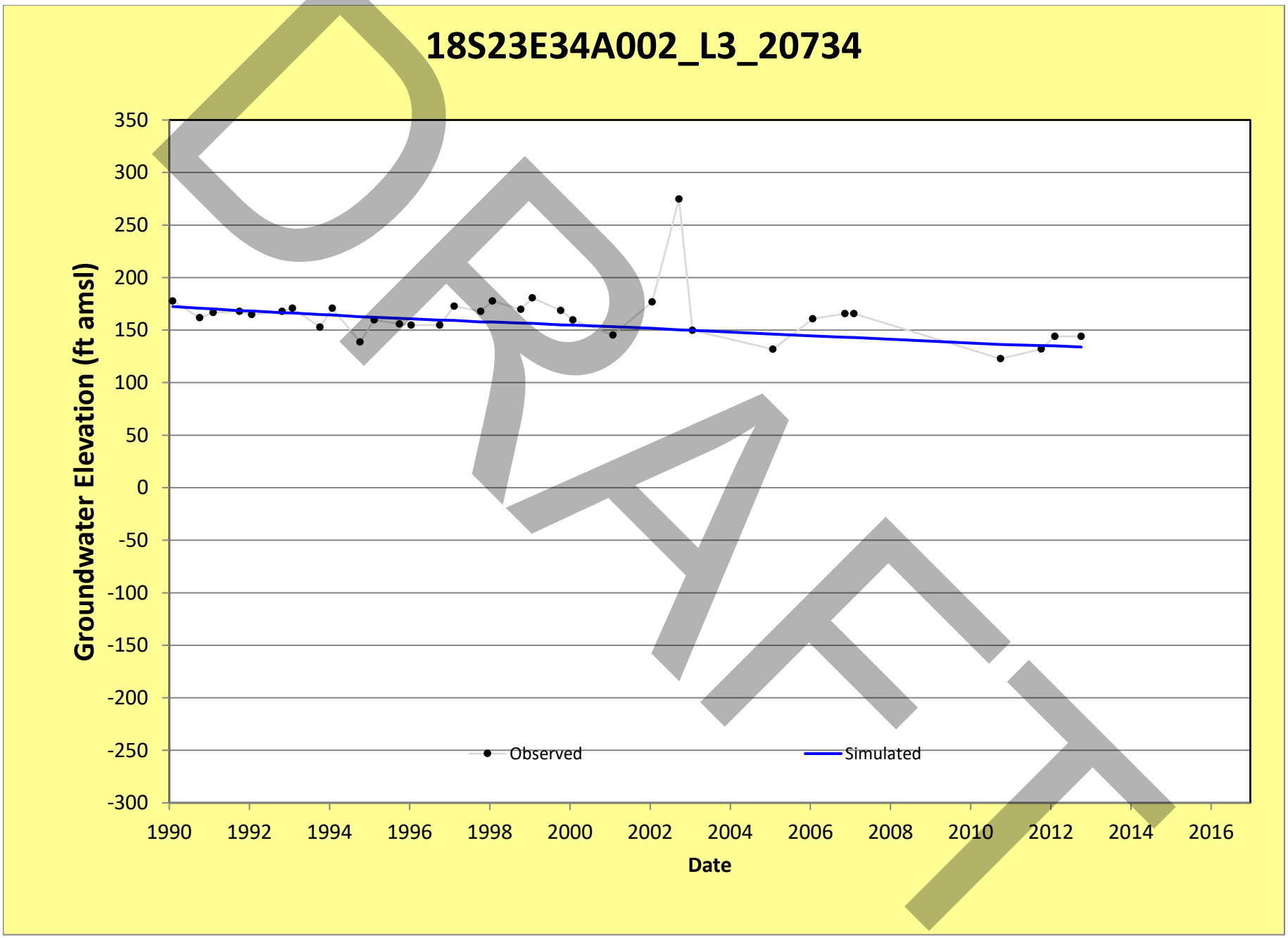
Date
Observed
Simulated
DRAFT


18S23E34A002_L3_20734
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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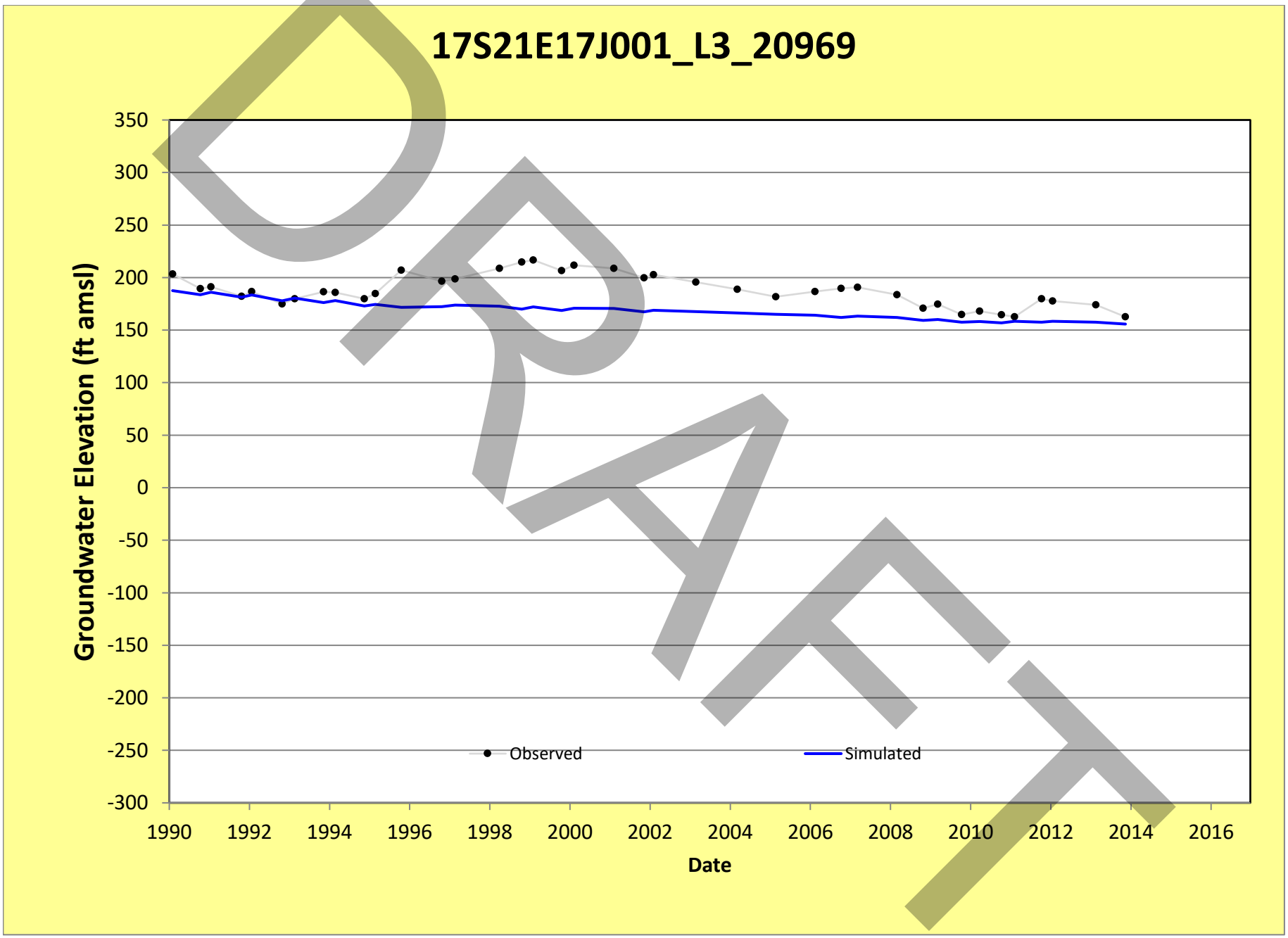
Date
Observed
Simulated
DRAFT


17S21E17J001_L3_20969
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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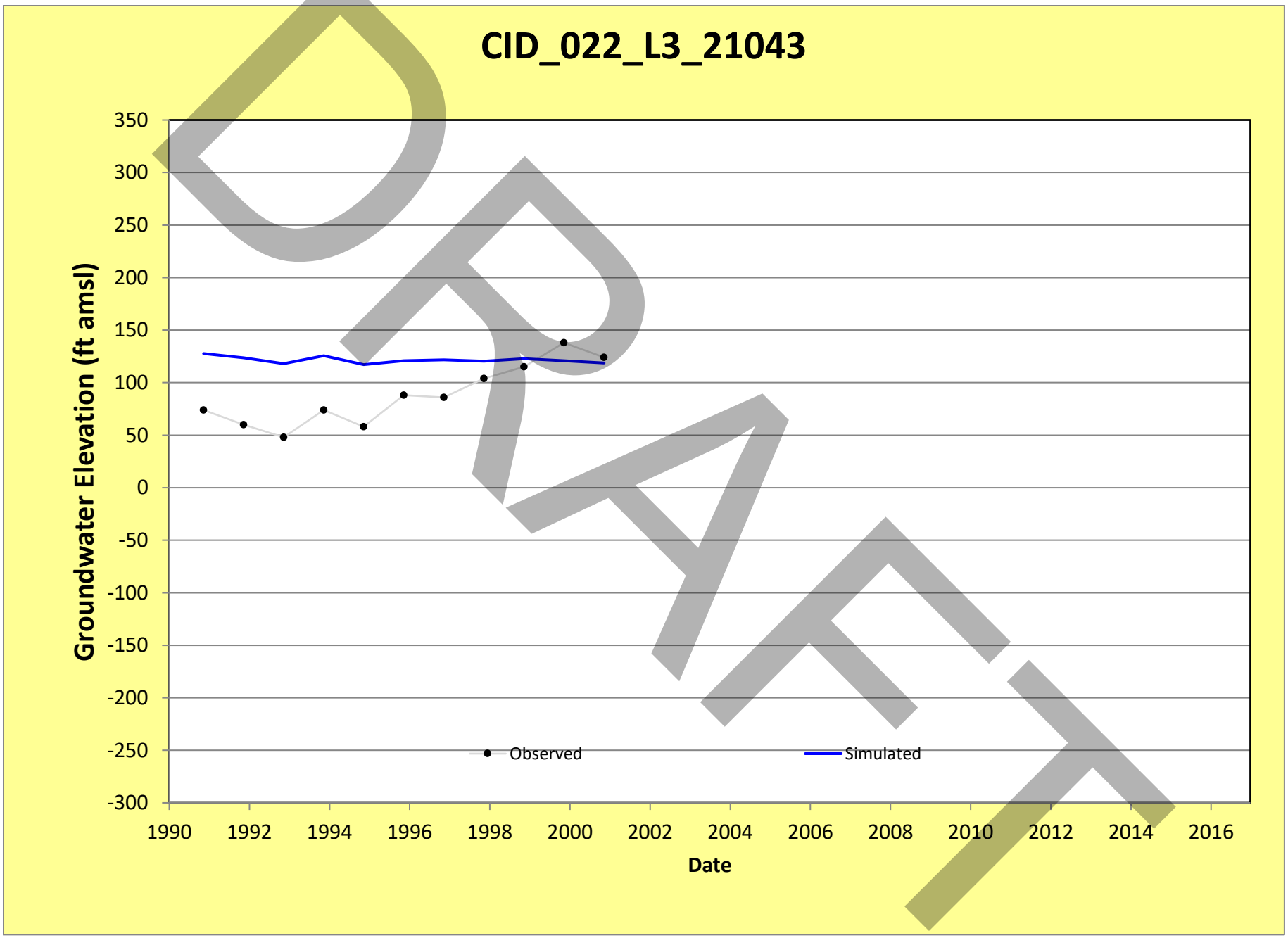
Date
Observed
Simulated
DRAFT


CID_022_L3_21043
Groundwater Elevation (ft amsl)
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-200
-250
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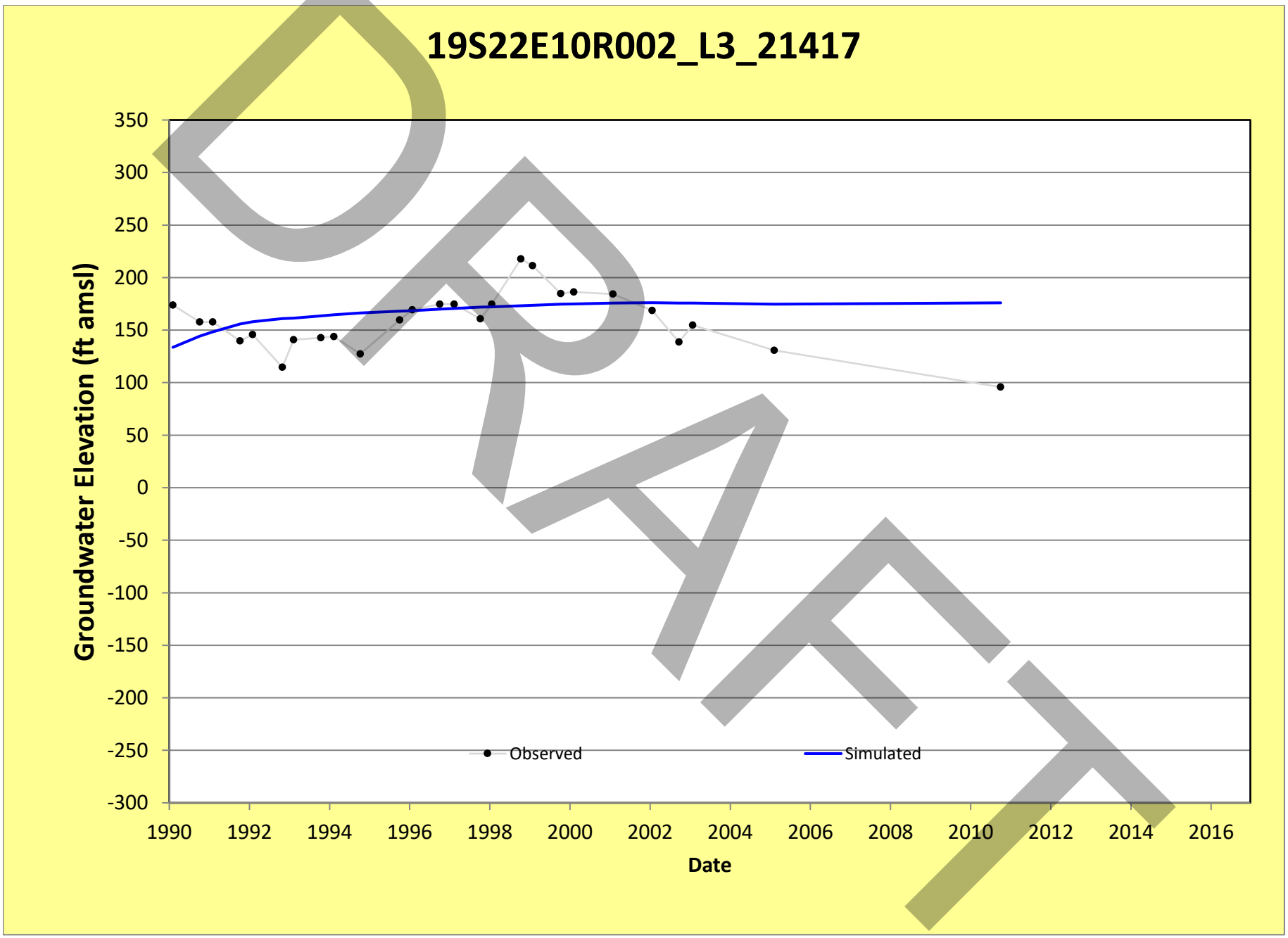
Date
Observed
Simulated
DRAFT


19S22E10R002_L3_21417
Groundwater Elevation (ft amsl)
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200
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100
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0
-50
-100
-150
-200
-250
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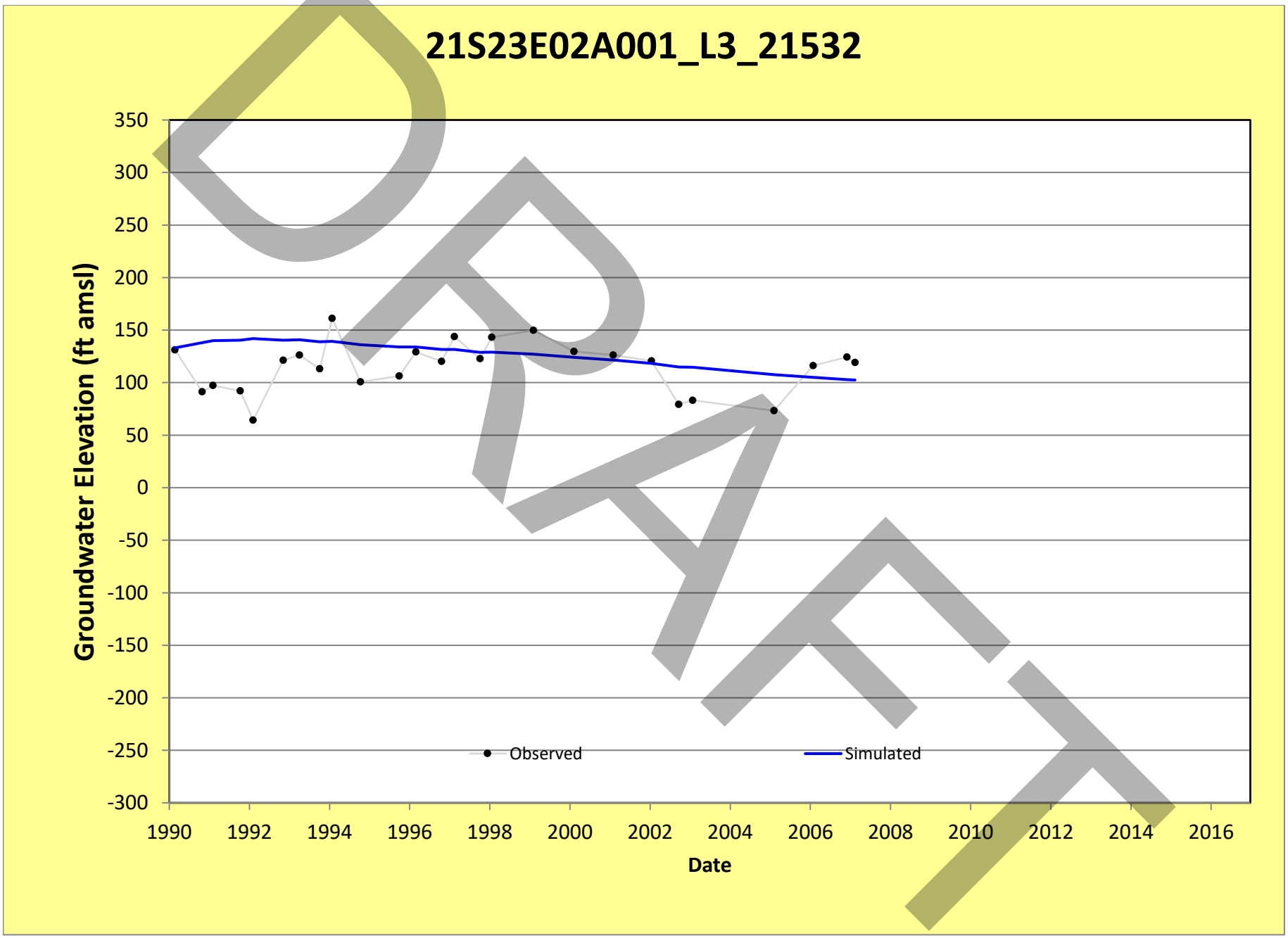
Date
Observed
Simulated
DRAFT


21S23E02A001_L3_21532
Groundwater Elevation (ft amsl)
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200
150
100
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0
-50
-100
-150
-200
-250
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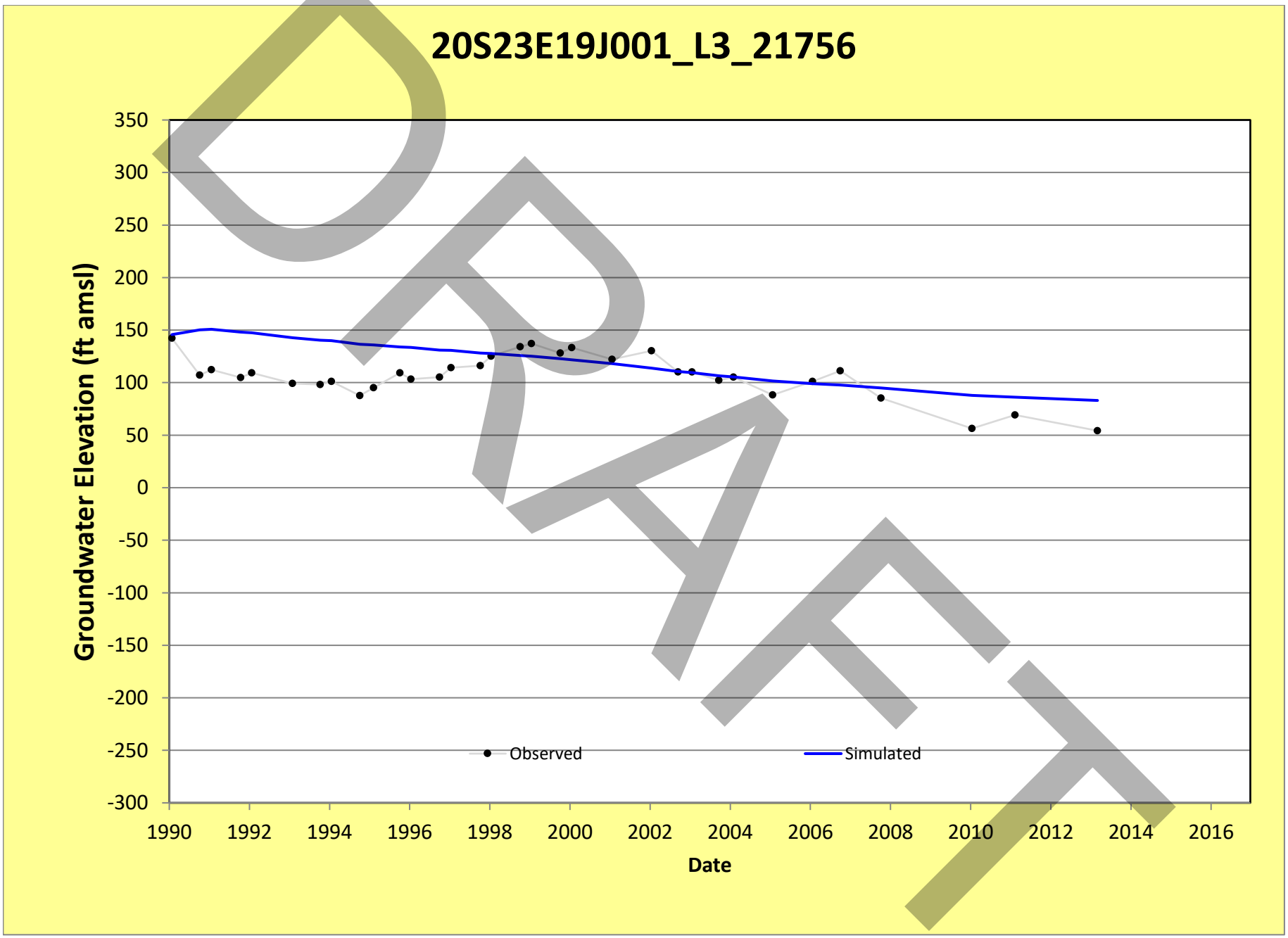
Date
Observed
Simulated
DRAFT


20S23E19J001_L3_21756
Groundwater Elevation (ft amsl)
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200
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100
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-50
-100
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-200
-250
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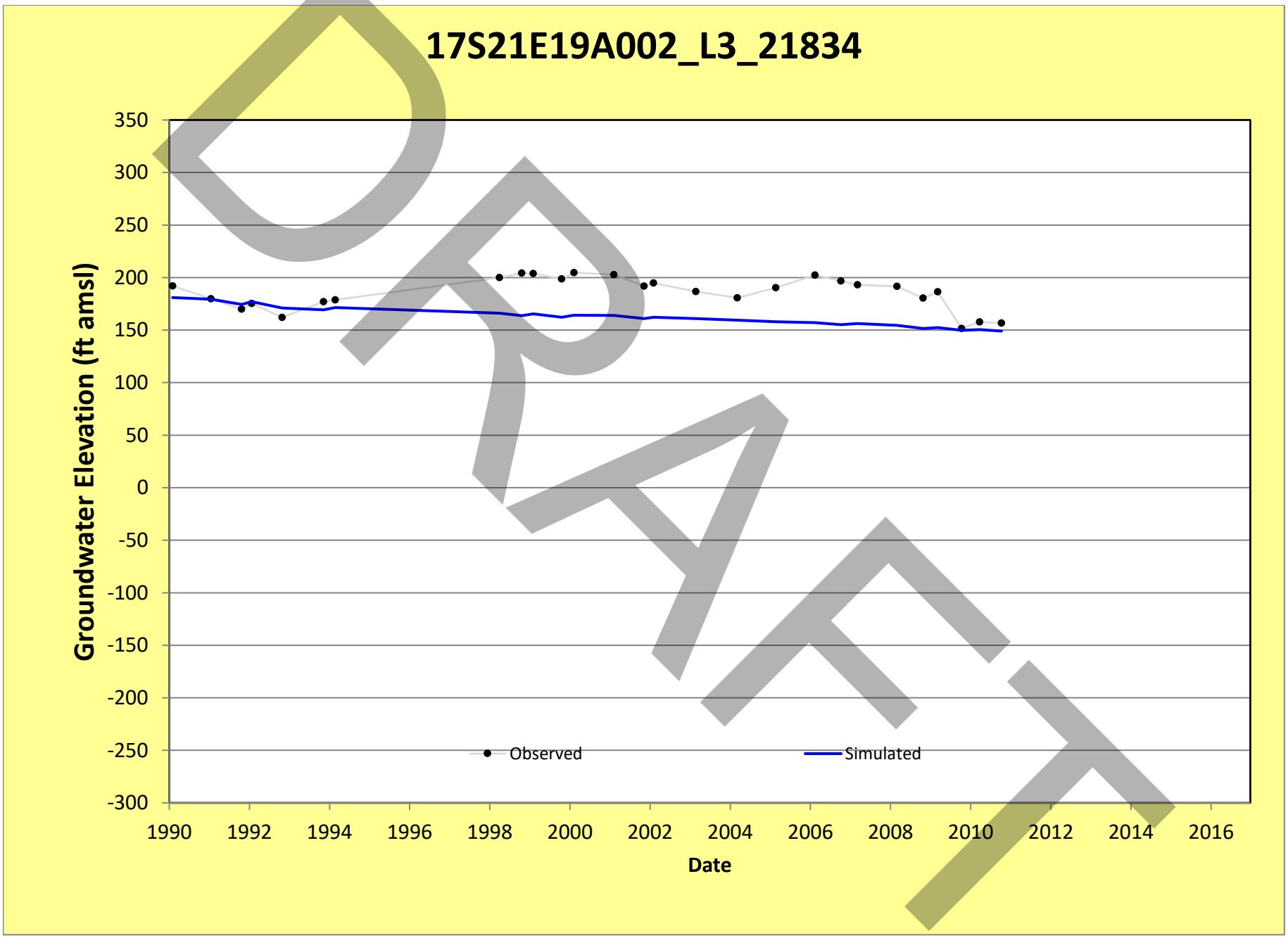
Date
Observed
Simulated
DRAFT


17S21E19A002_L3_21834
Groundwater Elevation (ft amsl)
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200
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100
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-50
-100
-150
-200
-250
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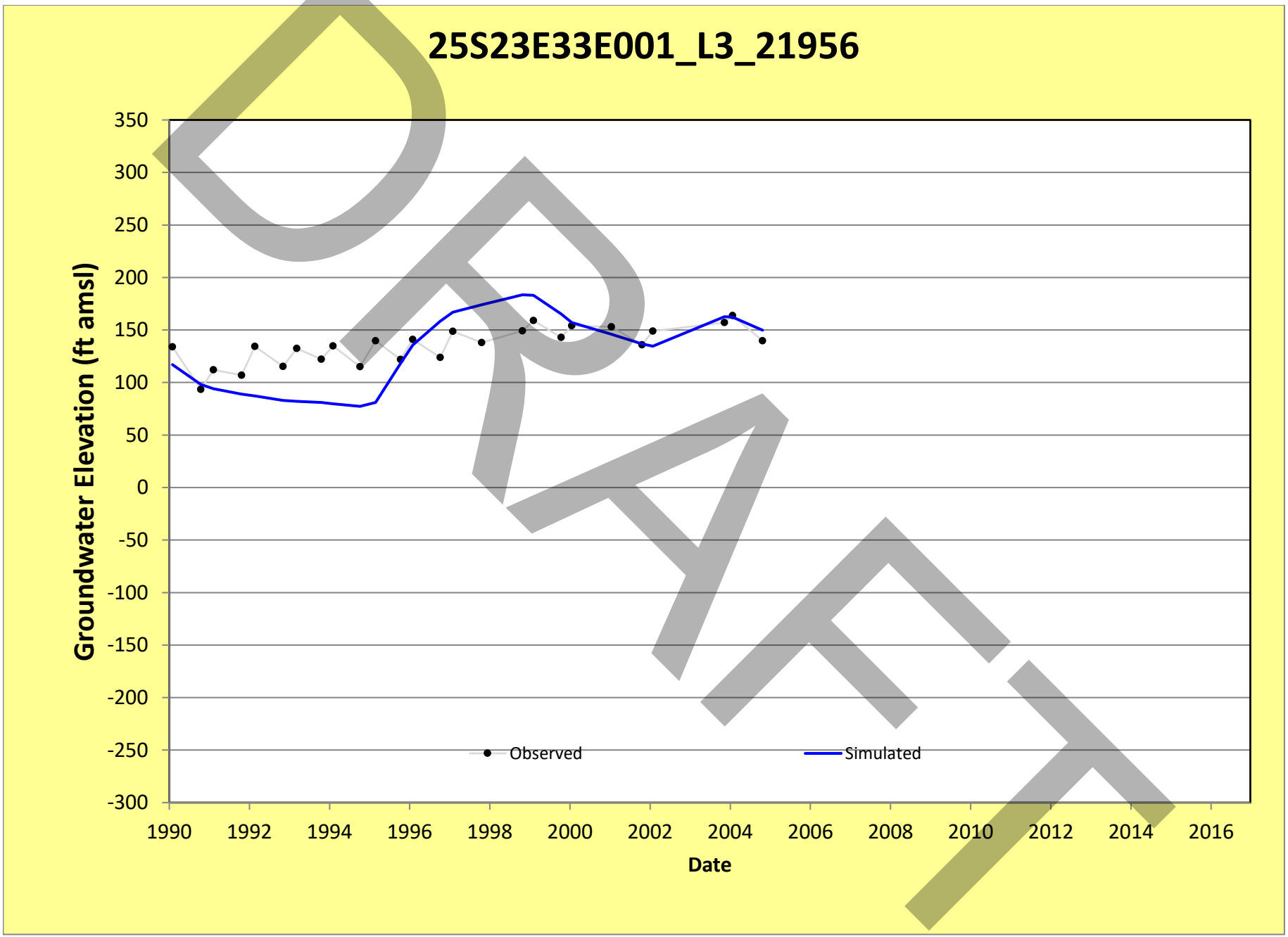
Date
Observed
Simulated
DRAFT


25S23E33E001_L3_21956
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated
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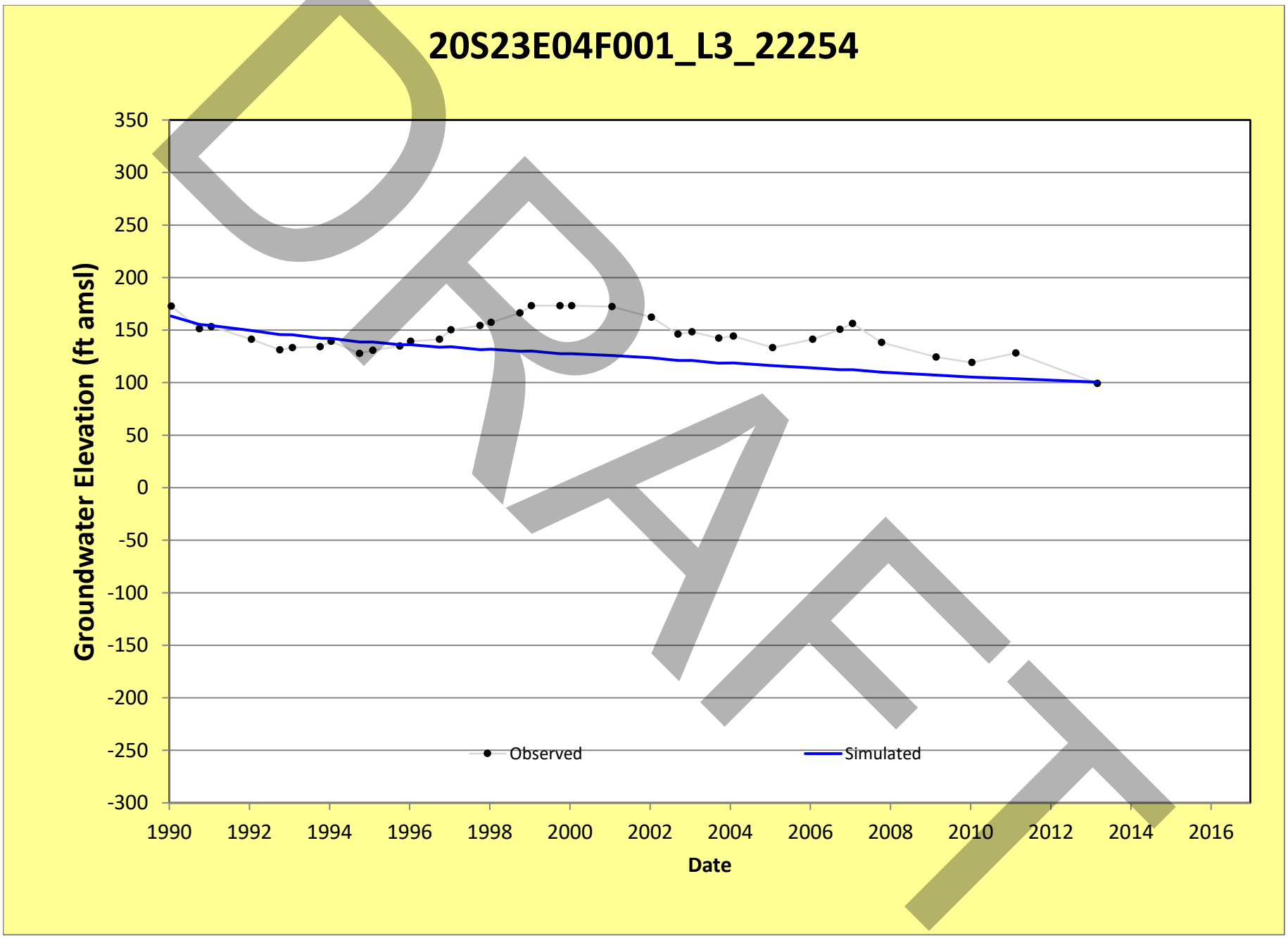
20S23E04F001_L3_22254
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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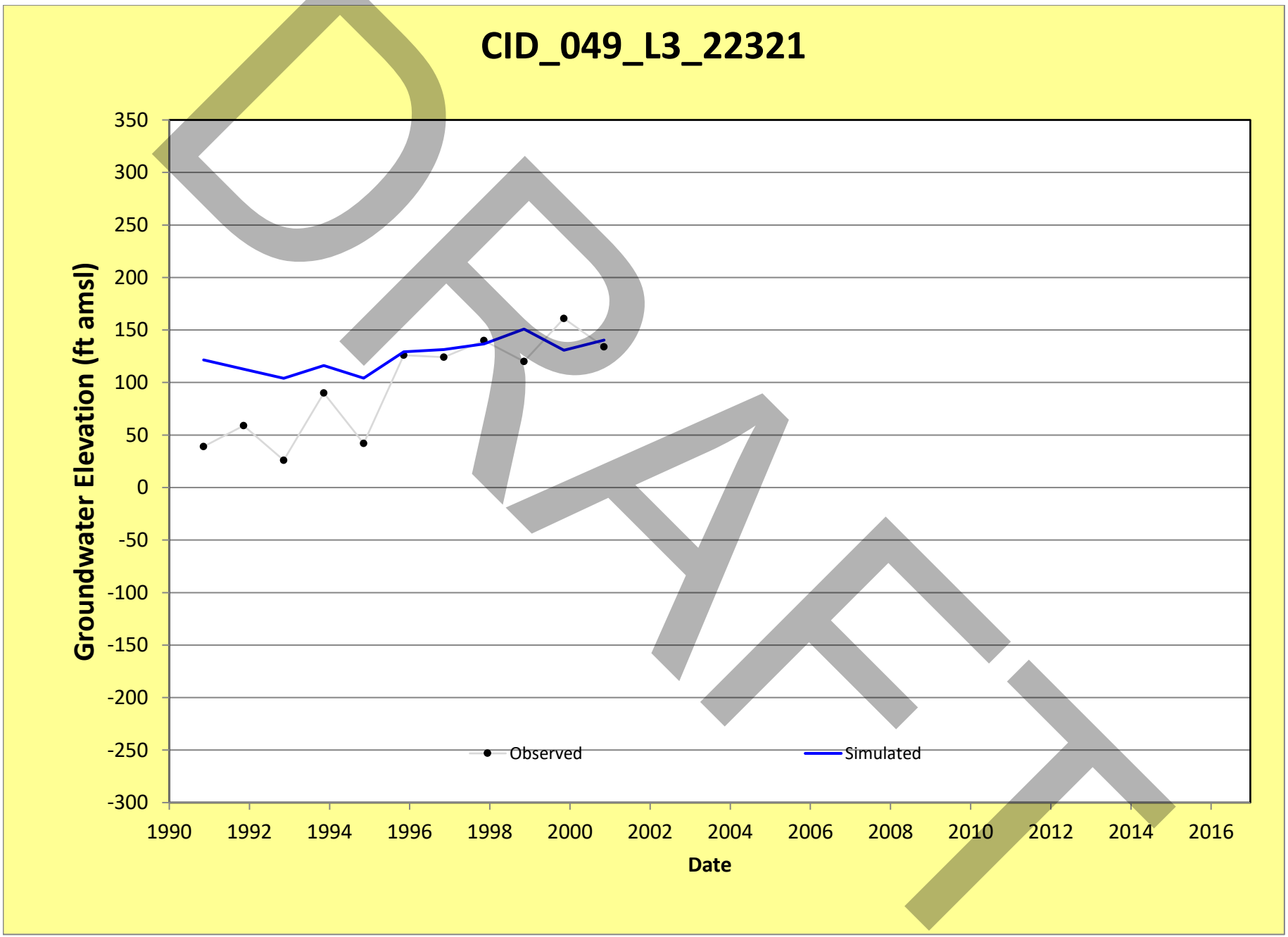
CID_049_L3_22321
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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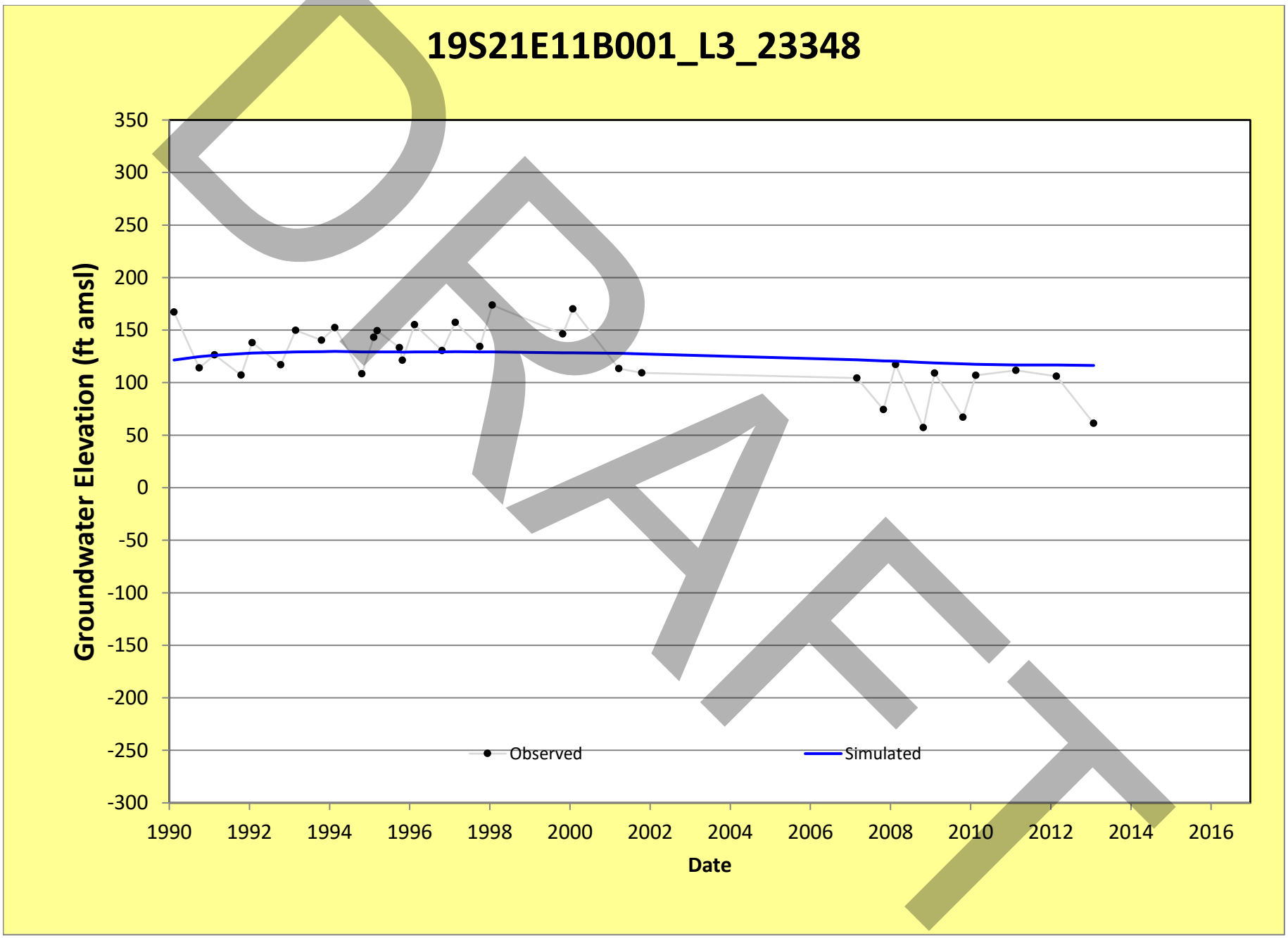
Date
Observed
Simulated
DRAFT


19S21E11B001_L3_23348
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
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2012
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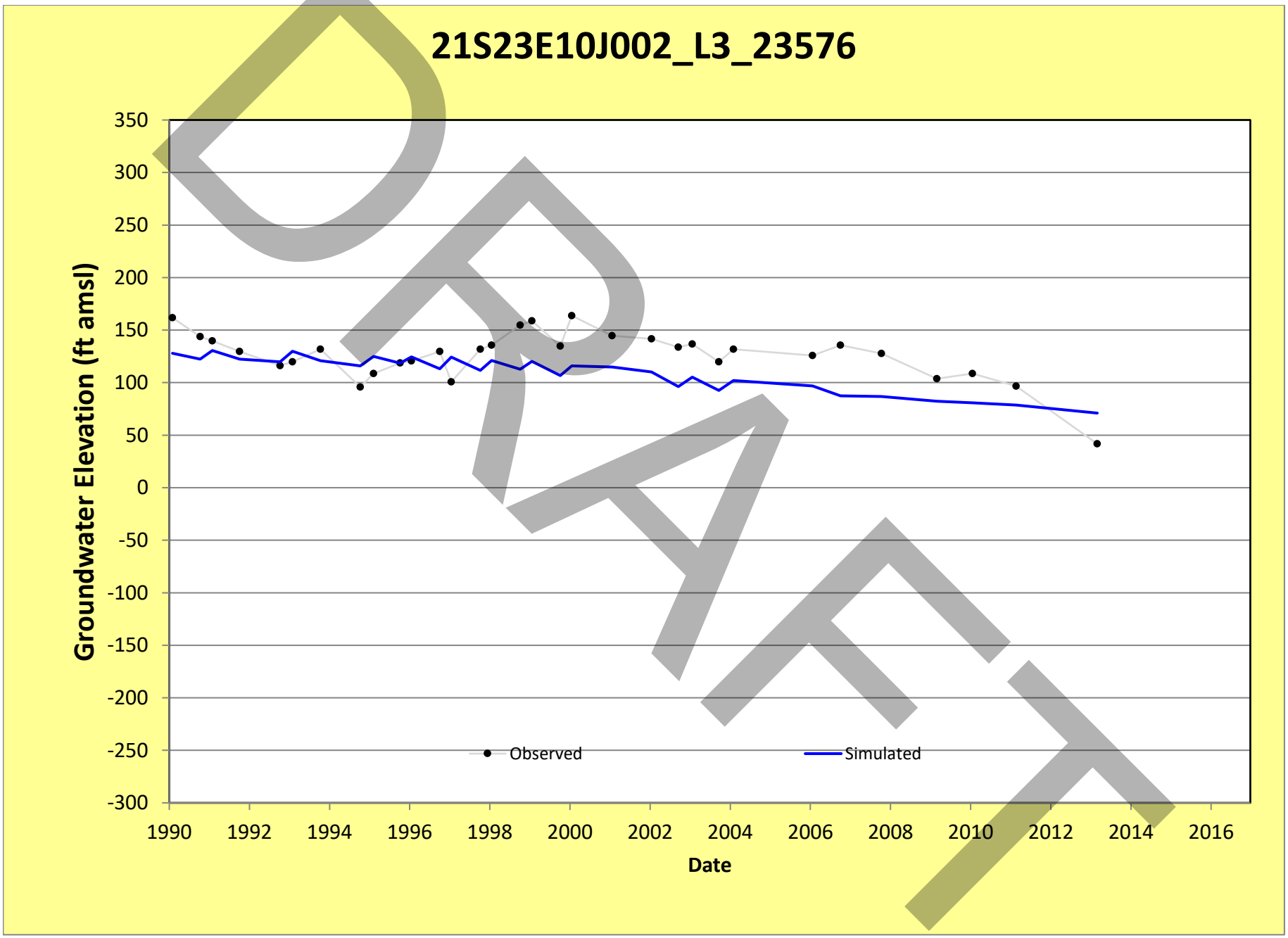
Date
Observed
Simulated
DRAFT


21S23E10J002_L3_23576
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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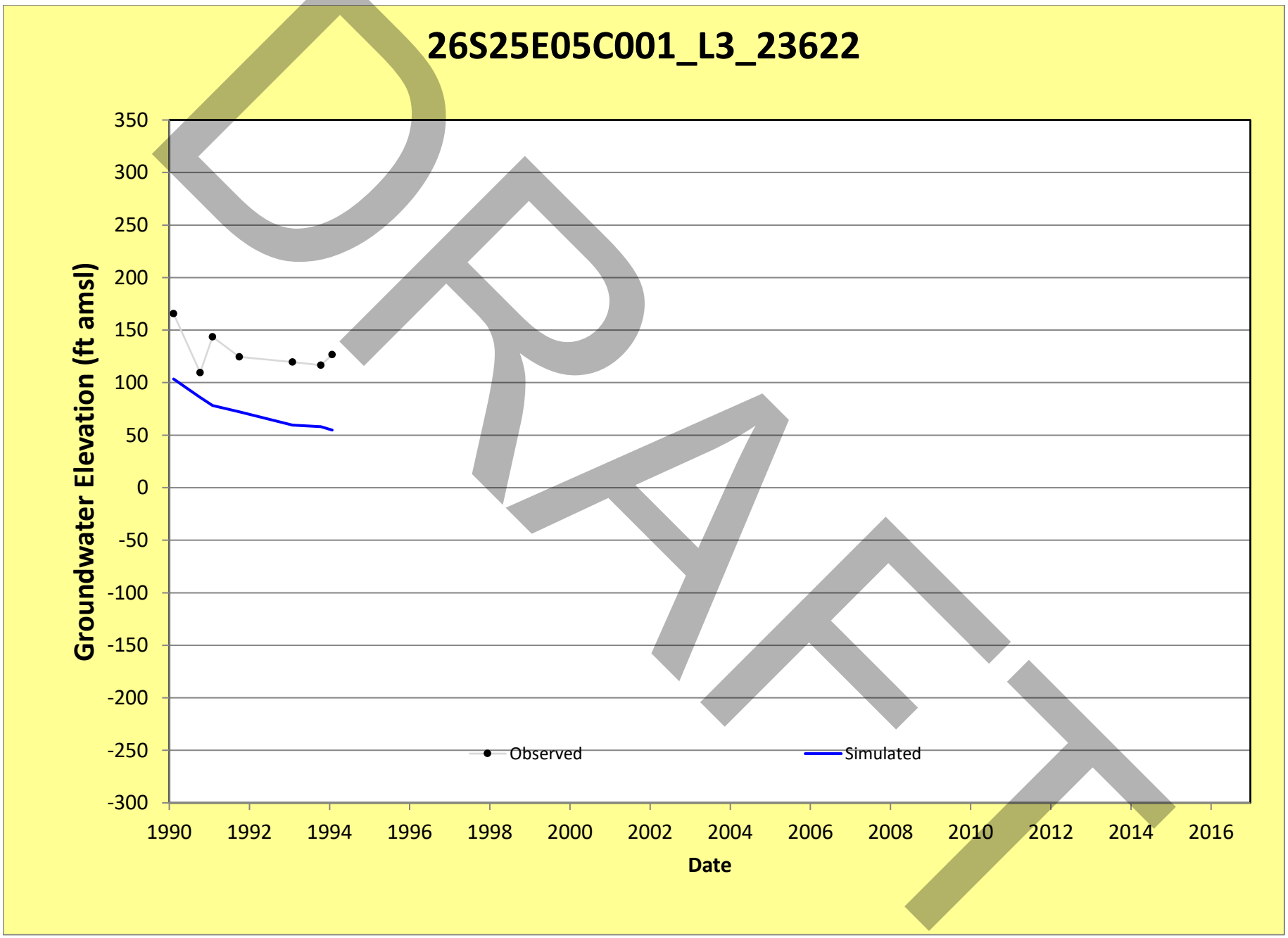
2012
2014
2016
Date
Observed
Simulated
DRAFT


26S25E05C001_L3_23622
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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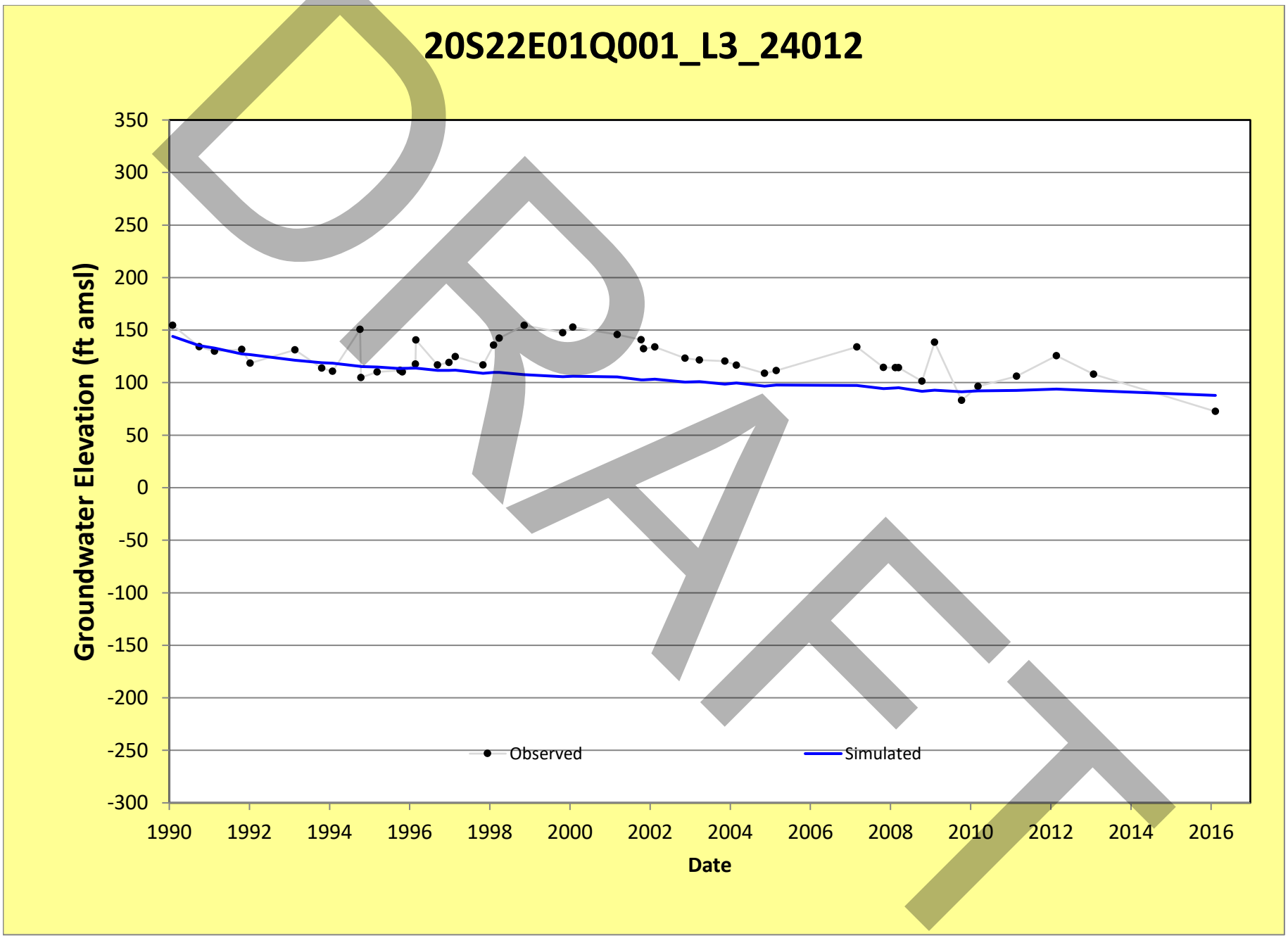
2012
2014
2016
Date
Observed
Simulated
DRAFT


20S22E01Q001_L3_24012
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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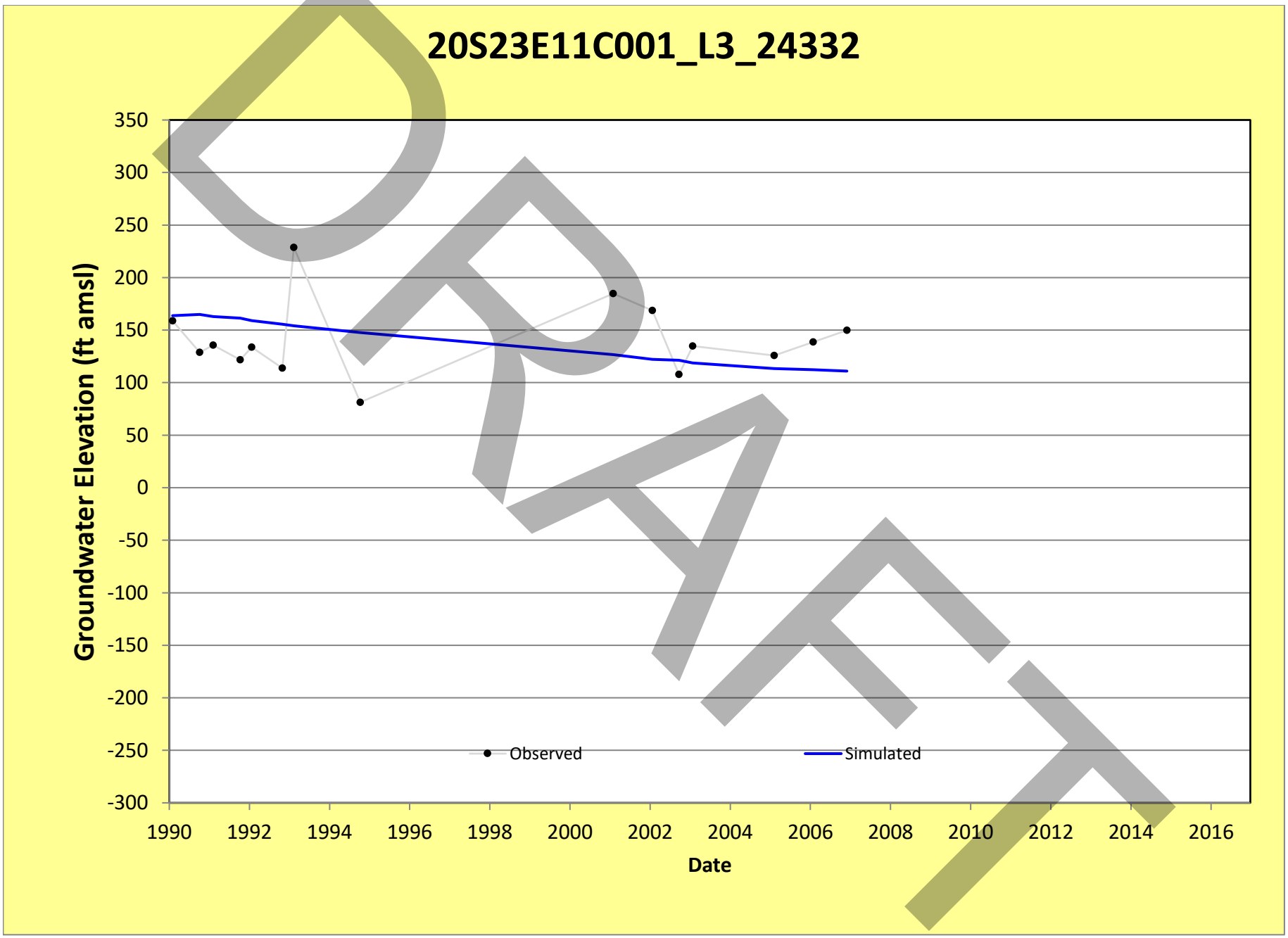
Date
Observed
Simulated
DRAFT


20S23E11C001_L3_24332
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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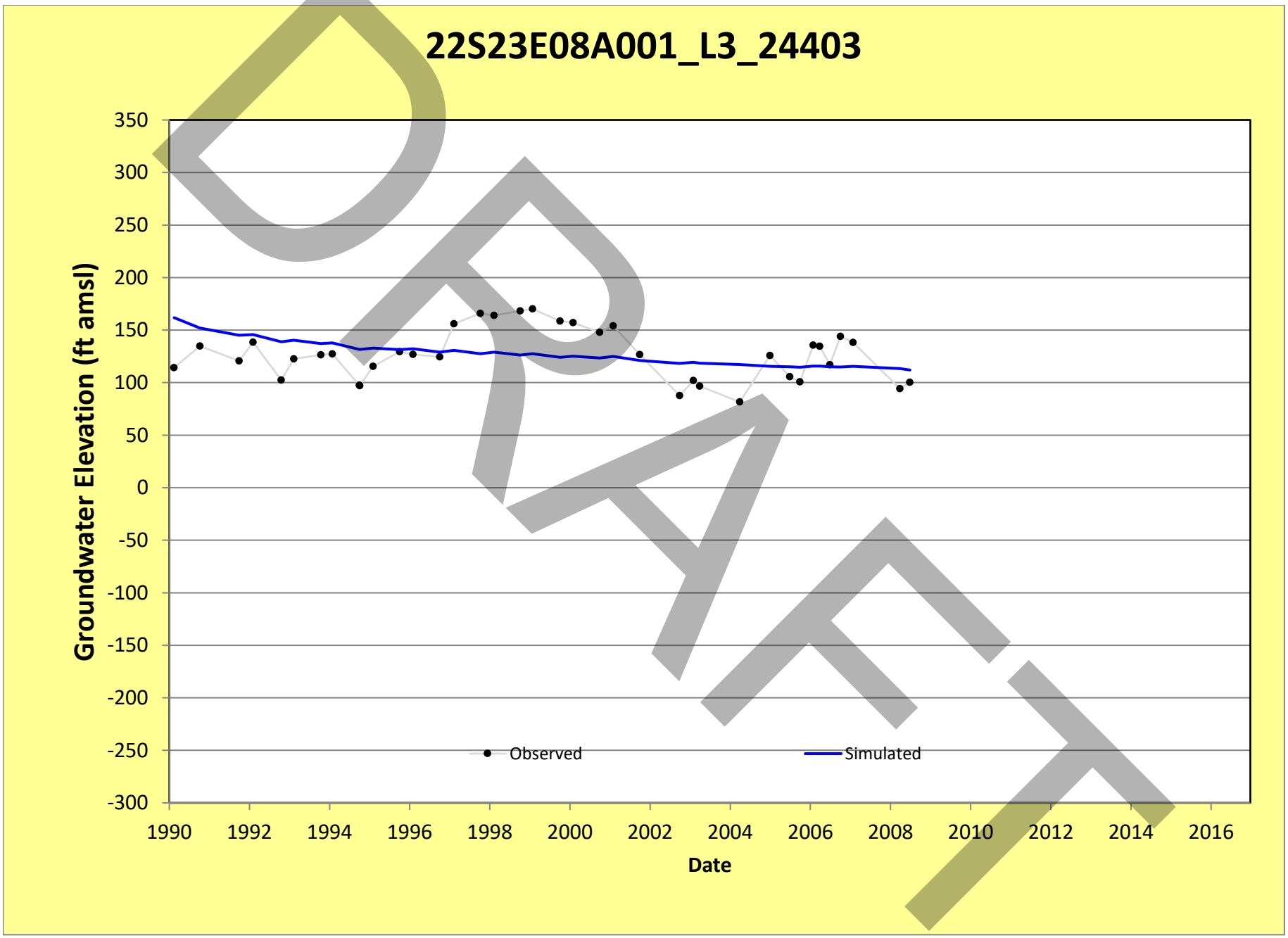
Date
Observed
Simulated
DRAFT


22S23E08A001_L3_24403
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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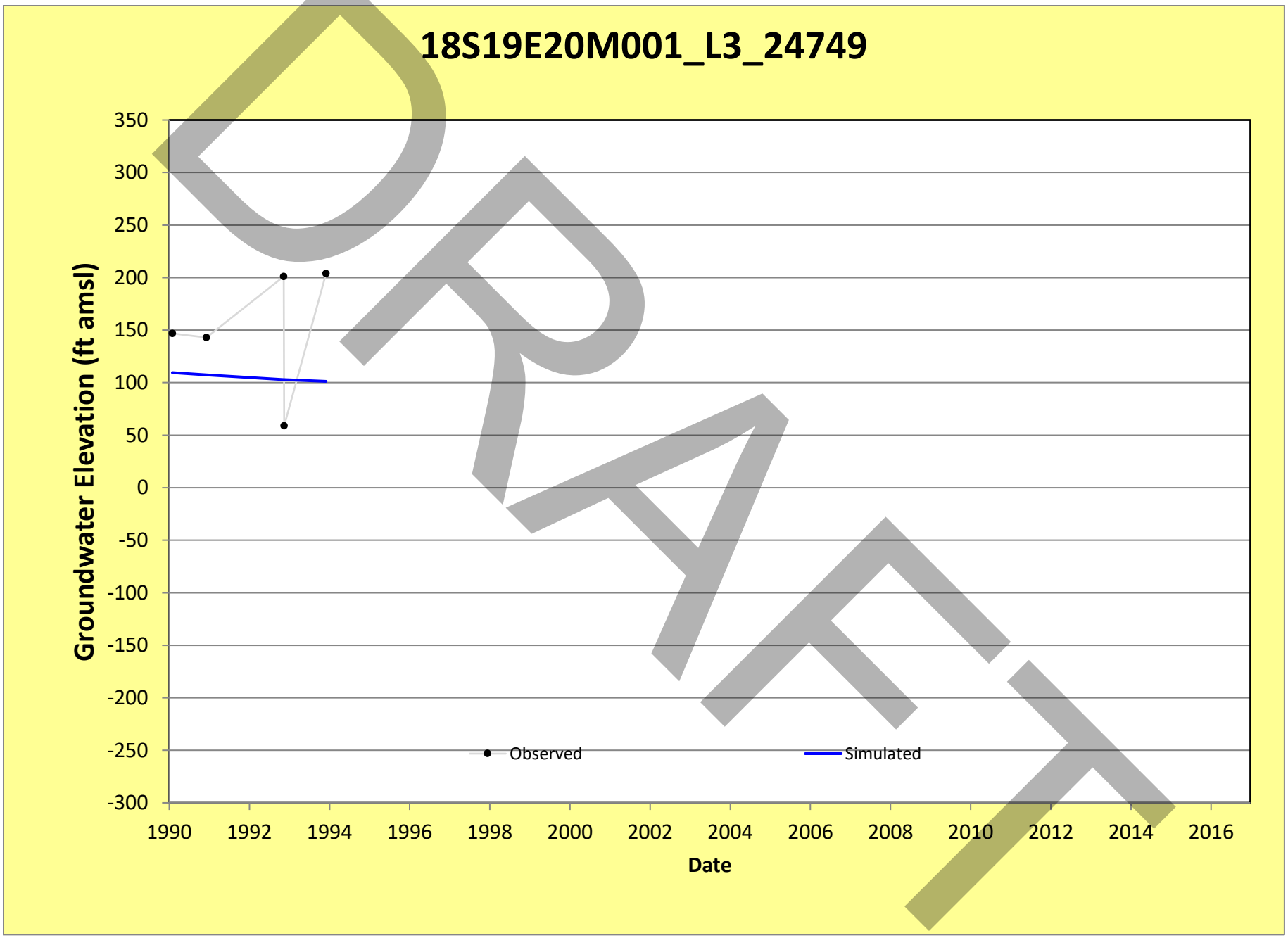
Date
Observed
Simulated
DRAFT


18S19E20M001_L3_24749
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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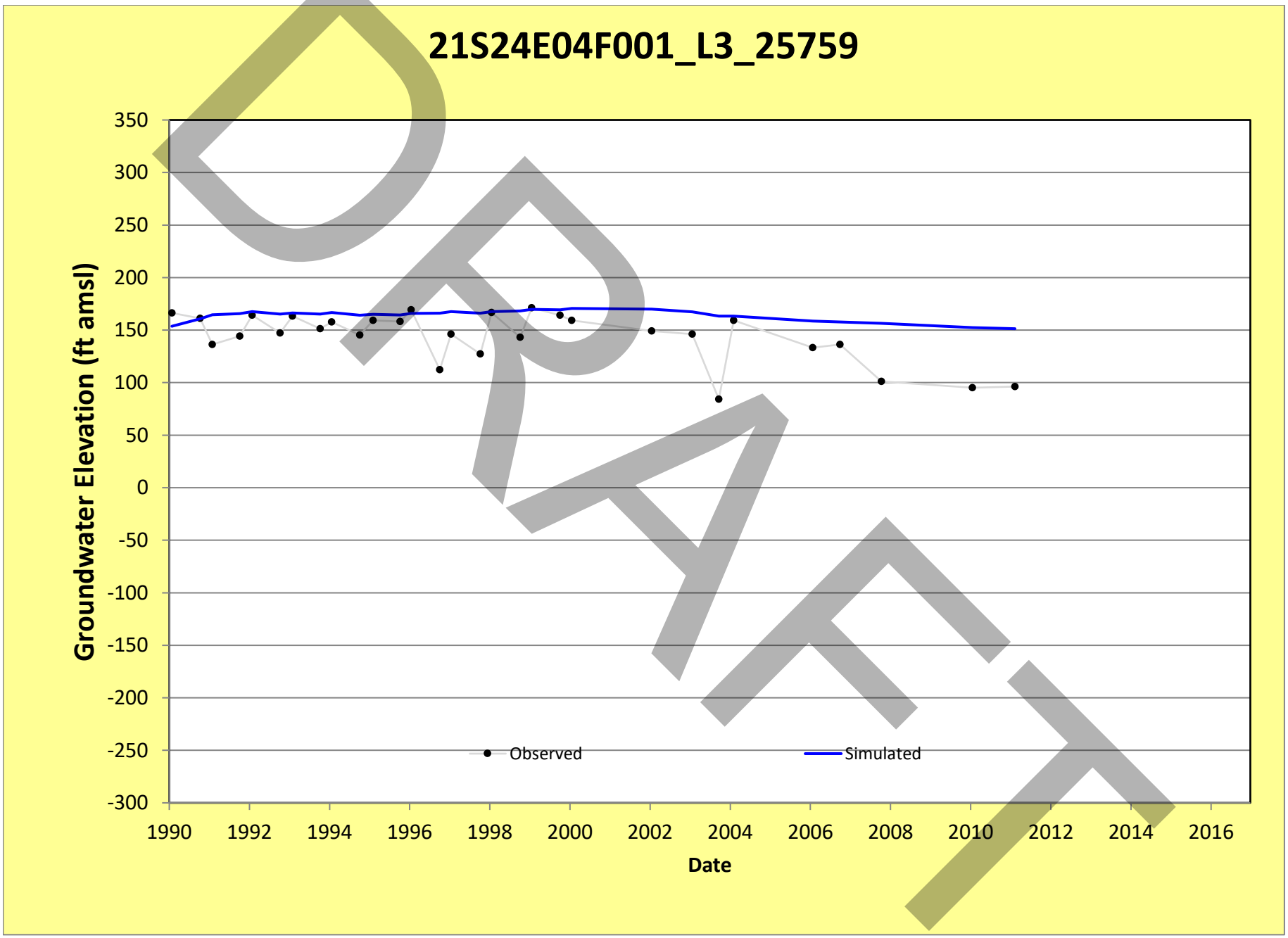
Date
Observed
Simulated
DRAFT


21S24E04F001_L3_25759
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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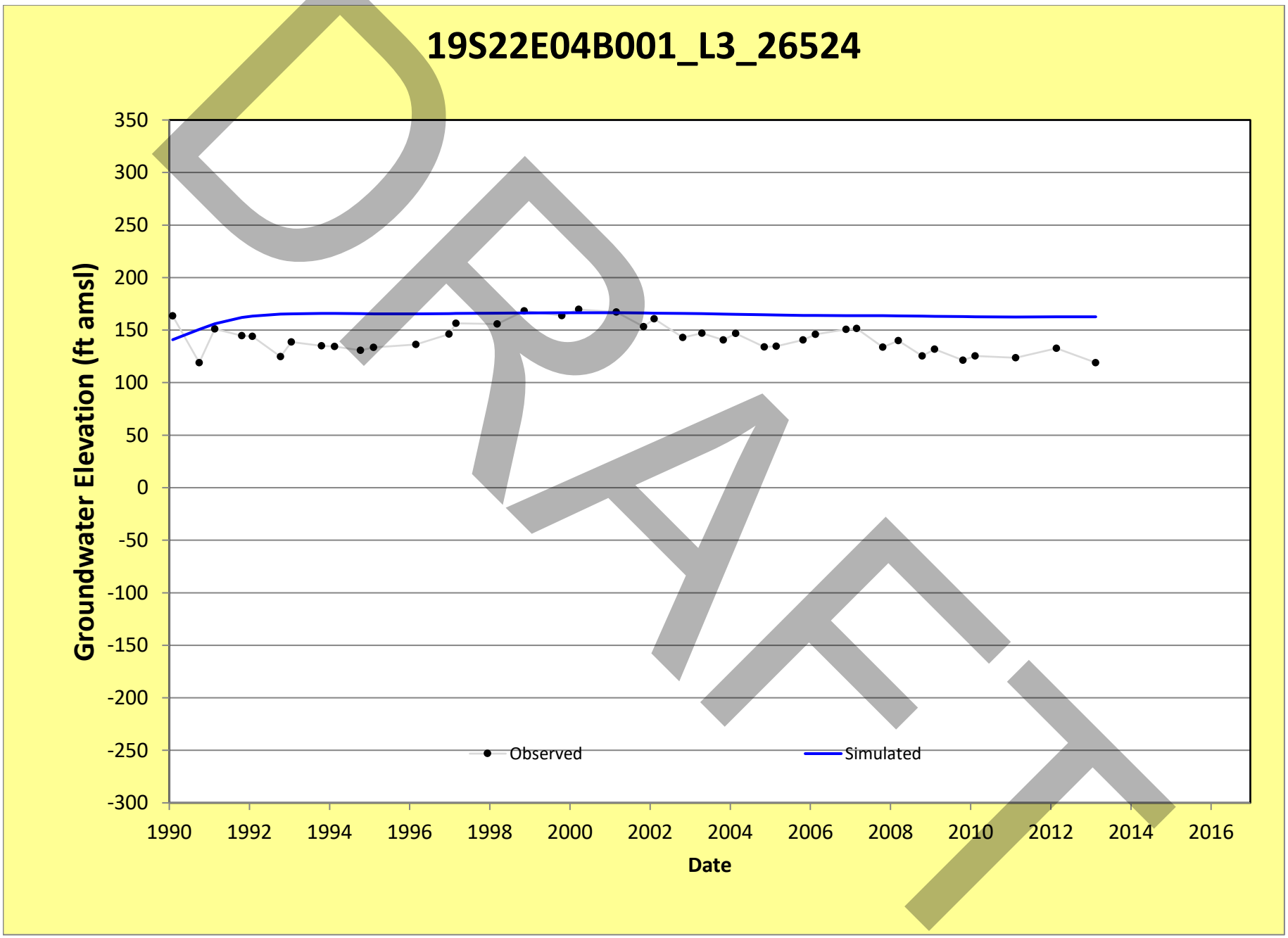
Date
Observed
Simulated
DRAFT


19S22E04B001_L3_26524
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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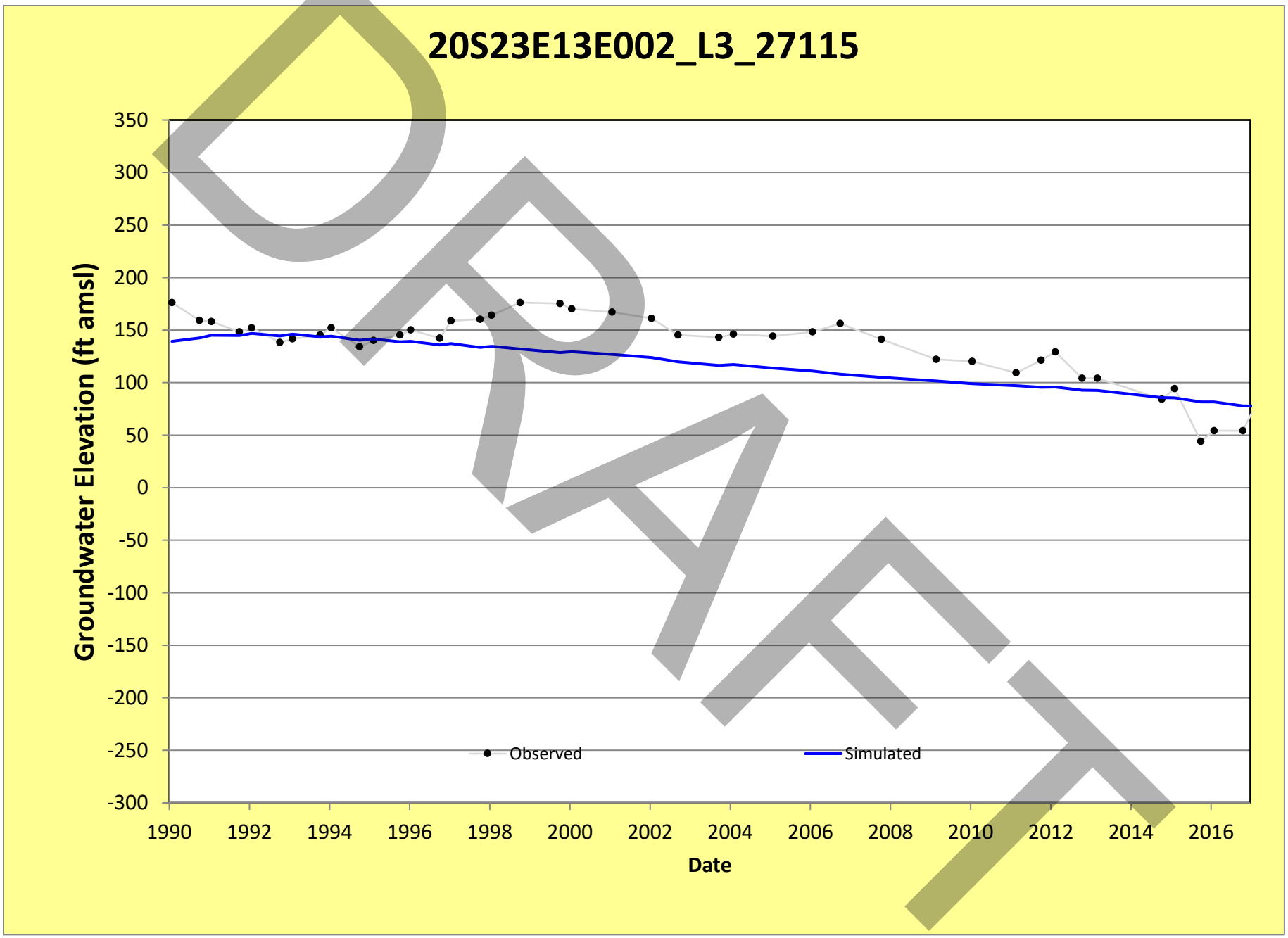
Date
Observed
Simulated

DRAFT


20S23E13E002_L3_27115
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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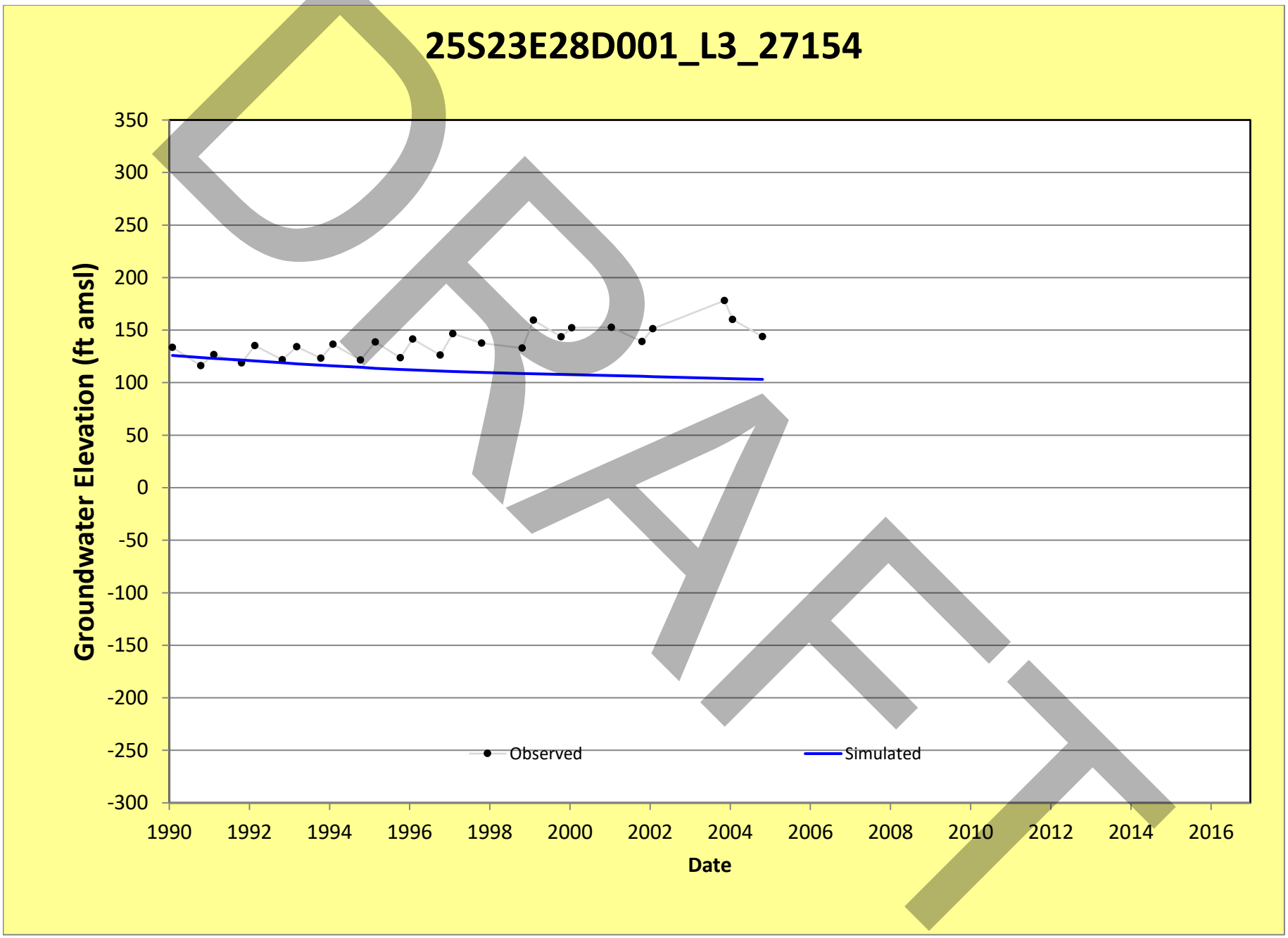
Date
Observed
Simulated
DRAFT


25S23E28D001_L3_27154
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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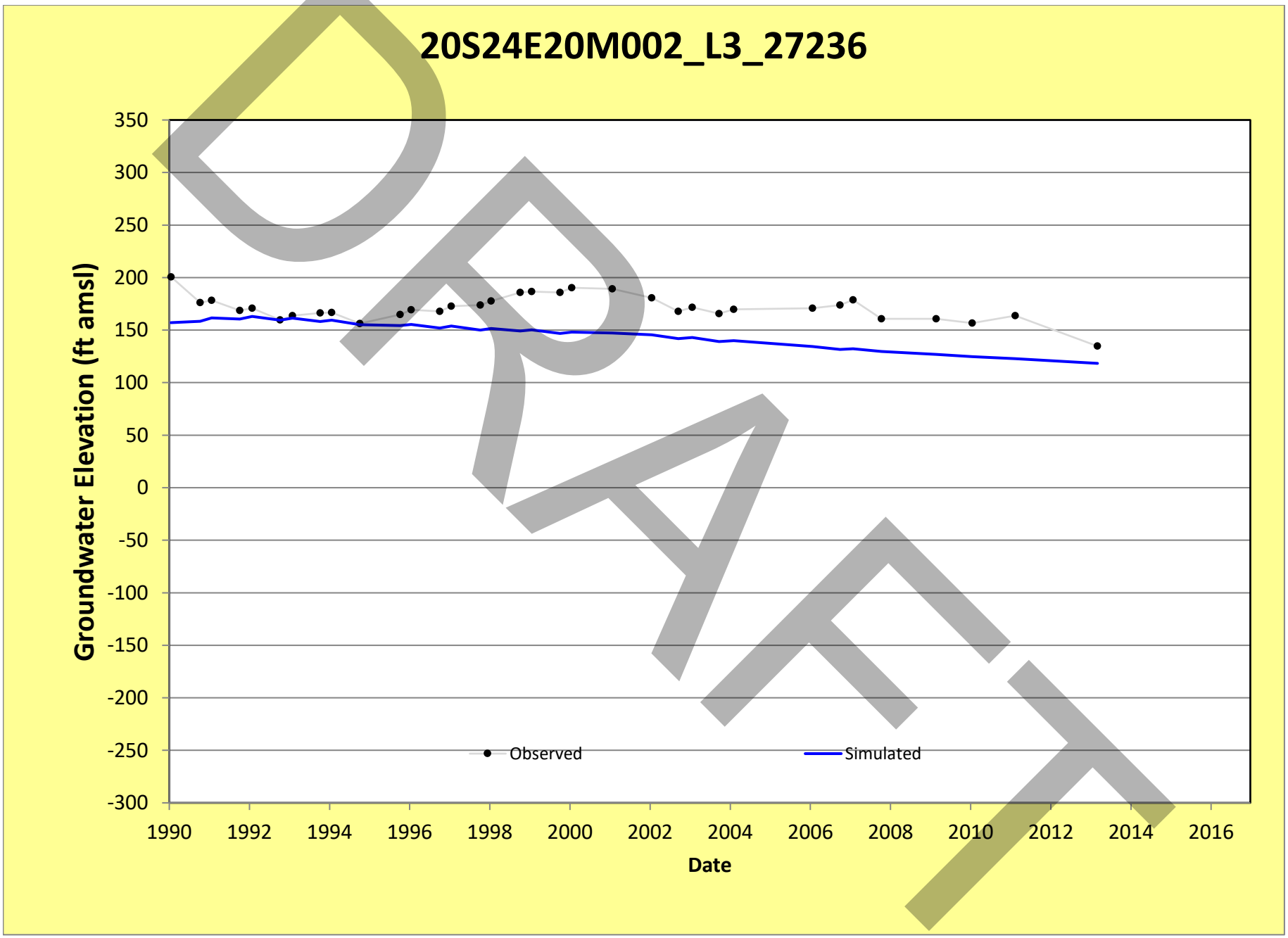
Date
Observed
Simulated
DRAFT


20S24E20M002_L3_27236
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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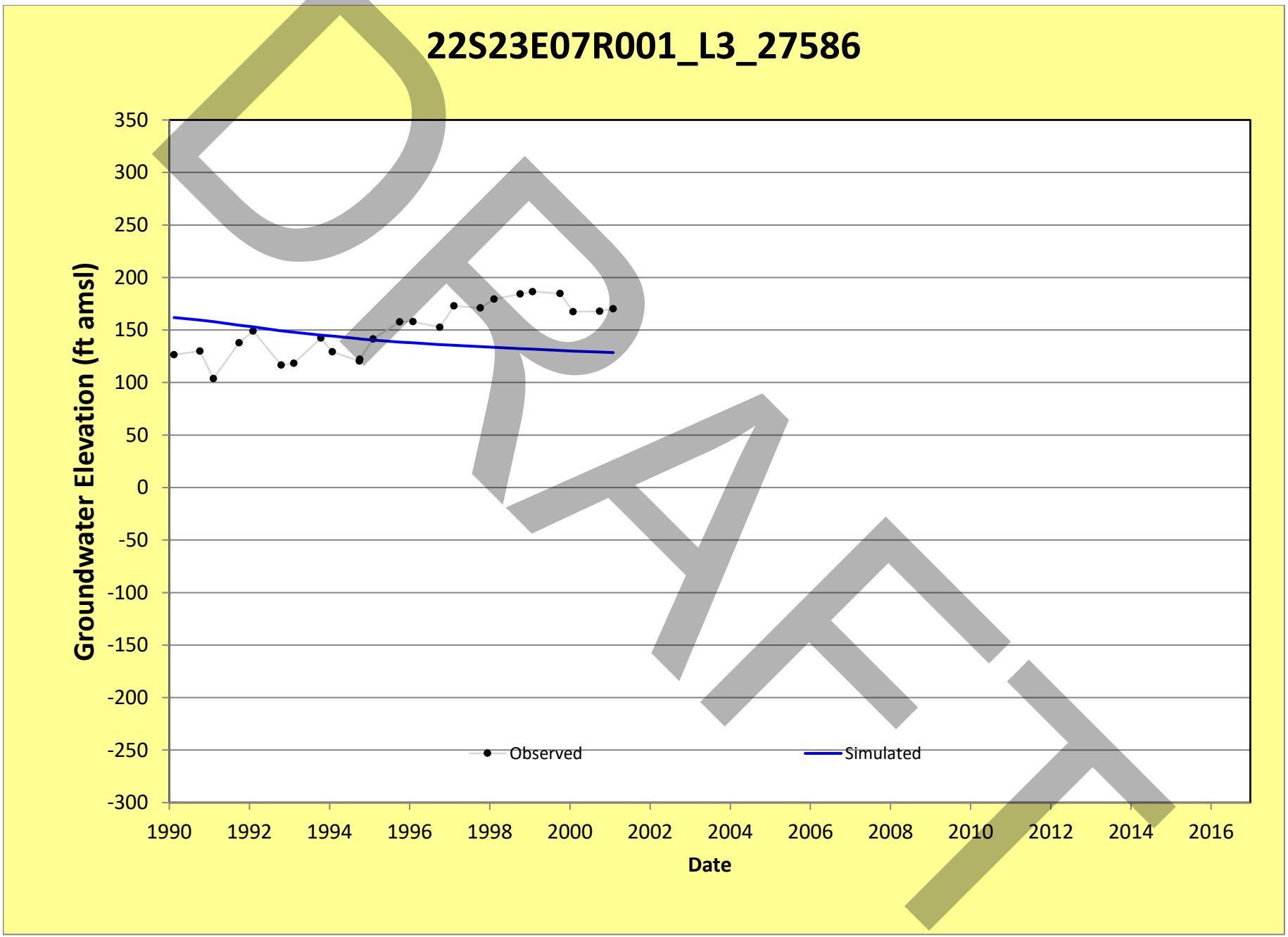
Date
Observed
Simulated
DRAFT


22S23E07R001_L3_27586
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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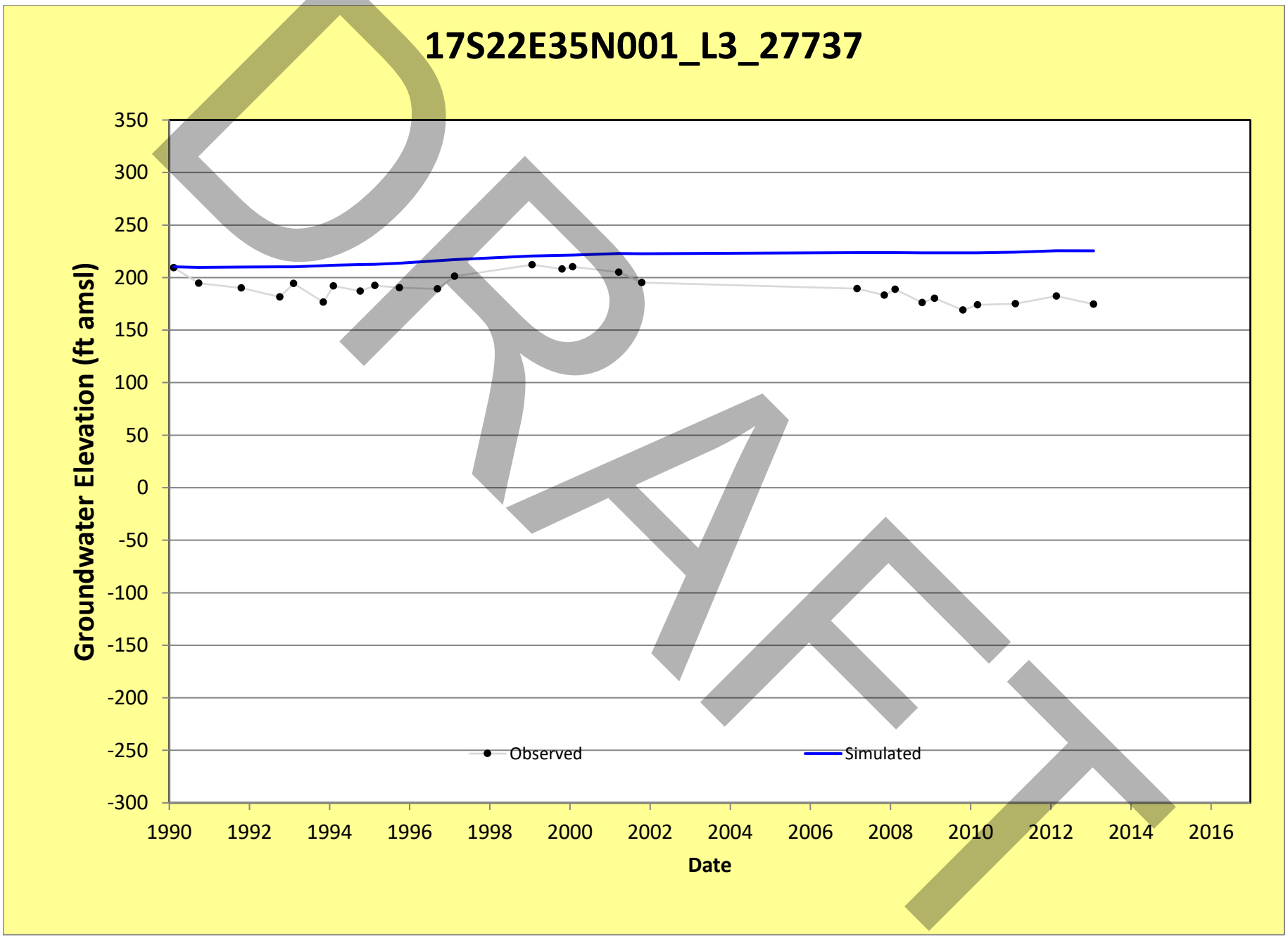
Date
Observed
Simulated
DRAFT


17S22E35N001_L3_27737
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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2012
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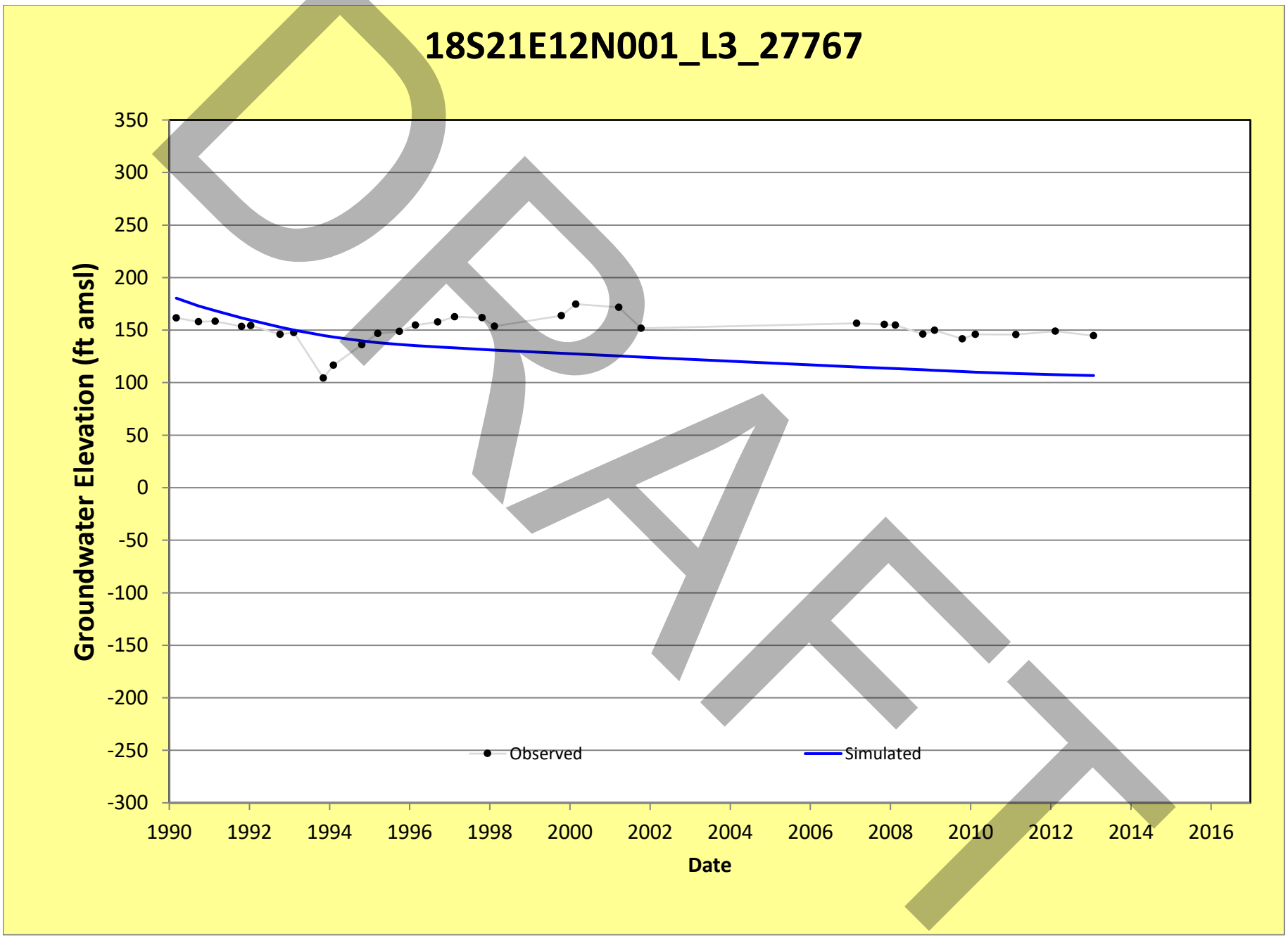
Date
Observed
Simulated
DRAFT


18S21E12N001_L3_27767
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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2012
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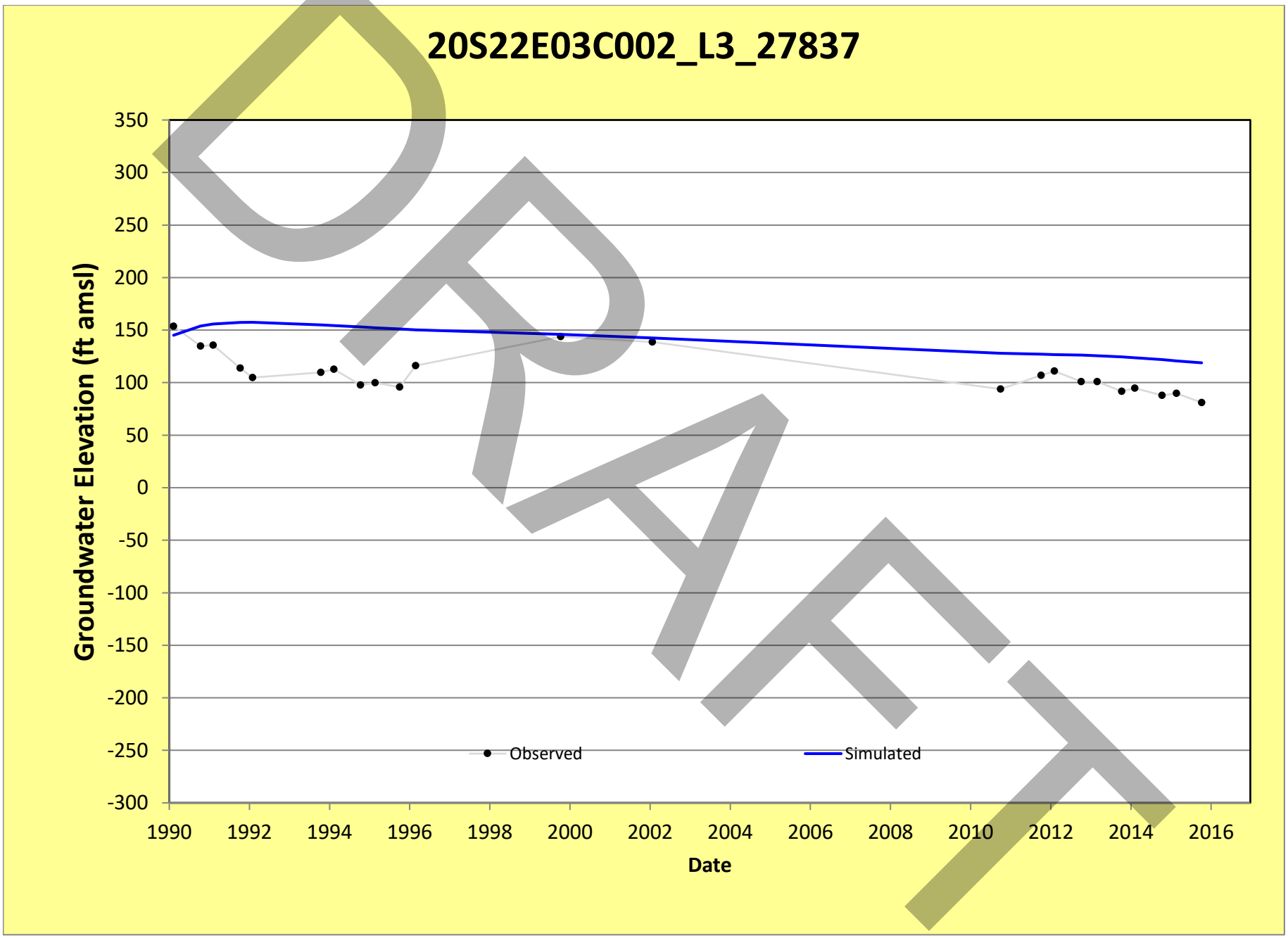
2016
Date
Observed
Simulated
DRAFT


20S22E03C002_L3_27837
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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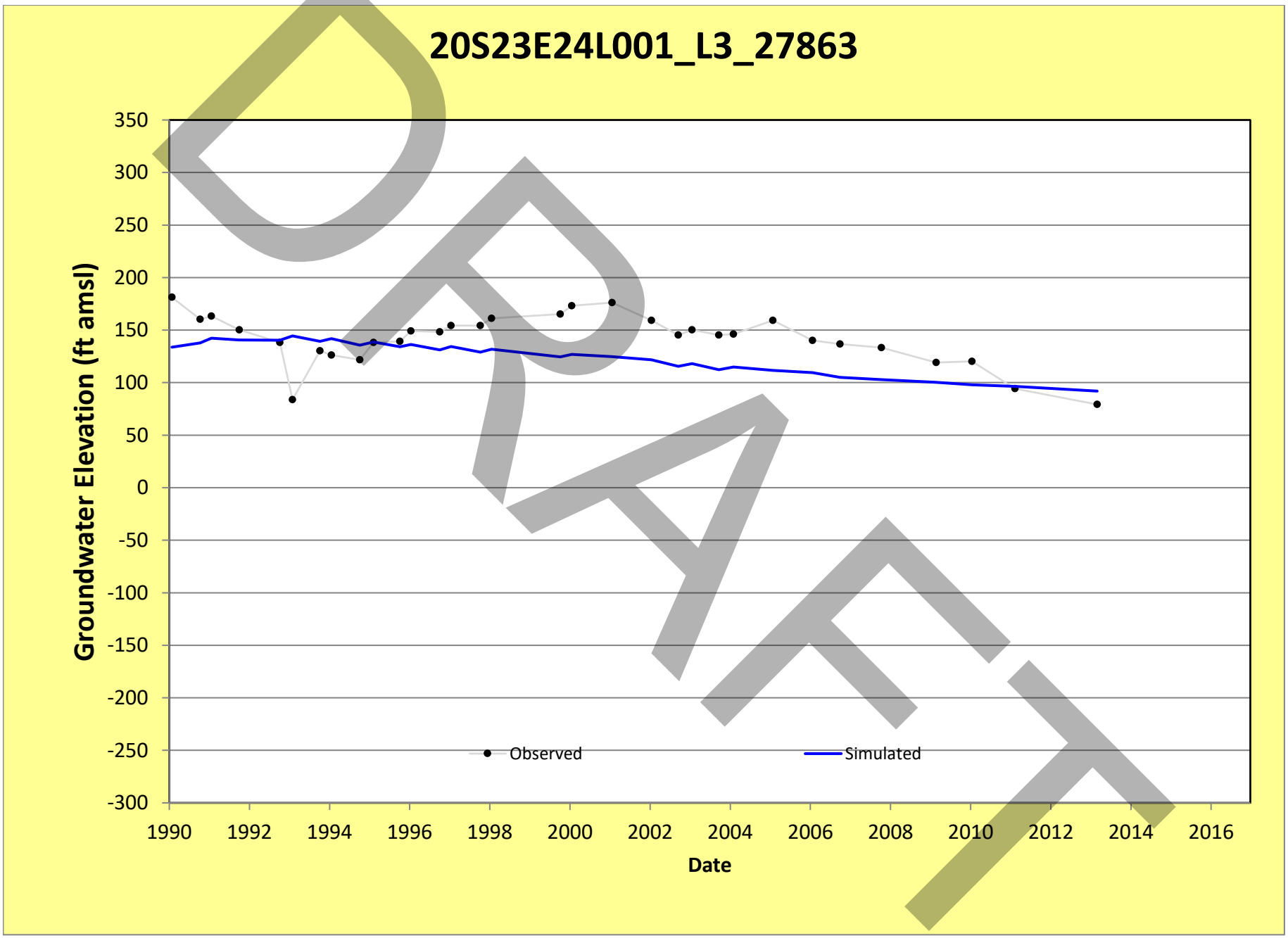
Date
Observed
Simulated
DRAFT


20S23E24L001_L3_27863
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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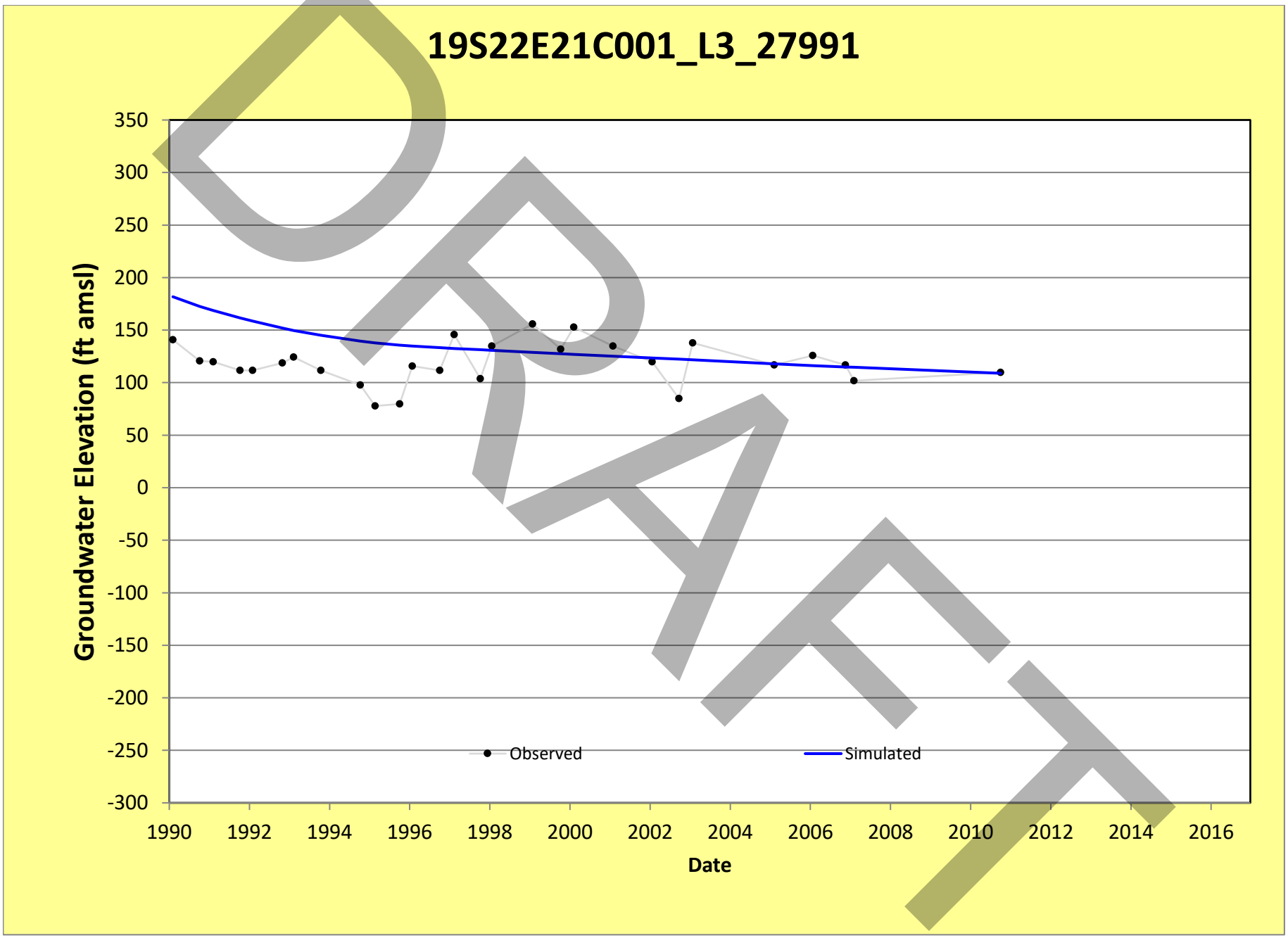
Date
Observed
Simulated
DRAFT


19S22E21C001_L3_27991
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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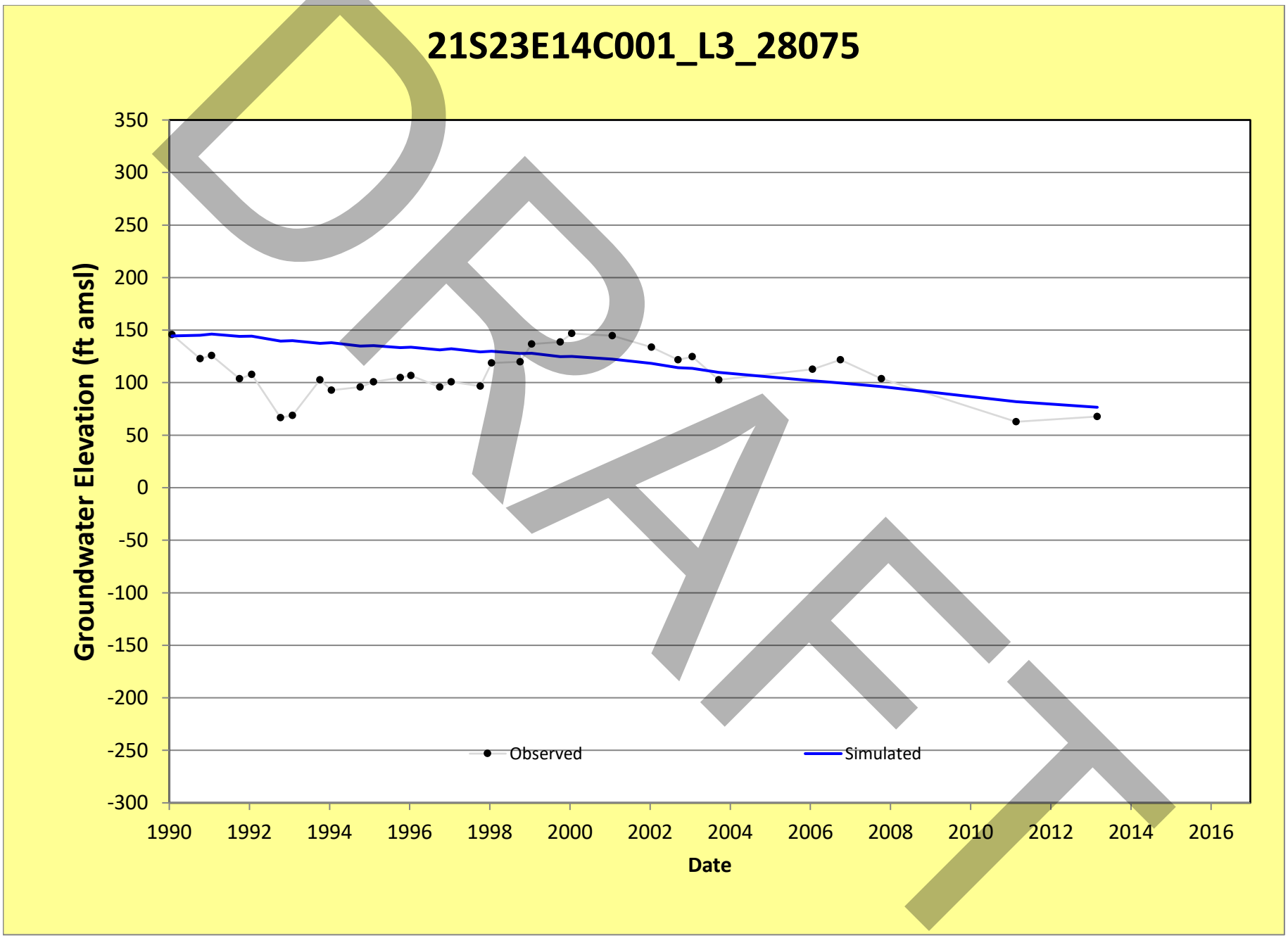
Date
Observed
Simulated
DRAFT


21S23E14C001_L3_28075
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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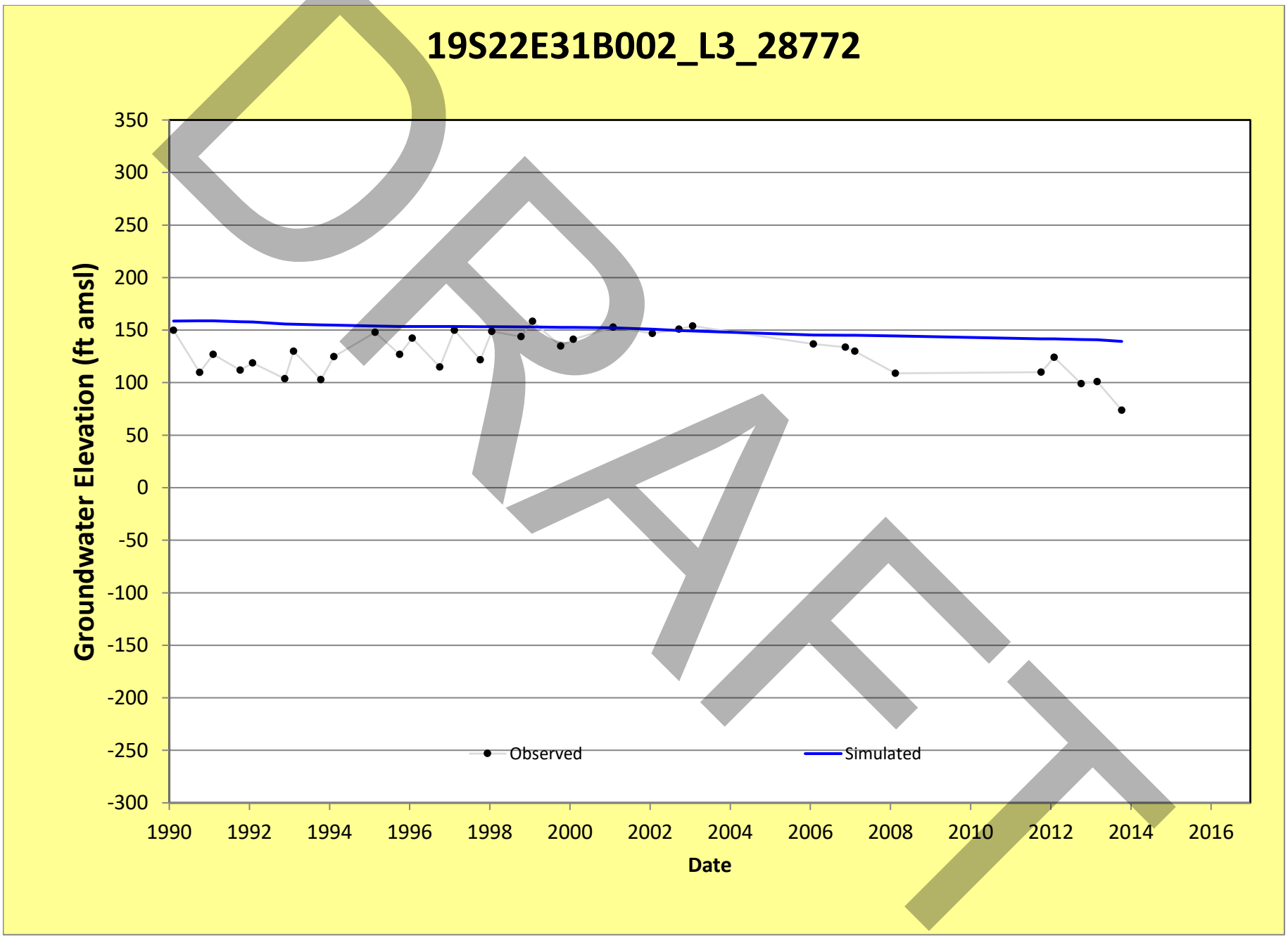
Date
Observed
Simulated
DRAFT


19S22E31B002_L3_28772
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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2012
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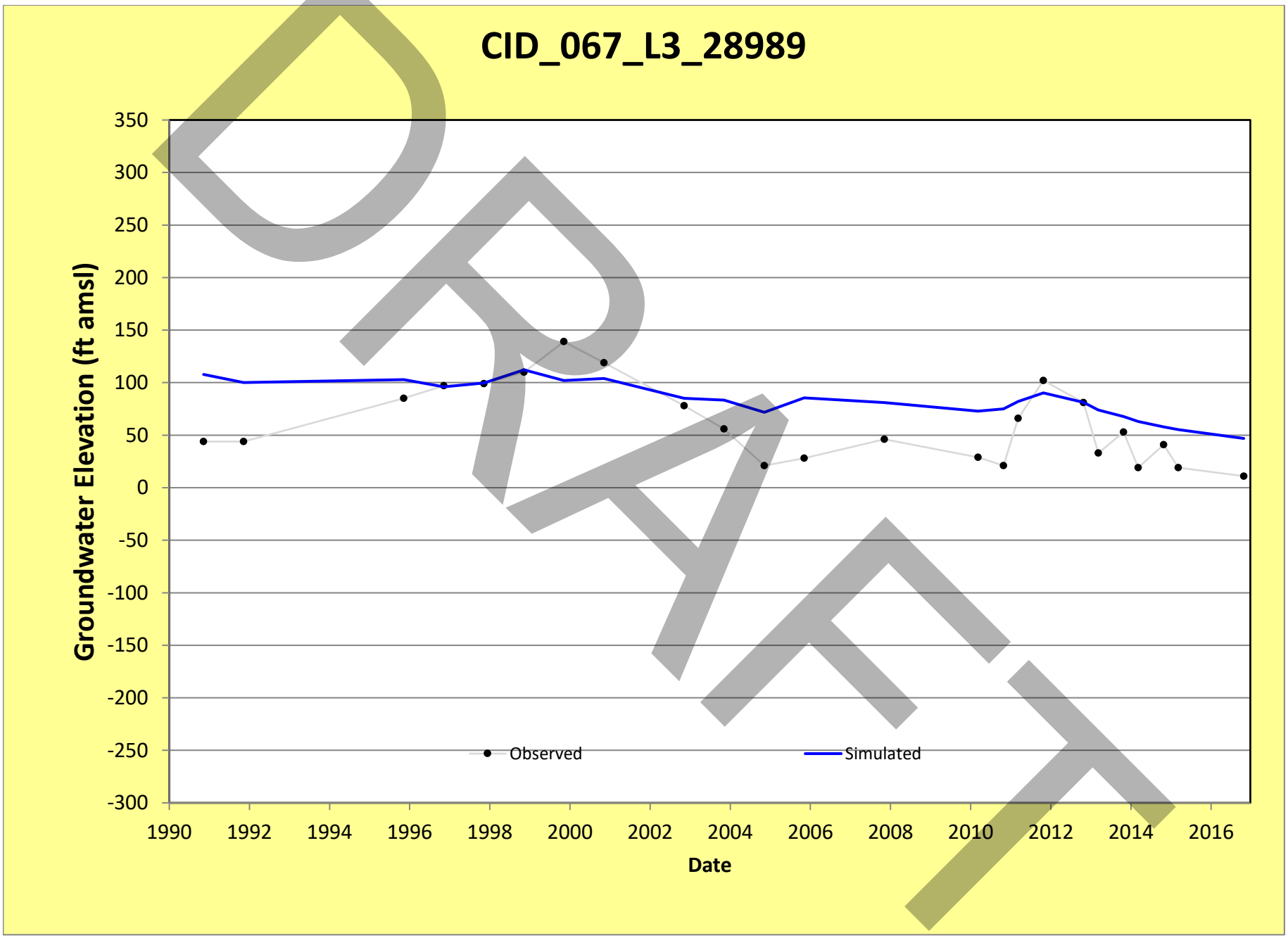
2016
Date
Observed
Simulated
DRAFT


CID_067_L3_28989
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
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-200
-250
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1990
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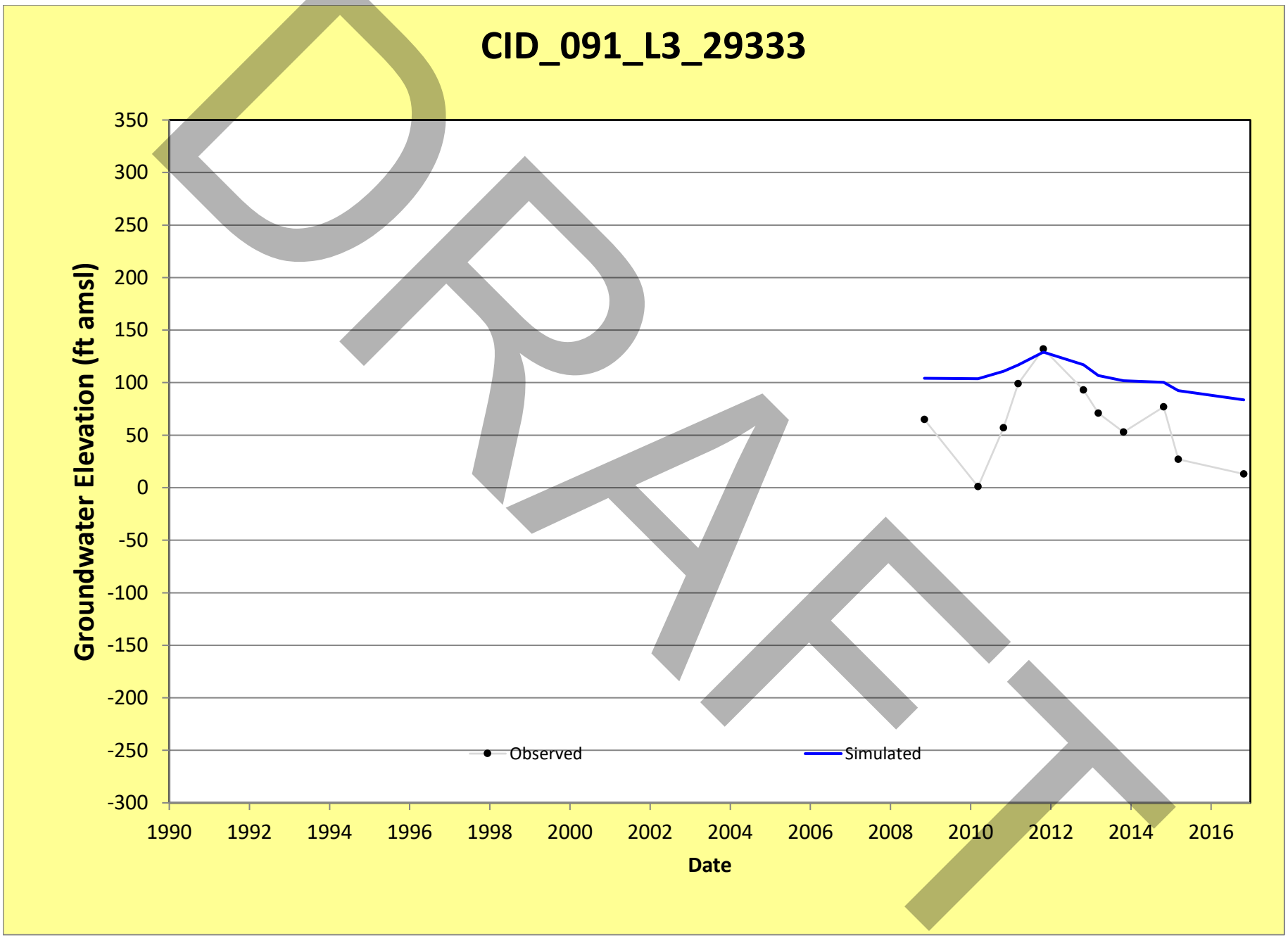
2016
Date
Observed
Simulated
DRAFT


CID_091_L3_29333
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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2012
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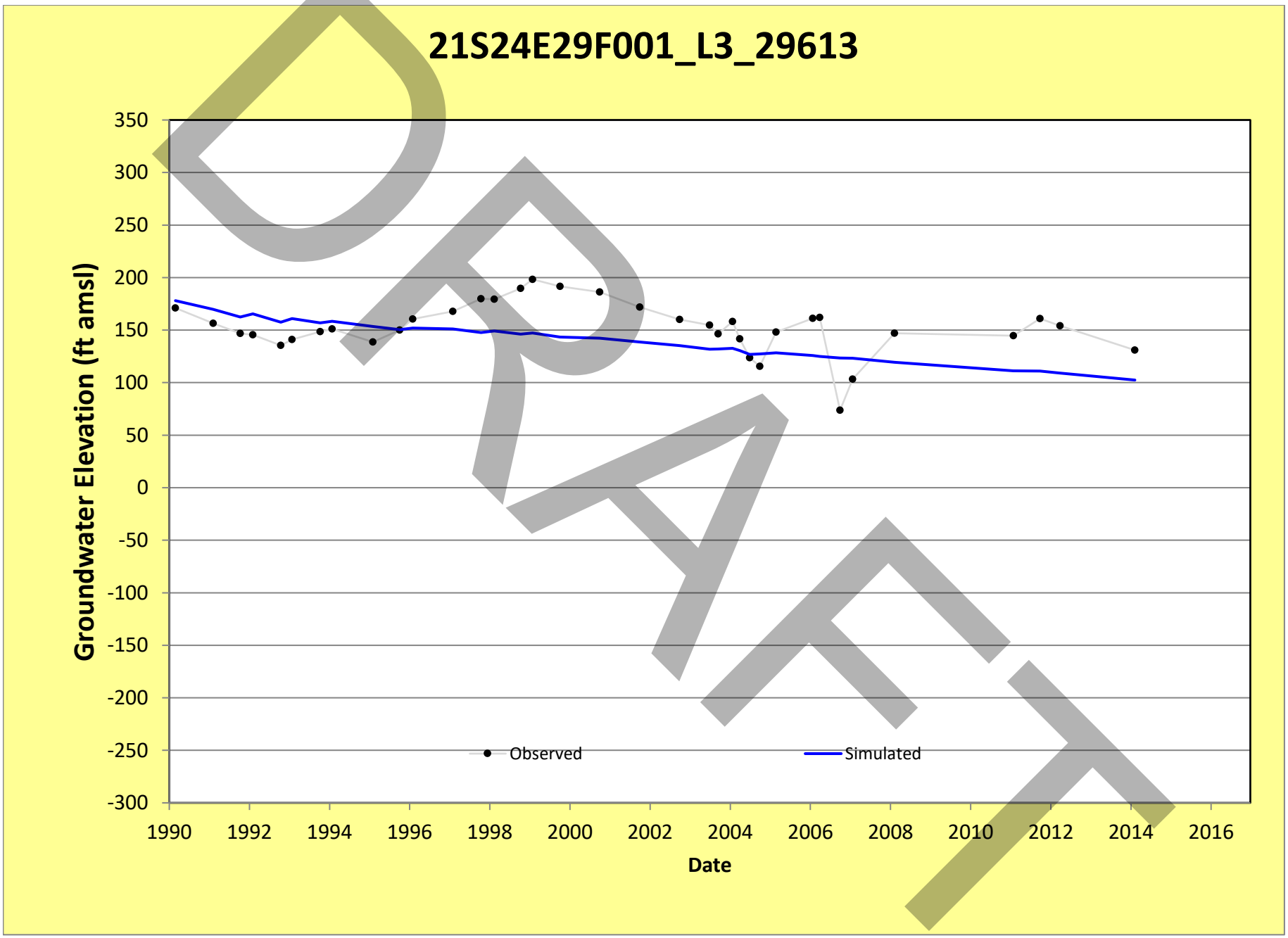
2016
Date
Observed
Simulated
DRAFT


21S24E29F001_L3_29613
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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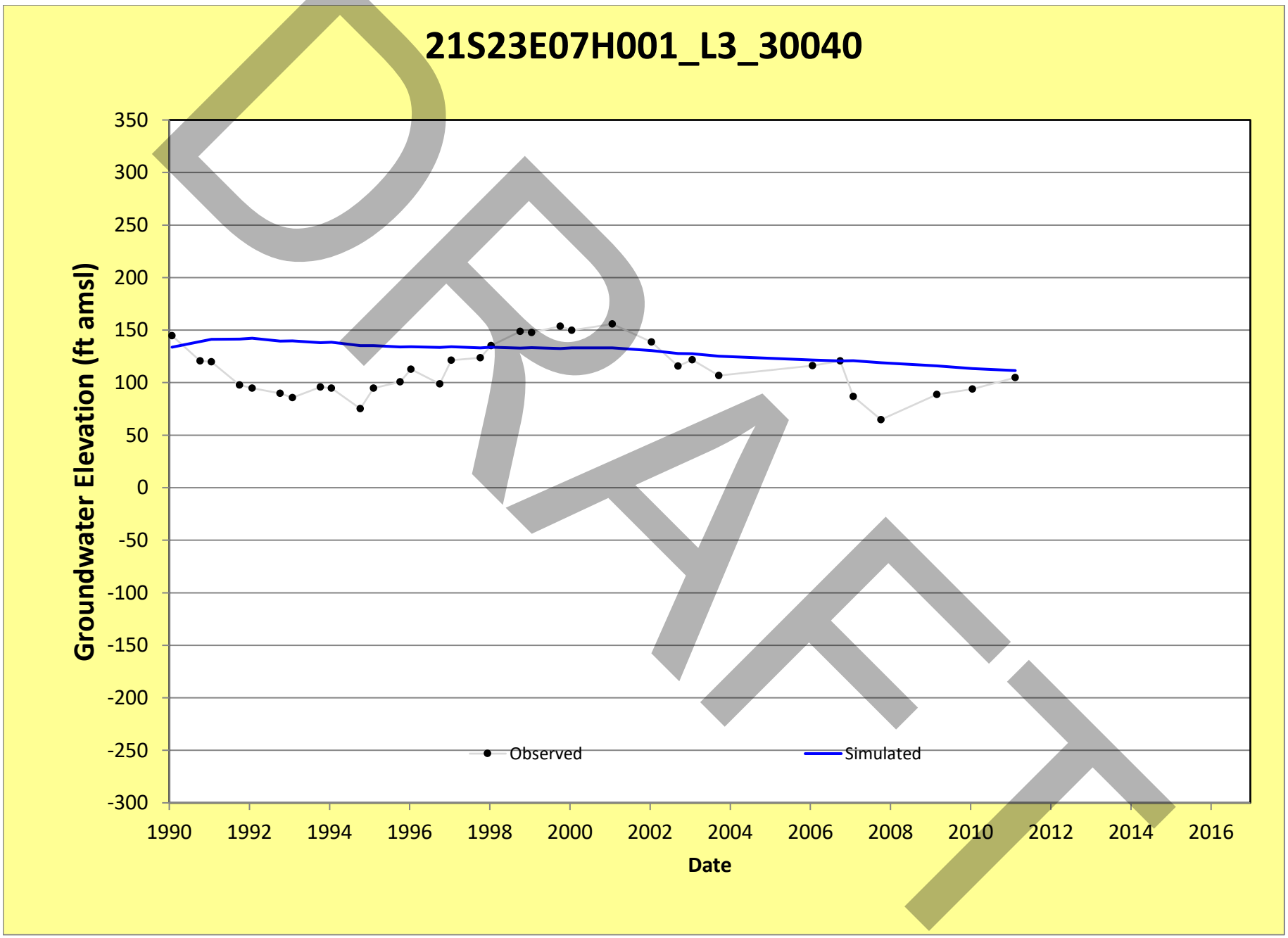
2016
Date
Observed
Simulated
DRAFT


21S23E07H001_L3_30040
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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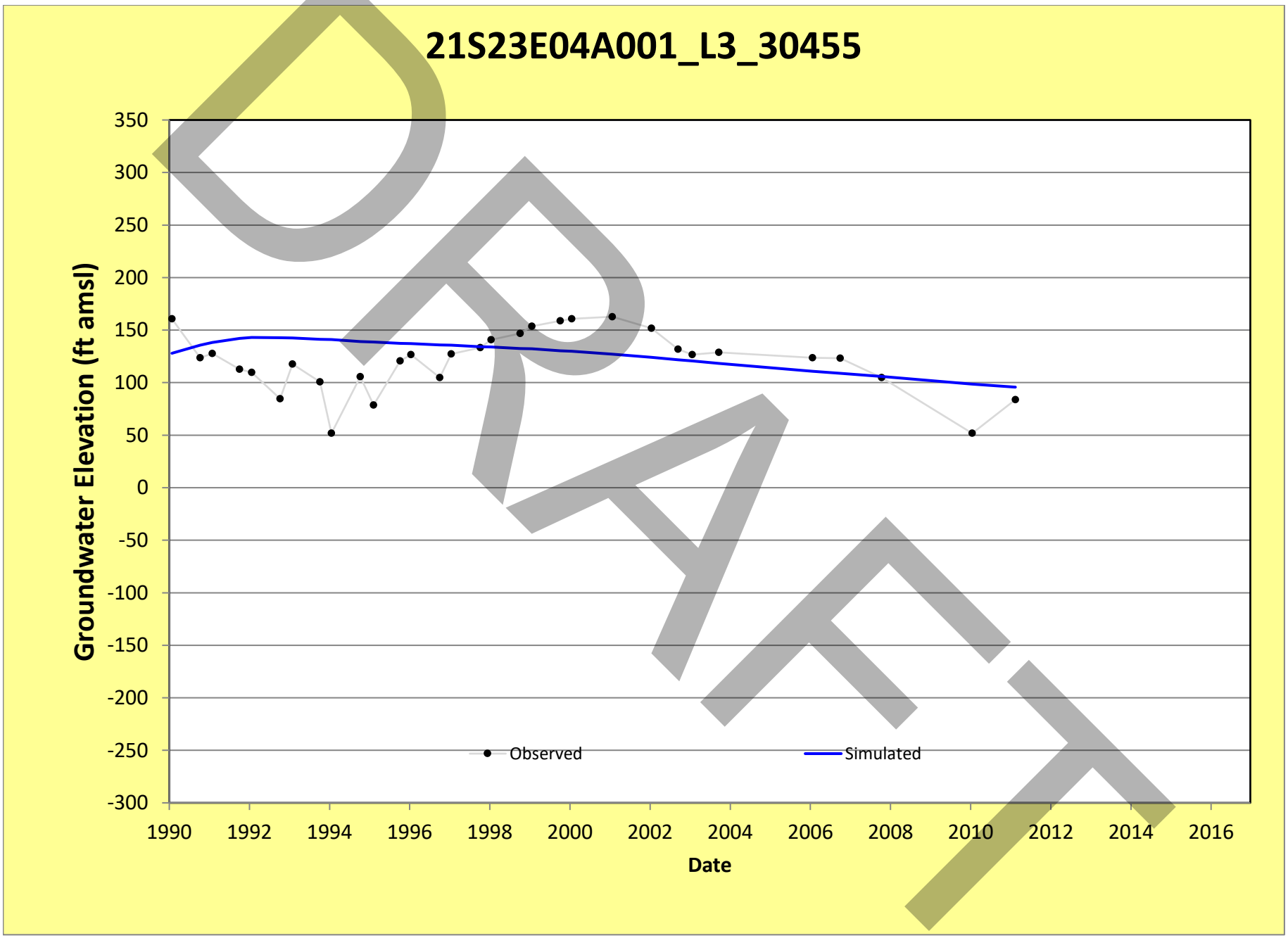
Date
Observed
Simulated
DRAFT


21S23E04A001_L3_30455
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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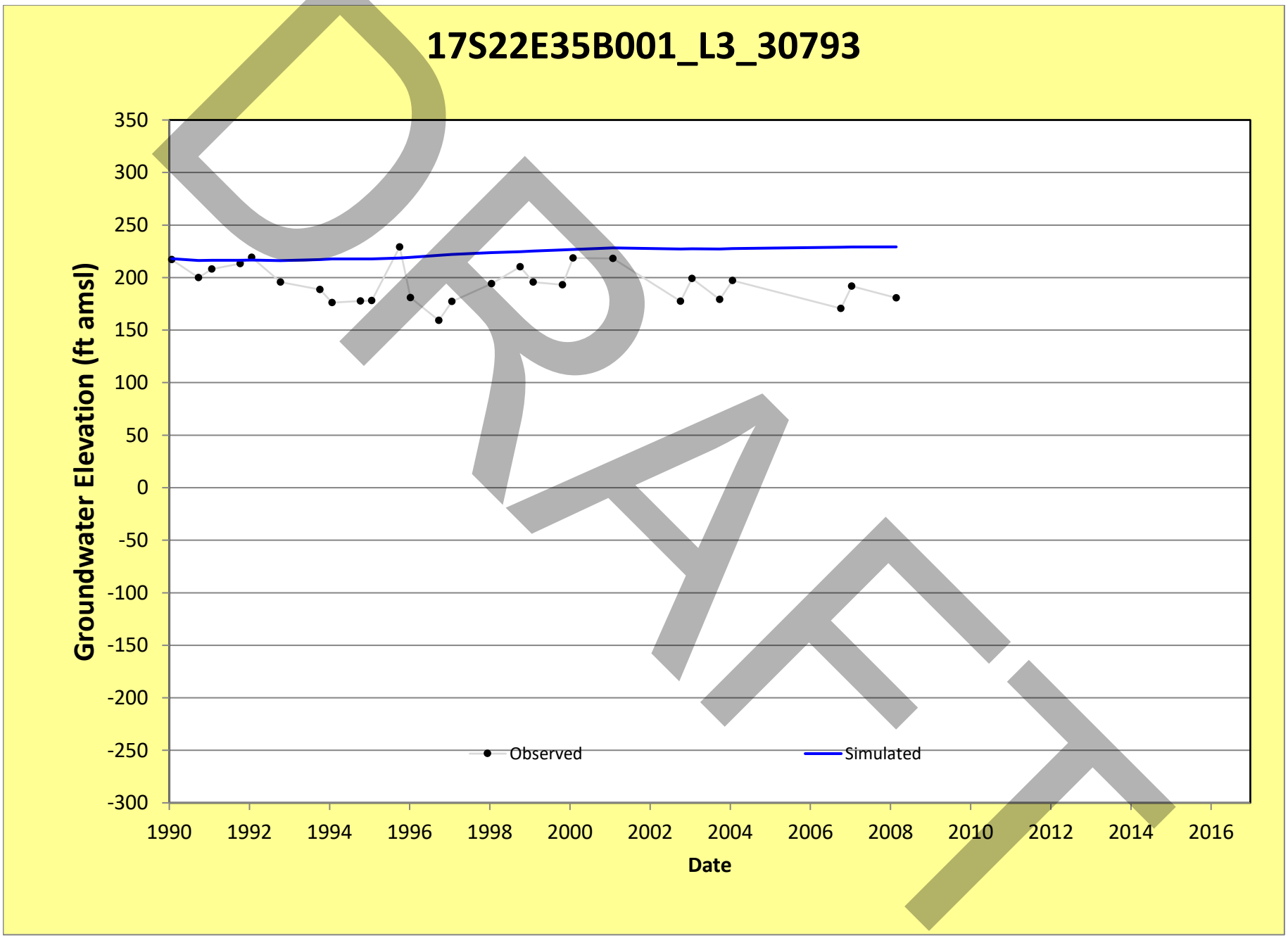
Date
Observed
Simulated
DRAFT


17S22E35B001_L3_30793
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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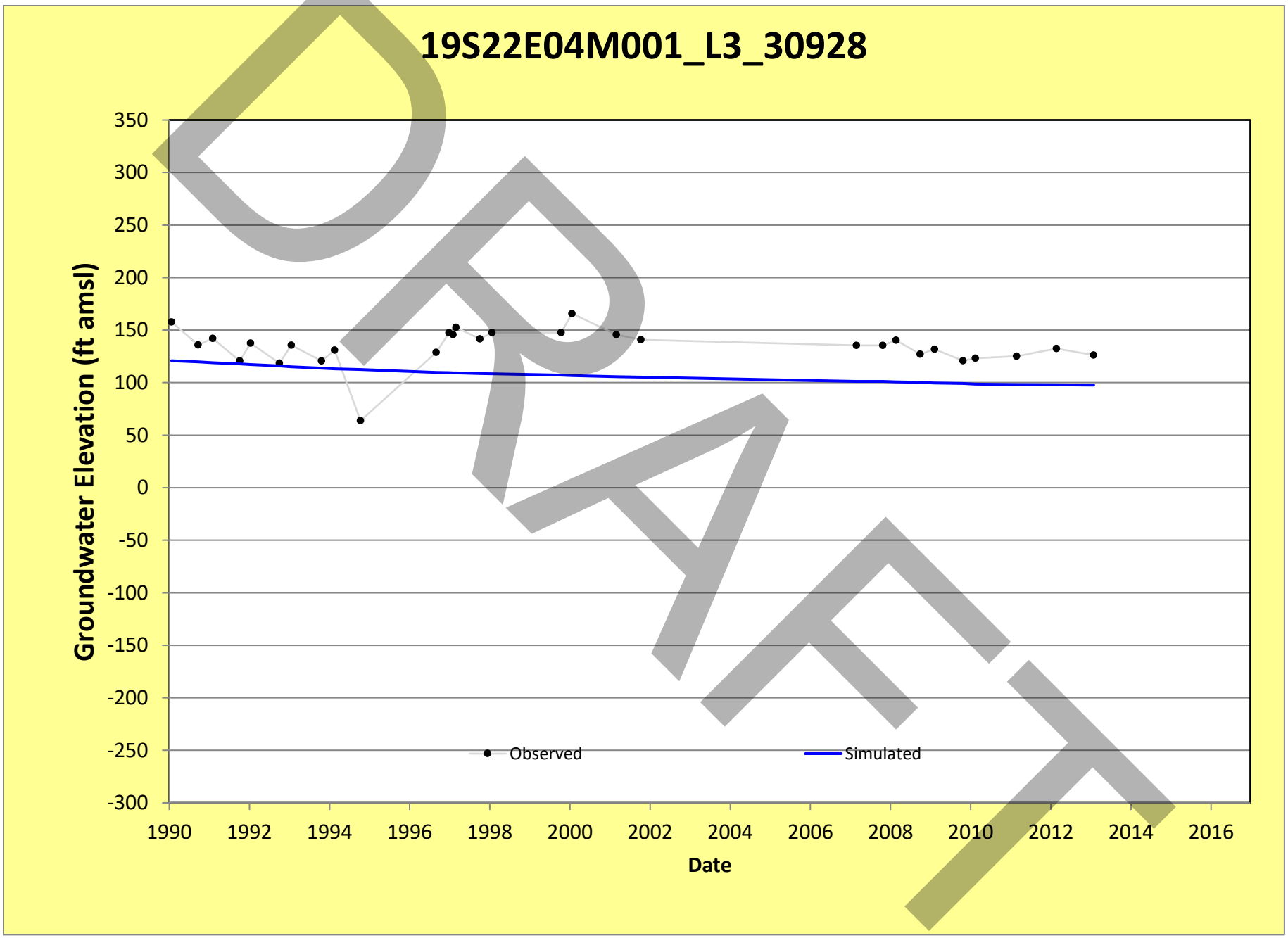
Date
Observed
Simulated
DRAFT


19S22E04M001_L3_30928
Groundwater Elevation (ft amsl)
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250
200
150
100
50
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-50
-100
-150
-200
-250
-300
1990
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Date
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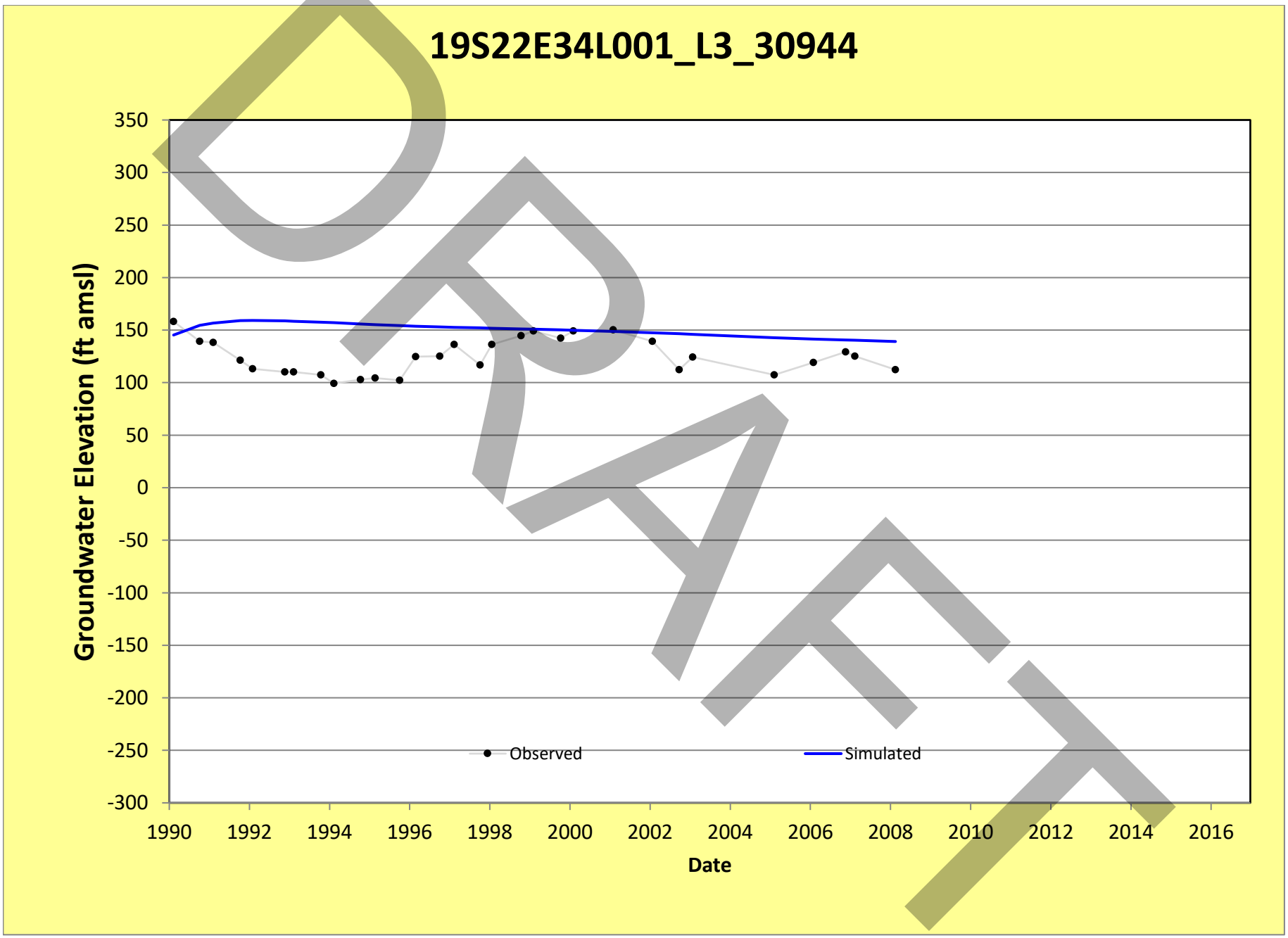
19S22E34L001_L3_30944
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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Observed
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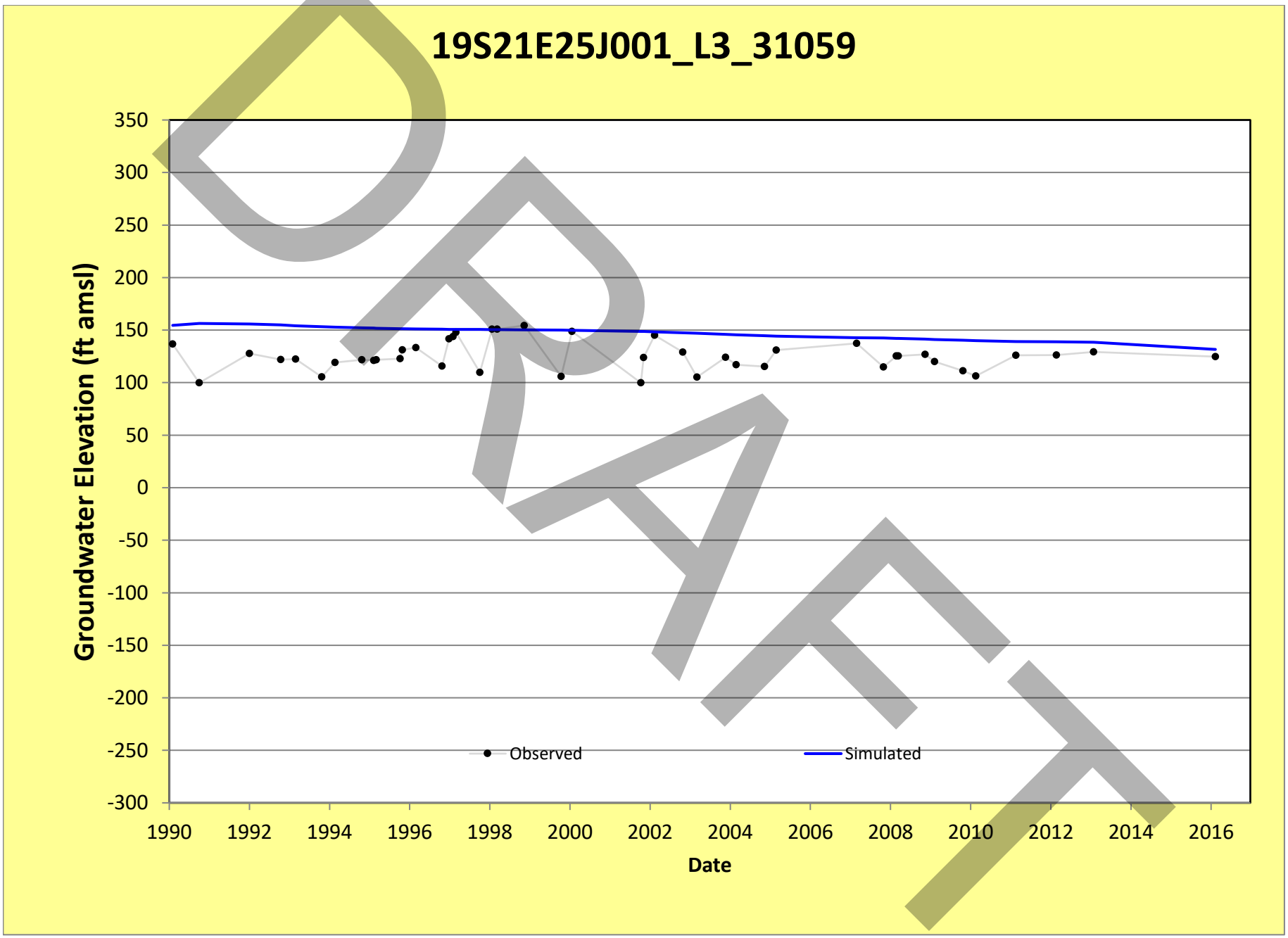
19S21E25J001_L3_31059
Groundwater Elevation (ft amsl)
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200
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-50
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-150
-200
-250
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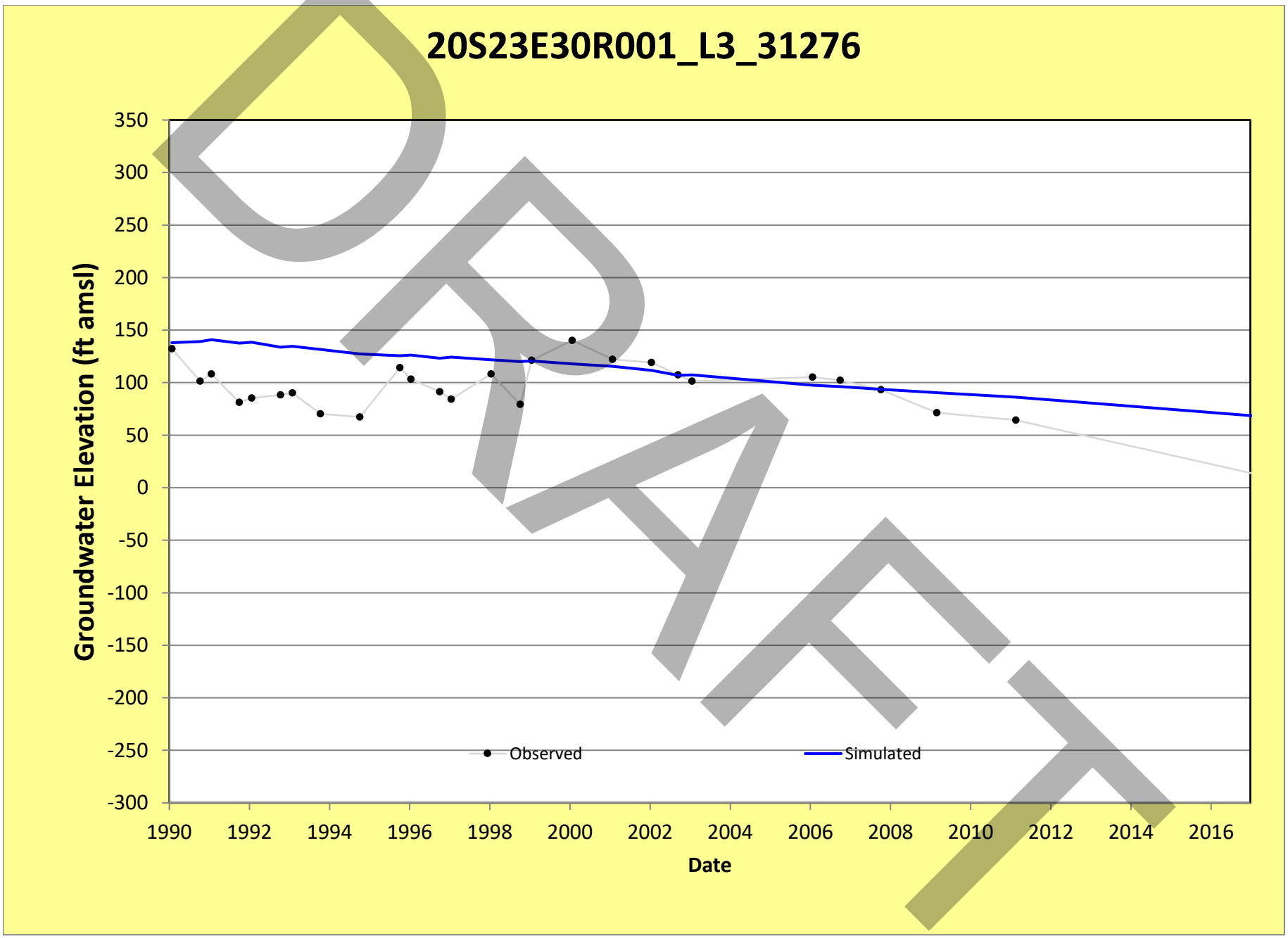
20S23E30R001_L3_31276
Groundwater Elevation (ft amsl)
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250
200
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0
-50
-100
-150
-200
-250
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Observed
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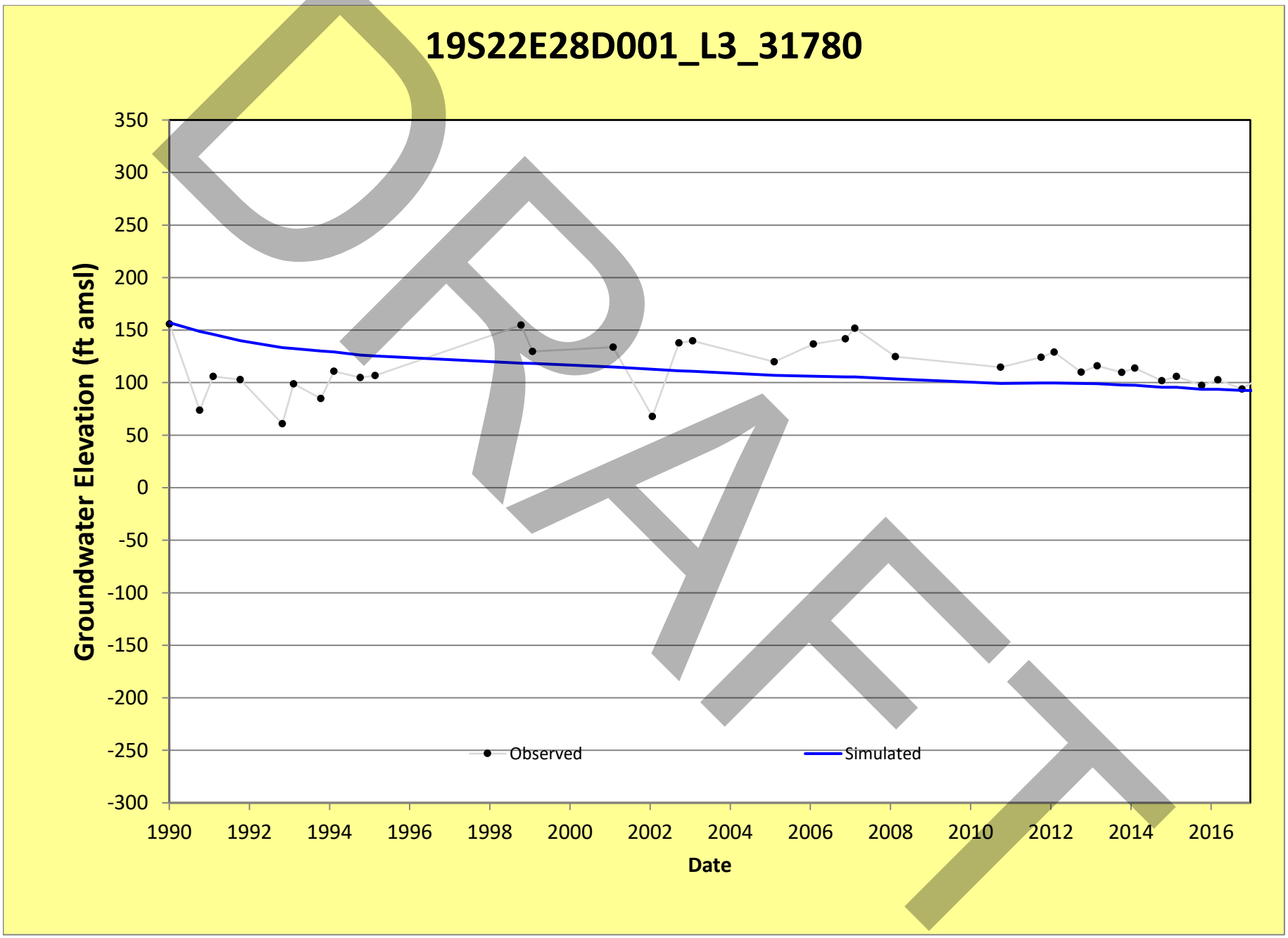
19S22E28D001_L3_31780
Groundwater Elevation (ft amsl)
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300
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200
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100
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0
-50
-100
-150
-200
-250
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Observed
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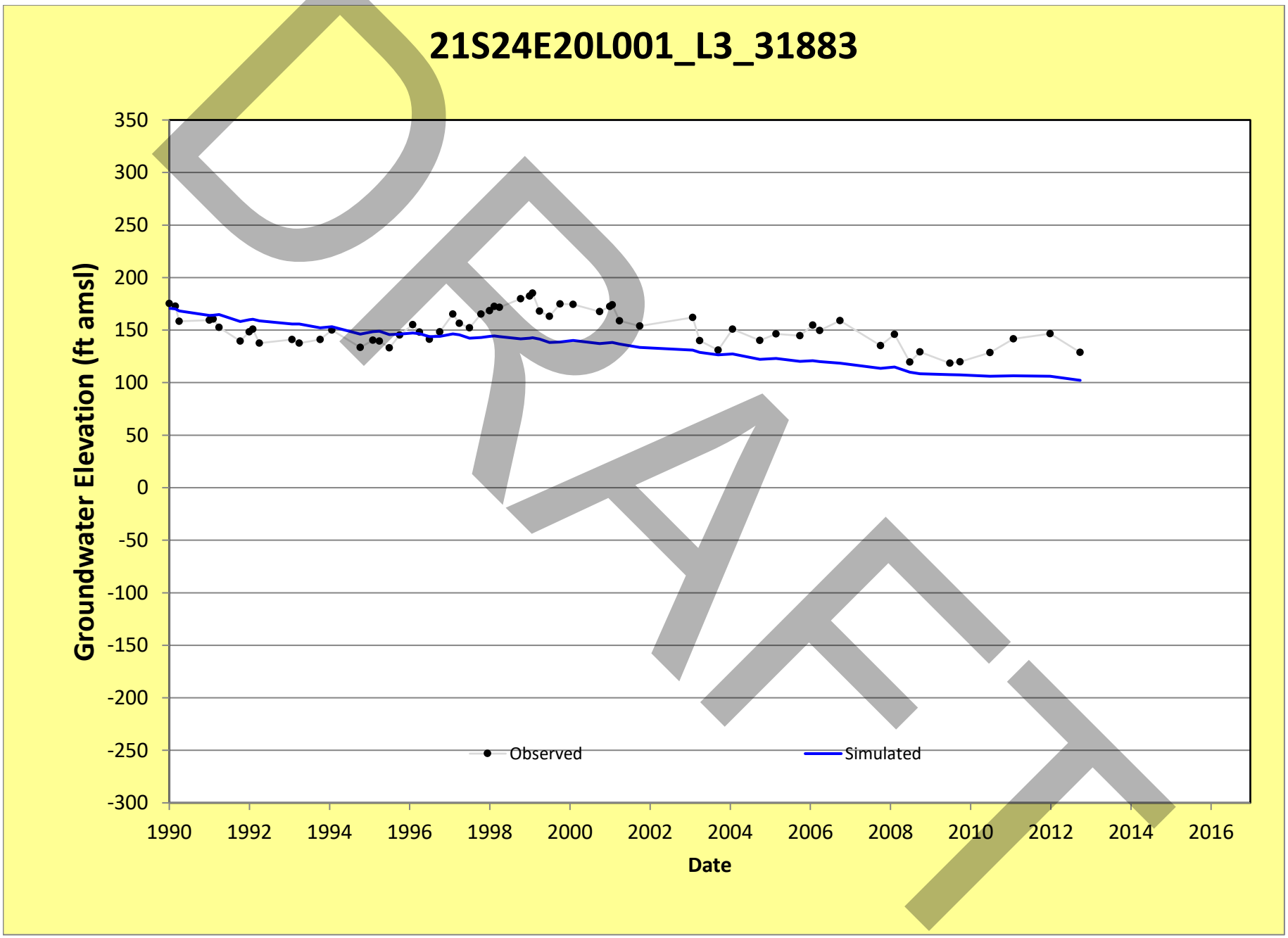
21S24E20L001_L3_31883
Groundwater Elevation (ft amsl)
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0
-50
-100
-150
-200
-250
-300
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Observed
Simulated
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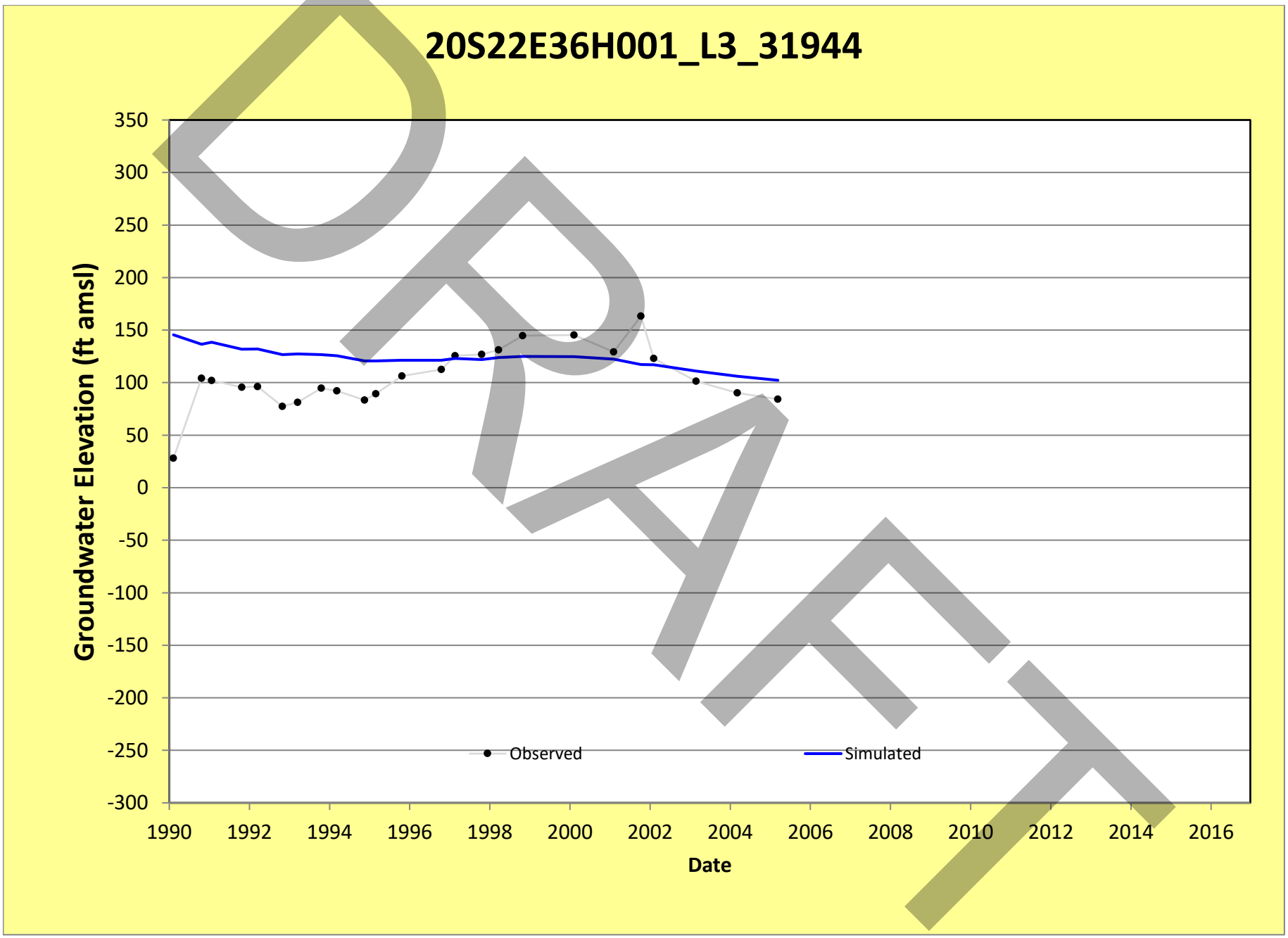
20S22E36H001_L3_31944
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
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Observed
Simulated
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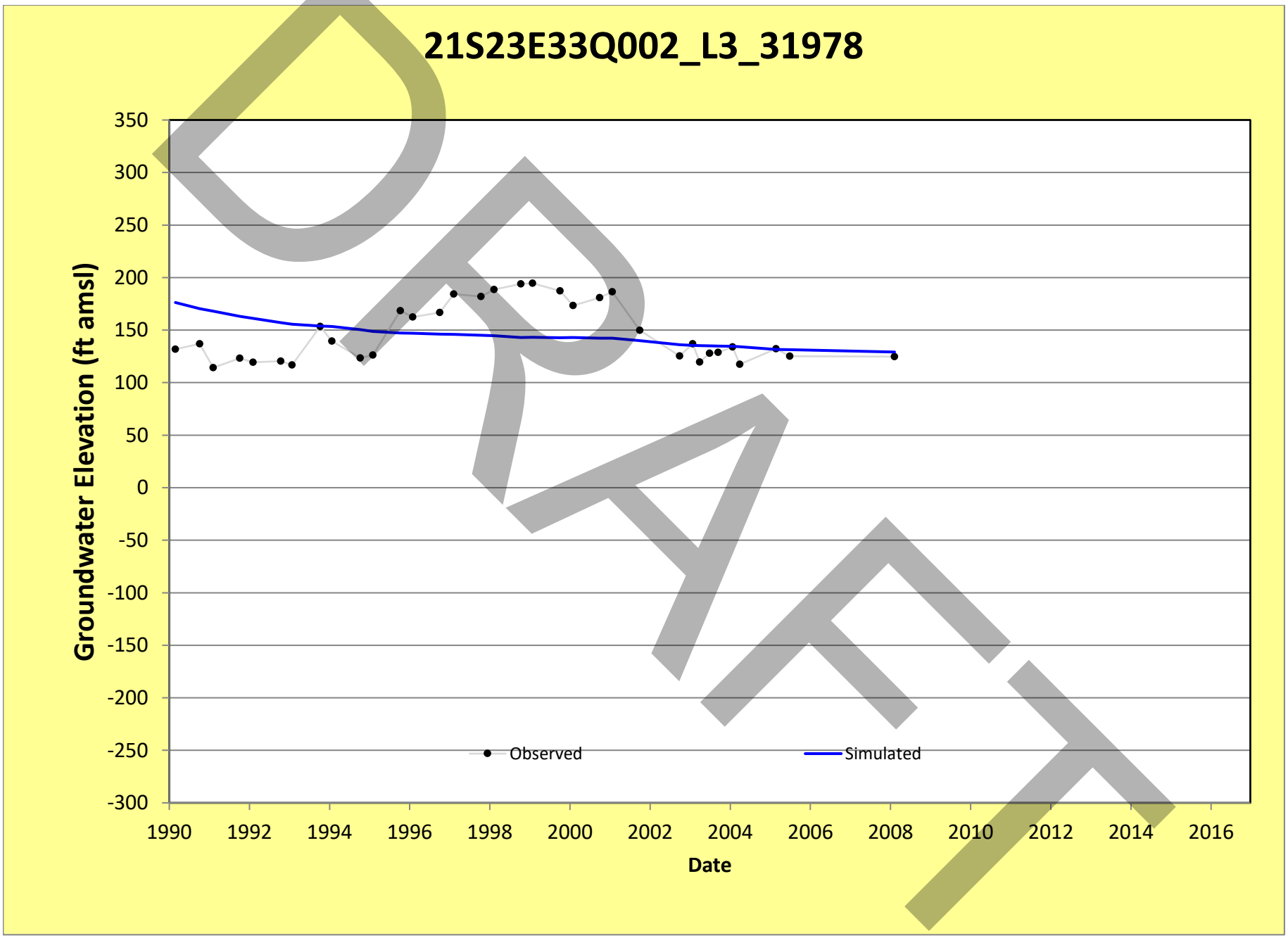
21S23E33Q002_L3_31978
Groundwater Elevation (ft amsl)
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300
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200
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100
50
0
-50
-100
-150
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Simulated
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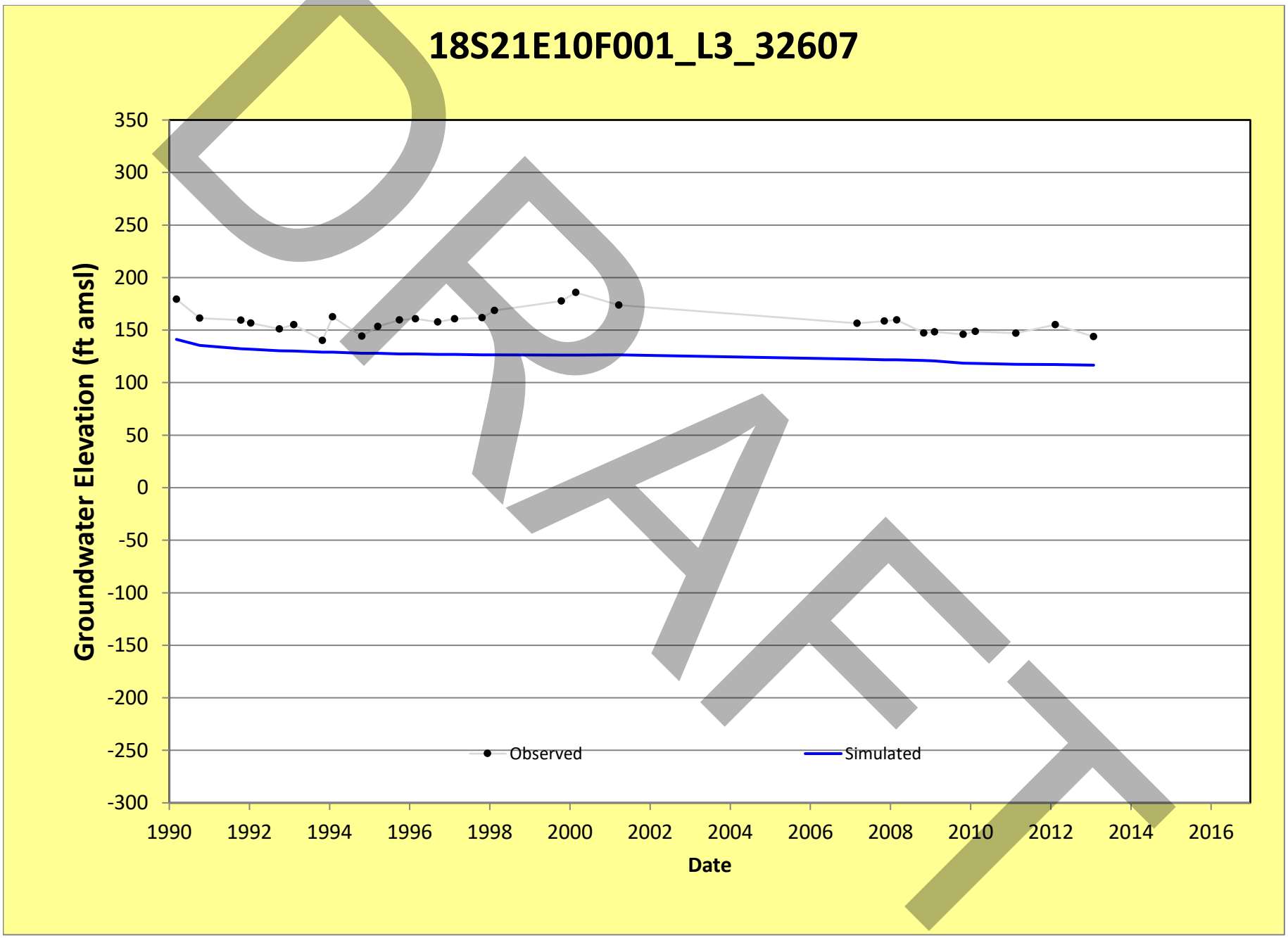
18S21E10F001_L3_32607
Groundwater Elevation (ft amsl)
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100
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-50
-100
-150
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-250
-300
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Observed
Simulated
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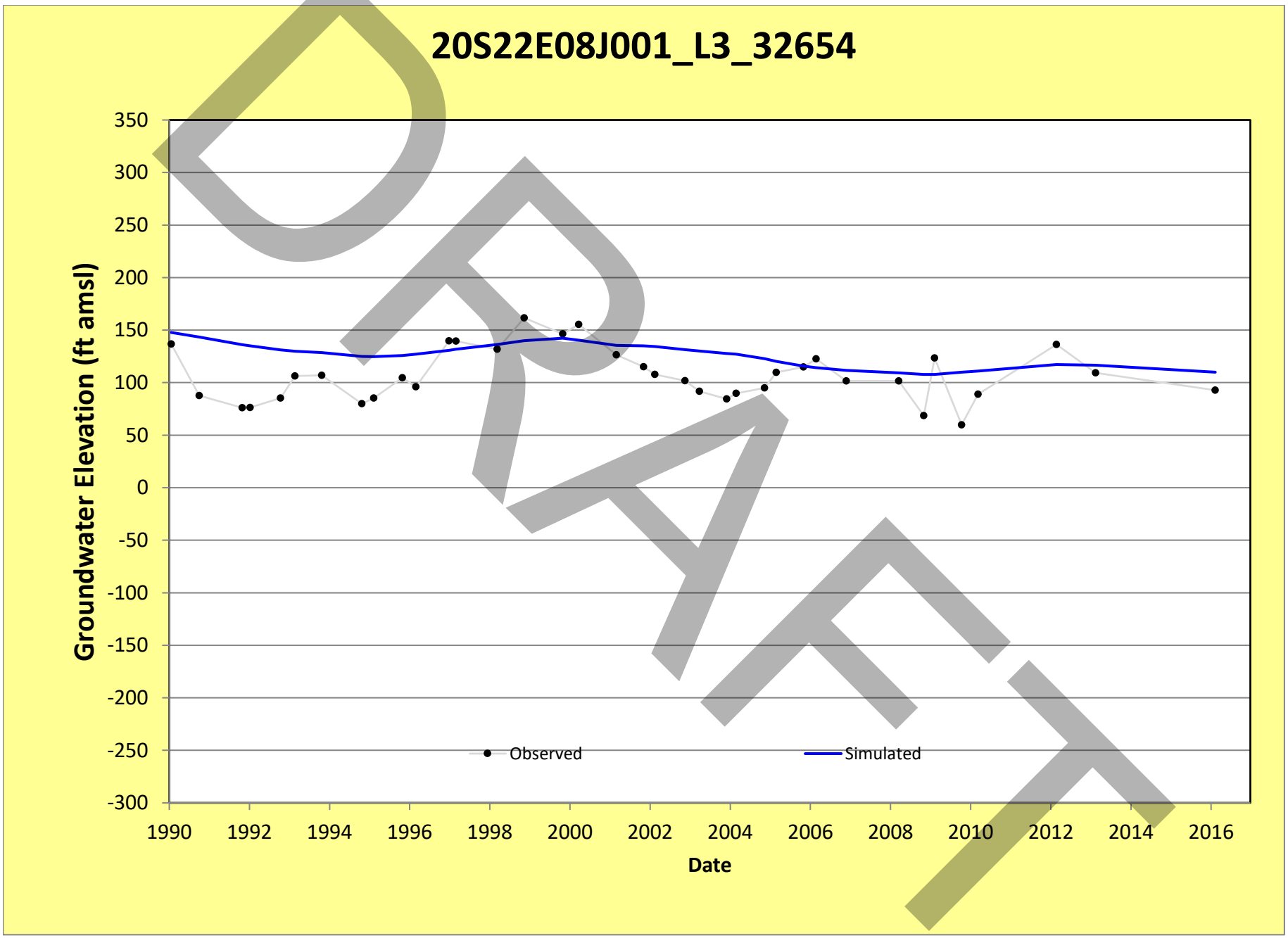
20S22E08J001_L3_32654
Groundwater Elevation (ft amsl)
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300
250
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100
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-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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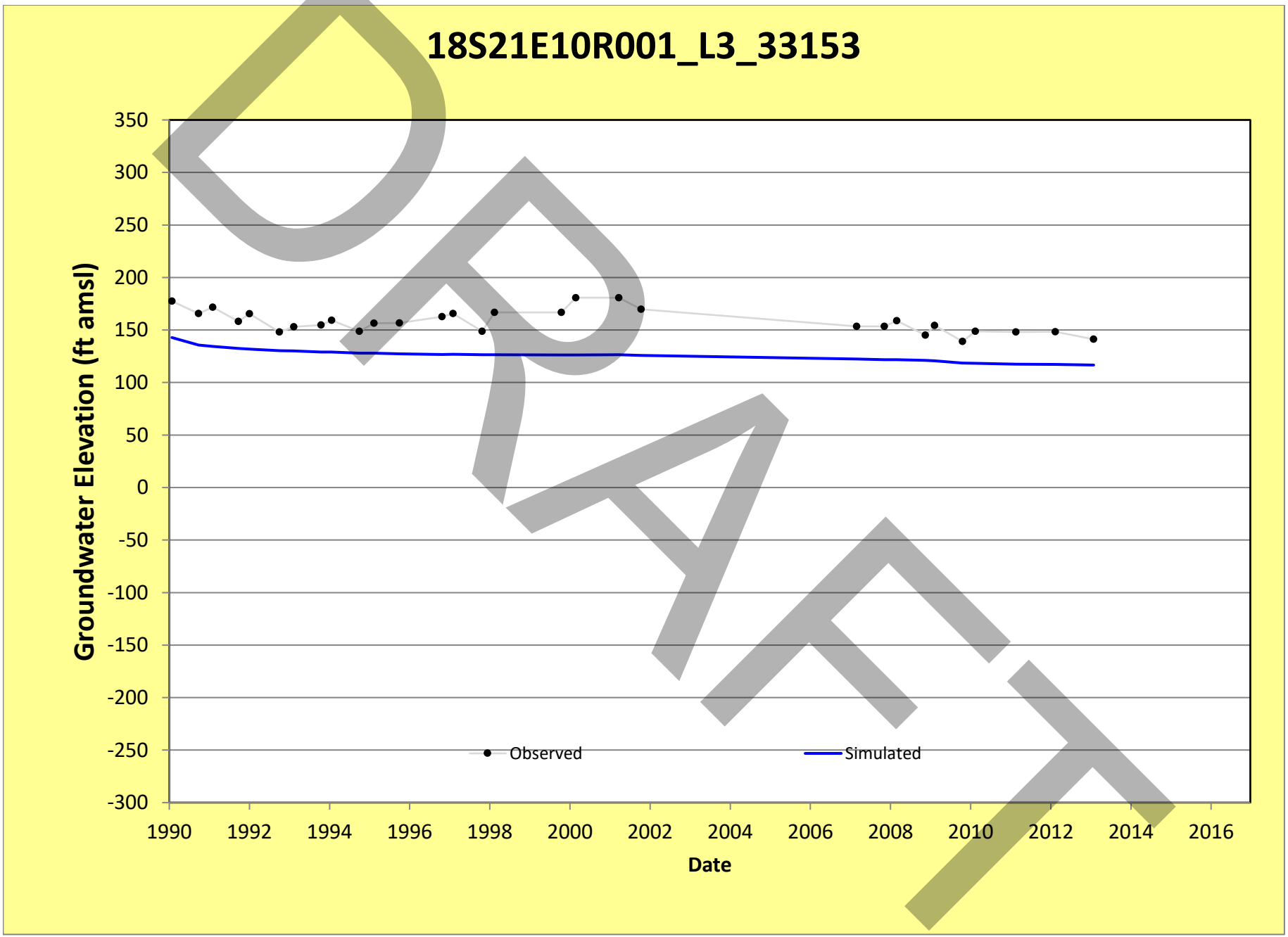
18S21E10R001_L3_33153
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
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-250
-300
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Date
Observed
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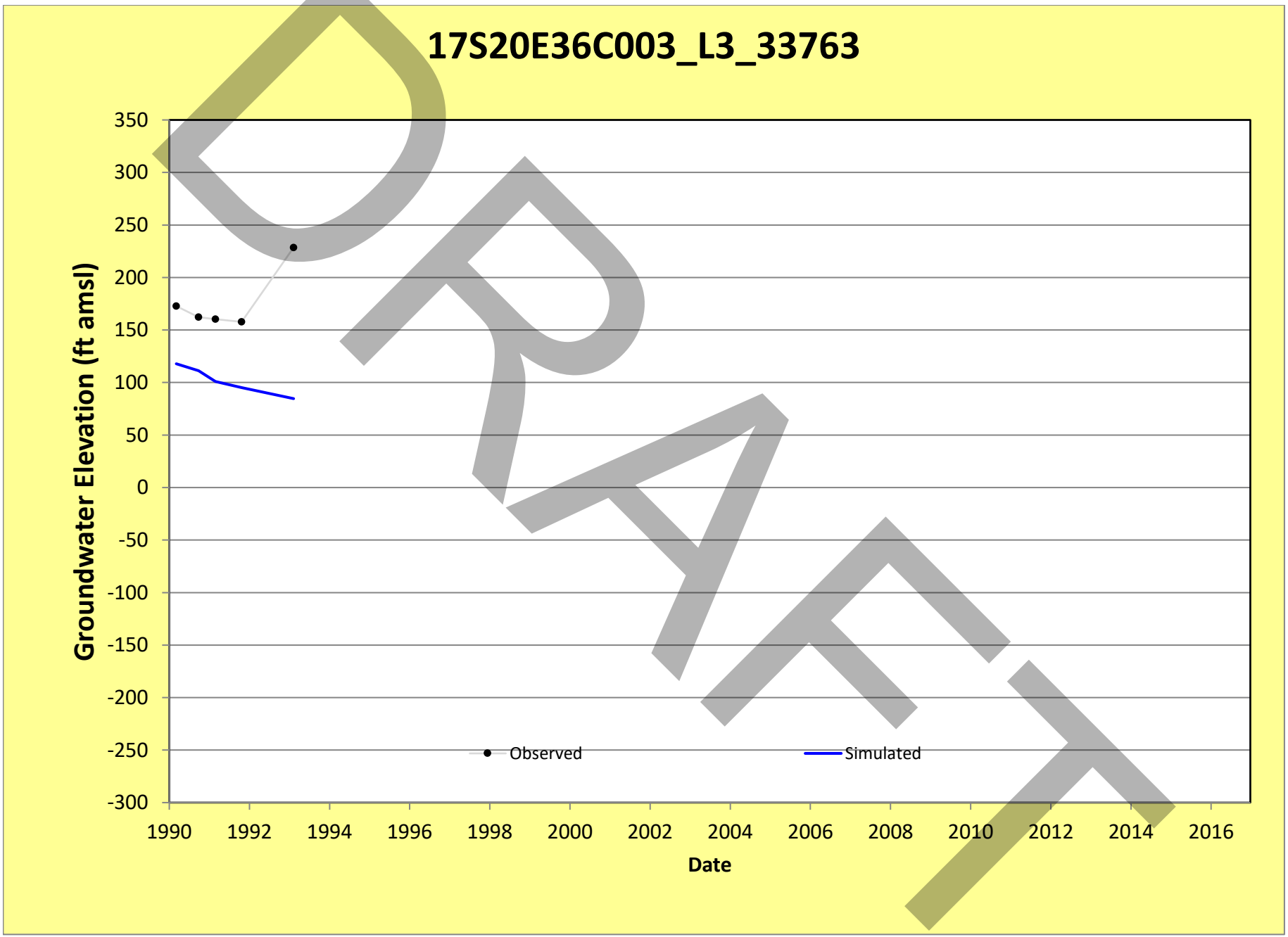
17S20E36C003_L3_33763
Groundwater Elevation (ft amsl)
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300
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100
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-50
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-150
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Observed
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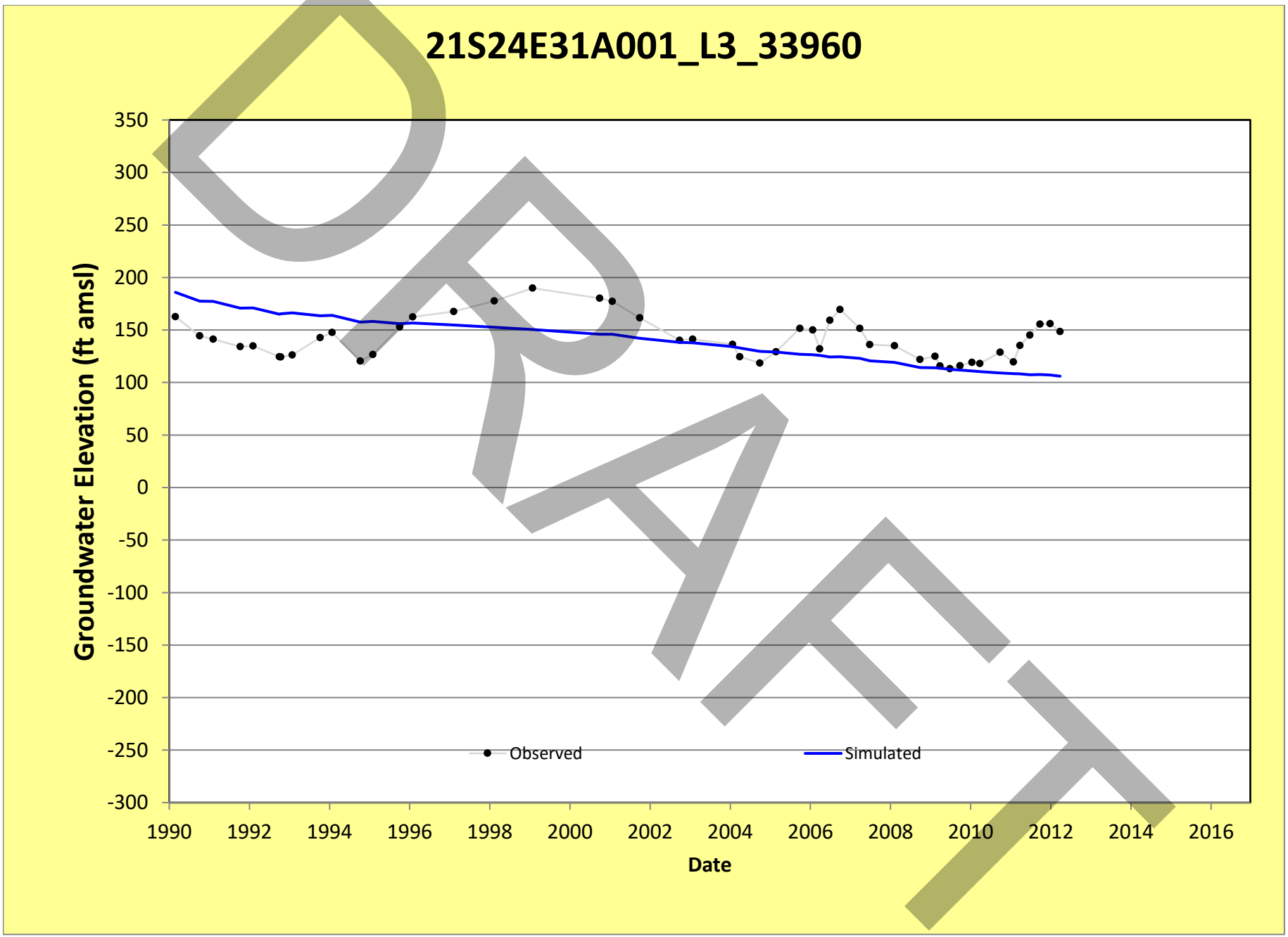
21S24E31A001_L3_33960
Groundwater Elevation (ft amsl)
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100
50
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-50
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-150
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Date
Observed
Simulated
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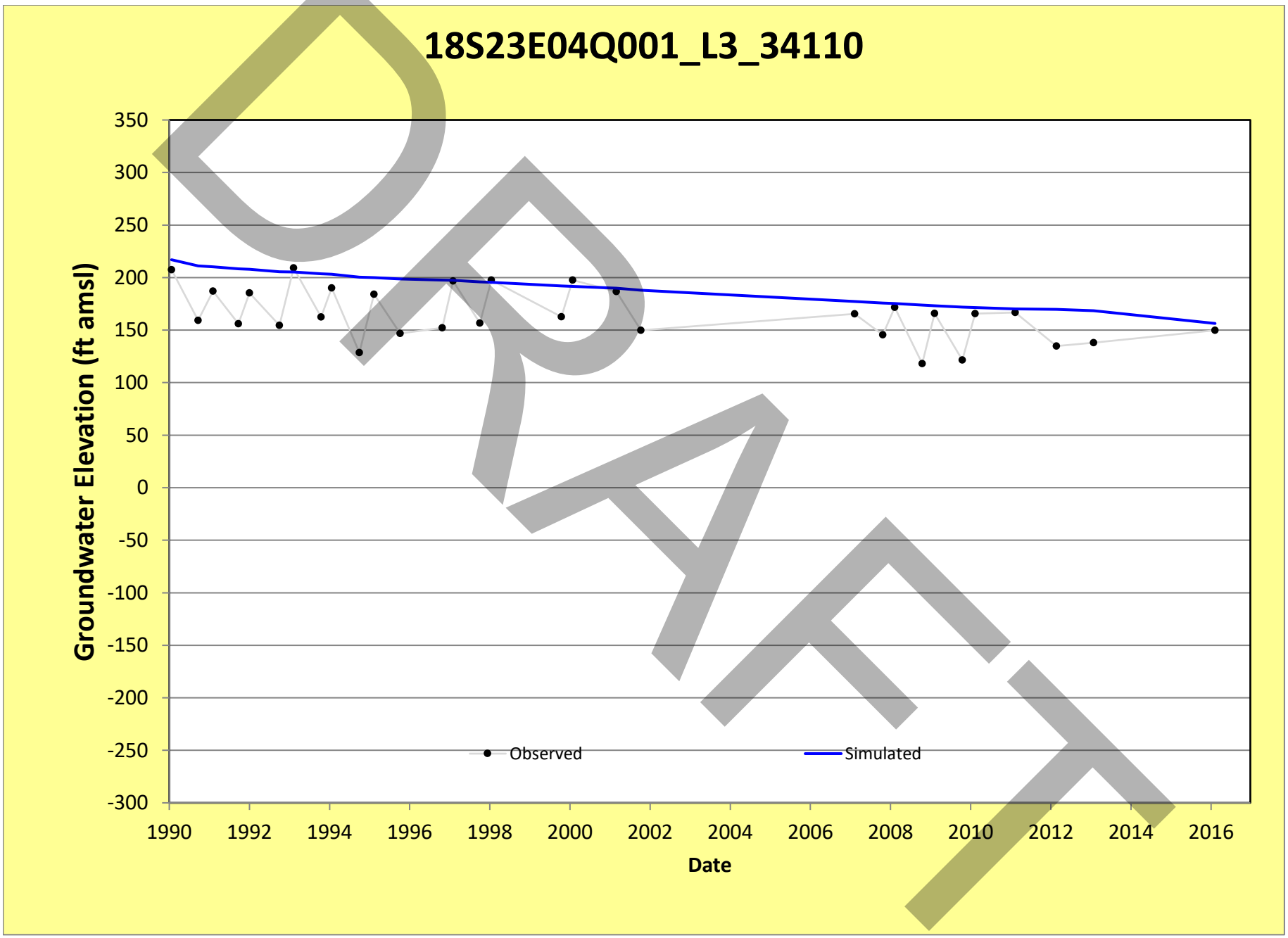
18S23E04Q001_L3_34110
Groundwater Elevation (ft amsl)
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-150
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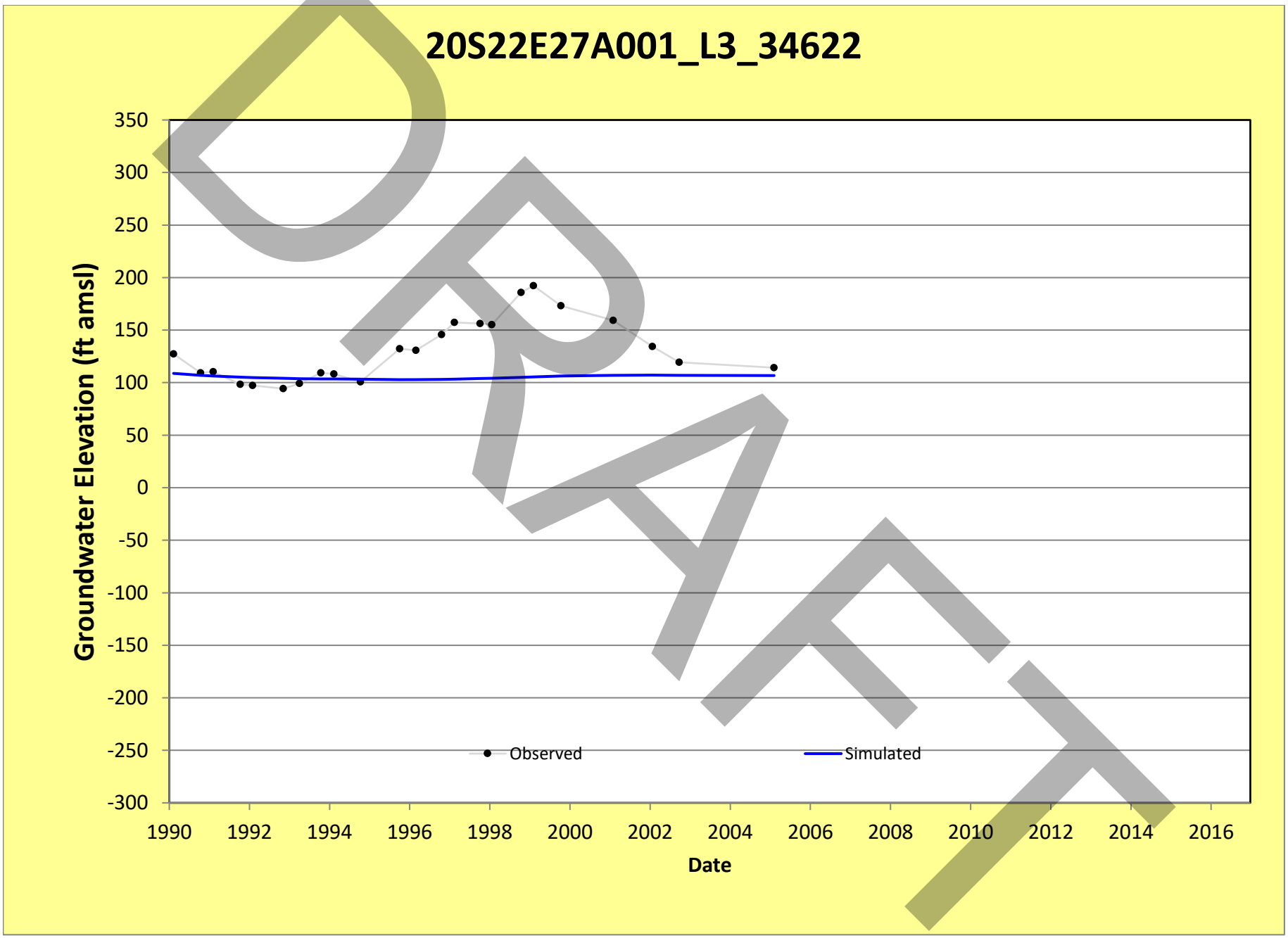
Date
Observed
Simulated
DRAFT


20S22E27A001_L3_34622
Groundwater Elevation (ft amsl)
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300
250
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100
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-50
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-150
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Date
Observed
Simulated
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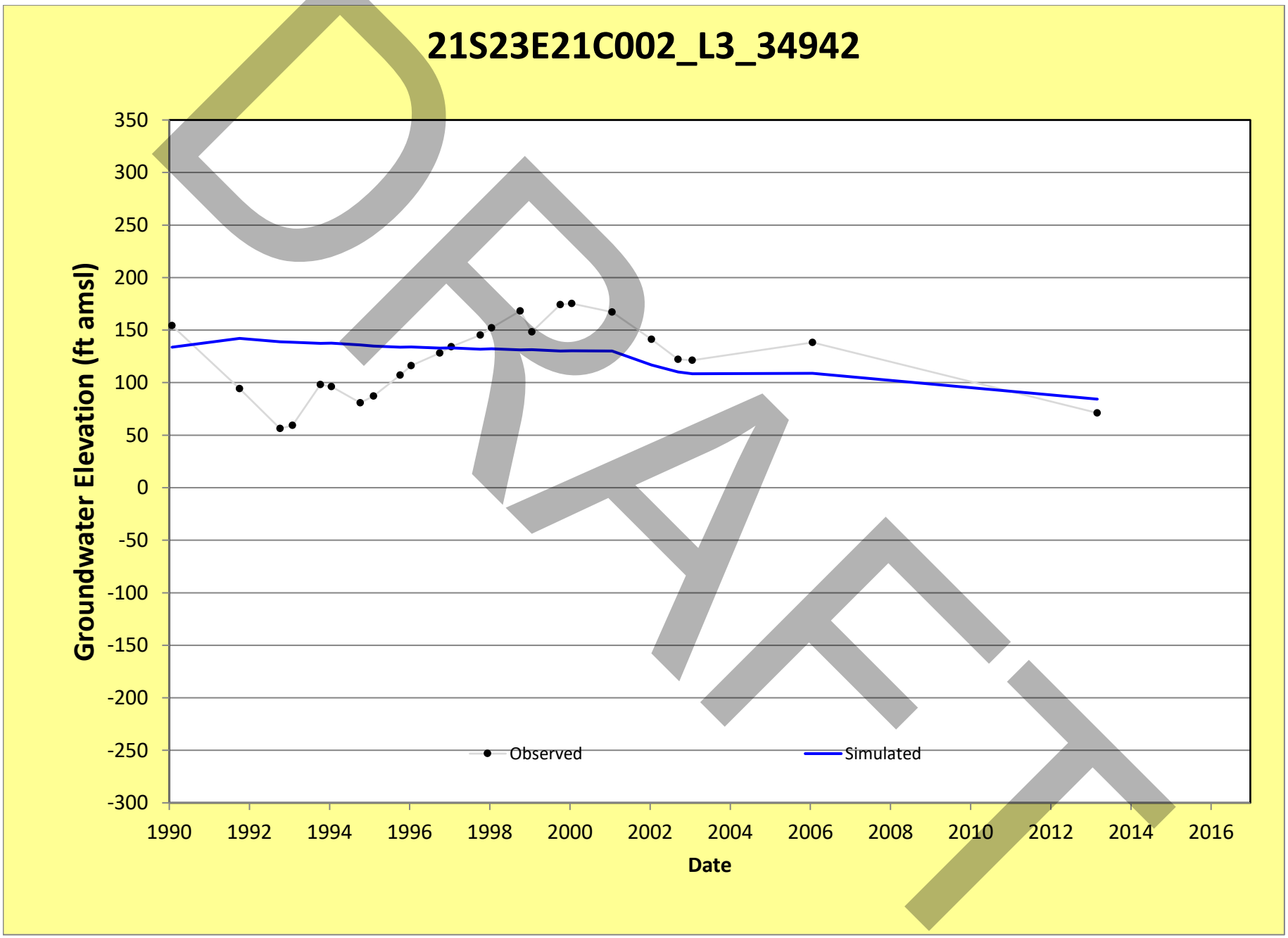
21S23E21C002_L3_34942
Groundwater Elevation (ft amsl)
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300
250
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100
50
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-50
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-150
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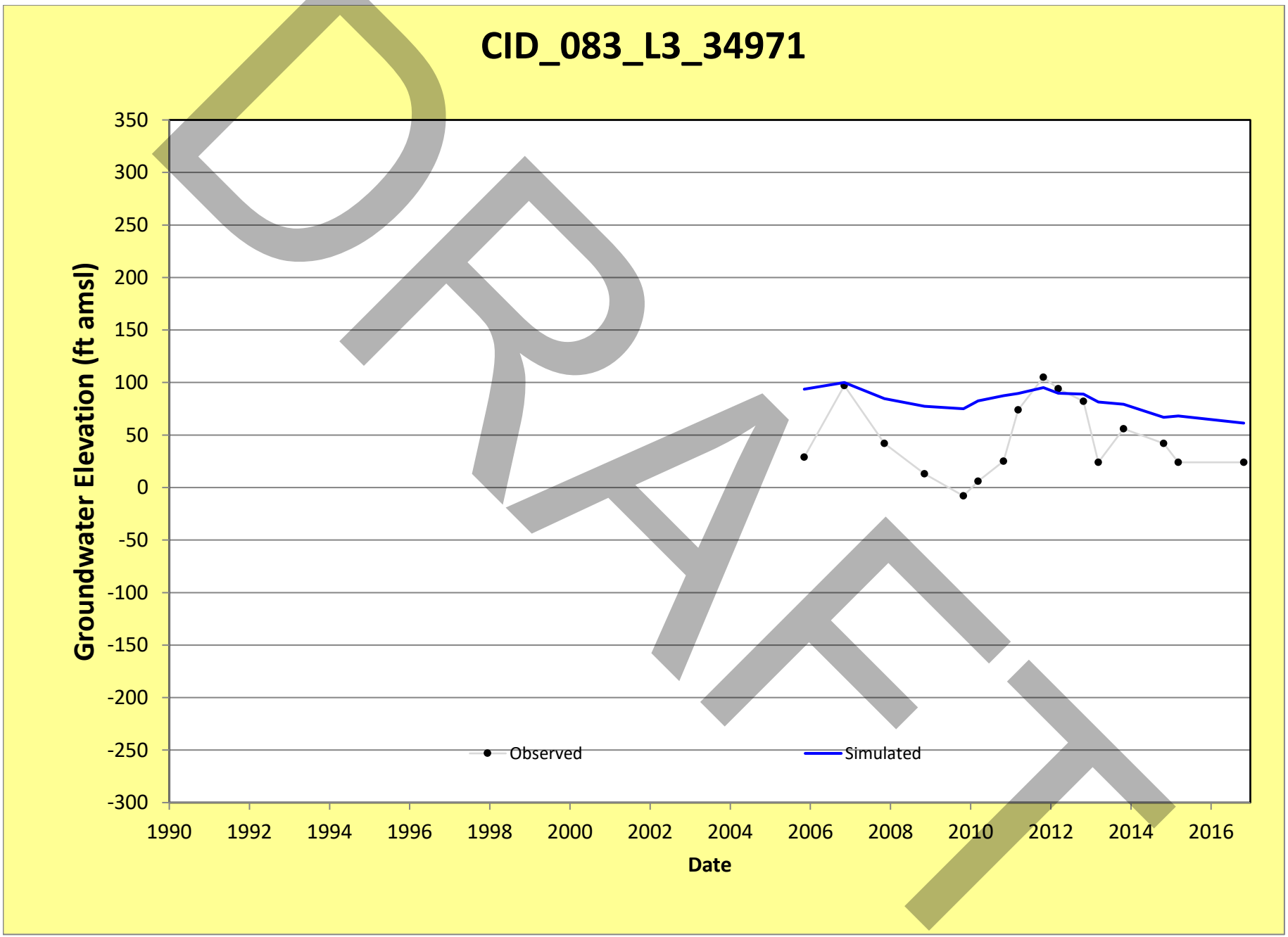
Date
Observed
Simulated
DRAFT


CID_083_L3_34971
Groundwater Elevation (ft amsl)
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300
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0
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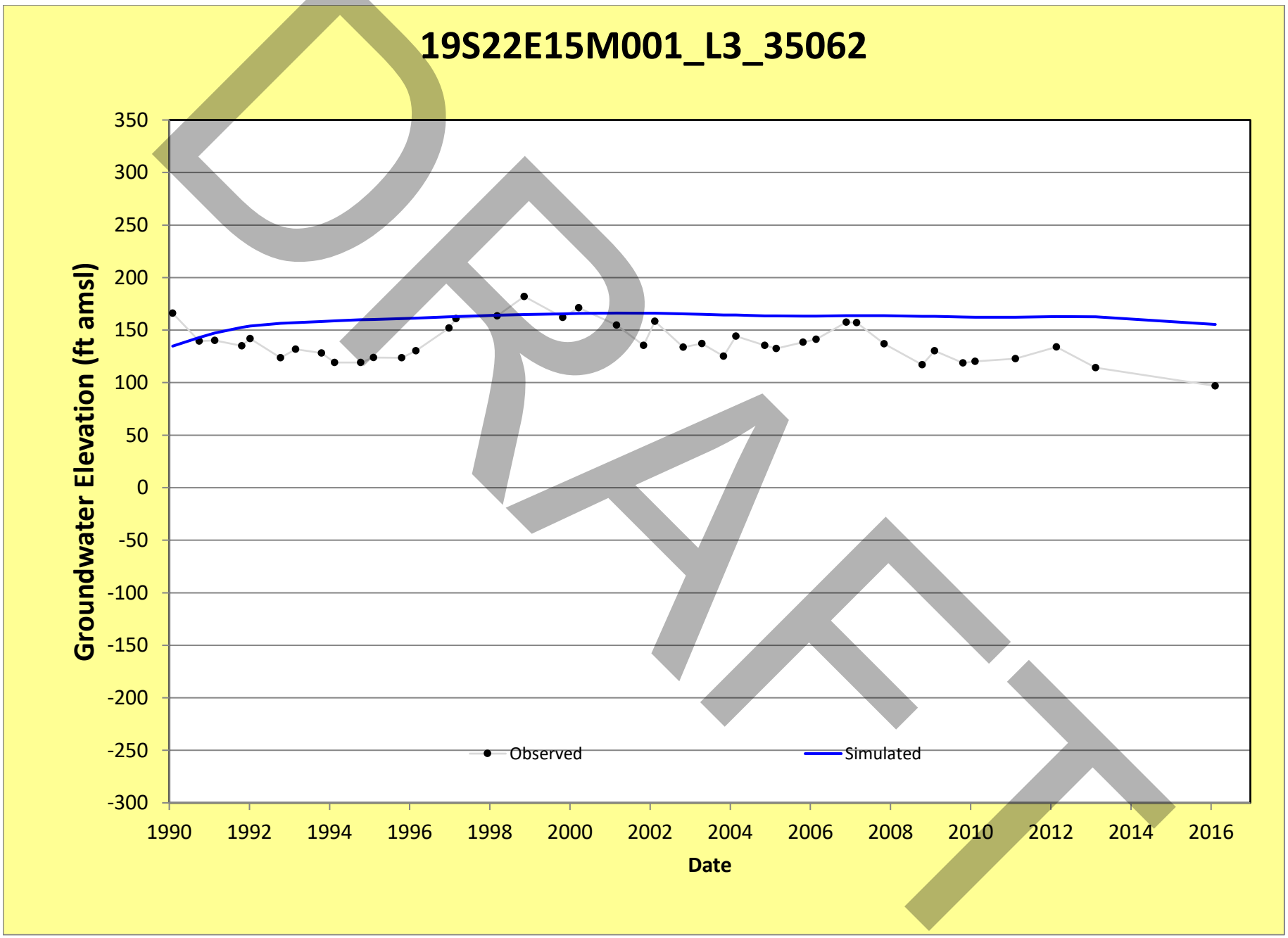
Observed
Simulated
DRAFT


19S22E15M001_L3_35062
Groundwater Elevation (ft amsl)
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-200
-250
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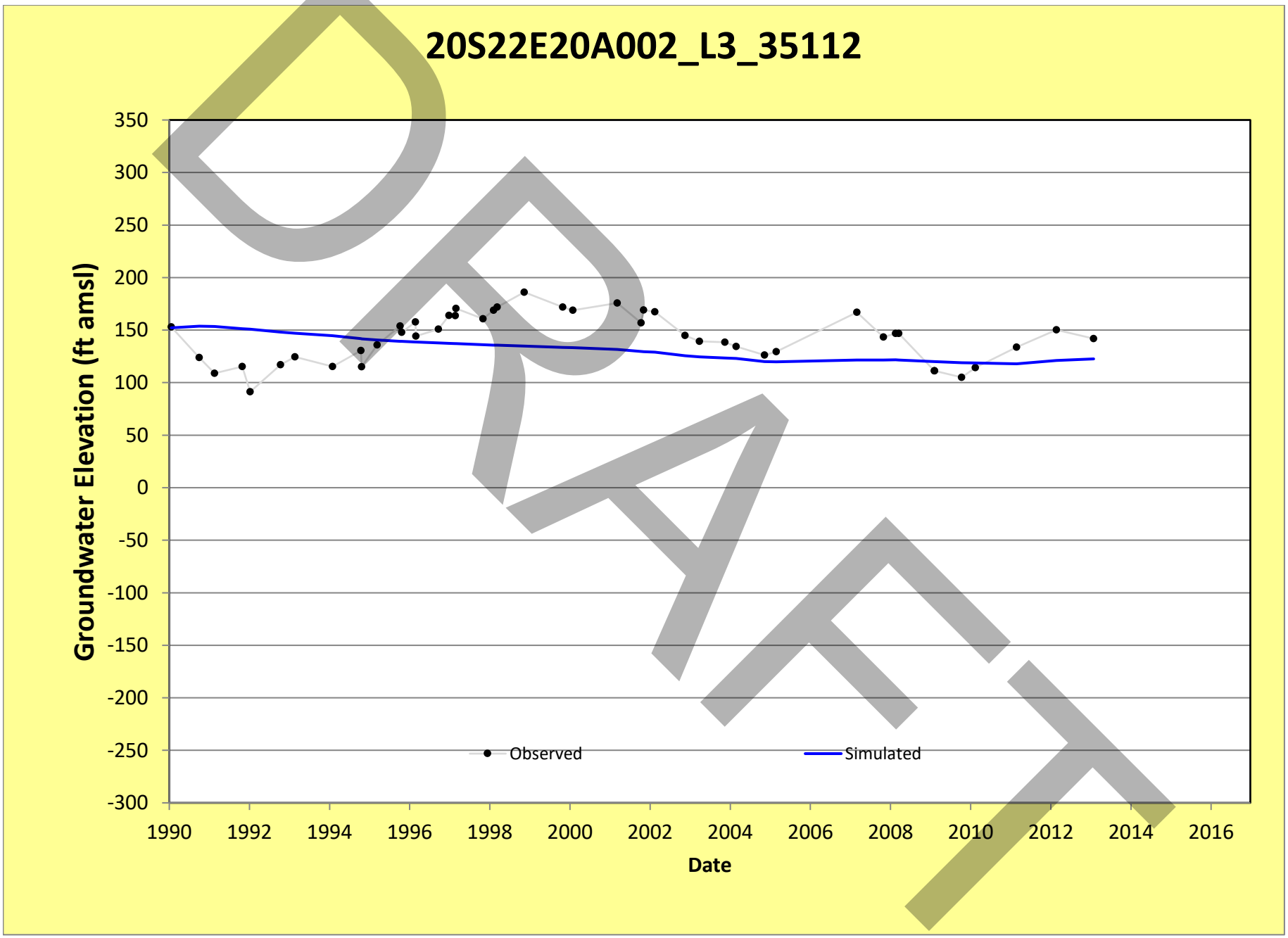
Date
Observed
Simulated
DRAFT


20S22E20A002_L3_35112
Groundwater Elevation (ft amsl)
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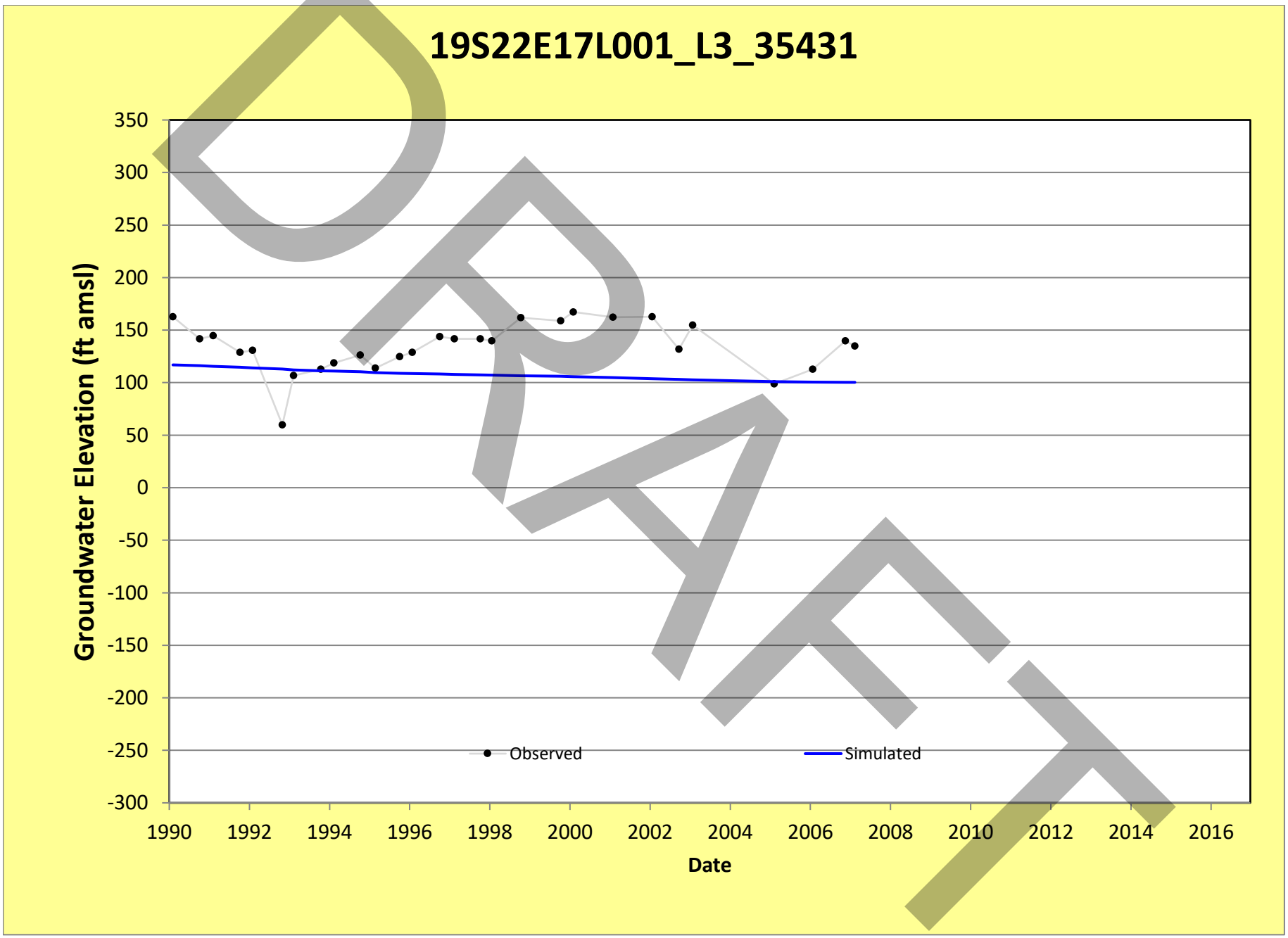
Date
Observed
Simulated
DRAFT


19S22E17L001_L3_35431
Groundwater Elevation (ft amsl)
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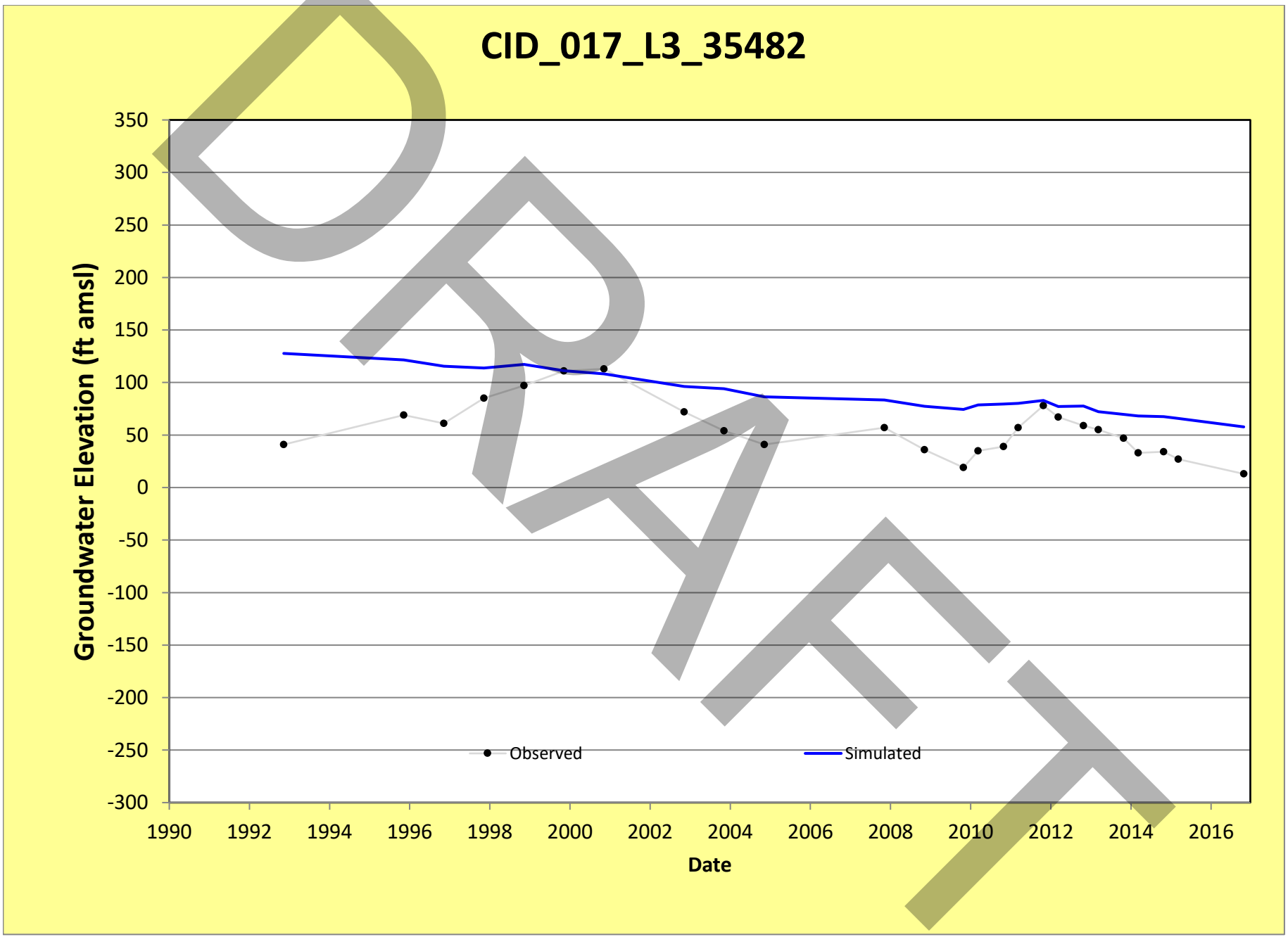
Observed
Simulated
DRAFT


CID_017_L3_35482
Groundwater Elevation (ft amsl)
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200
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100
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-200
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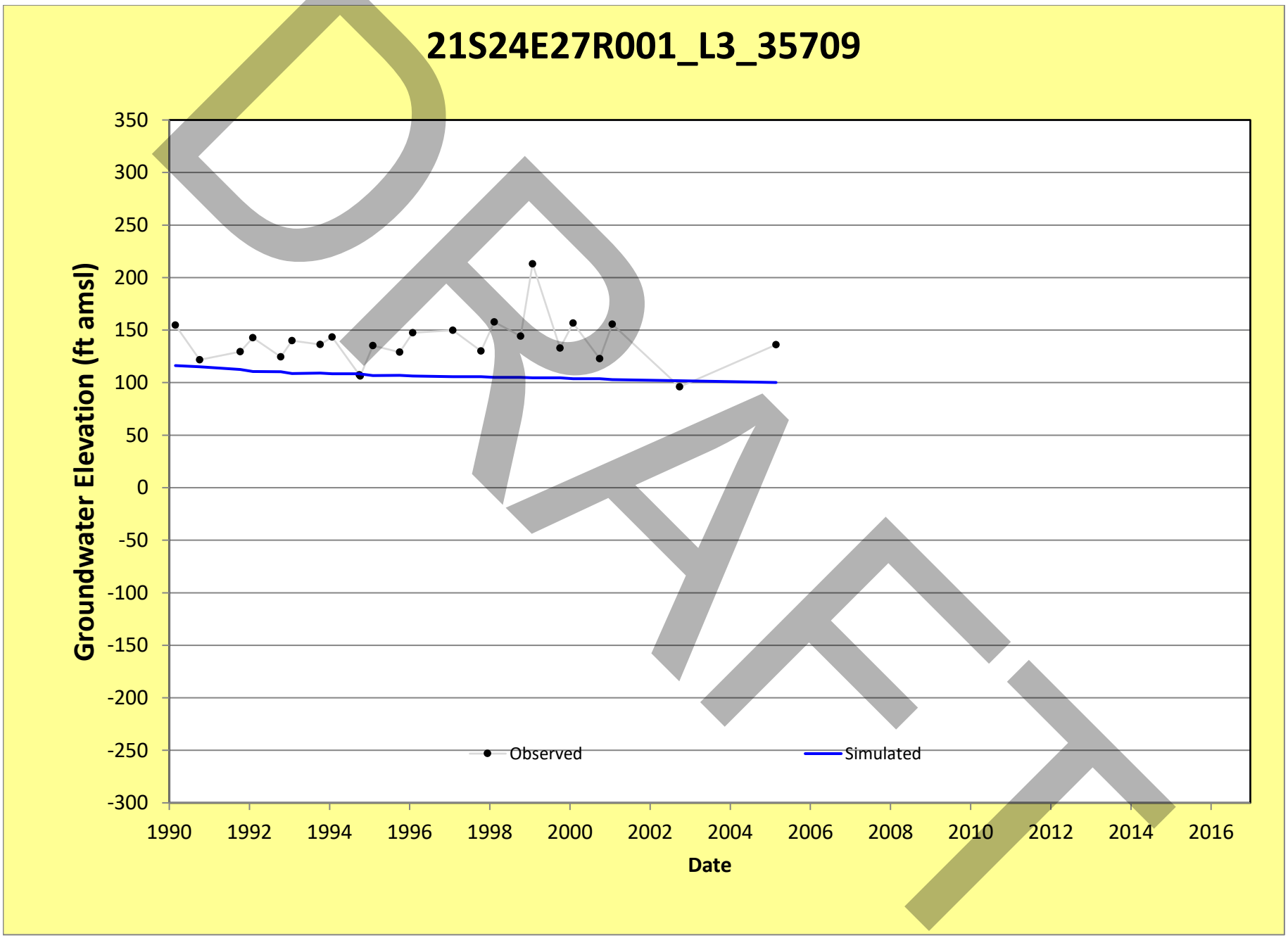
Observed
Simulated
DRAFT


21S24E27R001_L3_35709
Groundwater Elevation (ft amsl)
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100
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-100
-150
-200
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Date
Observed
Simulated
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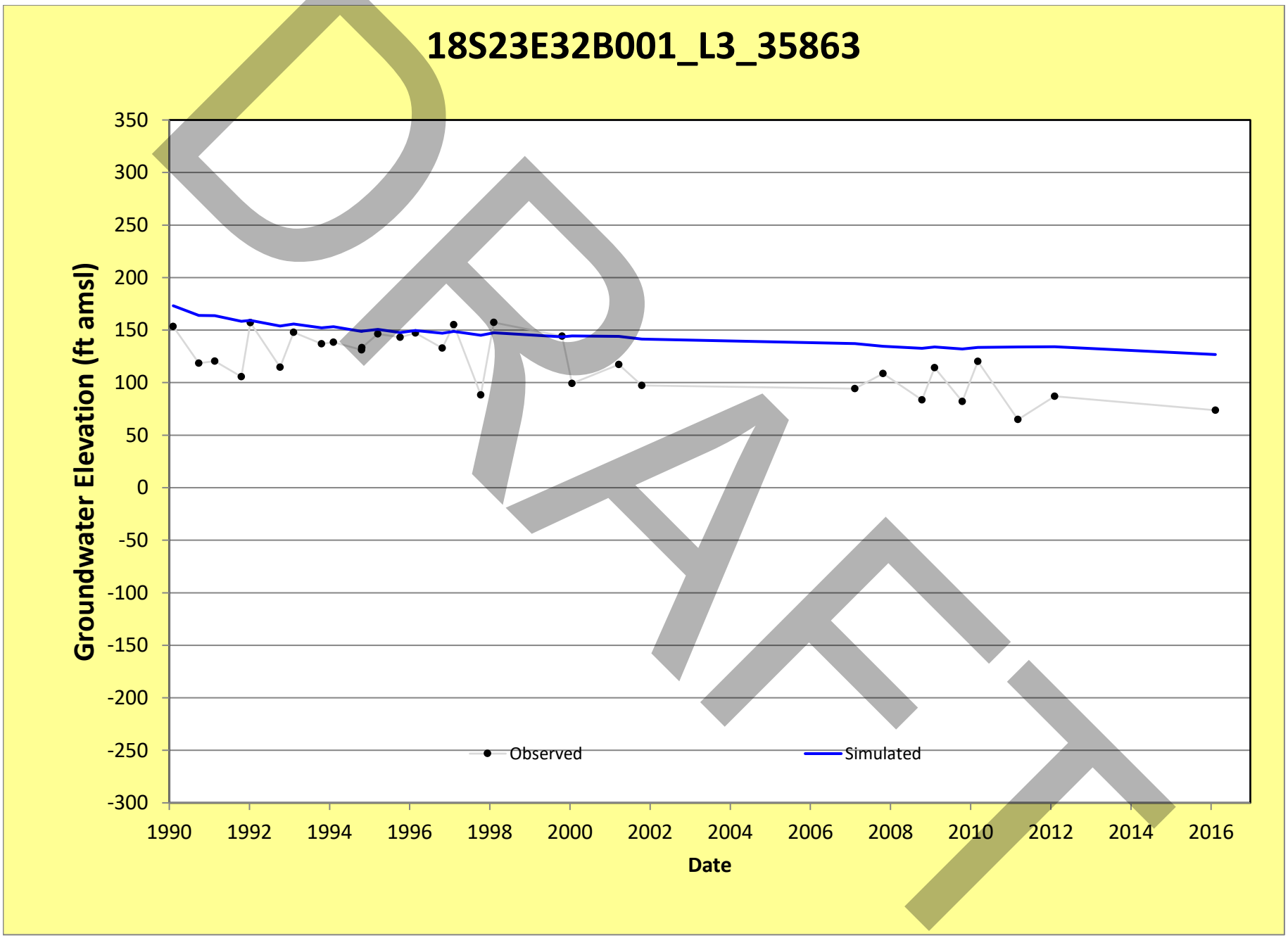
18S23E32B001_L3_35863
Groundwater Elevation (ft amsl)
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150
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-200
-250
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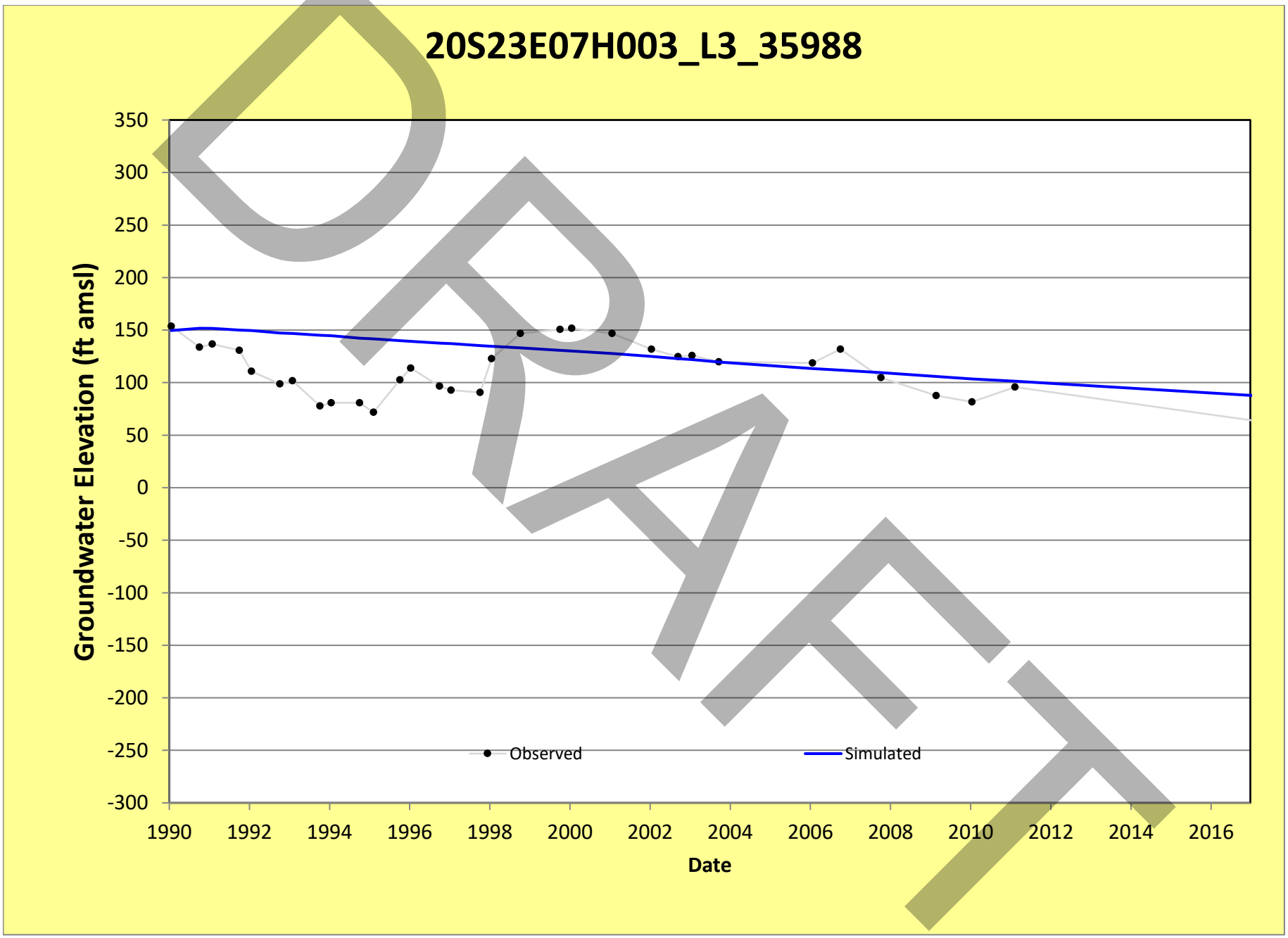
Date
Observed
Simulated
DRAFT


20S23E07H003_L3_35988
Groundwater Elevation (ft amsl)
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200
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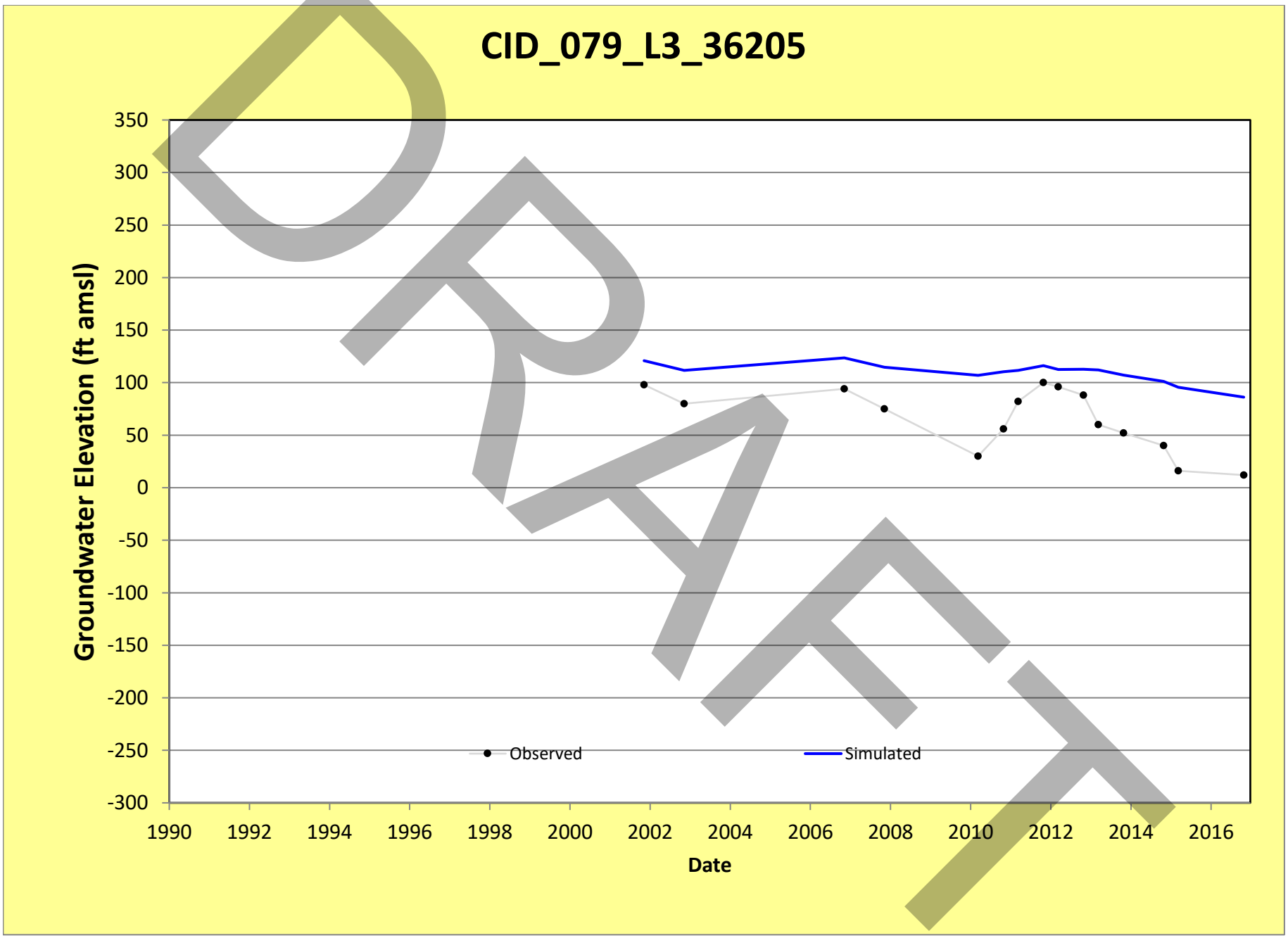
Date
Observed
Simulated
DRAFT


CID_079_L3_36205
Groundwater Elevation (ft amsl)
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300
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200
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100
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0
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-200
-250
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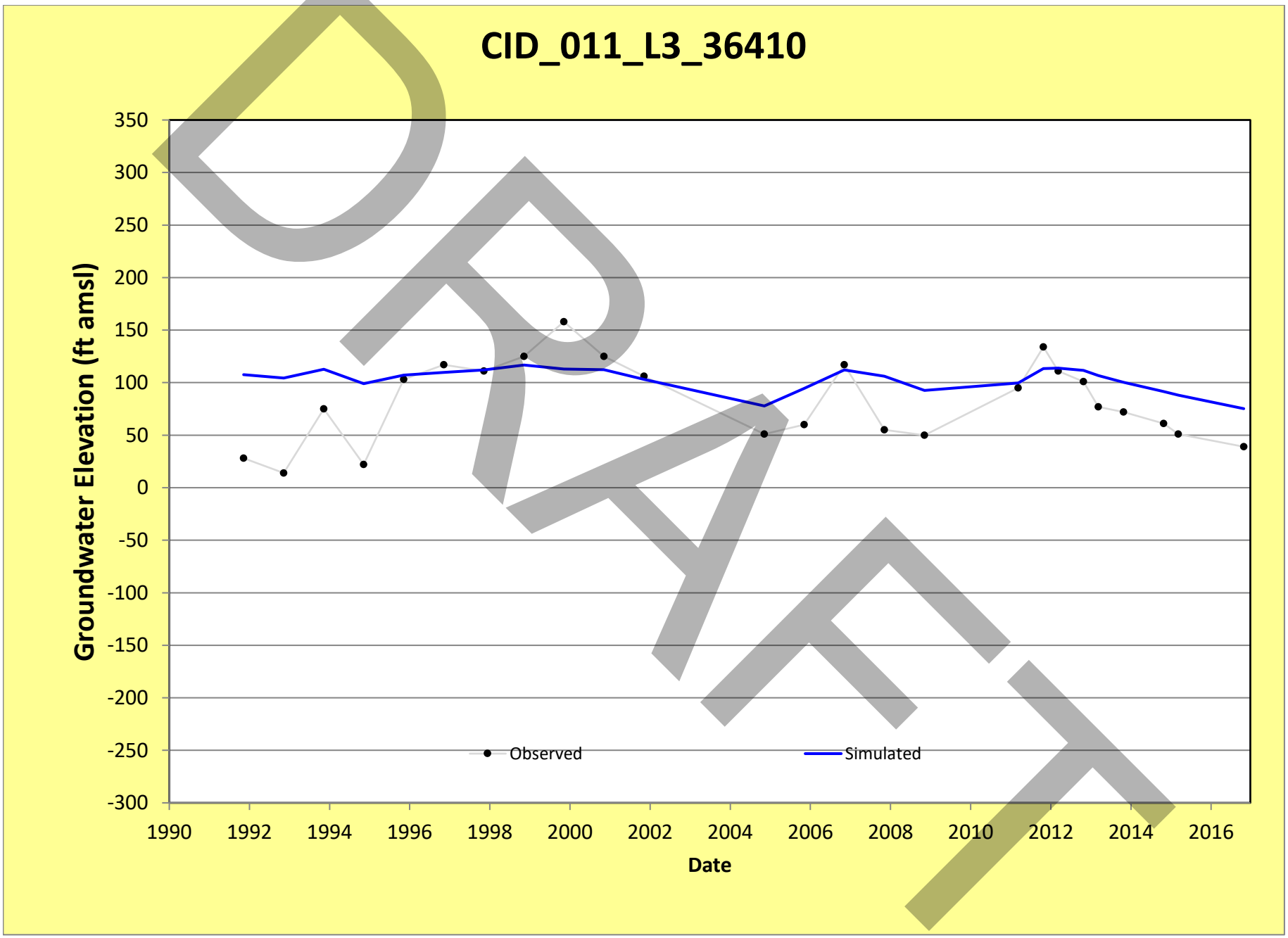
Date
Observed
Simulated
DRAFT


CID_011_L3_36410
Groundwater Elevation (ft amsl)
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200
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100
50
0
-50
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-200
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Date
Observed
Simulated

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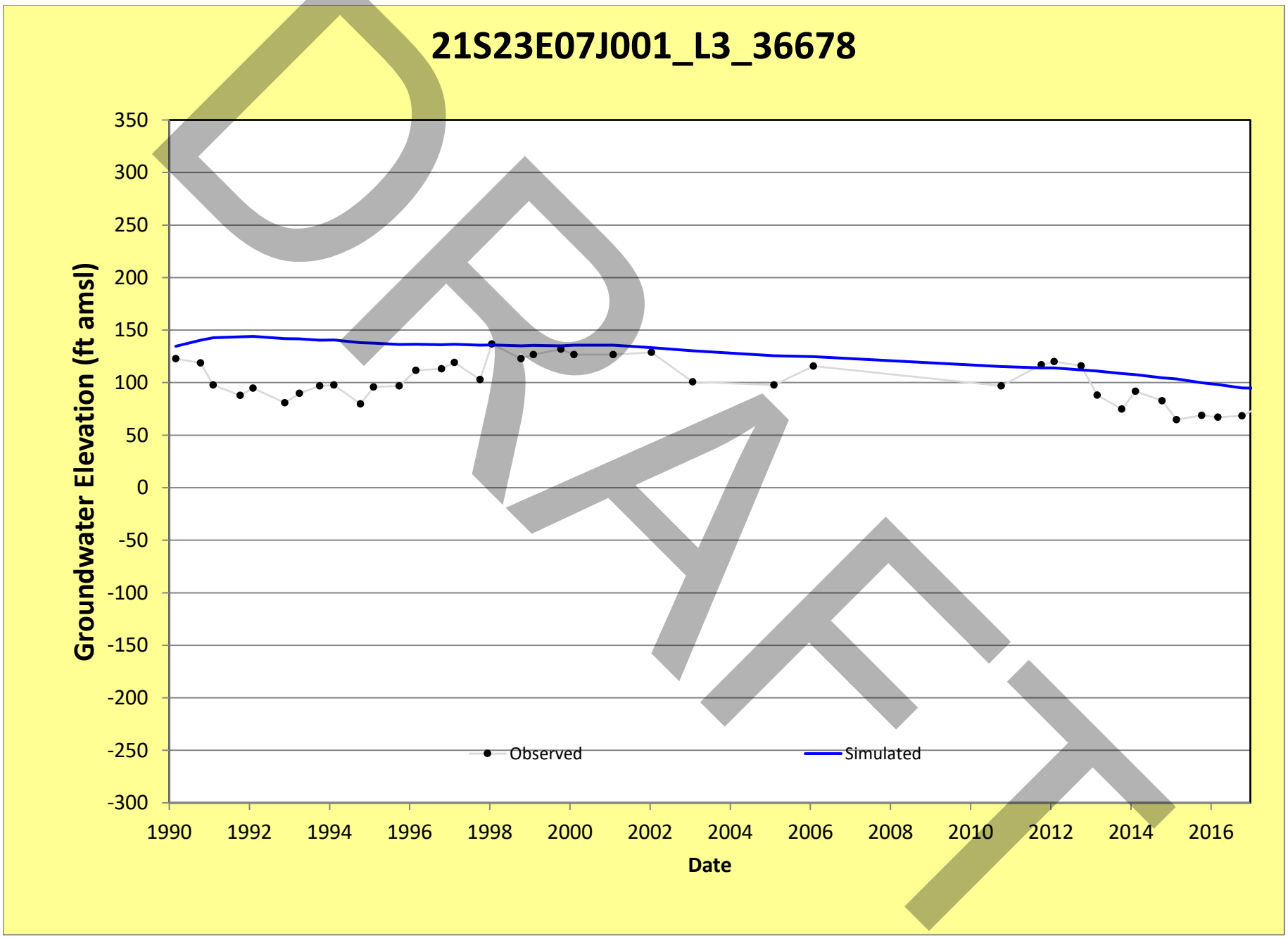
21S23E07J001_L3_36678
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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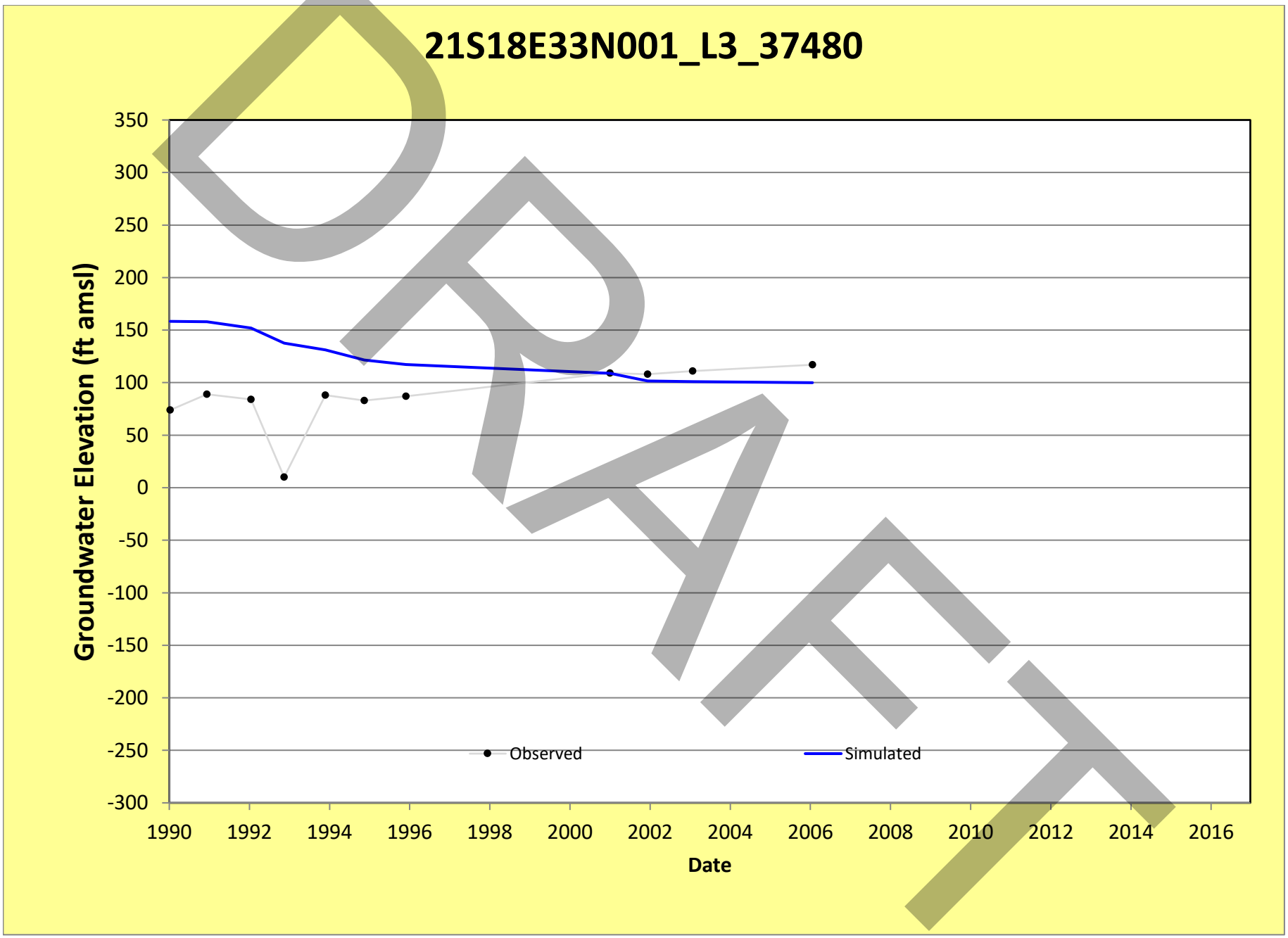
Date
Observed
Simulated
DRAFT


21S18E33N001_L3_37480
Groundwater Elevation (ft amsl)
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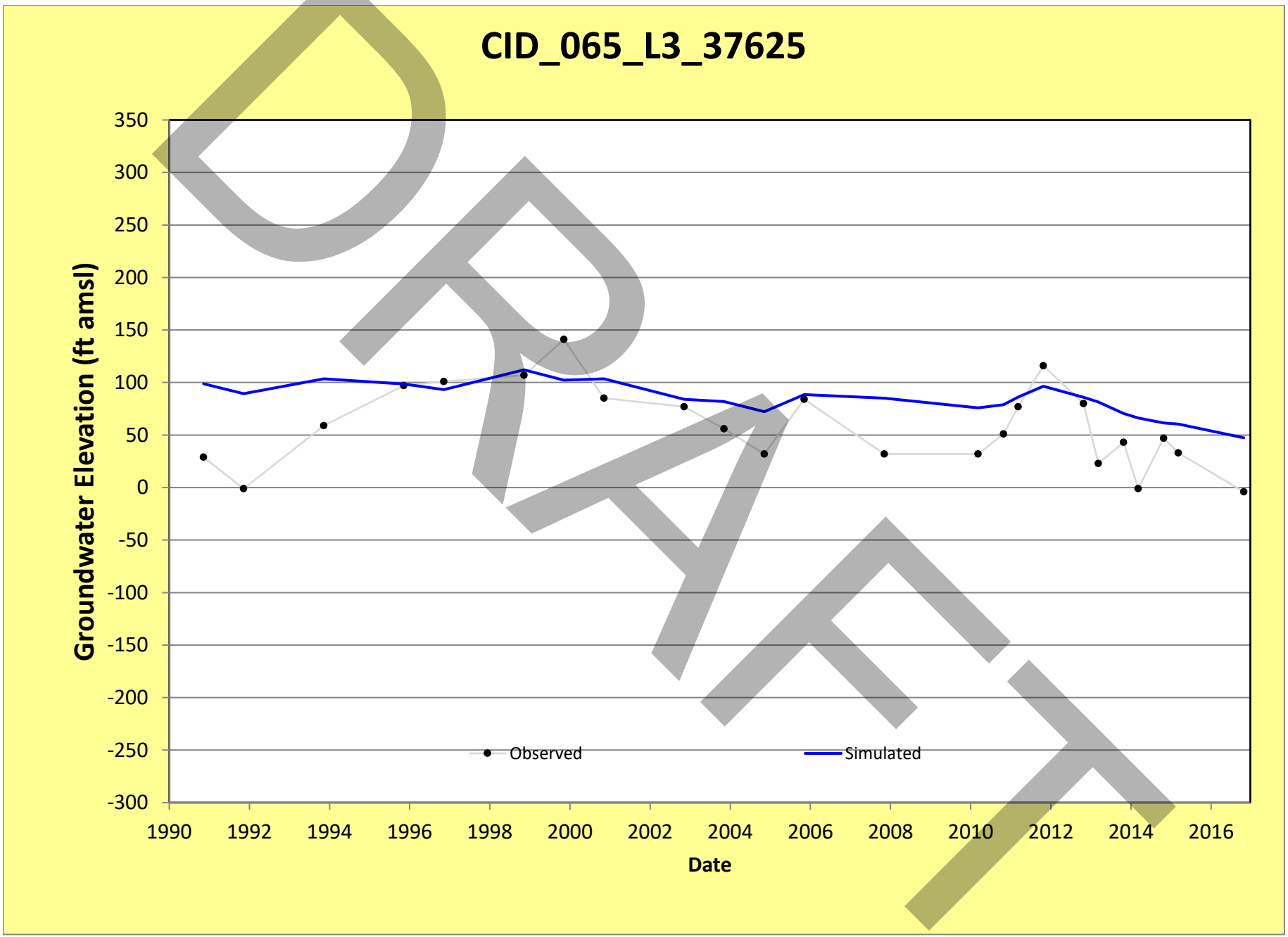
Date
Observed
Simulated
DRAFT


CID_065_L3_37625
Groundwater Elevation (ft amsl)
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200
150
100
50
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-50
-100
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-200
-250
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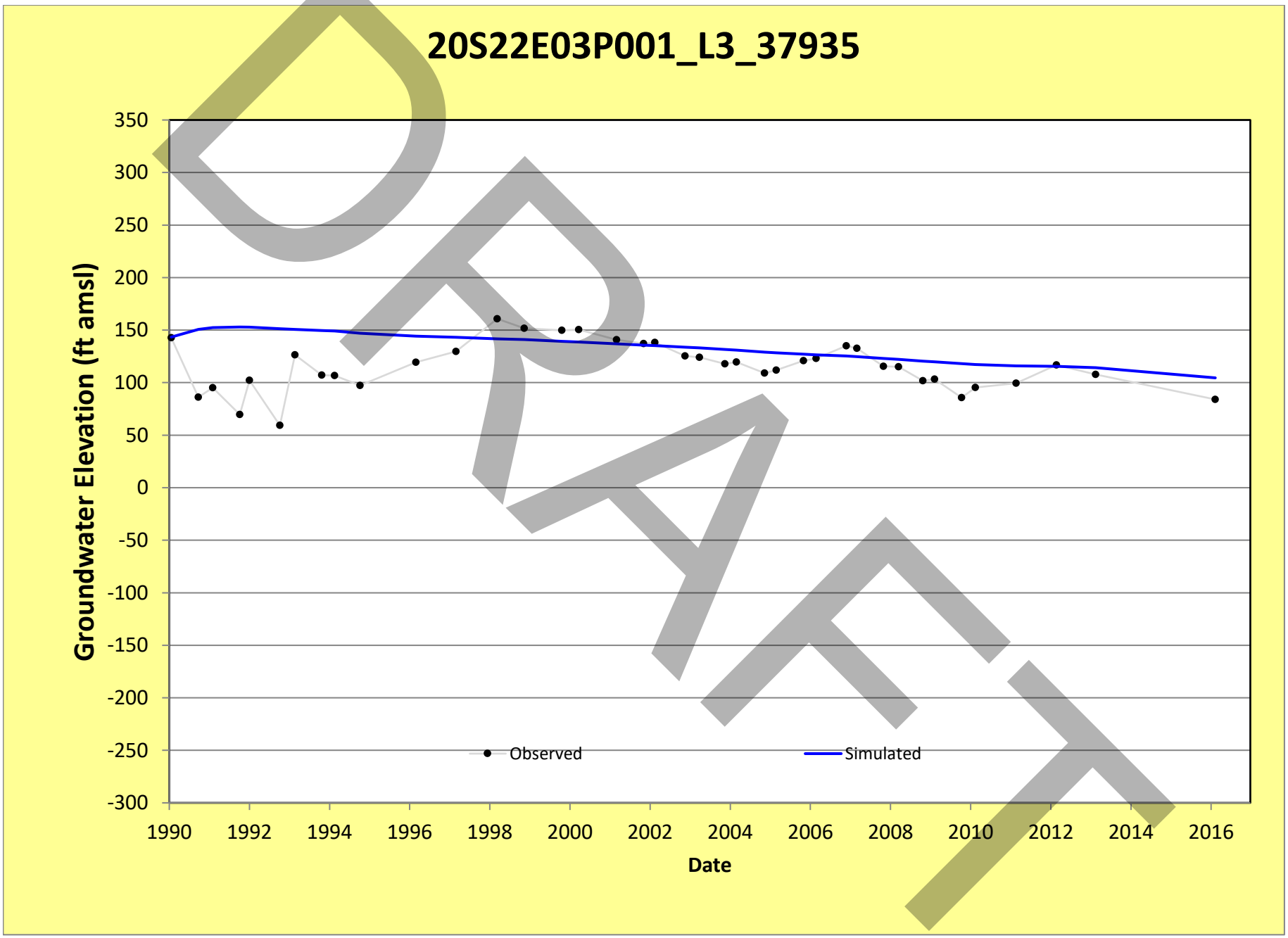
Date
Observed
Simulated
DRAFT


20S22E03P001_L3_37935
Groundwater Elevation (ft amsl)
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100
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-50
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-150
-200
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Observed
Simulated
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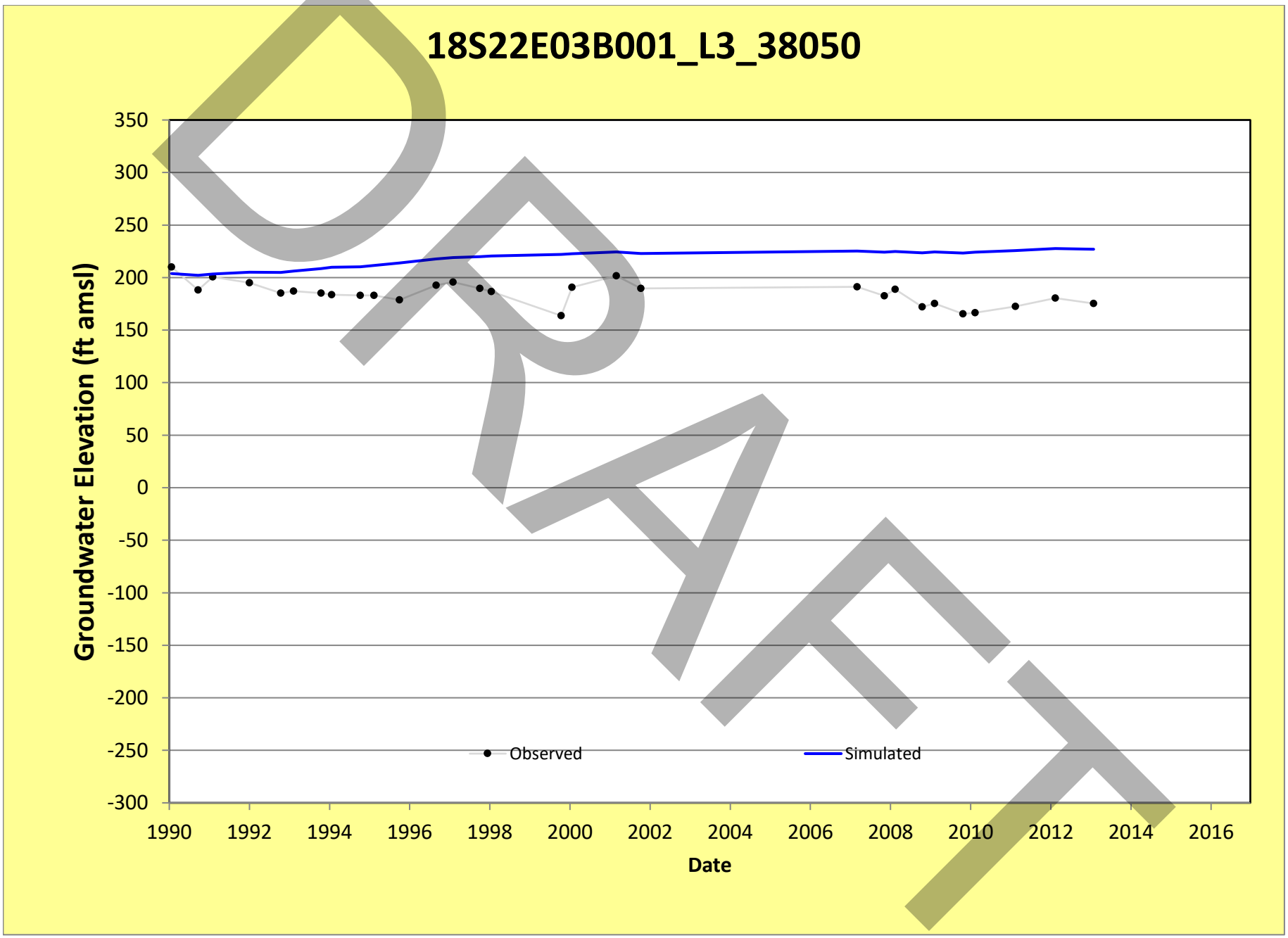
18S22E03B001_L3_38050
Groundwater Elevation (ft amsl)
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300
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150
100
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-50
-100
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Observed
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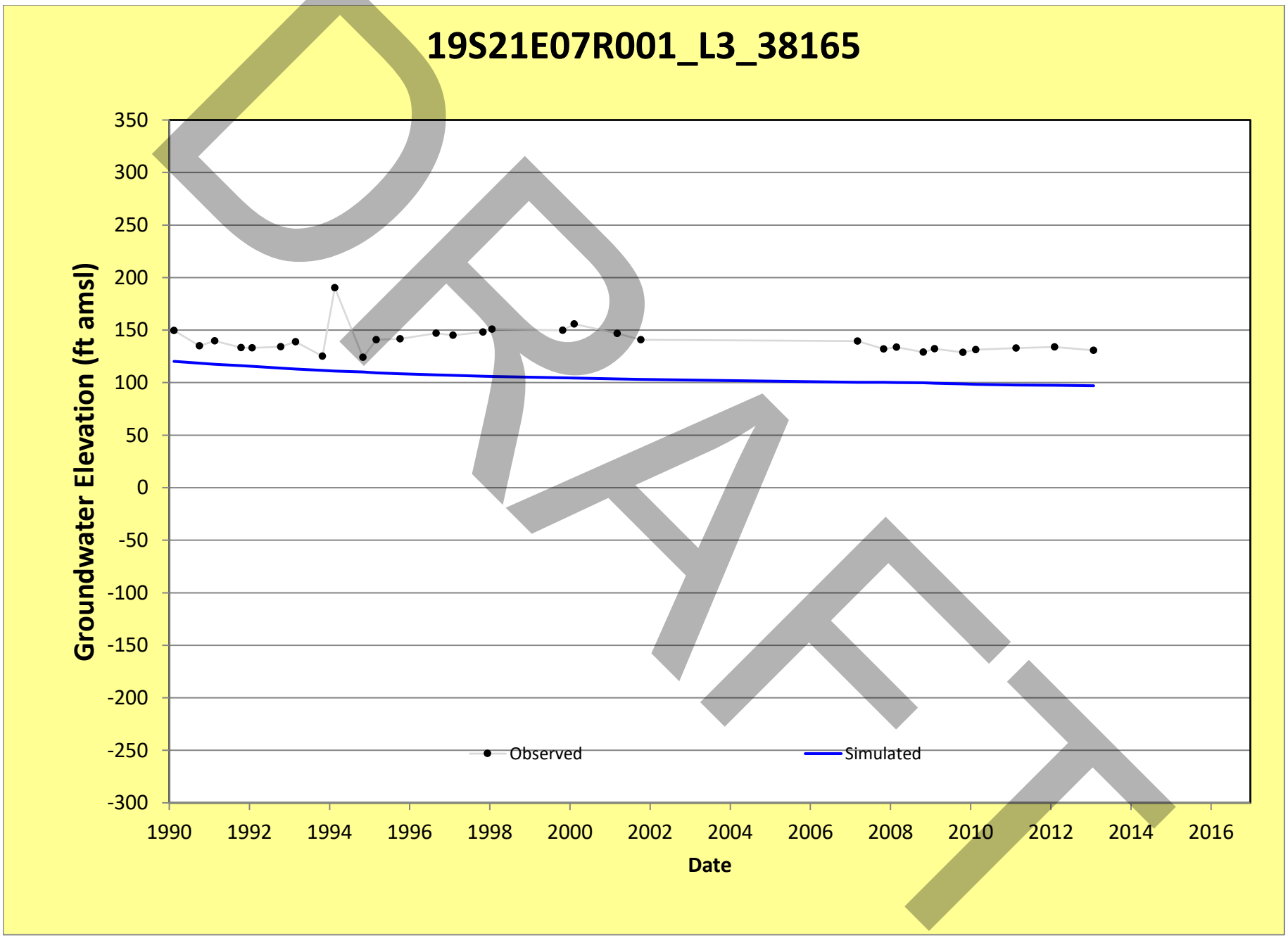
19S21E07R001_L3_38165
Groundwater Elevation (ft amsl)
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250
200
150
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0
-50
-100
-150
-200
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Observed
Simulated
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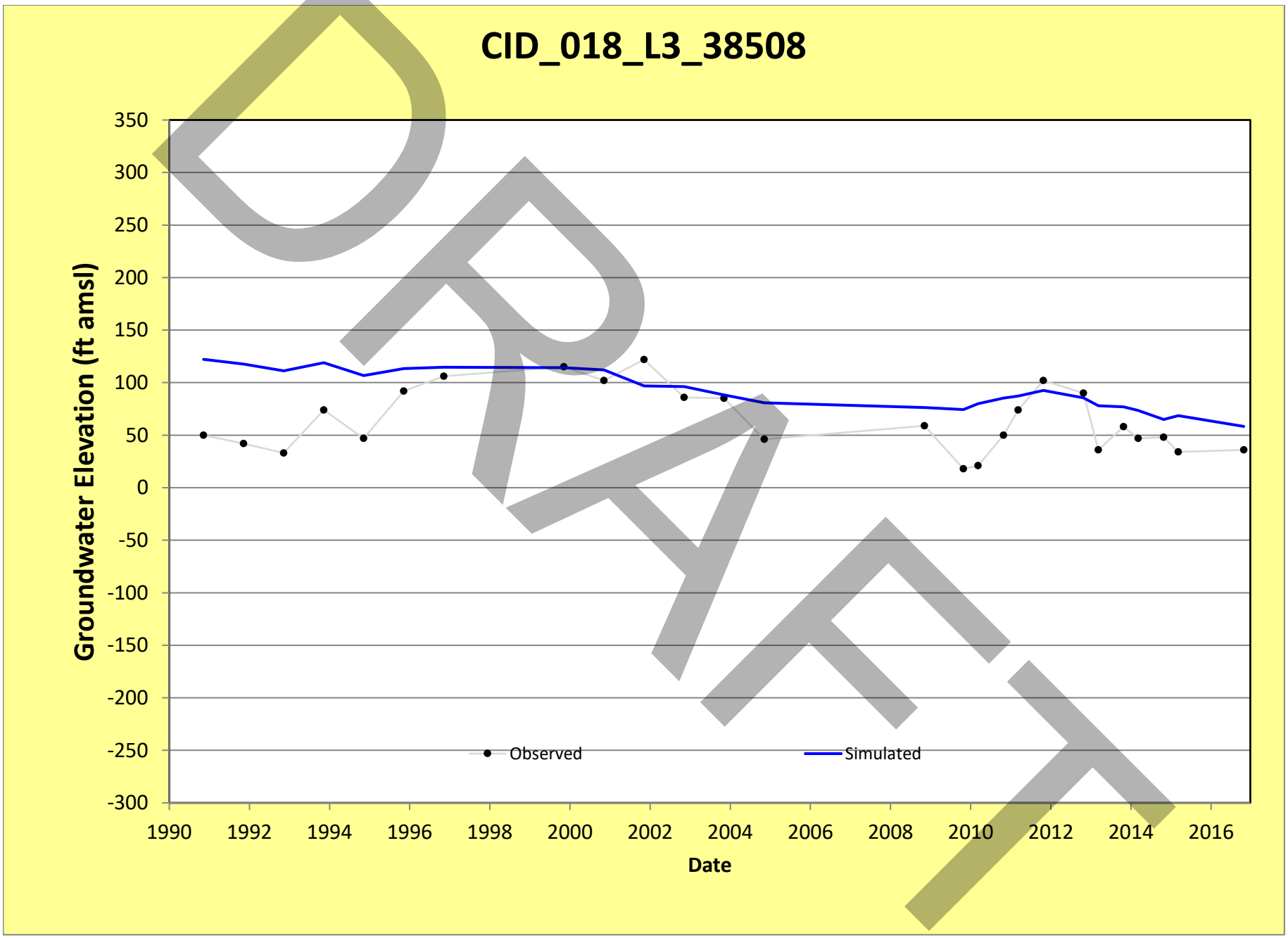
CID_018_L3_38508
Groundwater Elevation (ft amsl)
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250
200
150
100
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0
-50
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-150
-200
-250
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Observed
Simulated
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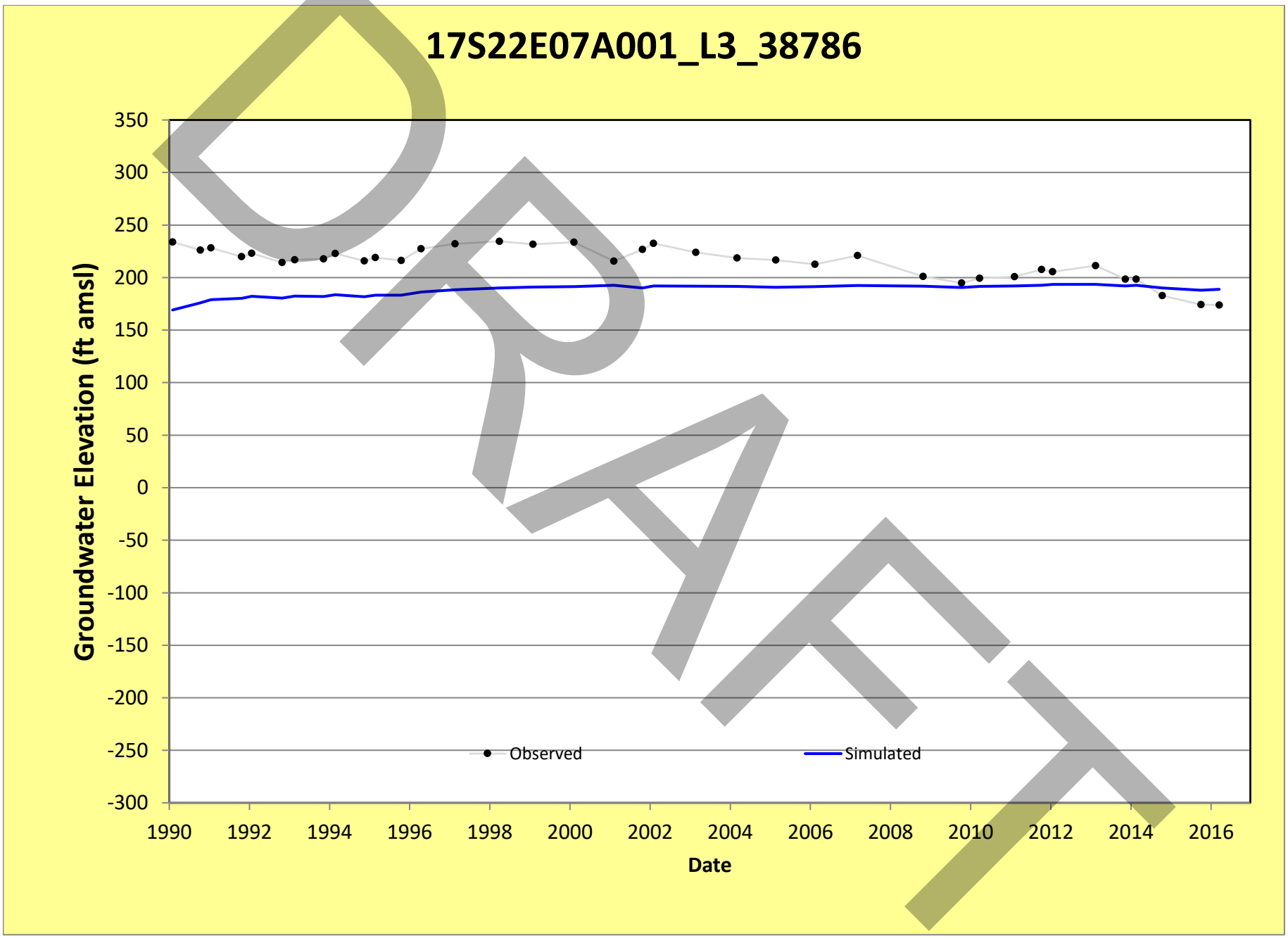
17S22E07A001_L3_38786
Groundwater Elevation (ft amsl)
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300
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200
150
100
50
0
-50
-100
-150
-200
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Date
Observed
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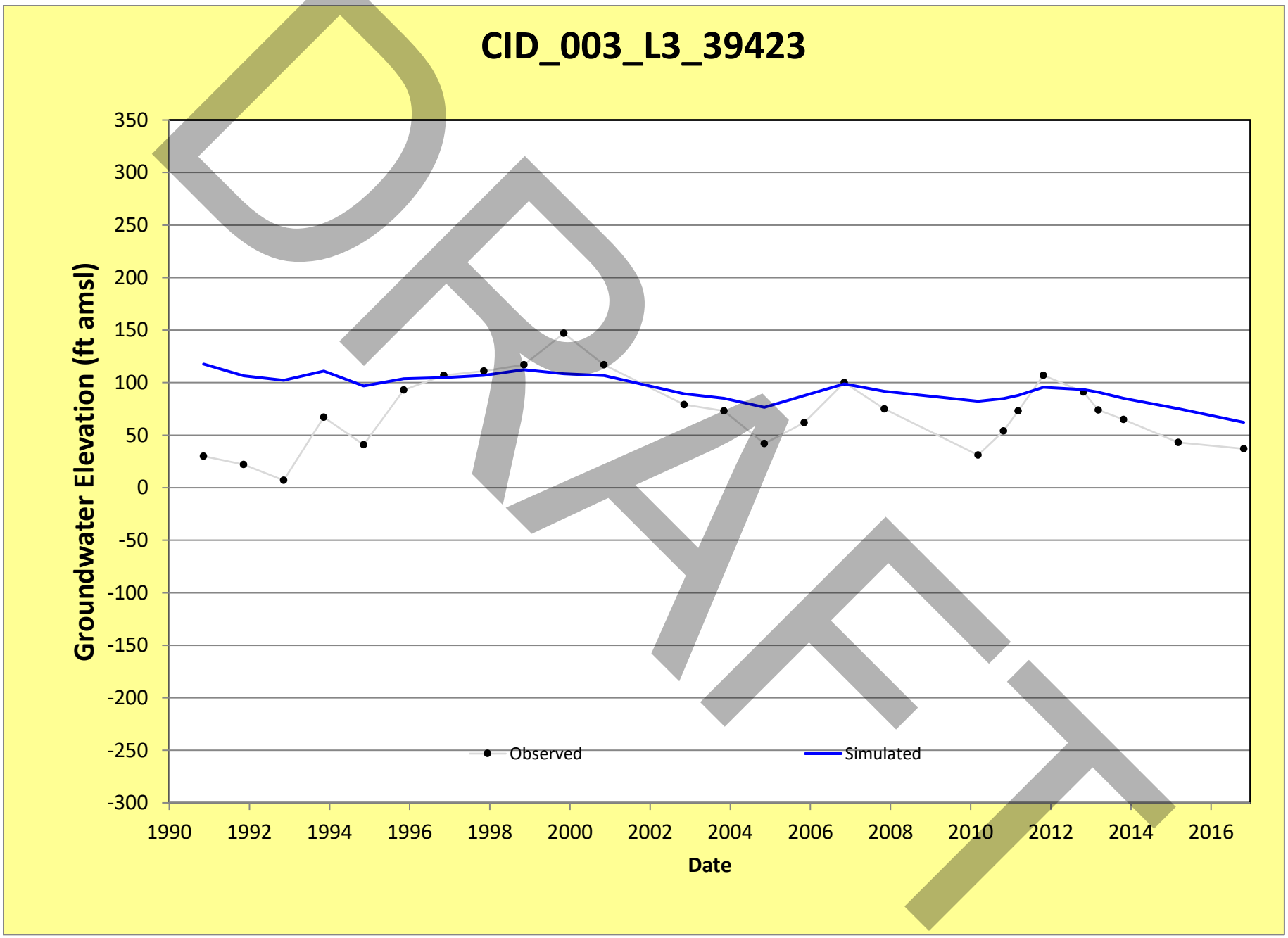
CID_003_L3_39423
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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Observed
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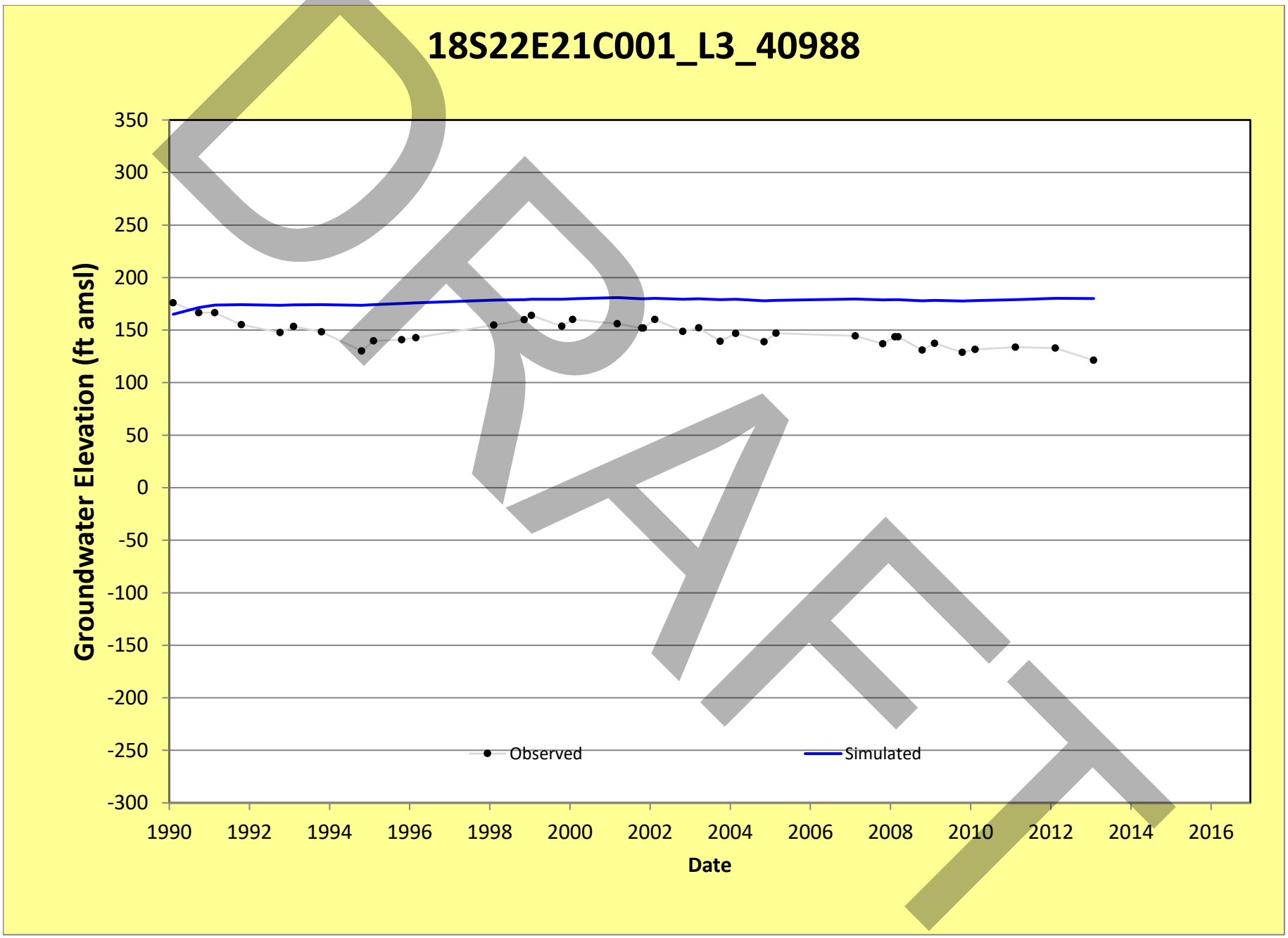
18S22E21C001_L3_40988
Groundwater Elevation (ft amsl)
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150
100
50
0
-50
-100
-150
-200
-250
-300
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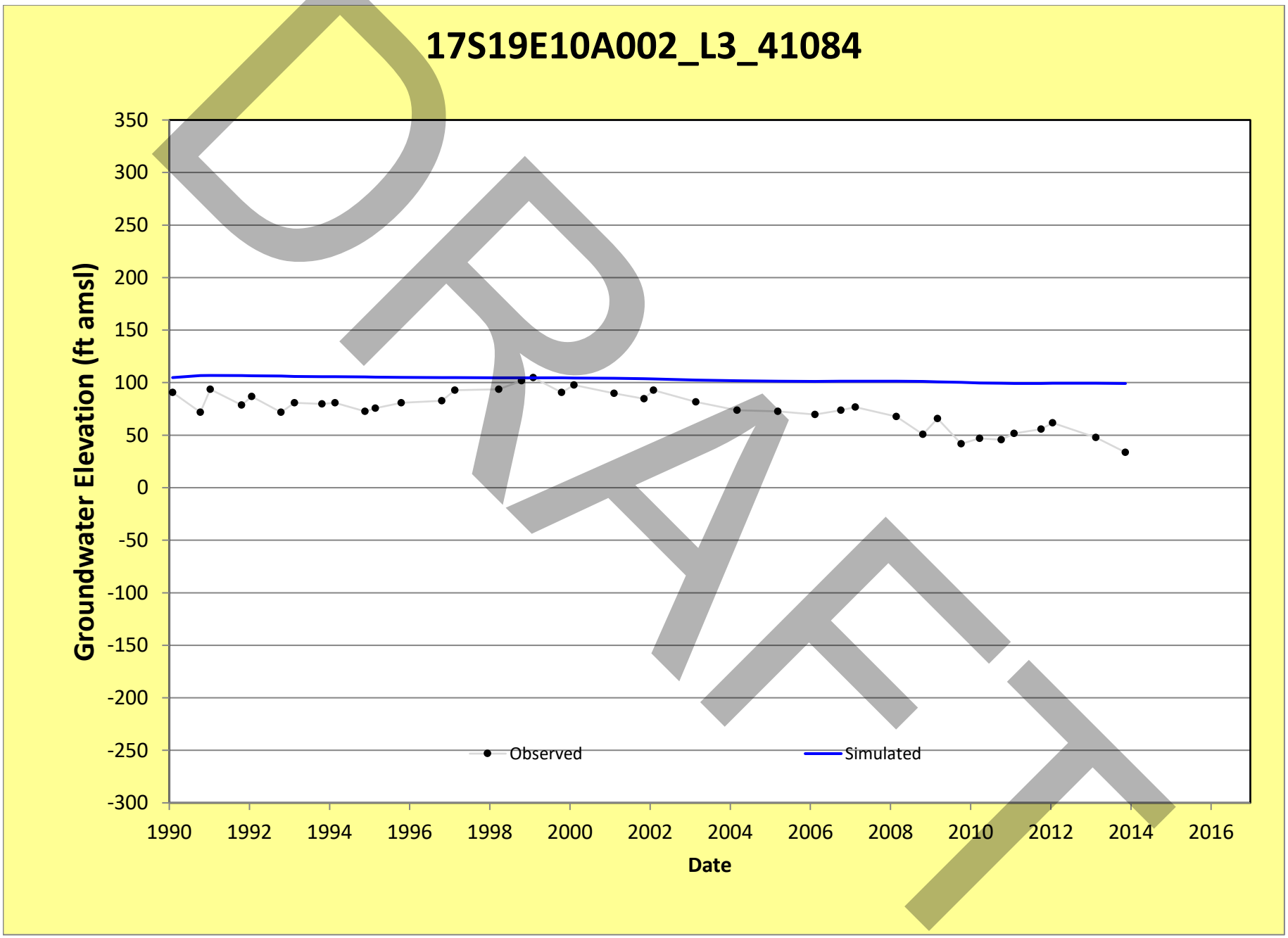
Date
Observed
Simulated
DRAFT


17S19E10A002_L3_41084
Groundwater Elevation (ft amsl)
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300
250
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150
100
50
0
-50
-100
-150
-200
-250
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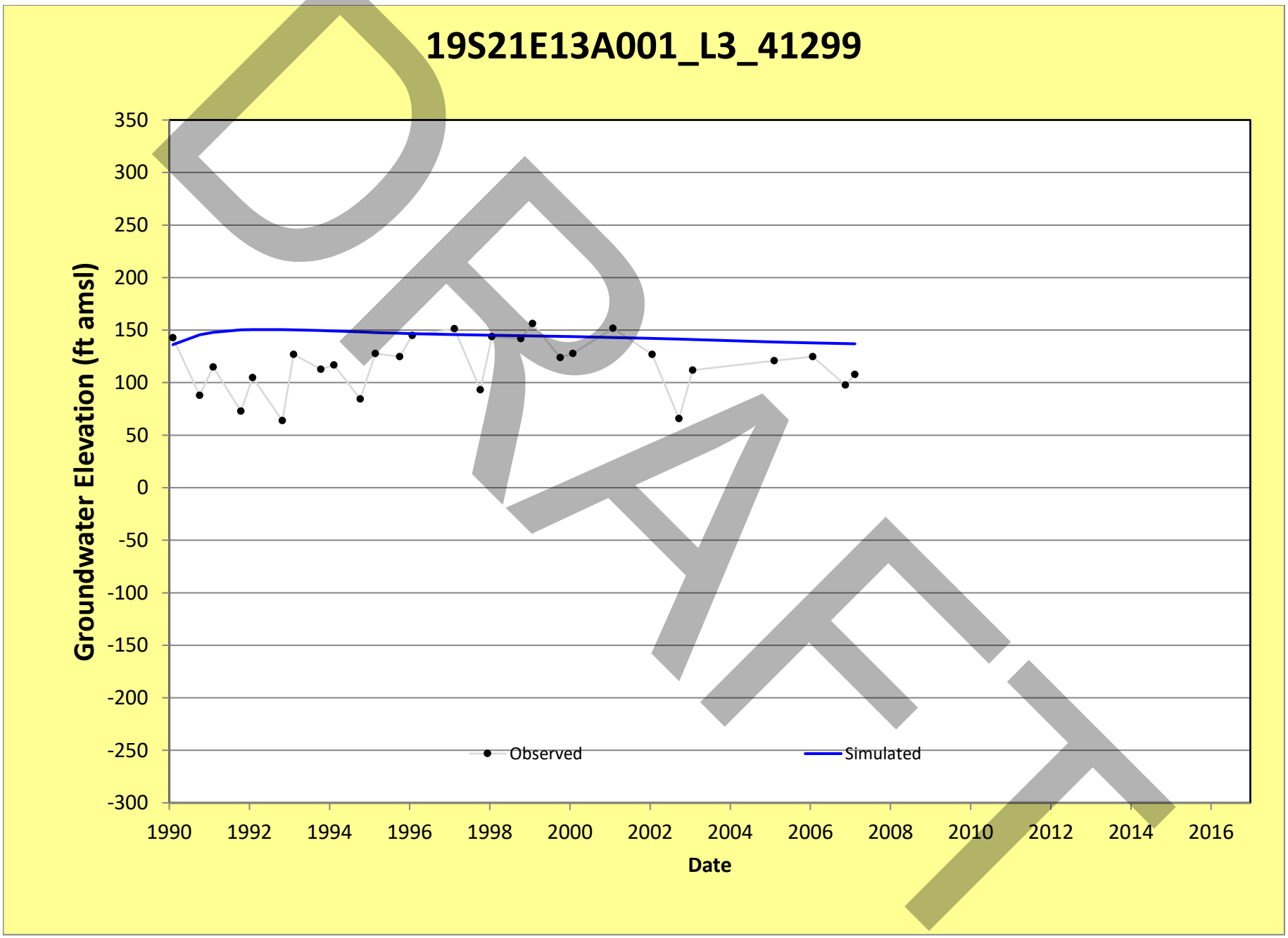
Observed
Simulated
DRAFT


19S21E13A001_L3_41299
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
-100
-150
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-250
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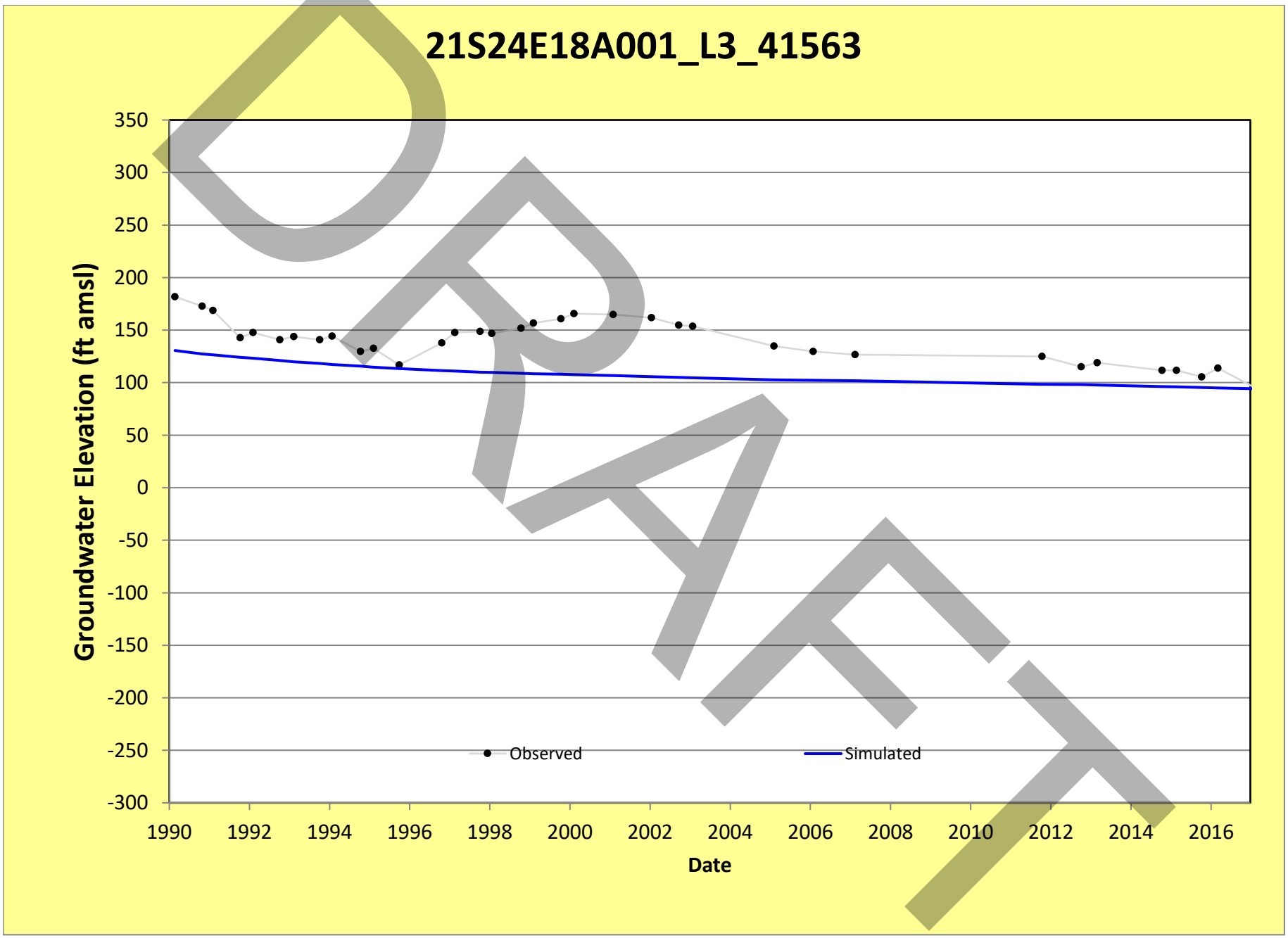
Date
Observed
Simulated
DRAFT


21S24E18A001_L3_41563
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
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-150
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Observed
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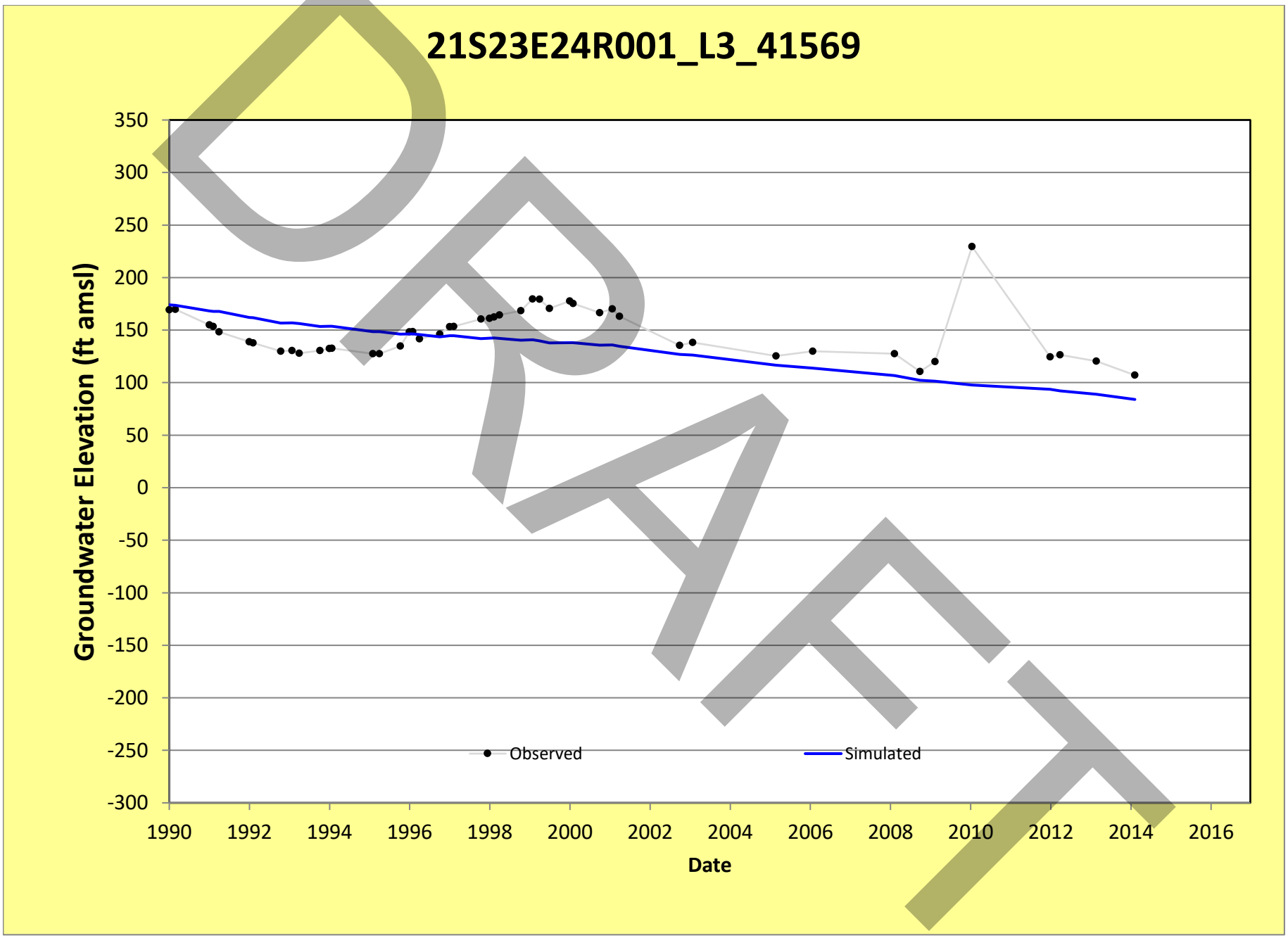
21S23E24R001_L3_41569
Groundwater Elevation (ft amsl)
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-50
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-150
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Date
Observed
Simulated
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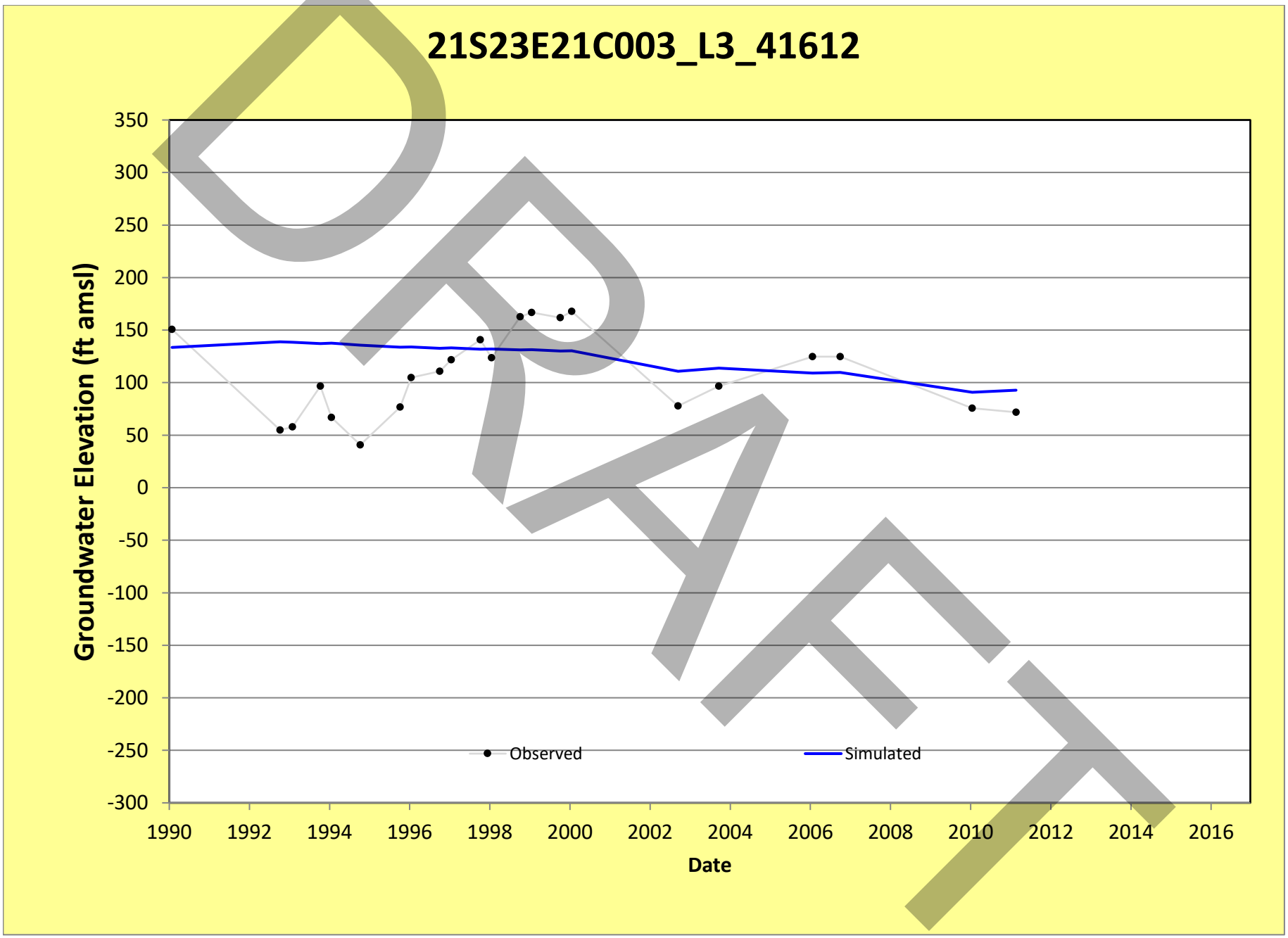
21S23E21C003_L3_41612
Groundwater Elevation (ft amsl)
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100
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0
-50
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-150
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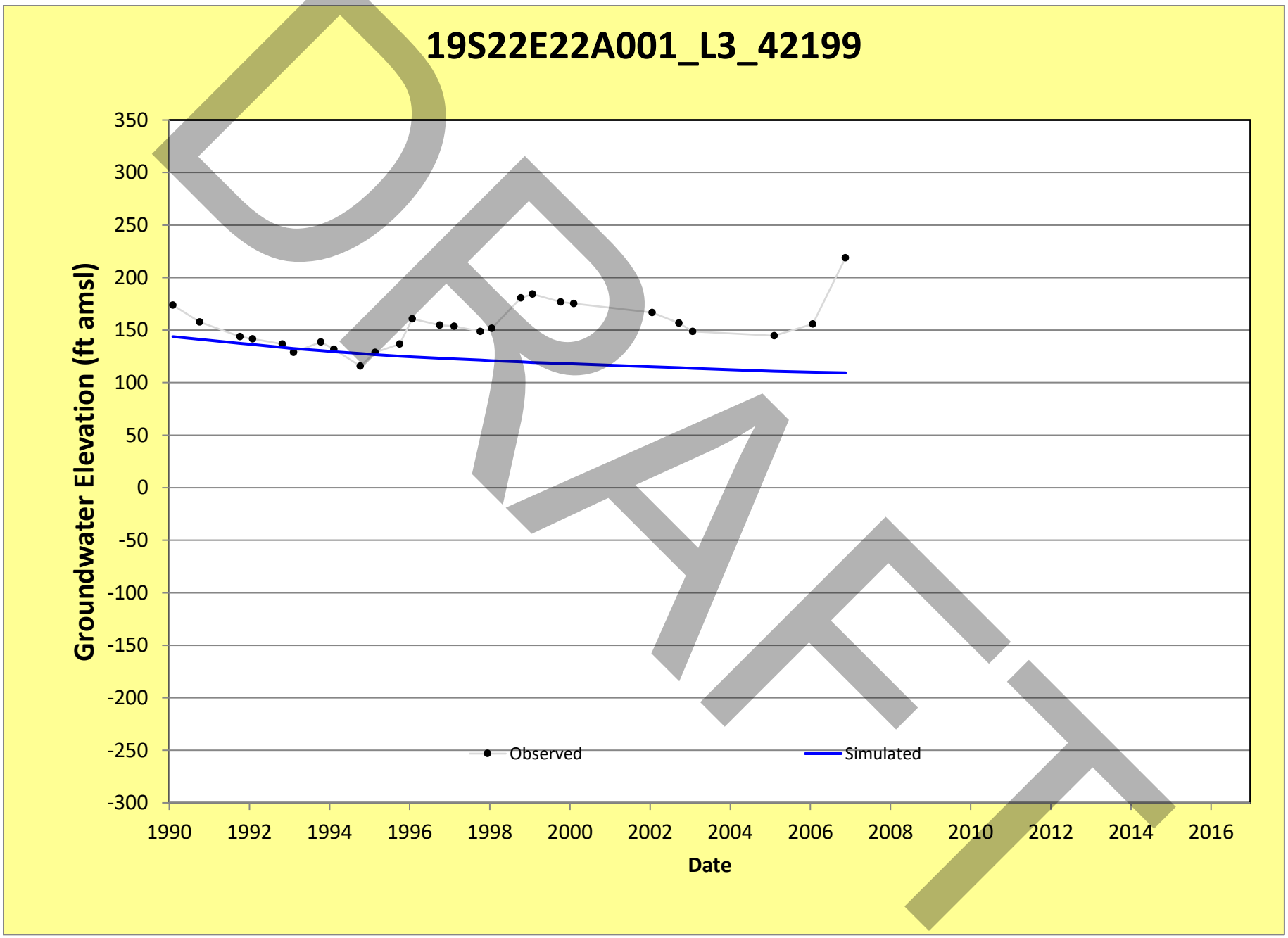
19S22E22A001_L3_42199
Groundwater Elevation (ft amsl)
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-50
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-150
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Observed
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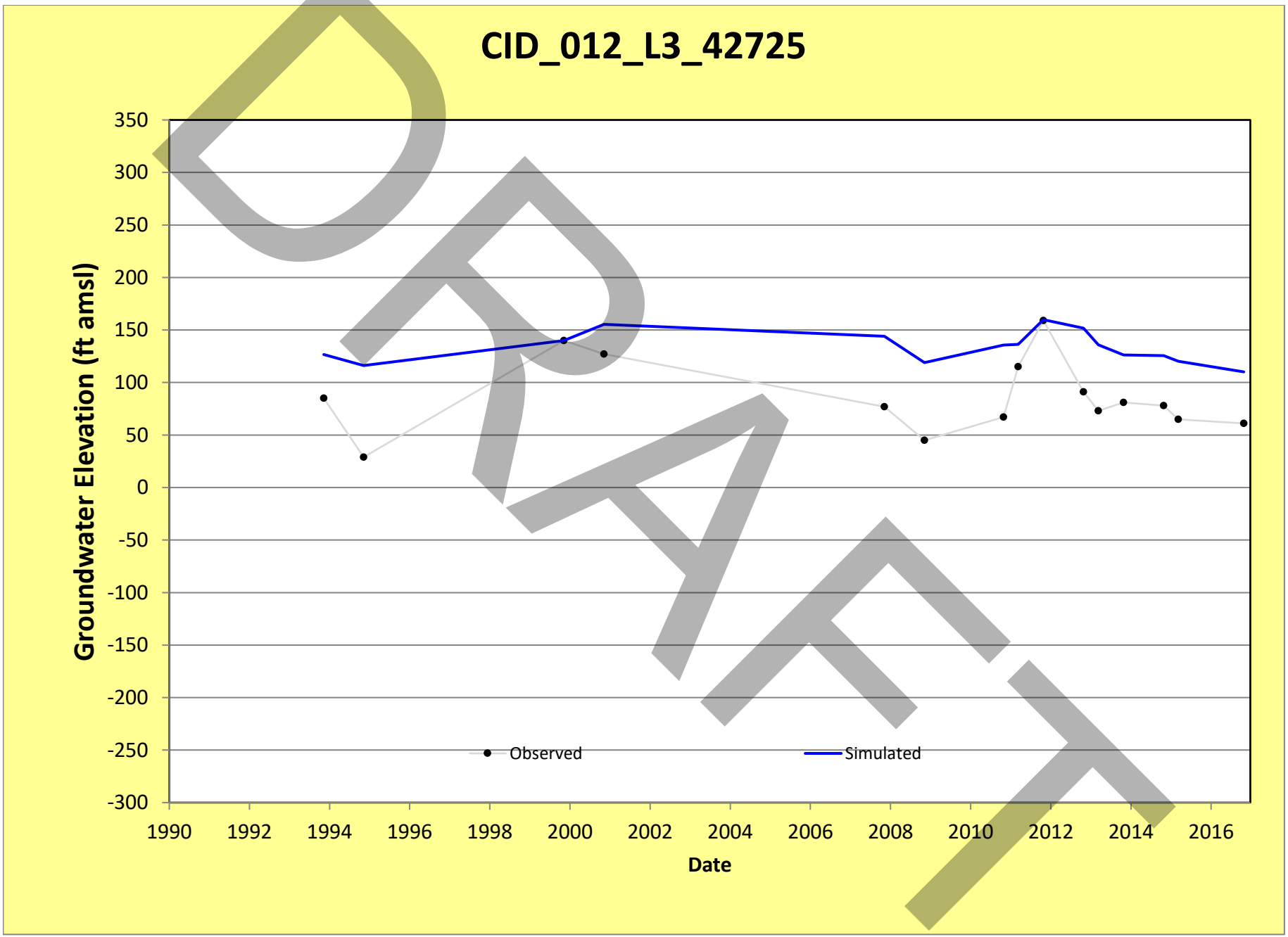
CID_012_L3_42725
Groundwater Elevation (ft amsl)
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-50
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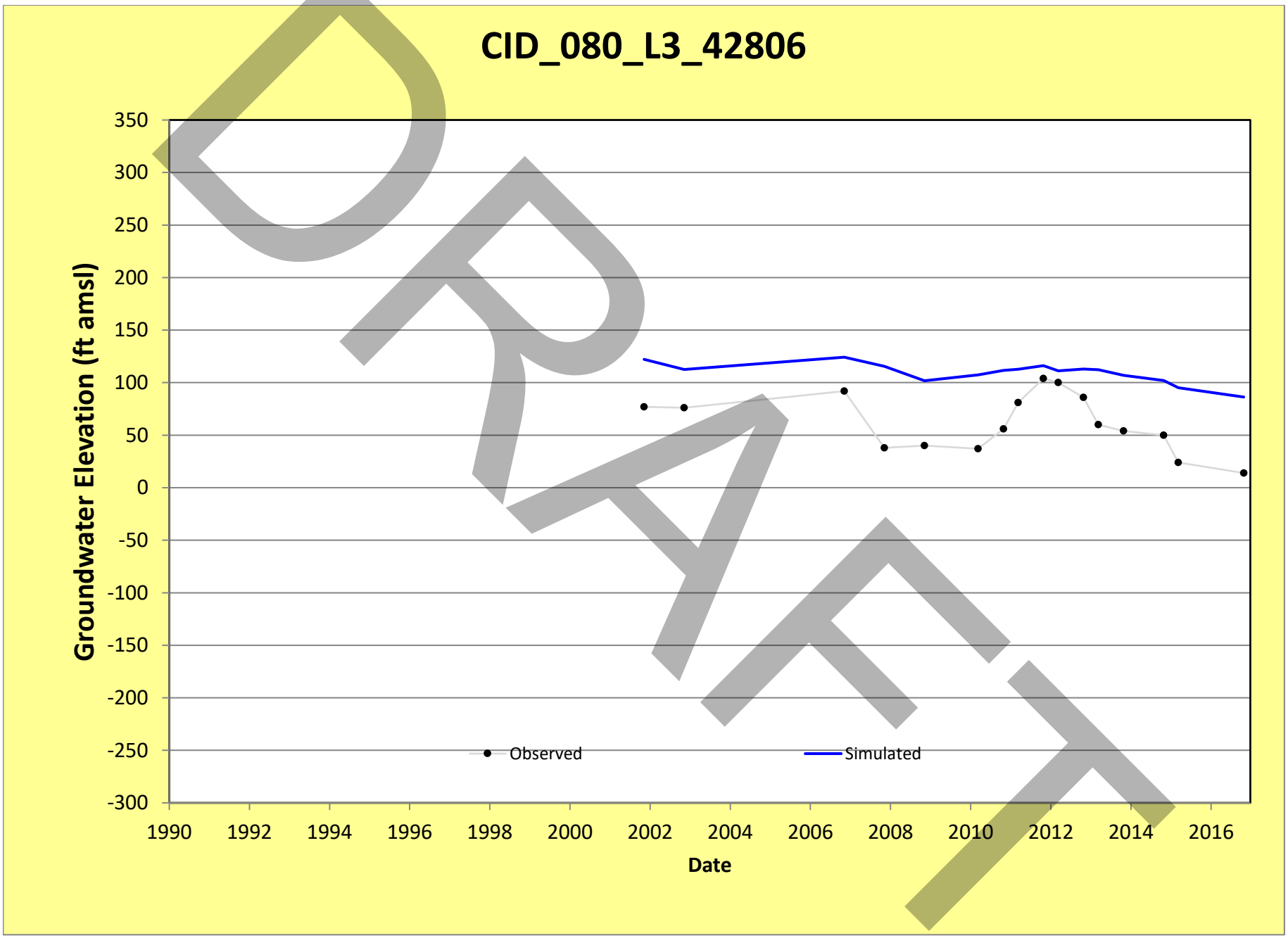
Date
Observed
Simulated
DRAFT


CID_080_L3_42806
Groundwater Elevation (ft amsl)
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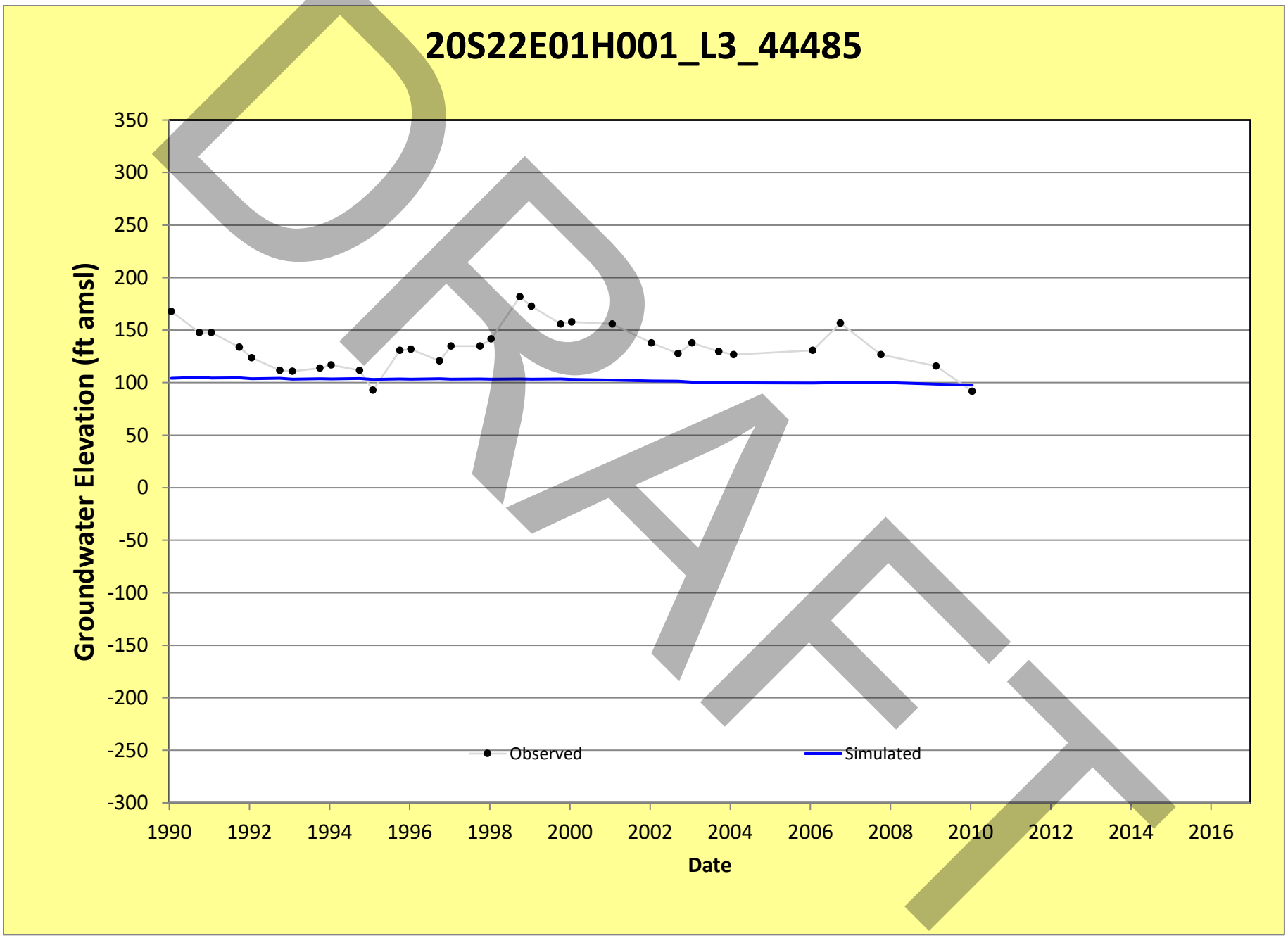
Observed
Simulated
DRAFT


20S22E01H001_L3_44485
Groundwater Elevation (ft amsl)
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-50
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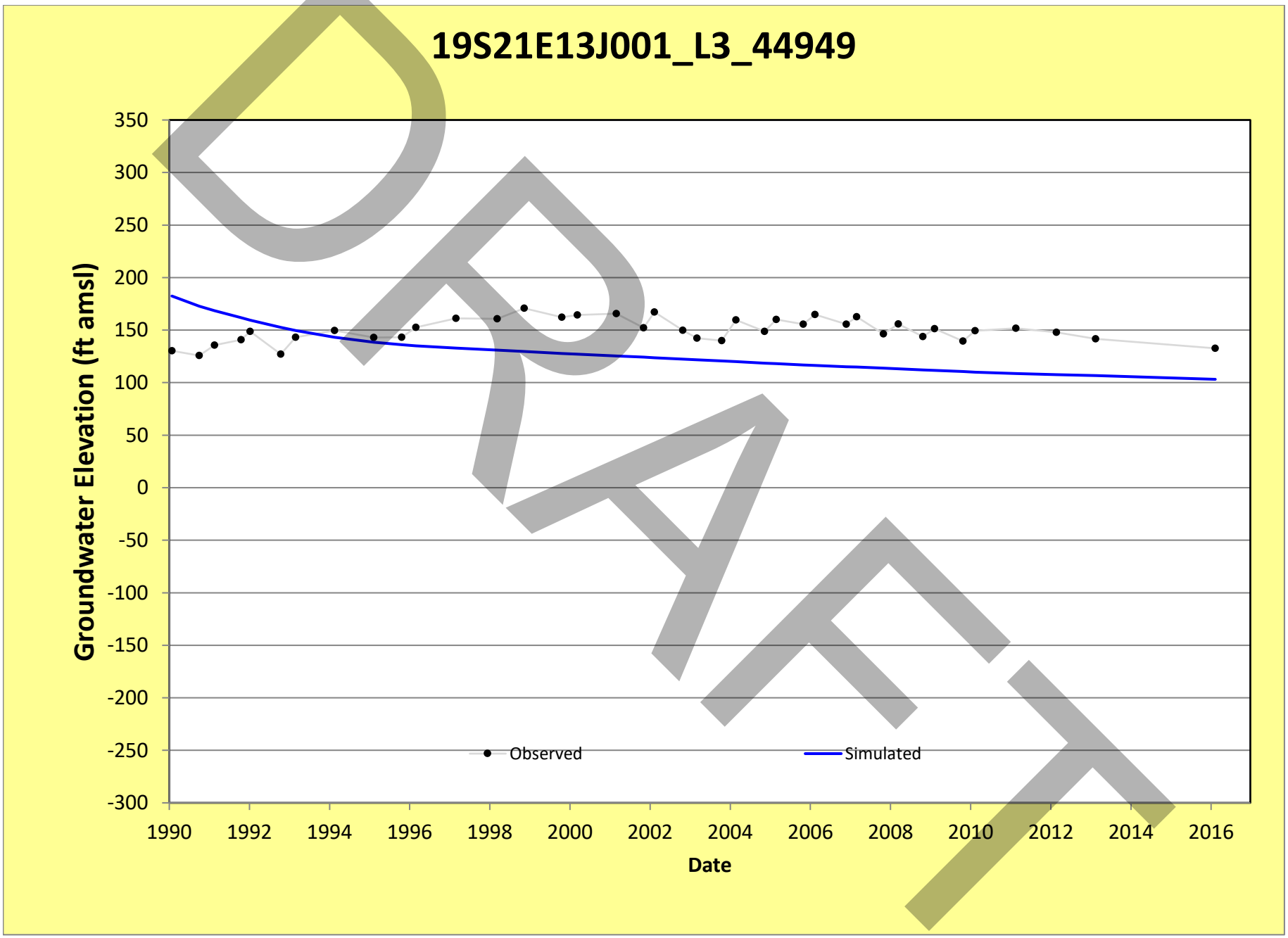
Observed
Simulated
DRAFT


19S21E13J001_L3_44949
Groundwater Elevation (ft amsl)
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-50
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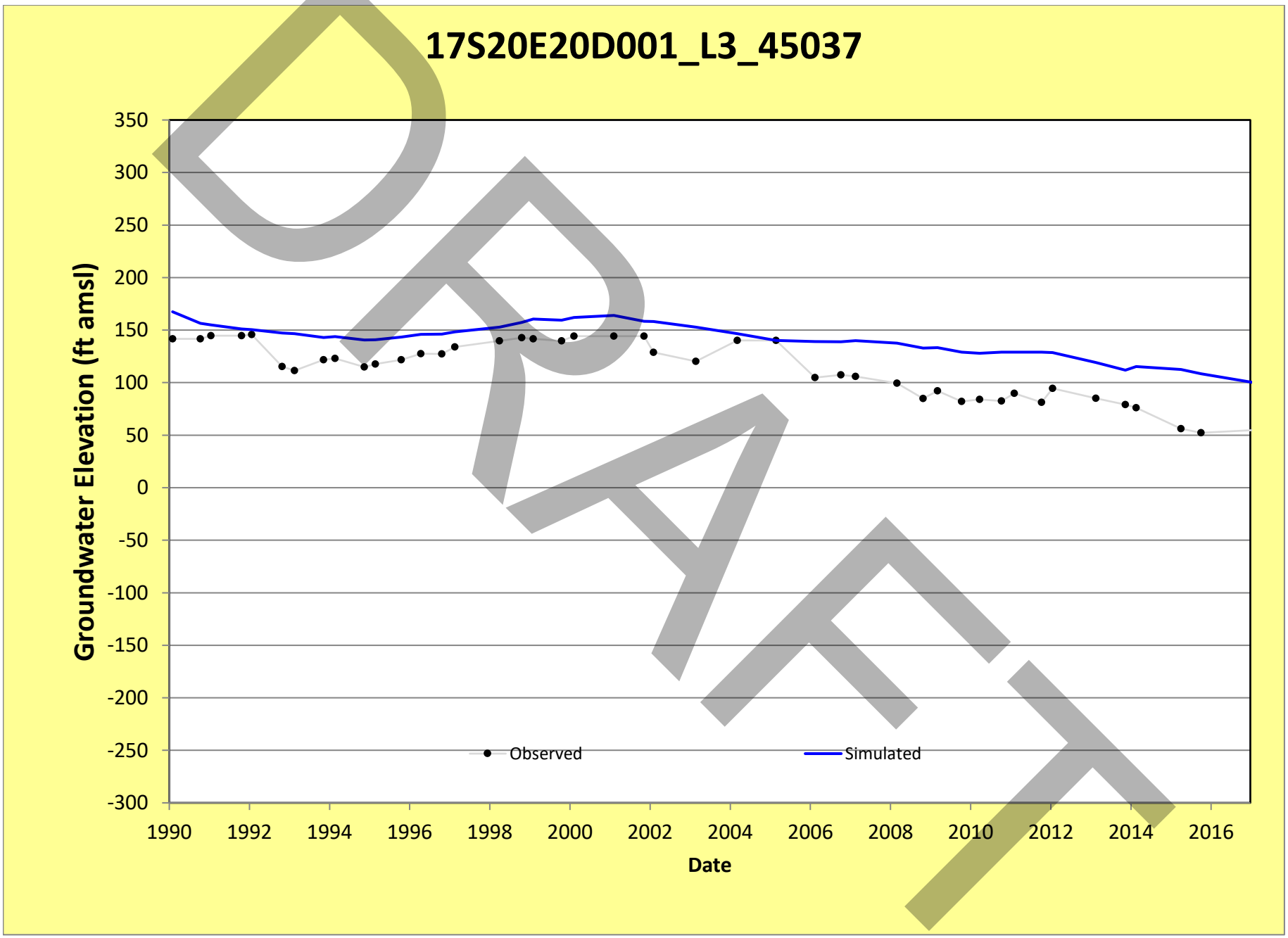
Observed
Simulated
DRAFT


17S20E20D001_L3_45037
Groundwater Elevation (ft amsl)
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100
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-150
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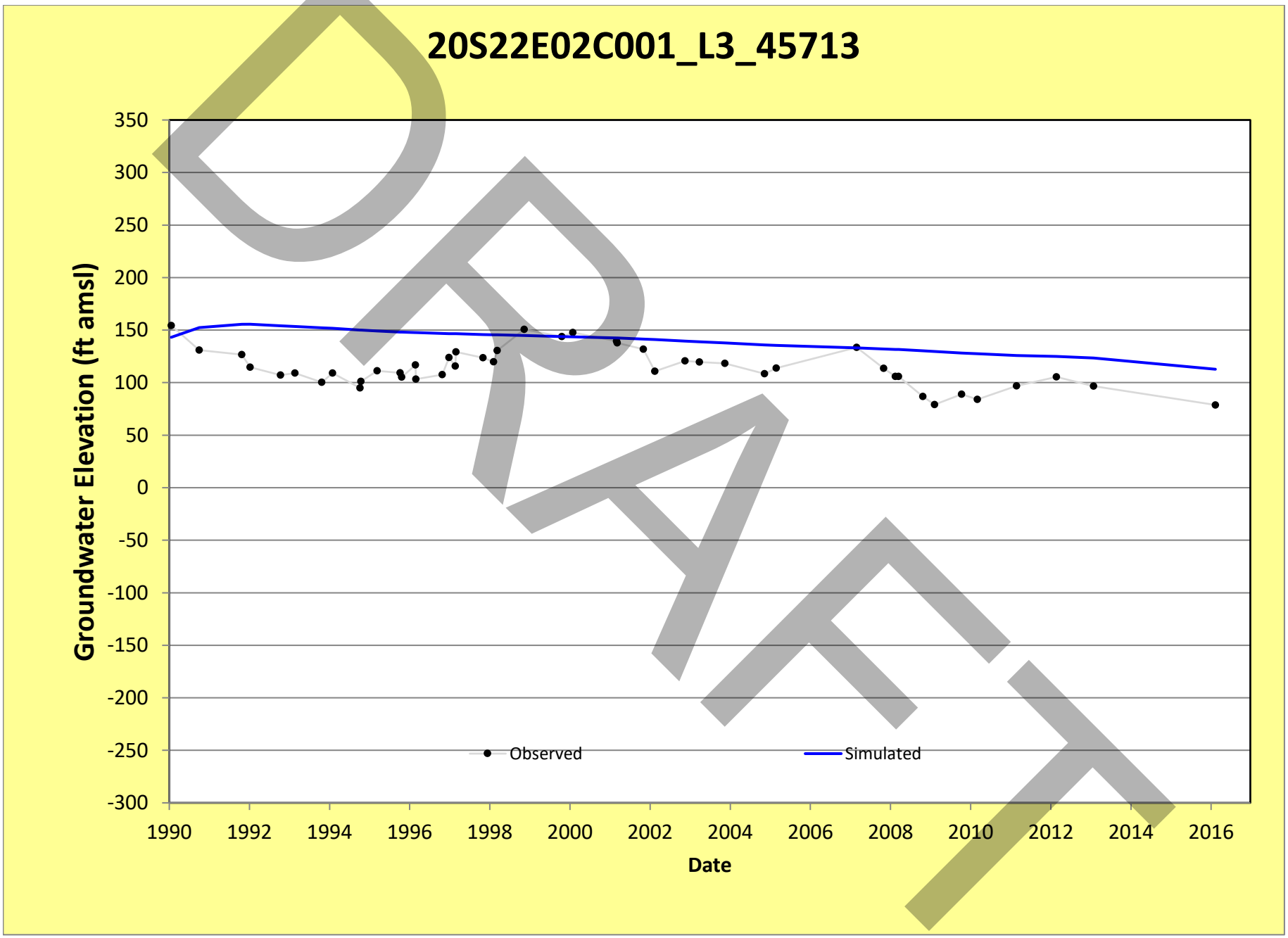
Date
Observed
Simulated
DRAFT


20S22E02C001_L3_45713
Groundwater Elevation (ft amsl)
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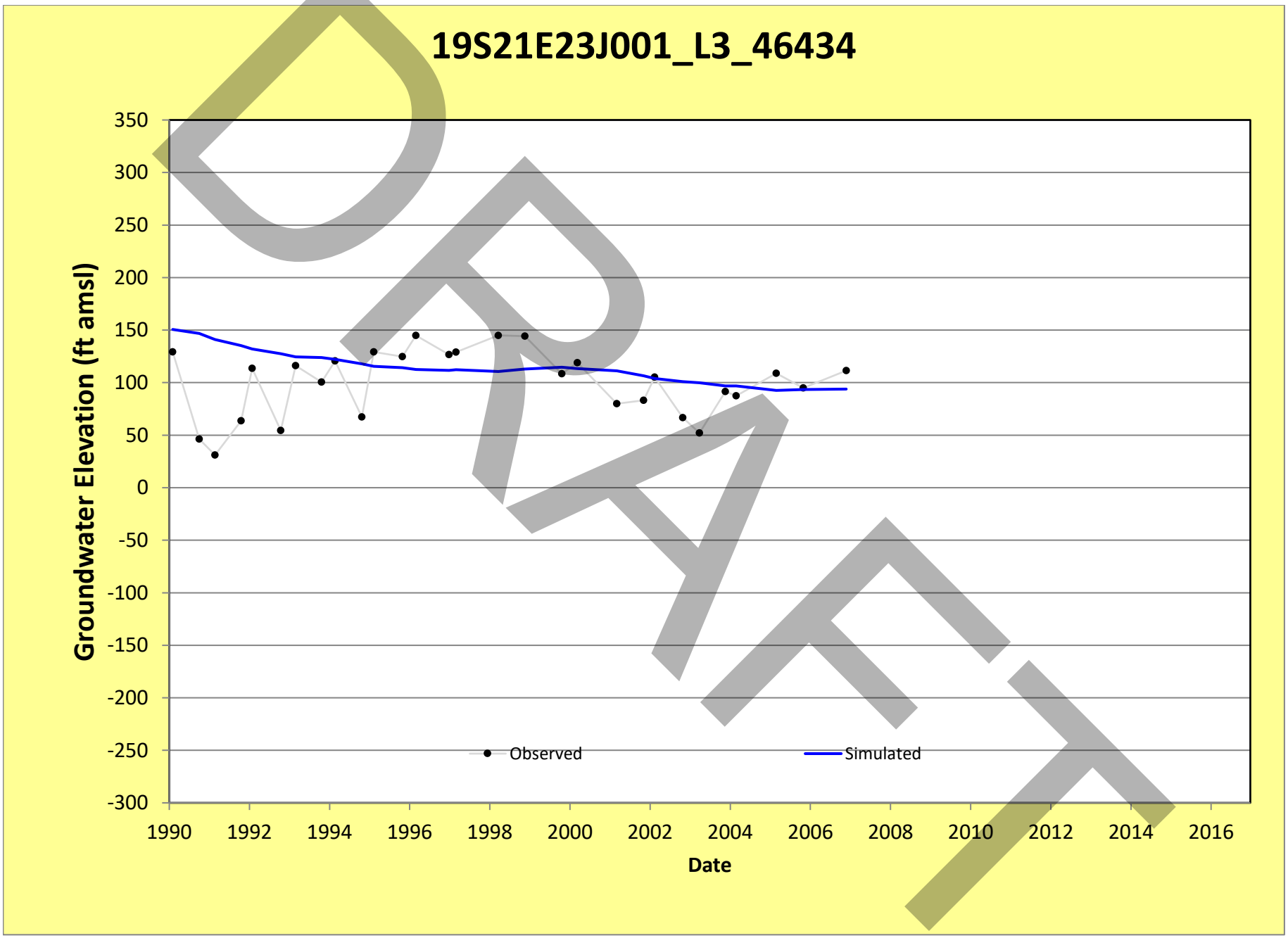
Date
Observed
Simulated
DRAFT


19S21E23J001_L3_46434
Groundwater Elevation (ft amsl)
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-100
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-200
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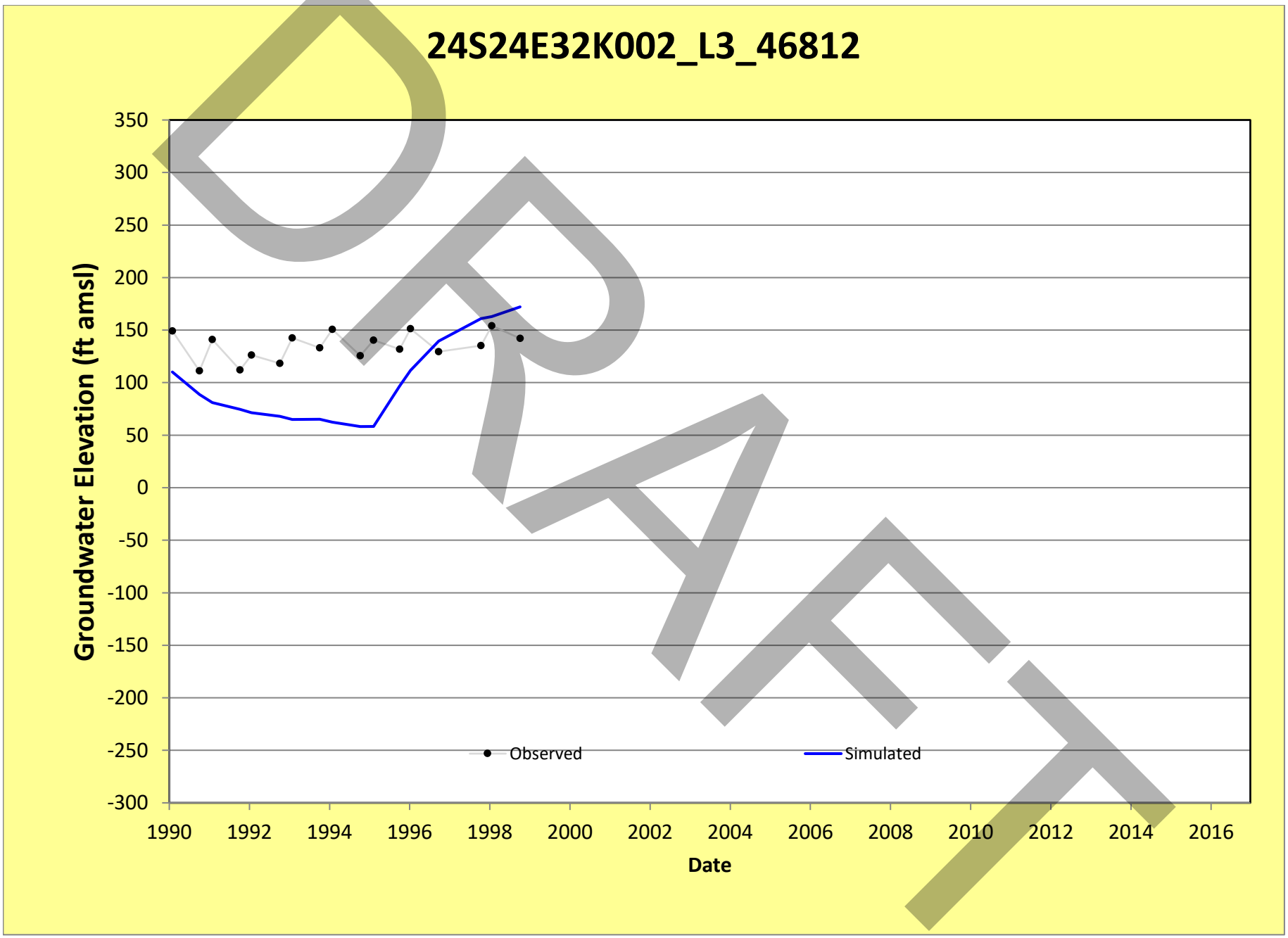
Date
Observed
Simulated
DRAFT


24S24E32K002_L3_46812
Groundwater Elevation (ft amsl)
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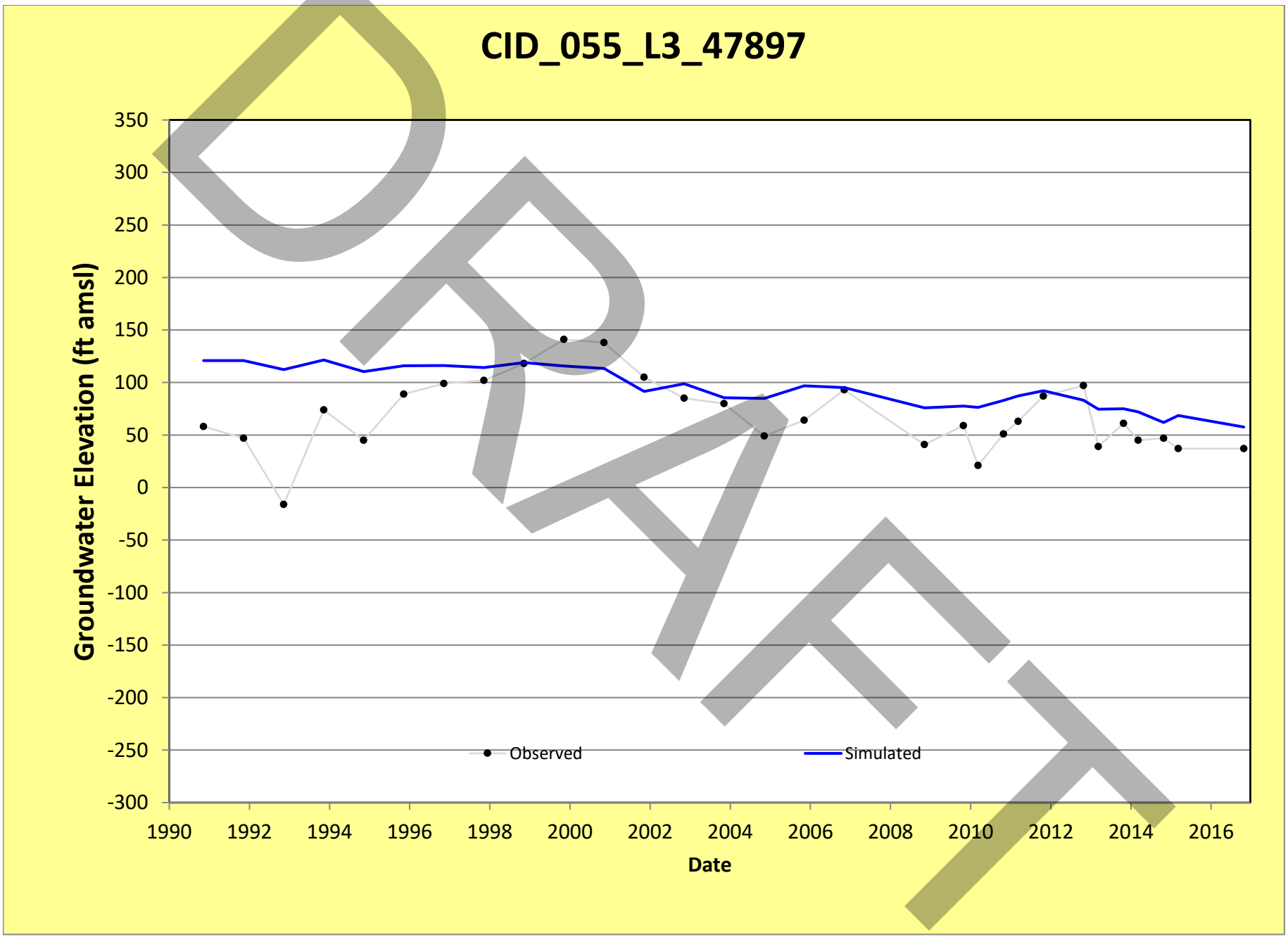
CID_055_L3_47897
Groundwater Elevation (ft amsl)
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100
50
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-200
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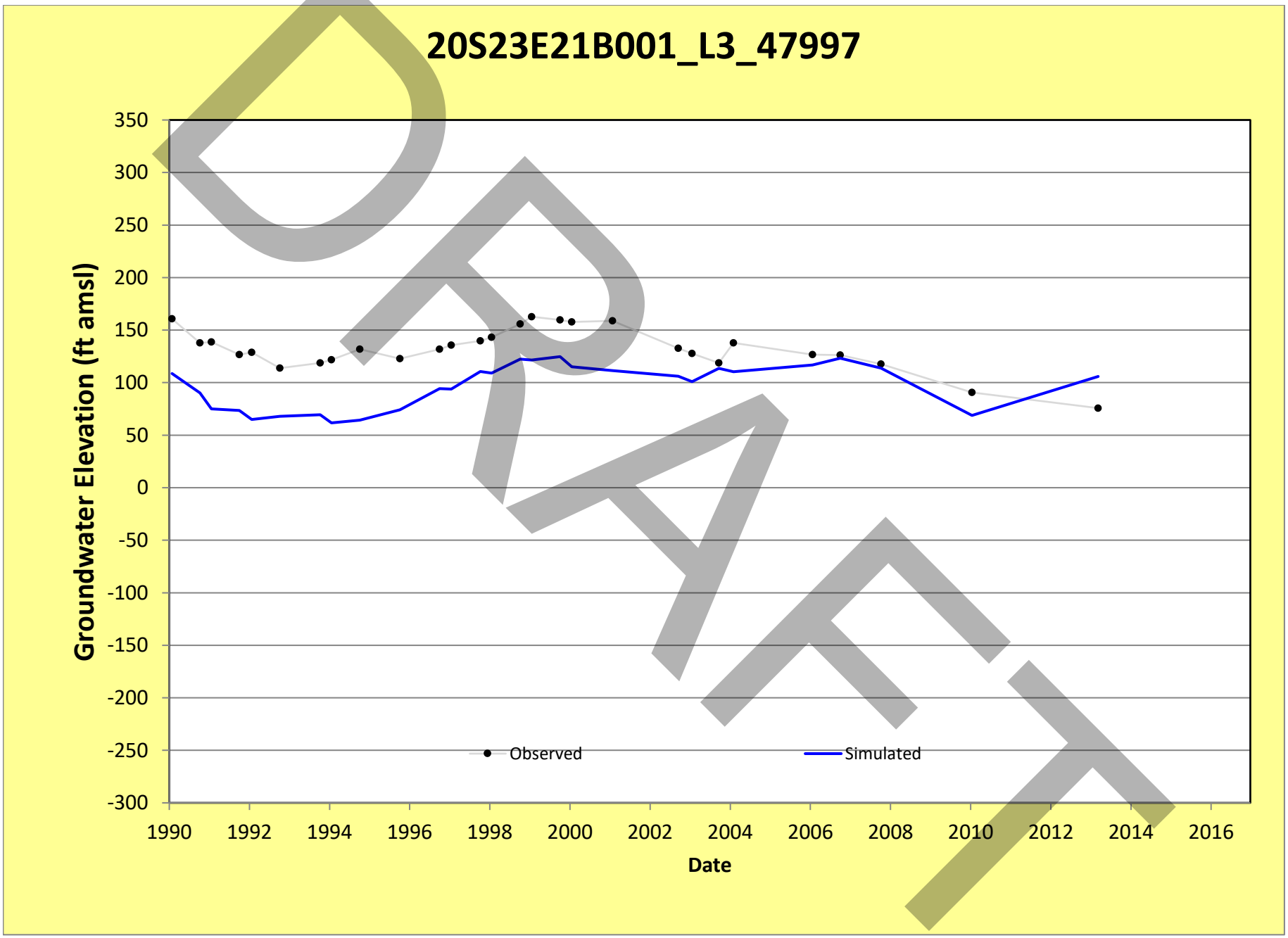
Date
Observed
Simulated
DRAFT


20S23E21B001_L3_47997
Groundwater Elevation (ft amsl)
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100
50
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-150
-200
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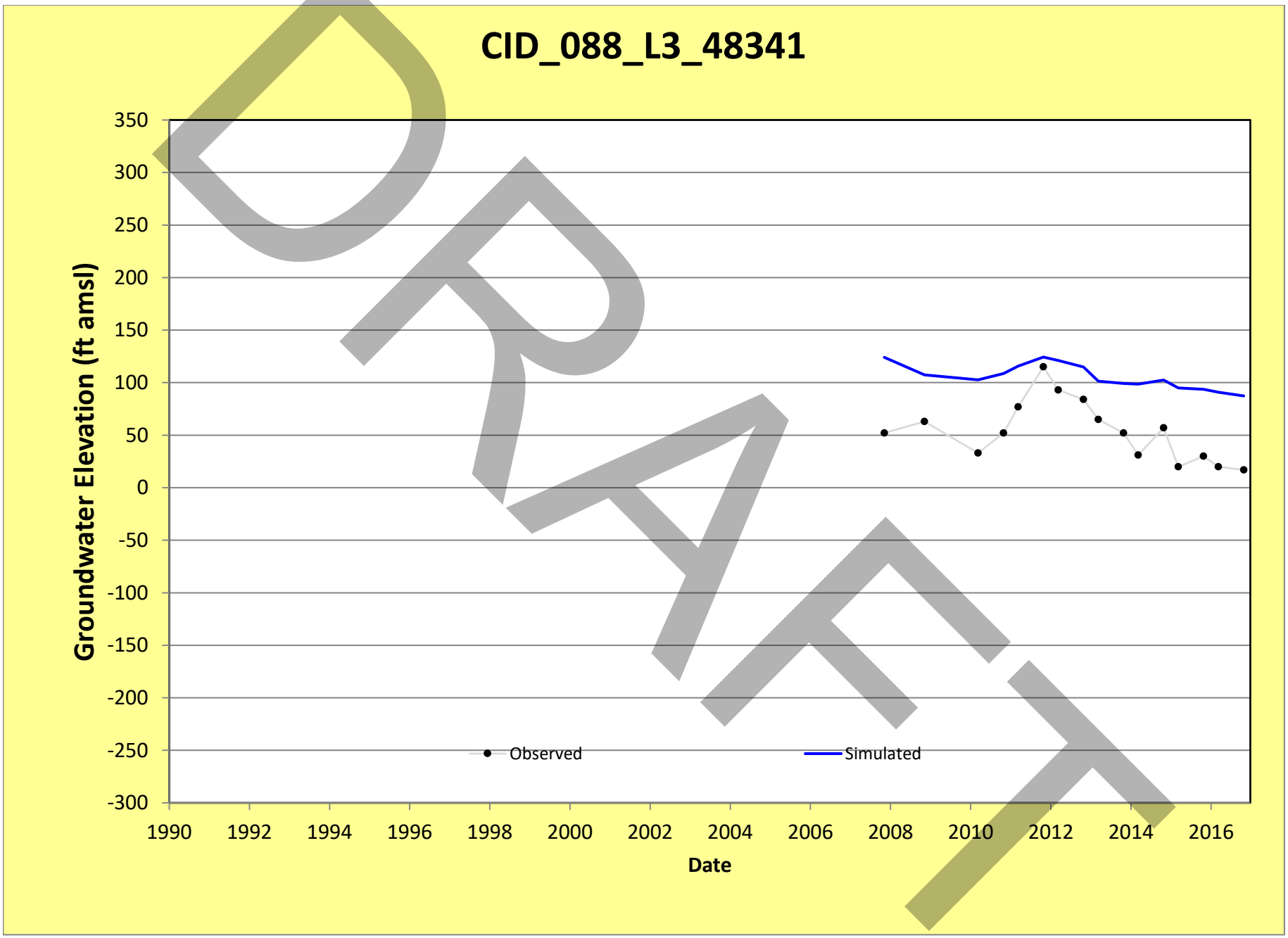
Date
Observed
Simulated
DRAFT


CID_088_L3_48341
Groundwater Elevation (ft amsl)
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100
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0
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-250
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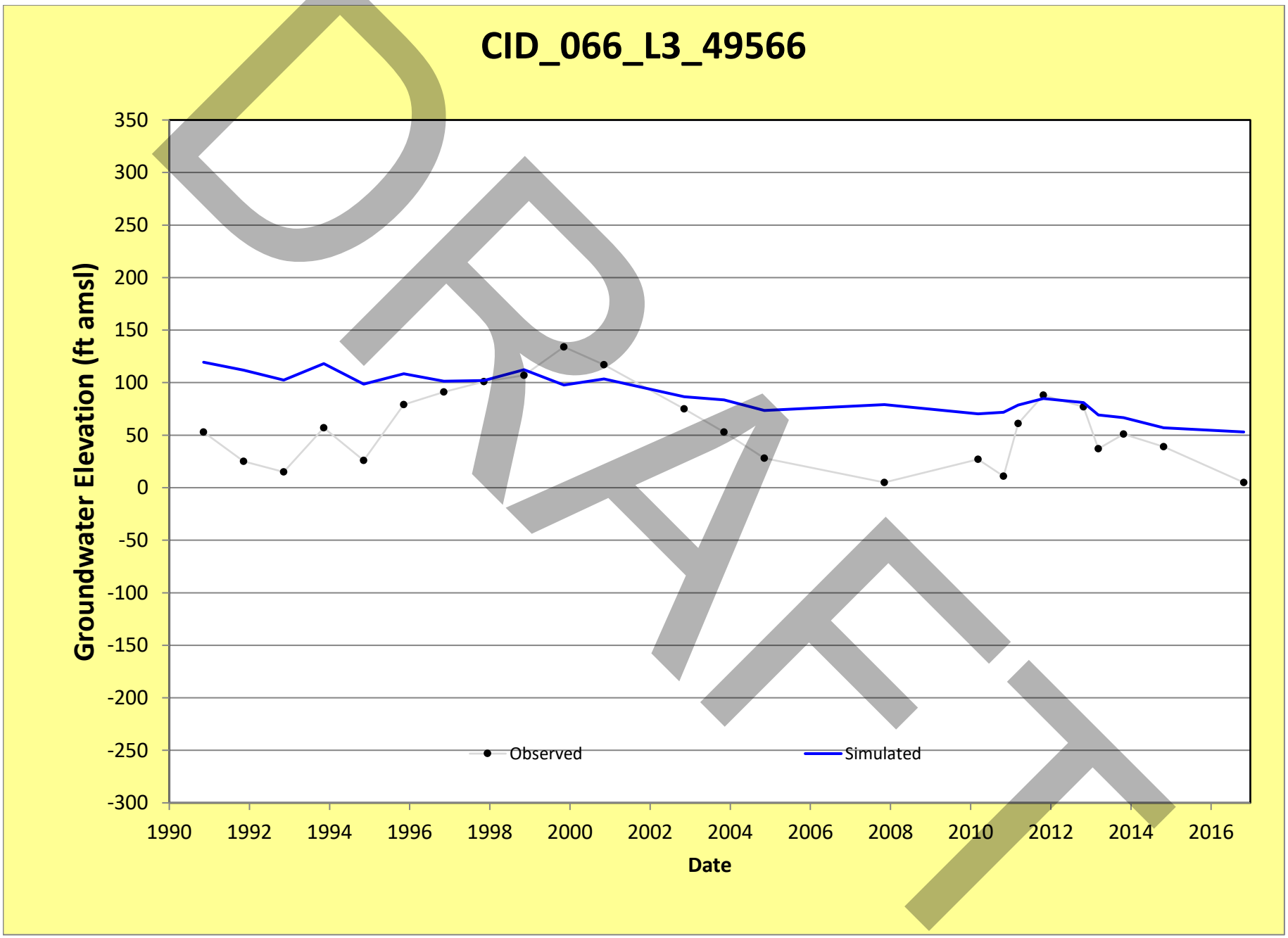
Observed
Simulated
DRAFT


CID_066_L3_49566
Groundwater Elevation (ft amsl)
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100
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0
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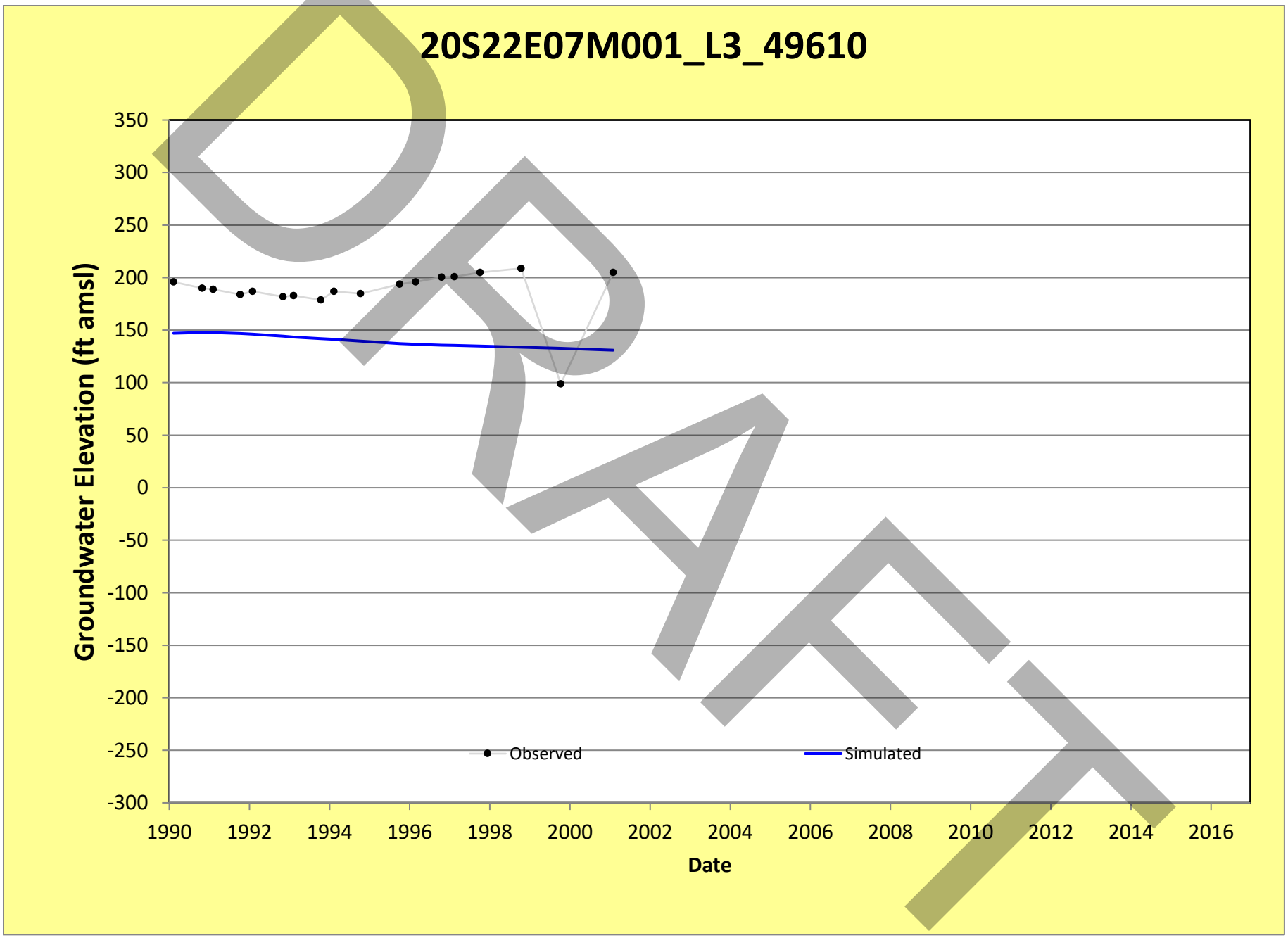
Date
Observed
Simulated
DRAFT


20S22E07M001_L3_49610
Groundwater Elevation (ft amsl)
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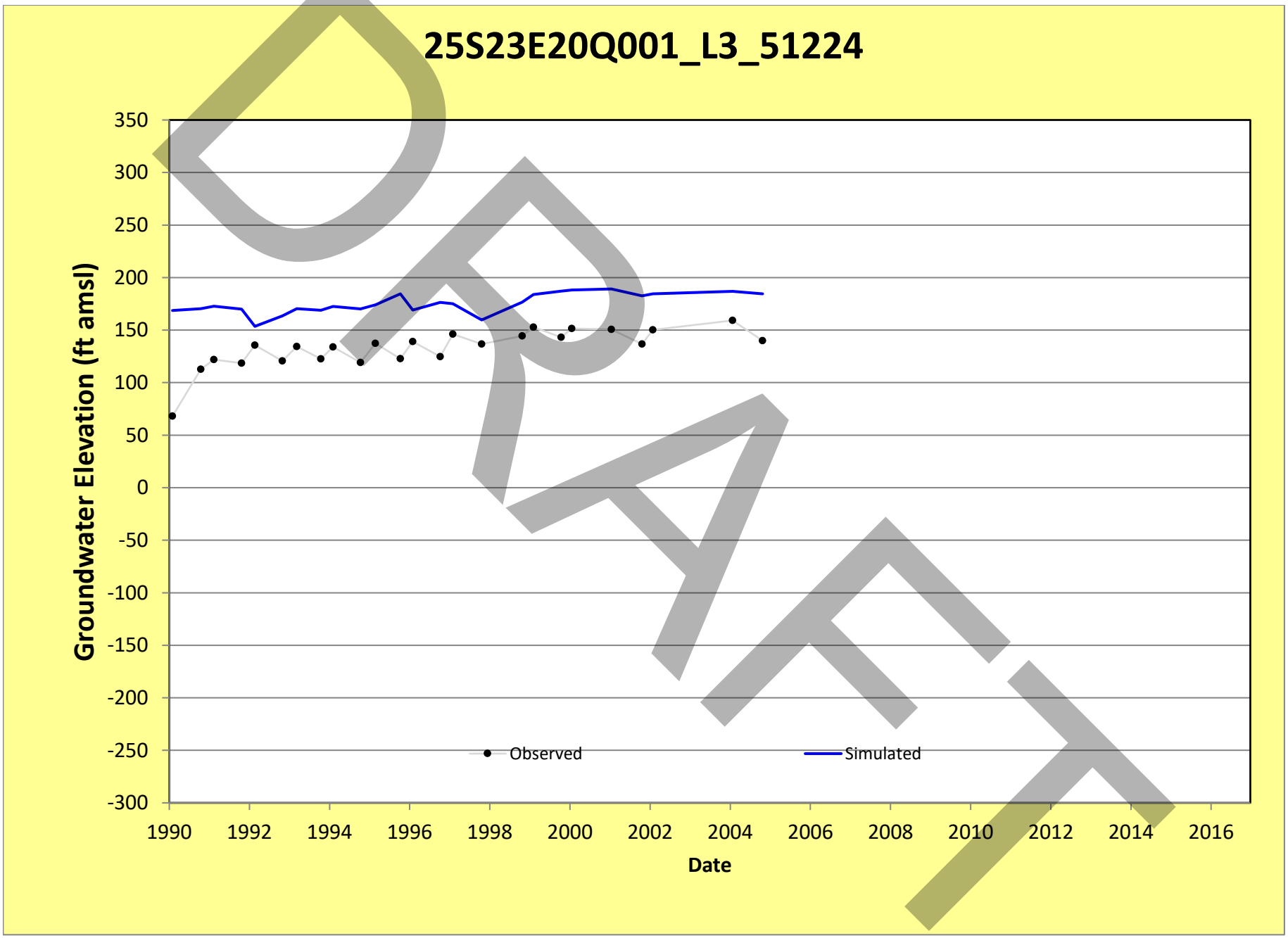
Observed
Simulated
DRAFT


25S23E20Q001_L3_51224
Groundwater Elevation (ft amsl)
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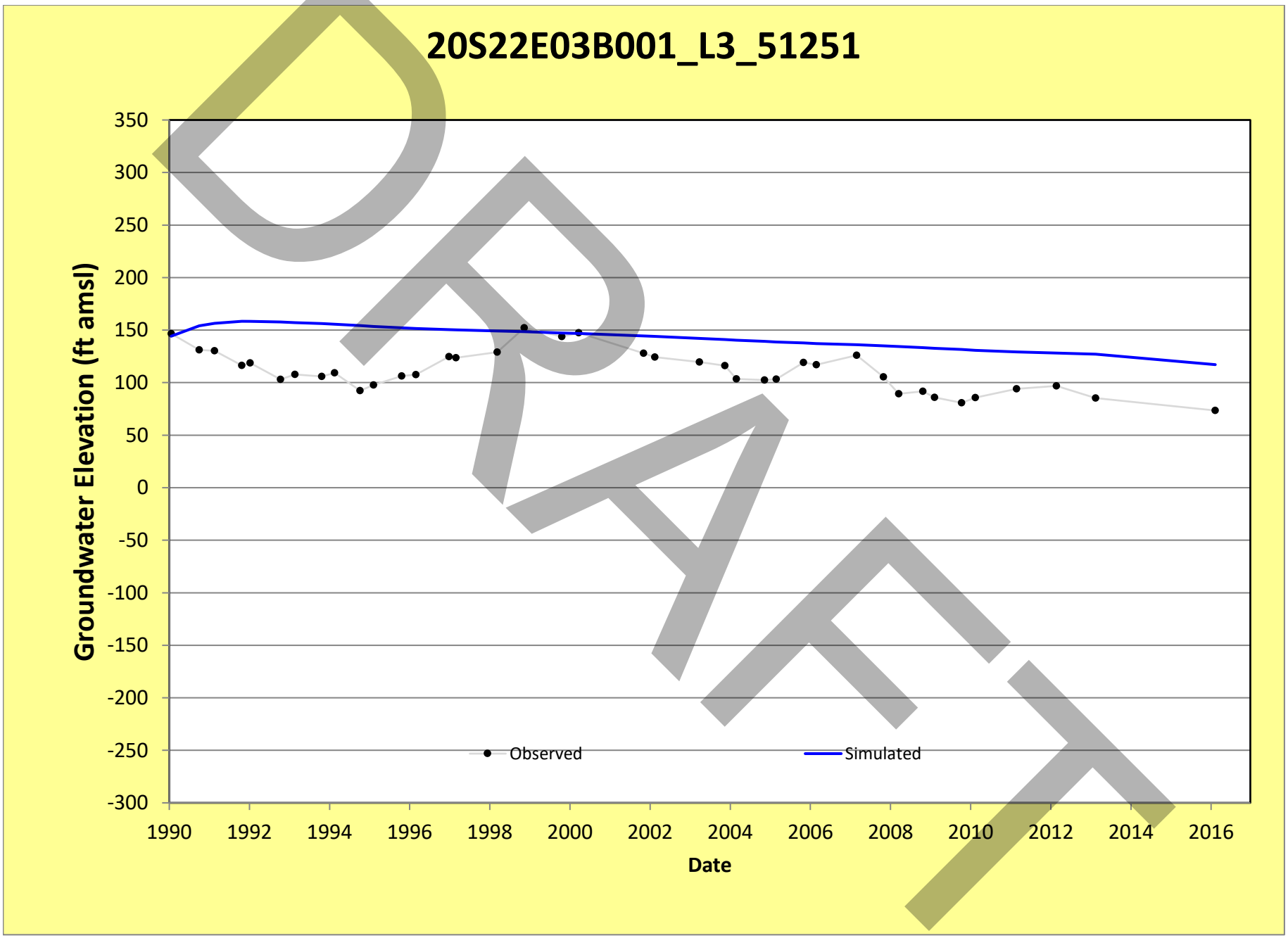
Date
Observed
Simulated
DRAFT


20S22E03B001_L3_51251
Groundwater Elevation (ft amsl)
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-50
-100
-150
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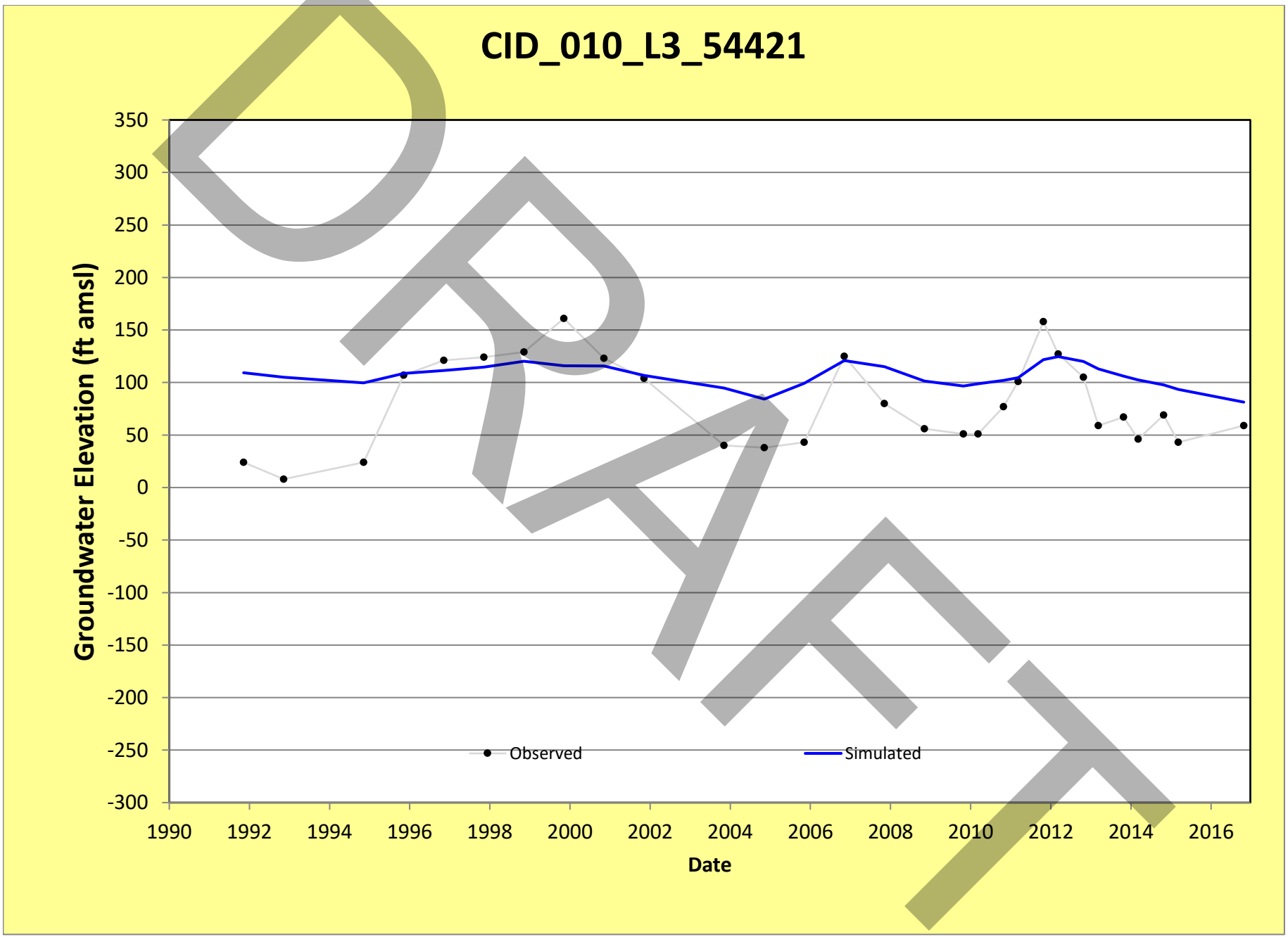
Date
Observed
Simulated
DRAFT


CID_010_L3_54421
Groundwater Elevation (ft amsl)
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Observed
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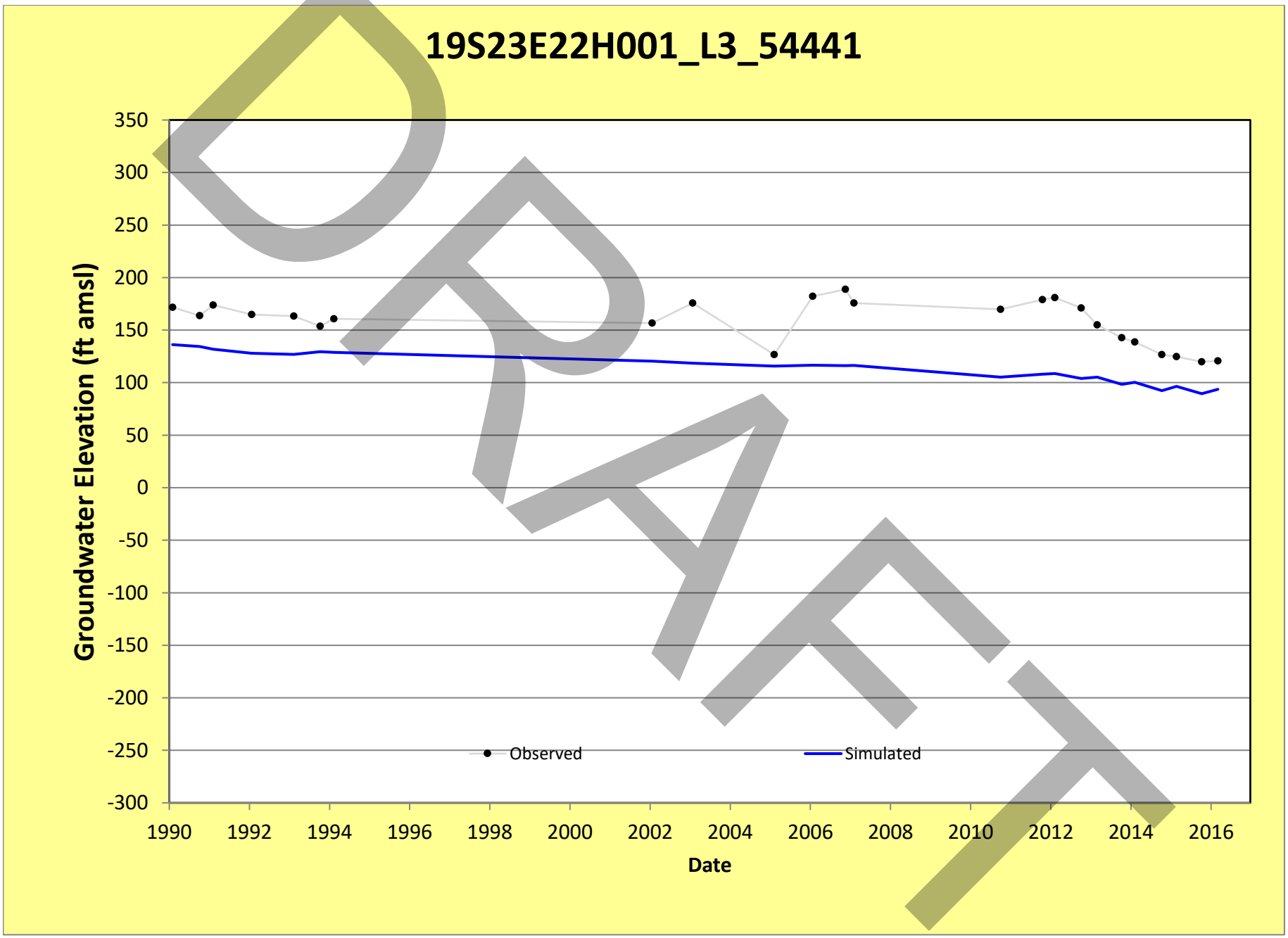
19S23E22H001_L3_54441
Groundwater Elevation (ft amsl)
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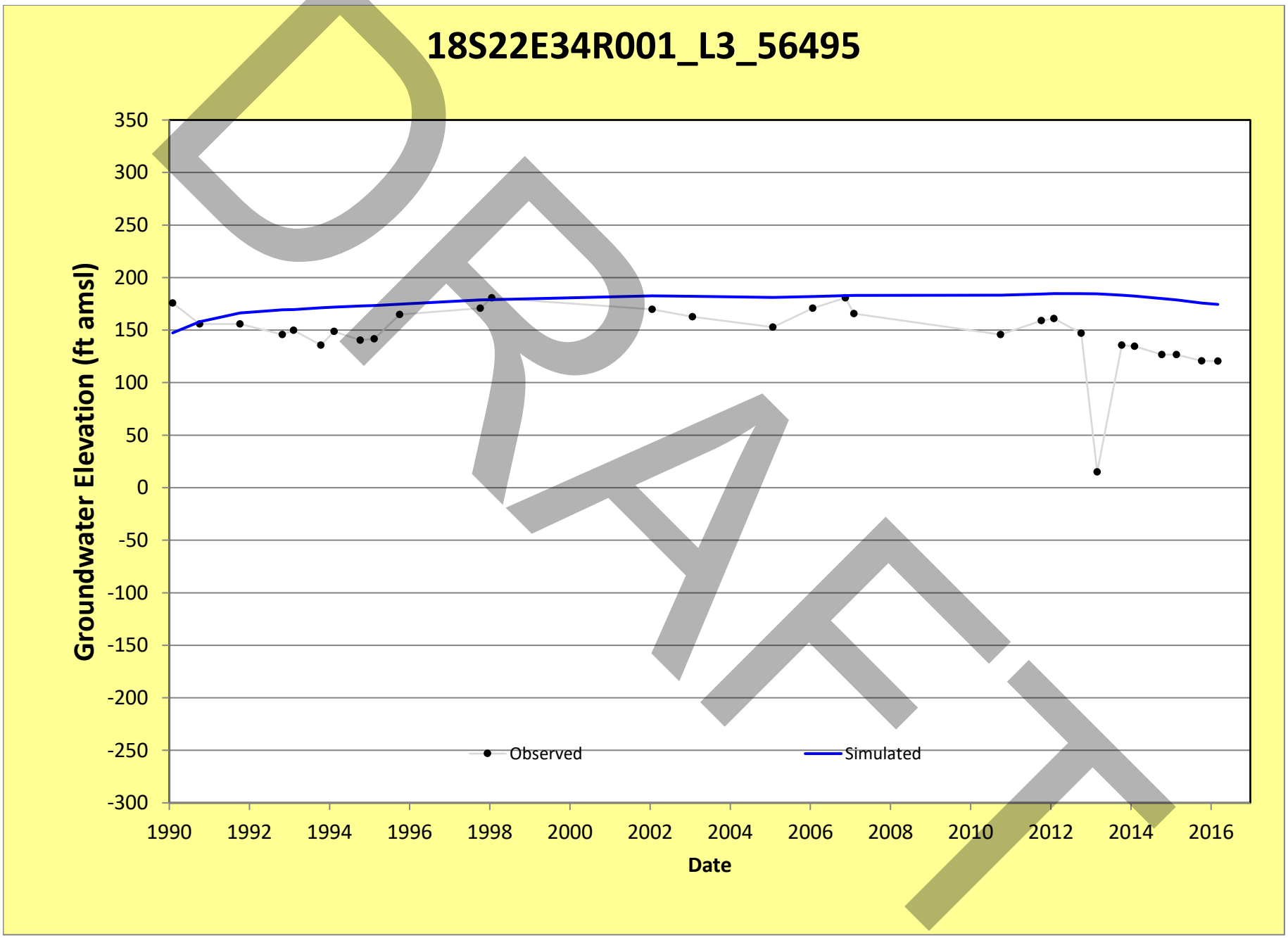
Observed
Simulated
DRAFT


18S22E34R001_L3_56495
Groundwater Elevation (ft amsl)
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-50
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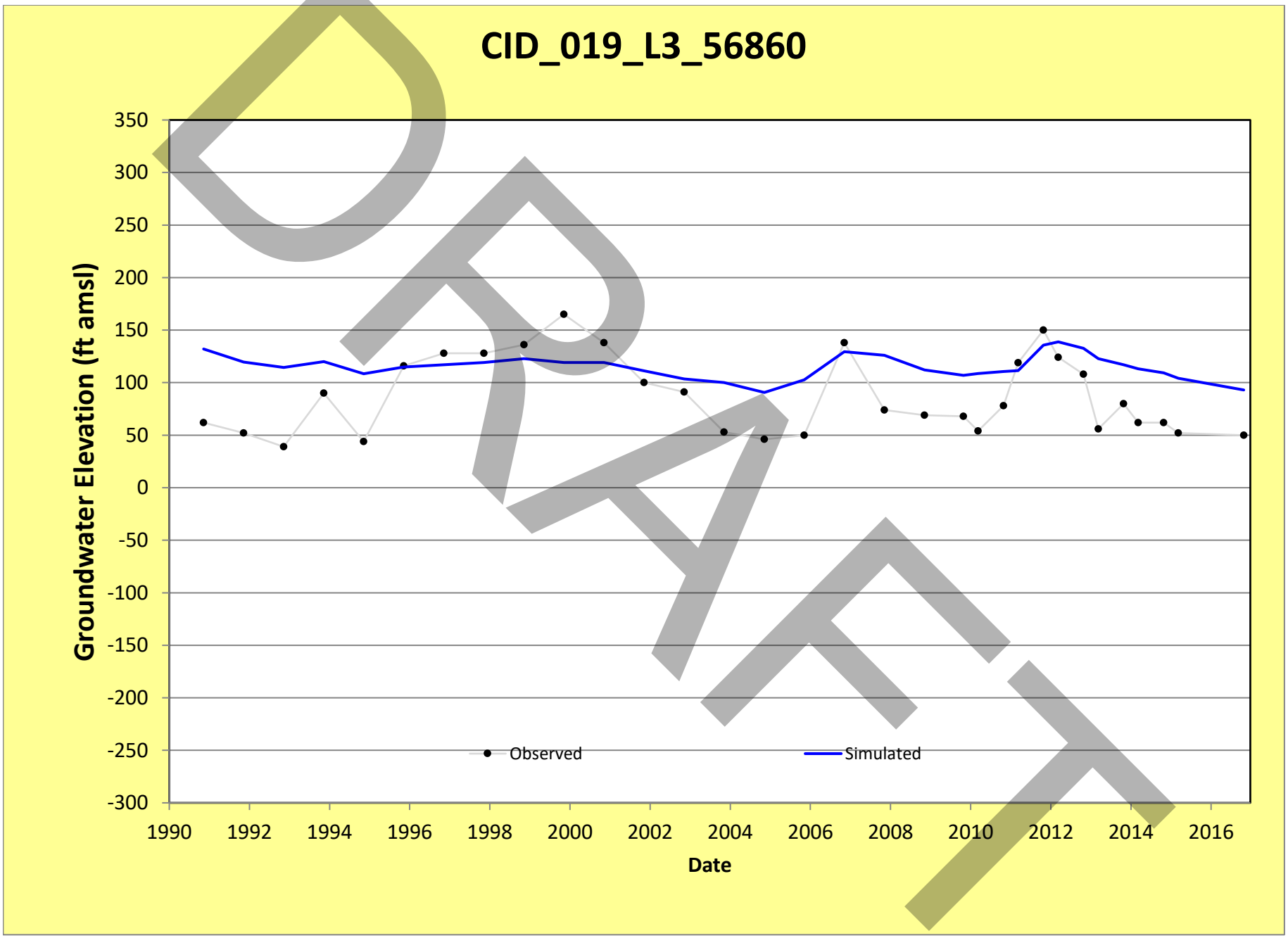
Date
Observed
Simulated
DRAFT


CID_019_L3_56860
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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Date
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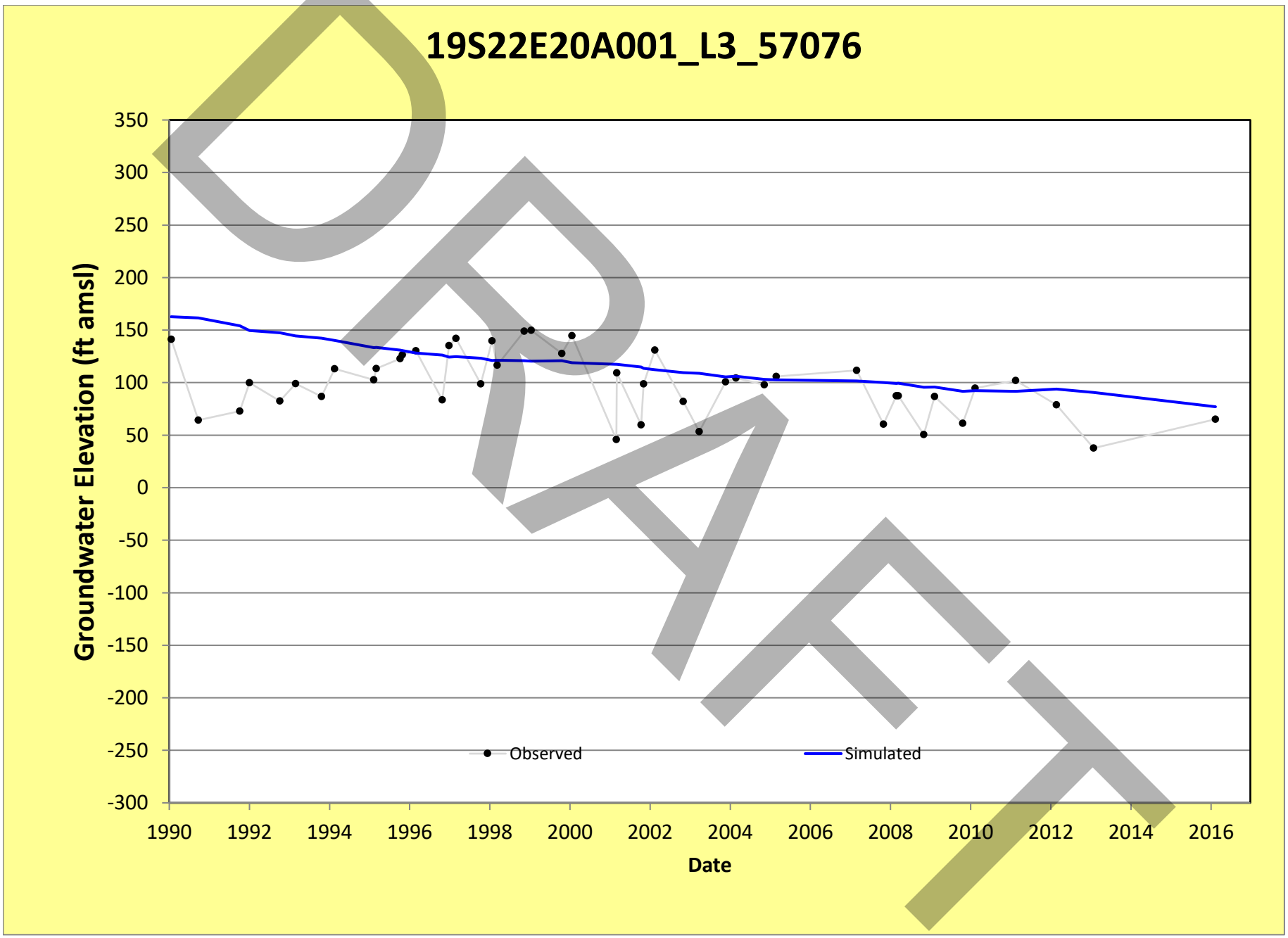
19S22E20A001_L3_57076
Groundwater Elevation (ft amsl)
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300
250
200
150
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50
0
-50
-100
-150
-200
-250
-300
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Observed
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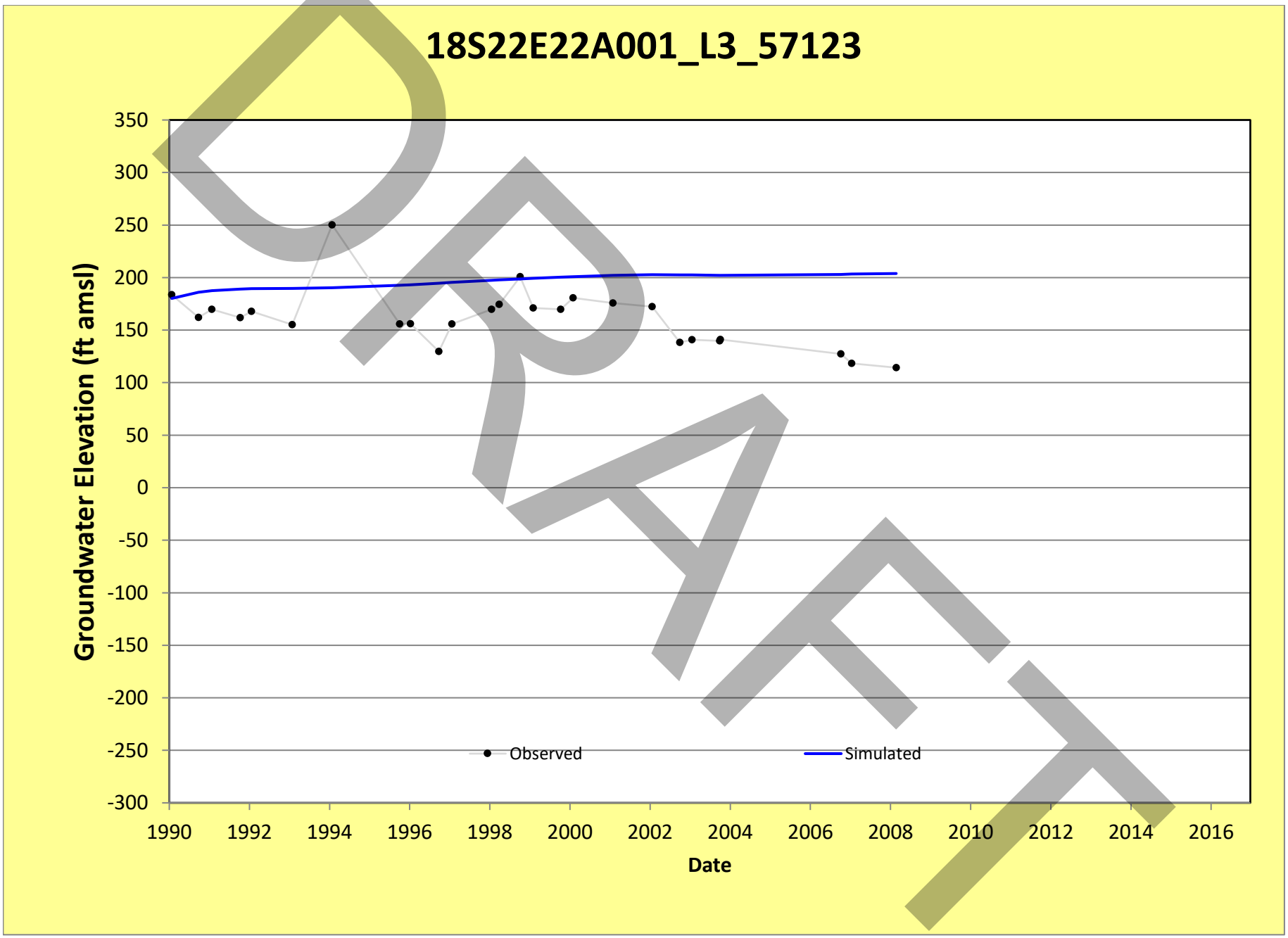
18S22E22A001_L3_57123
Groundwater Elevation (ft amsl)
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300
250
200
150
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50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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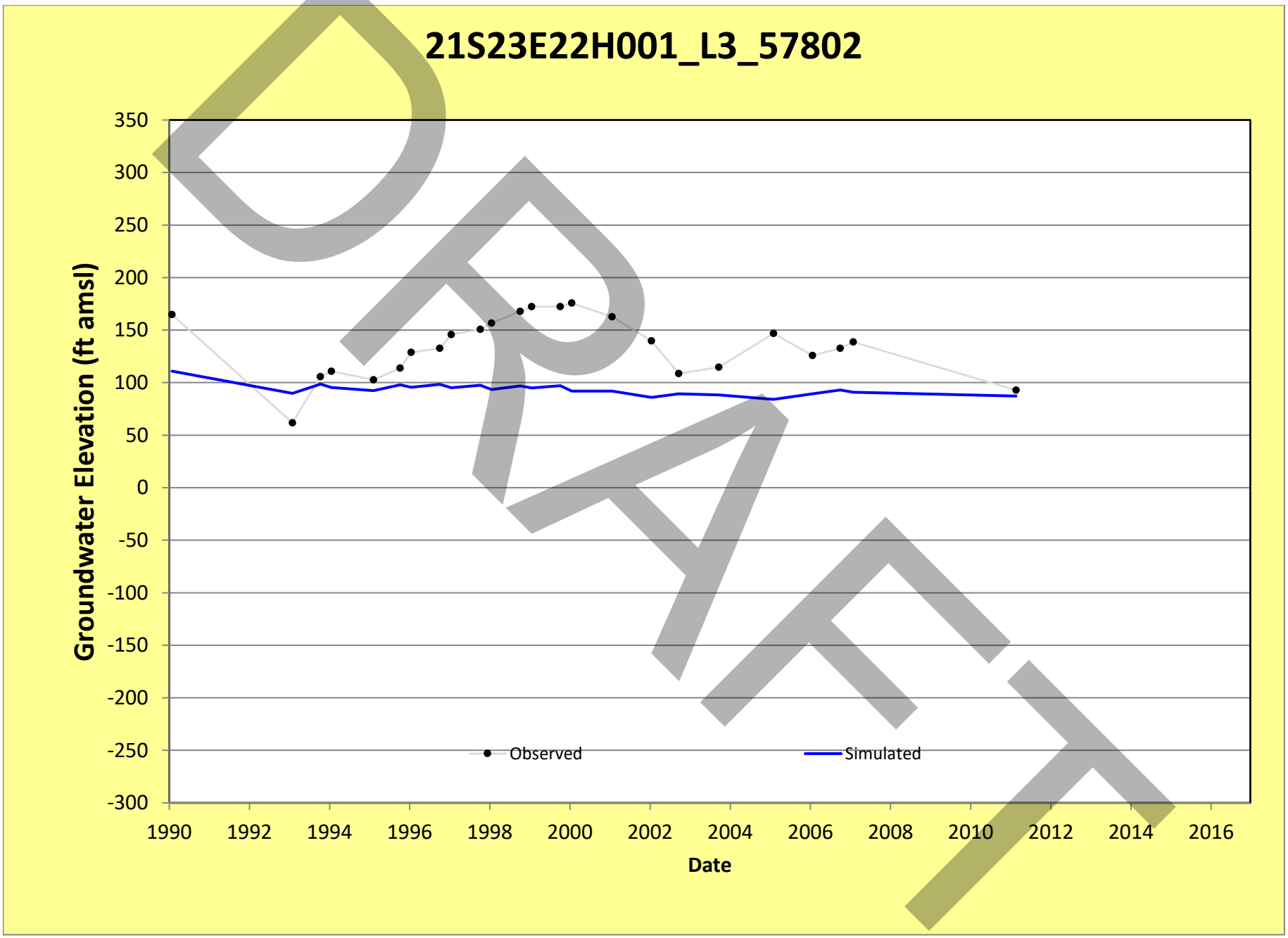
21S23E22H001_L3_57802
Groundwater Elevation (ft amsl)
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200
150
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50
0
-50
-100
-150
-200
-250
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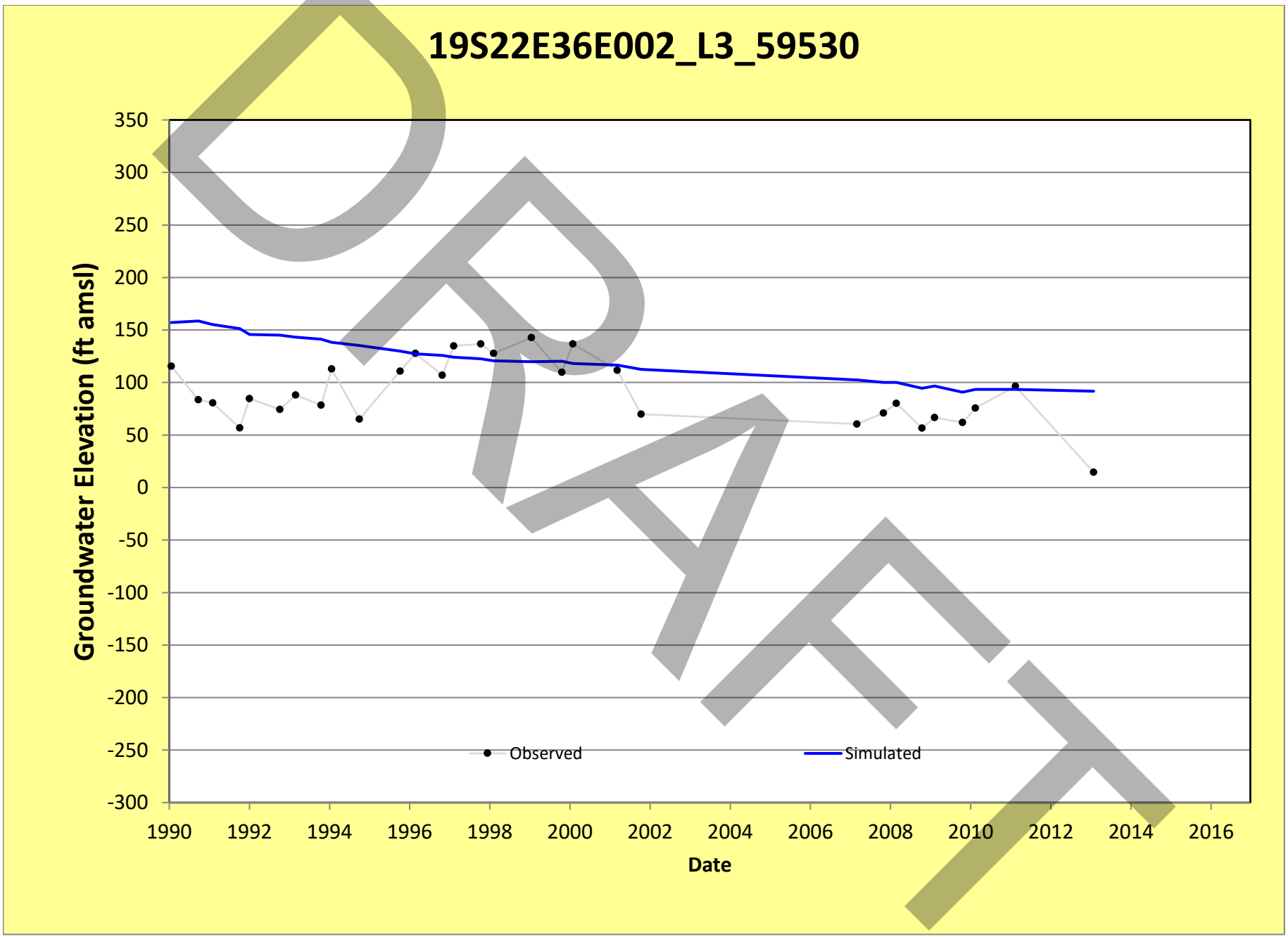
Date
Observed
Simulated
DRAFT


19S22E36E002_L3_59530
Groundwater Elevation (ft amsl)
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300
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200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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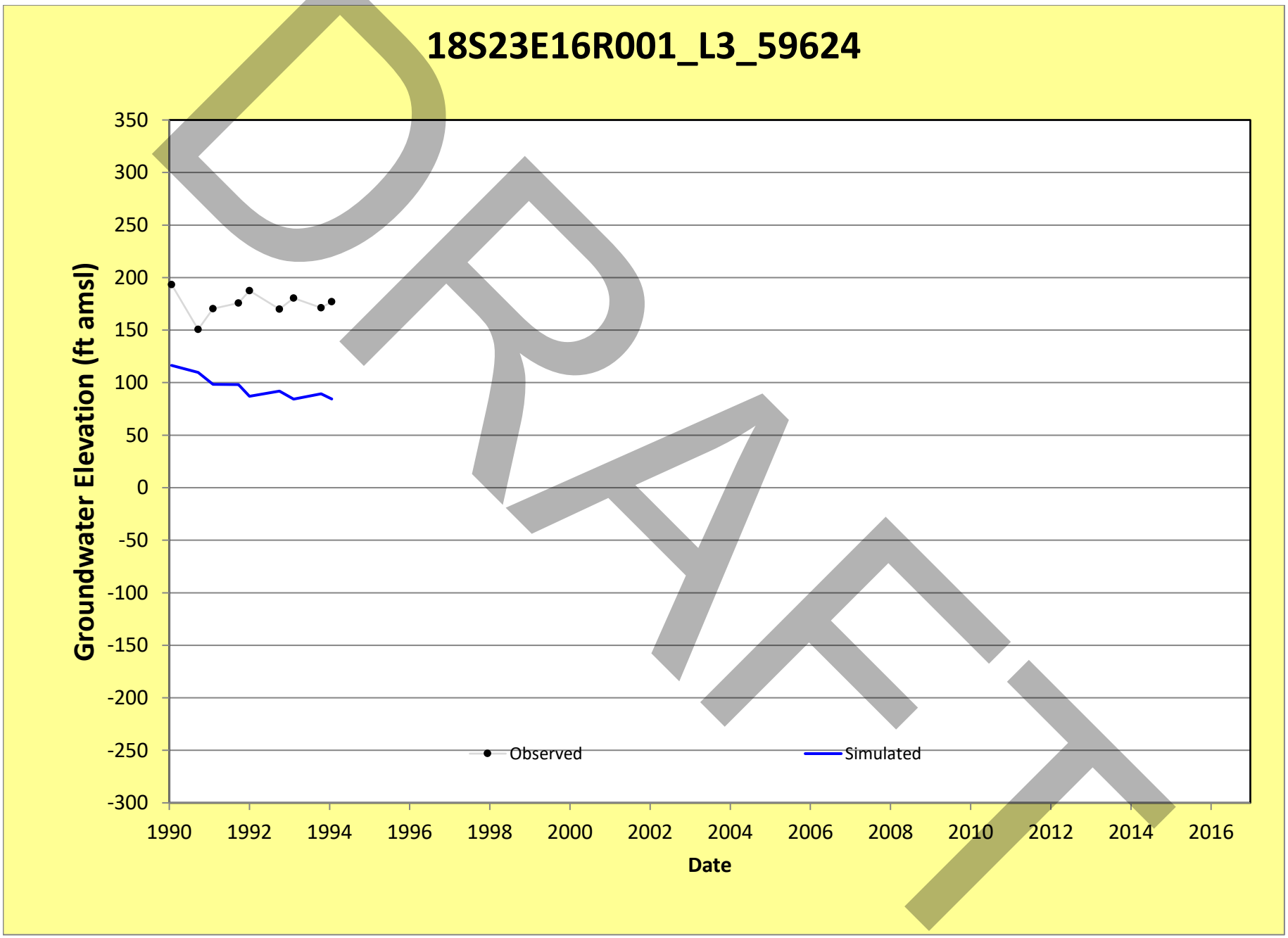
18S23E16R001_L3_59624
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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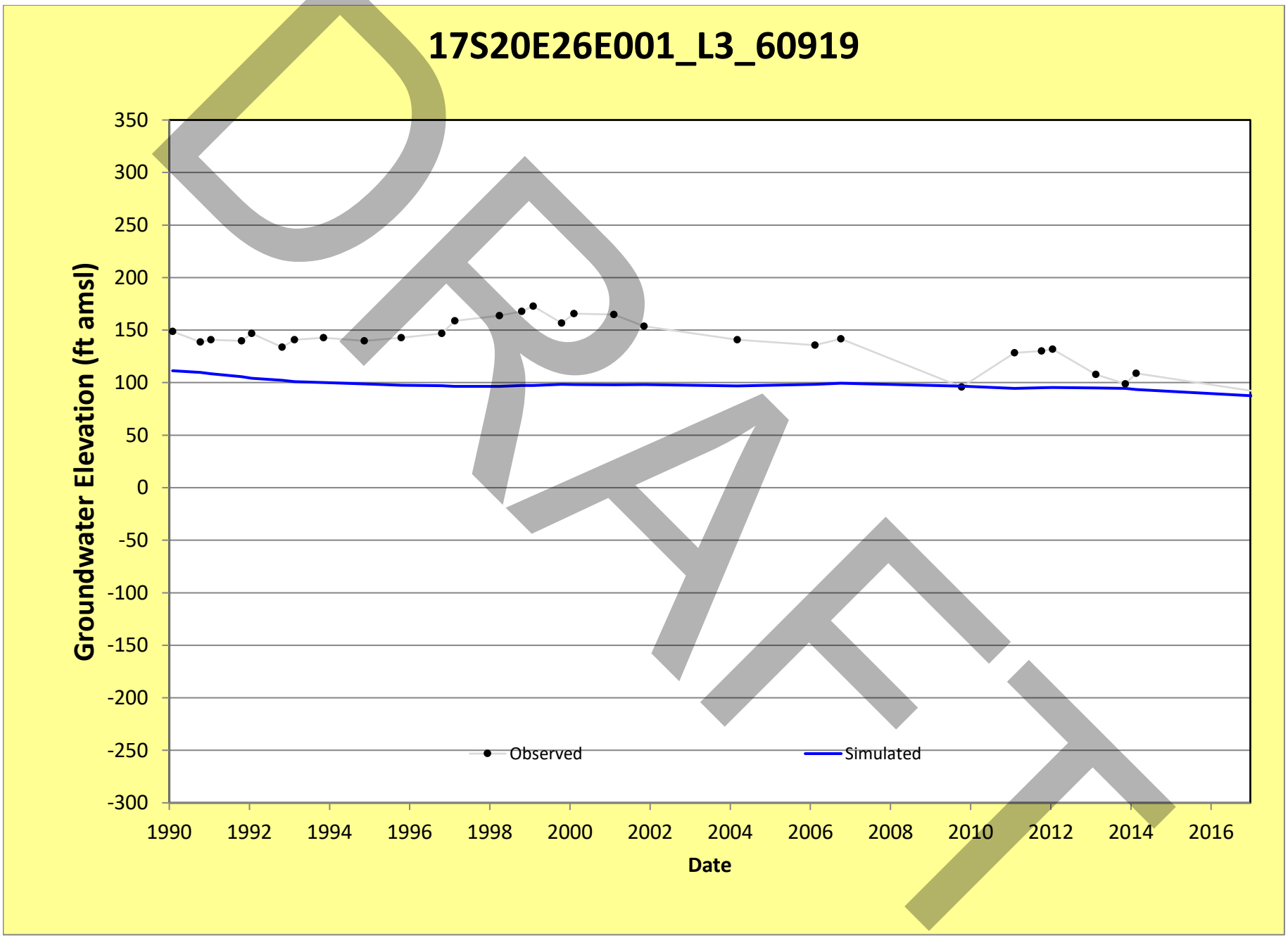
Date
Observed
Simulated
DRAFT


17S20E26E001_L3_60919
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated
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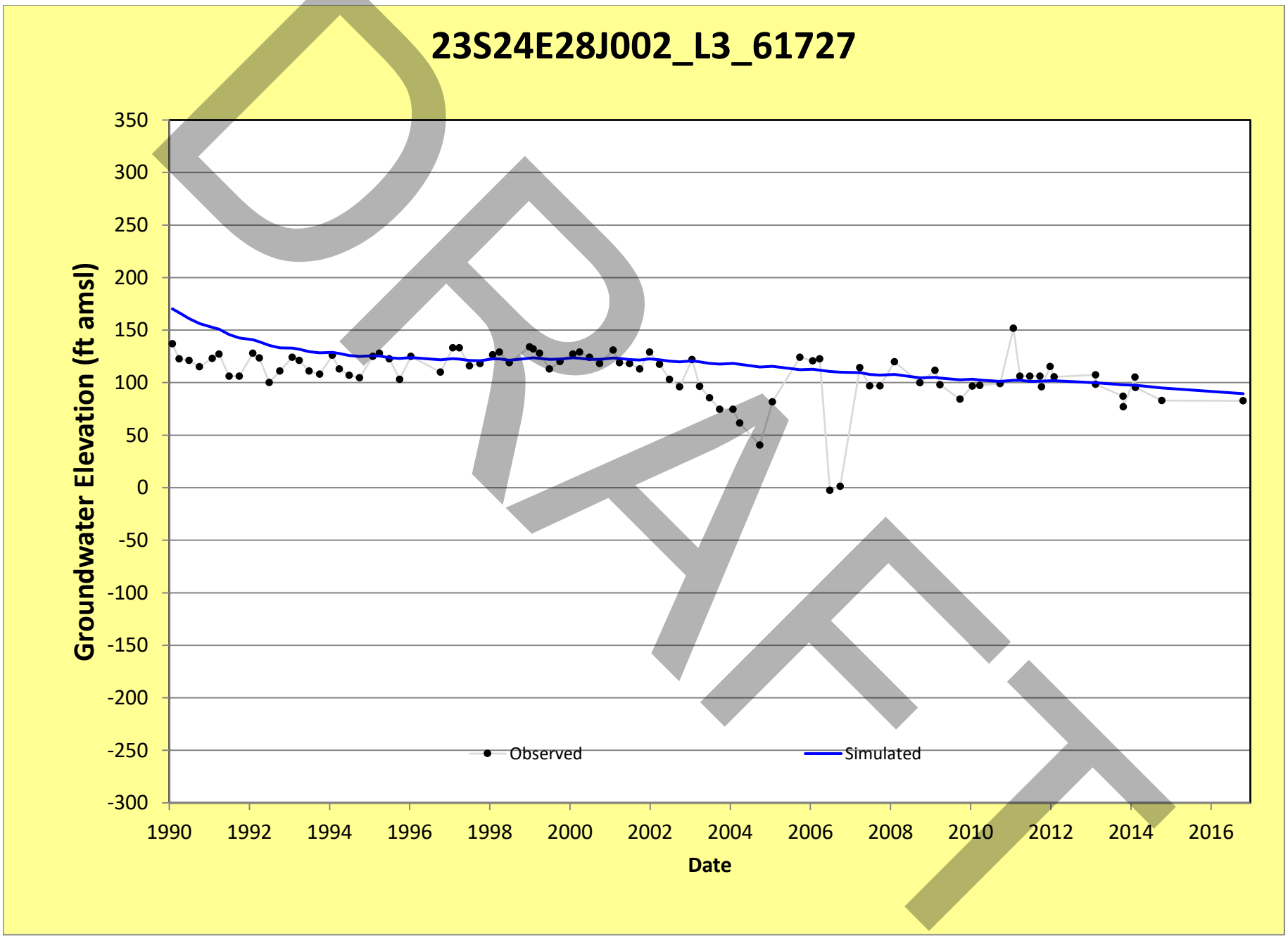
23S24E28J002_L3_61727
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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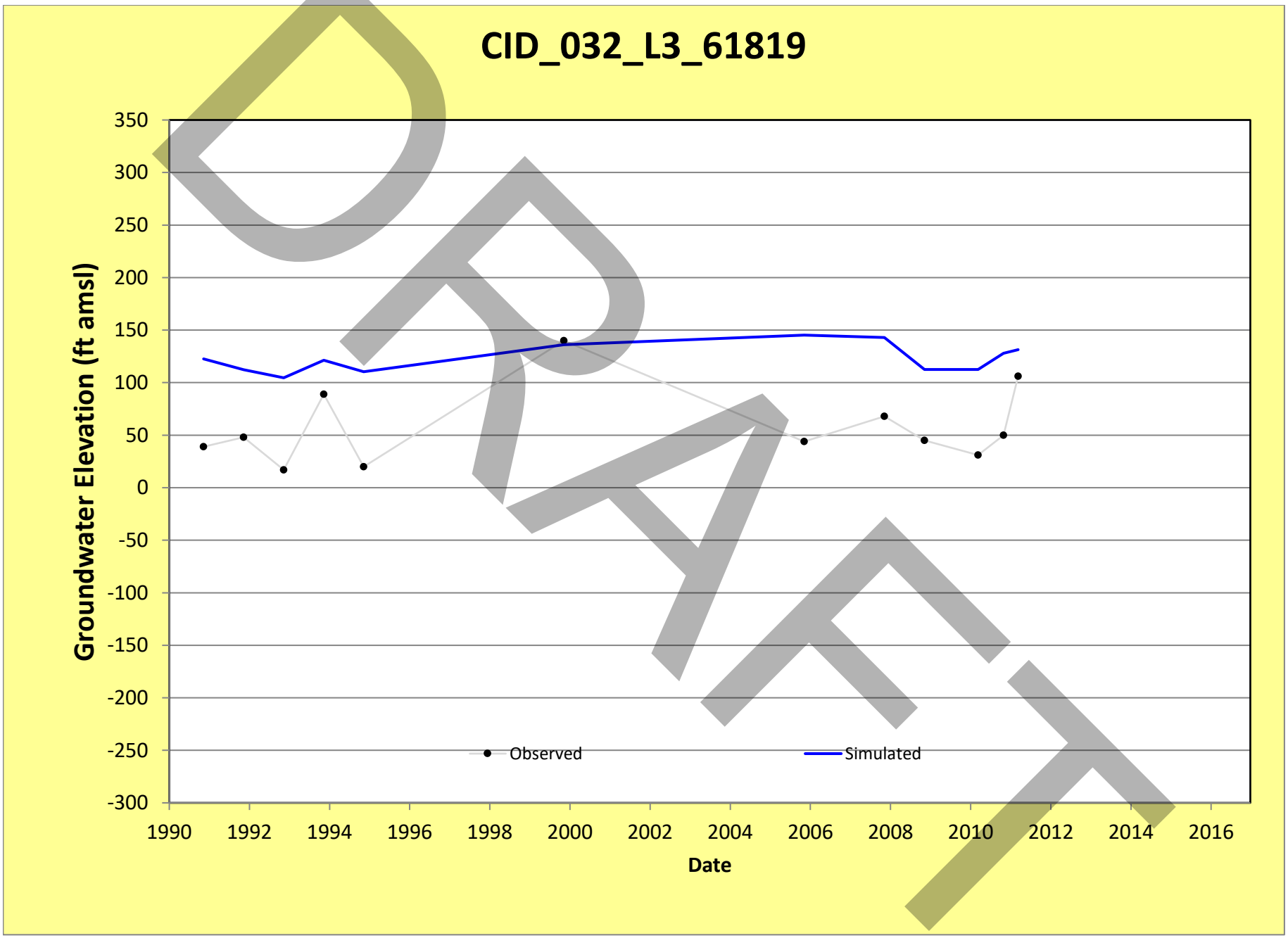
Date
Observed
Simulated
DRAFT


CID_032_L3_61819
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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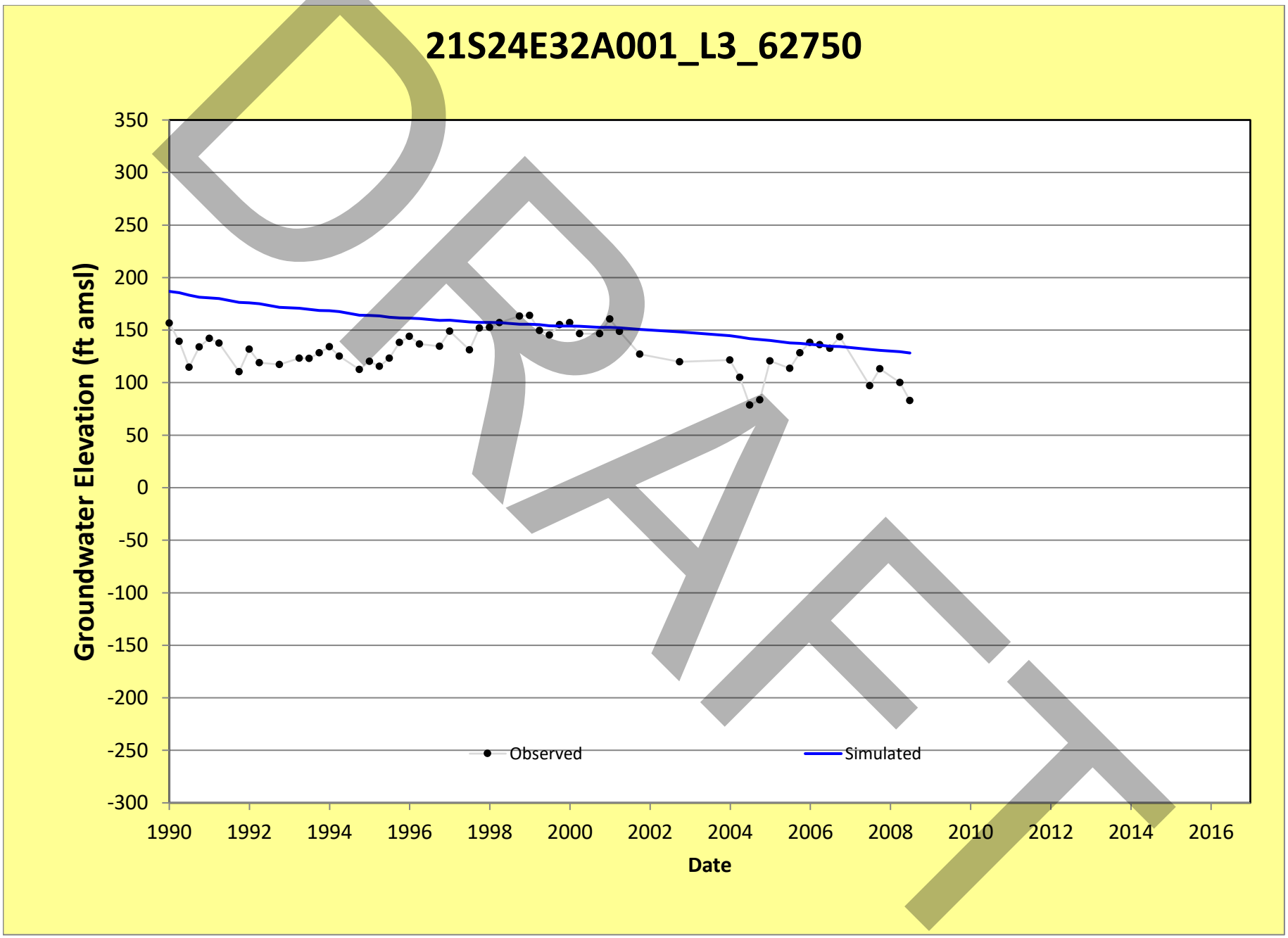
21S24E32A001_L3_62750
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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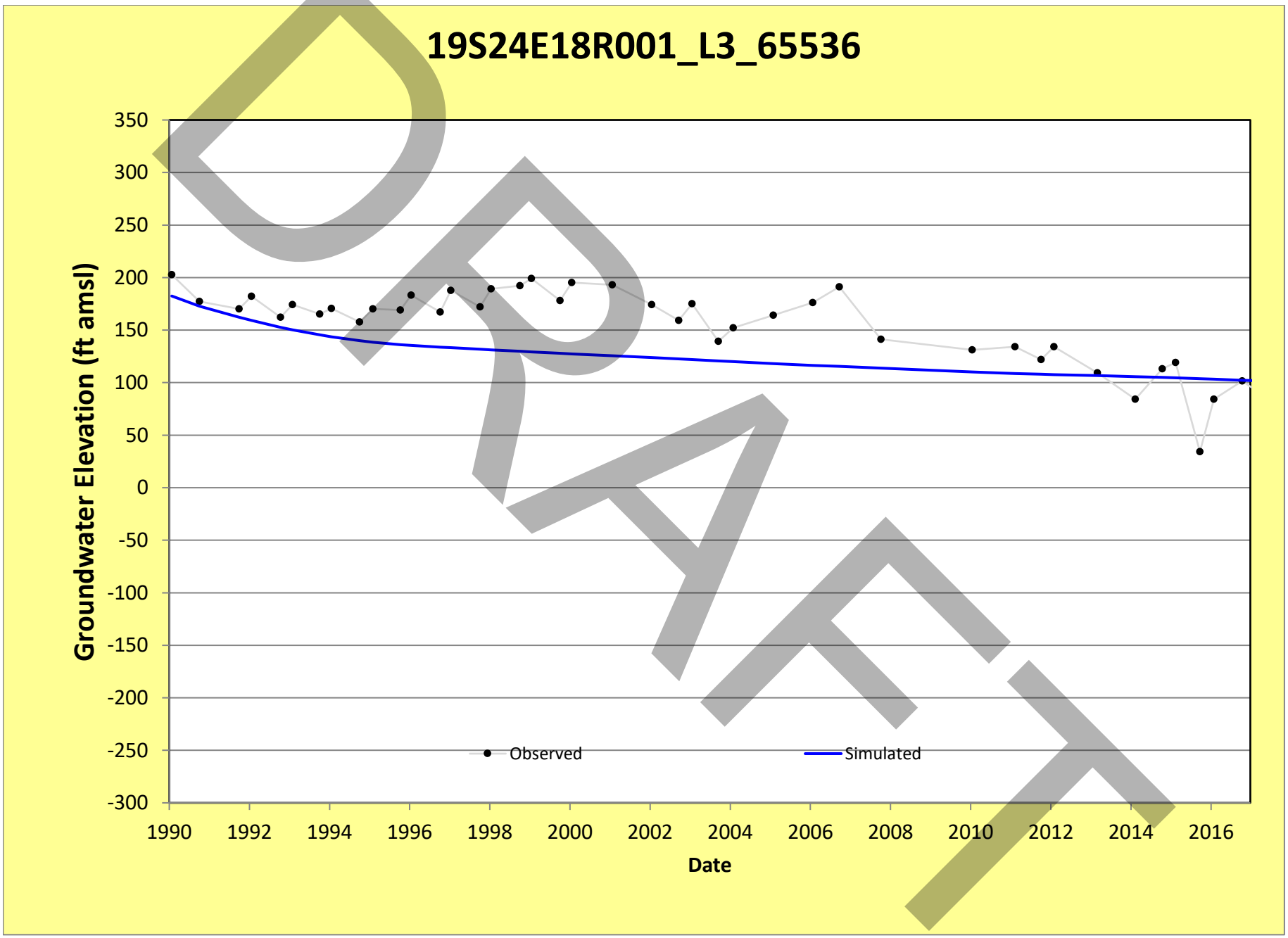
19S24E18R001_L3_65536
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
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-150
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Observed
Simulated
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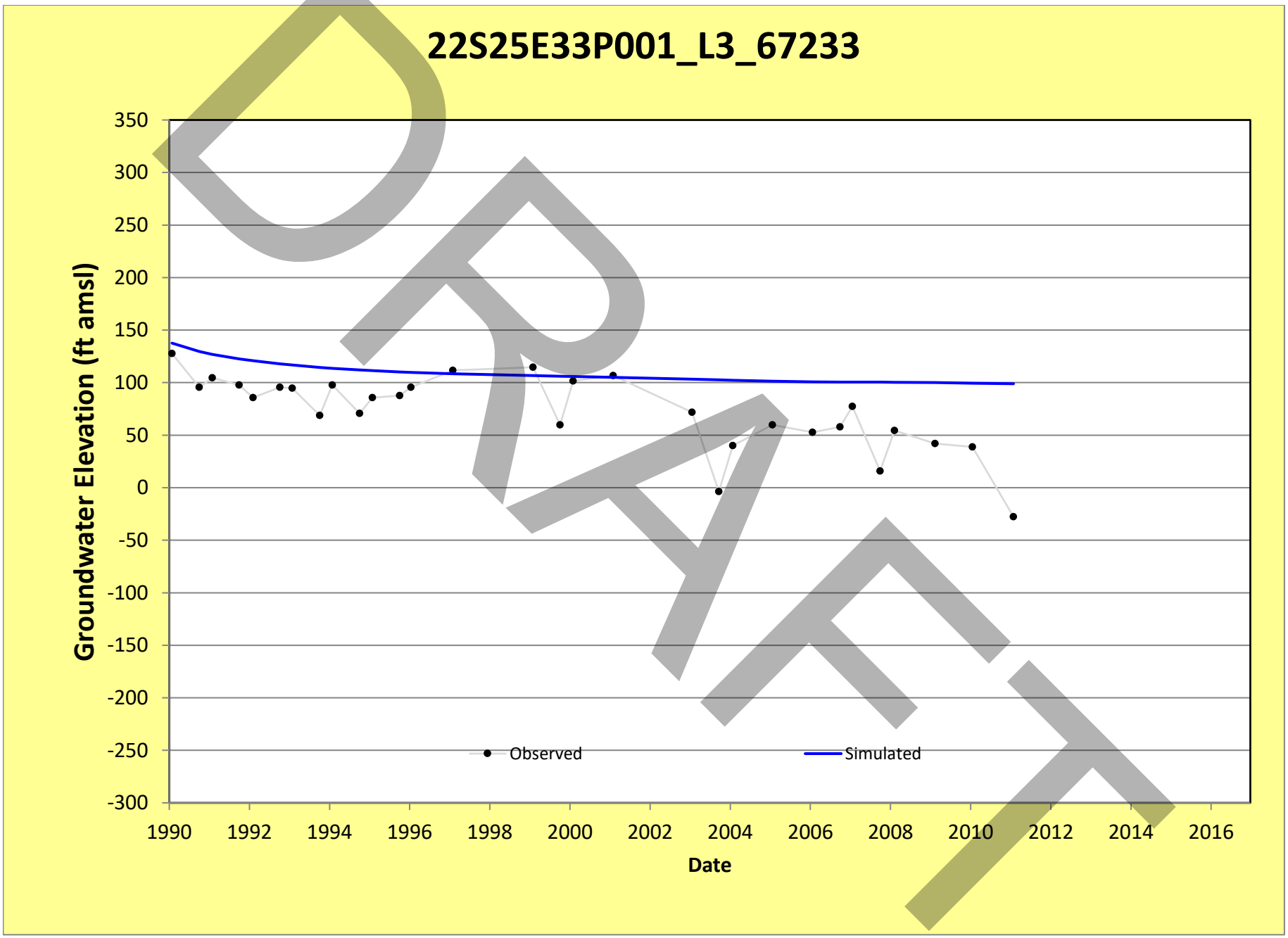
22S25E33P001_L3_67233
Groundwater Elevation (ft amsl)
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300
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100
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0
-50
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-150
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Date
Observed
Simulated
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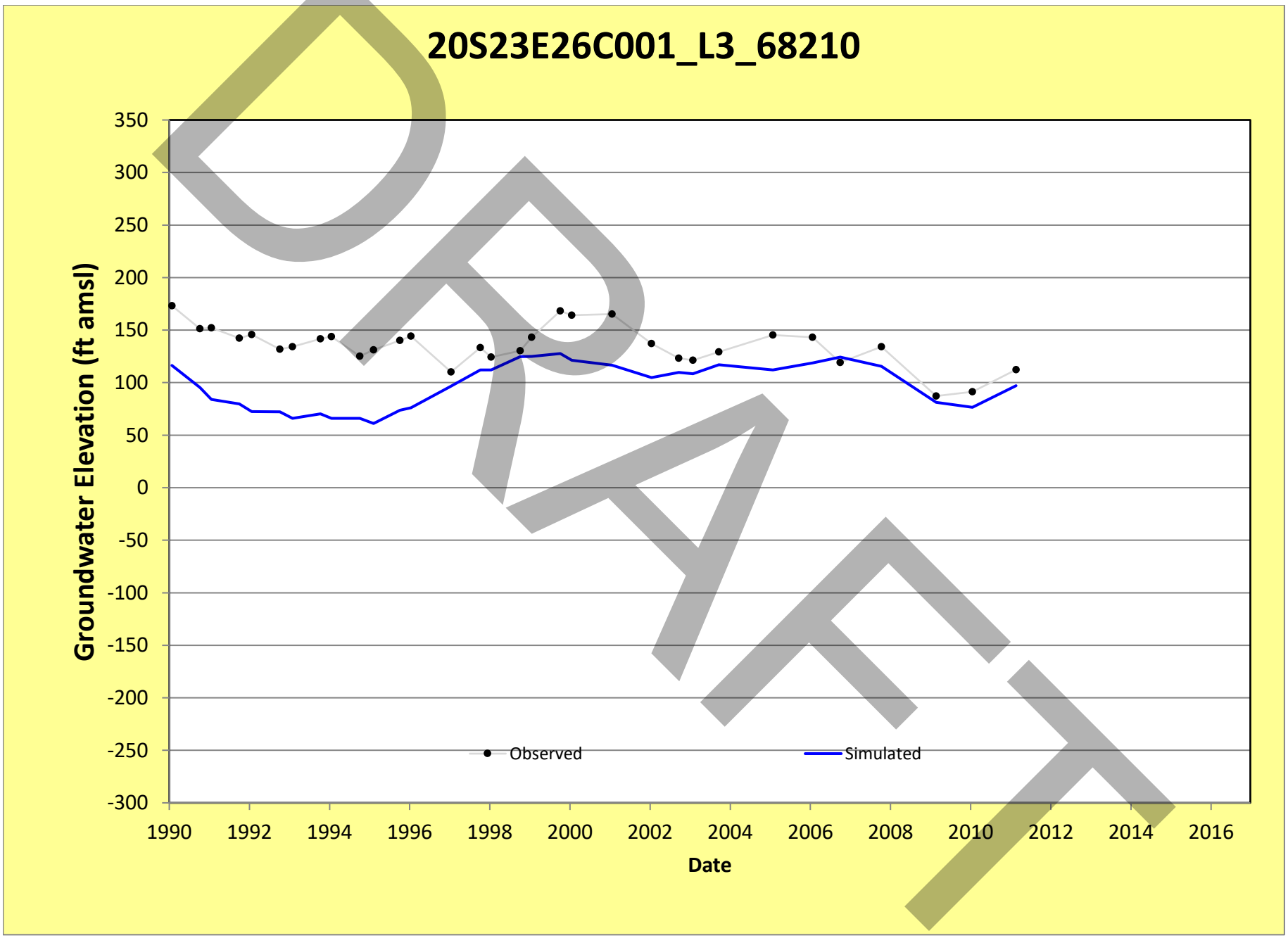
20S23E26C001_L3_68210
Groundwater Elevation (ft amsl)
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100
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0
-50
-100
-150
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-300
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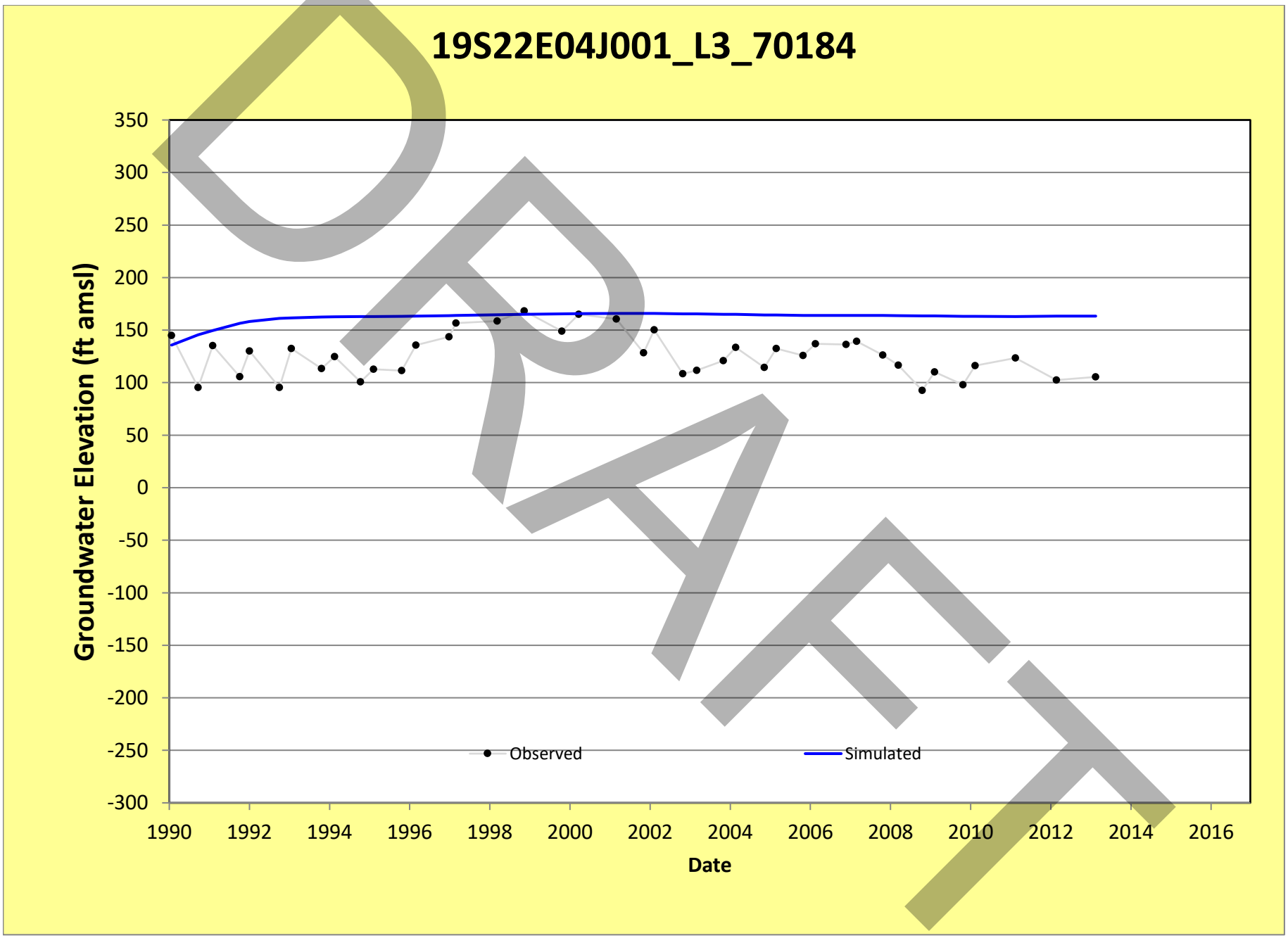
Date
Observed
Simulated
DRAFT


19S22E04J001_L3_70184
Groundwater Elevation (ft amsl)
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-50
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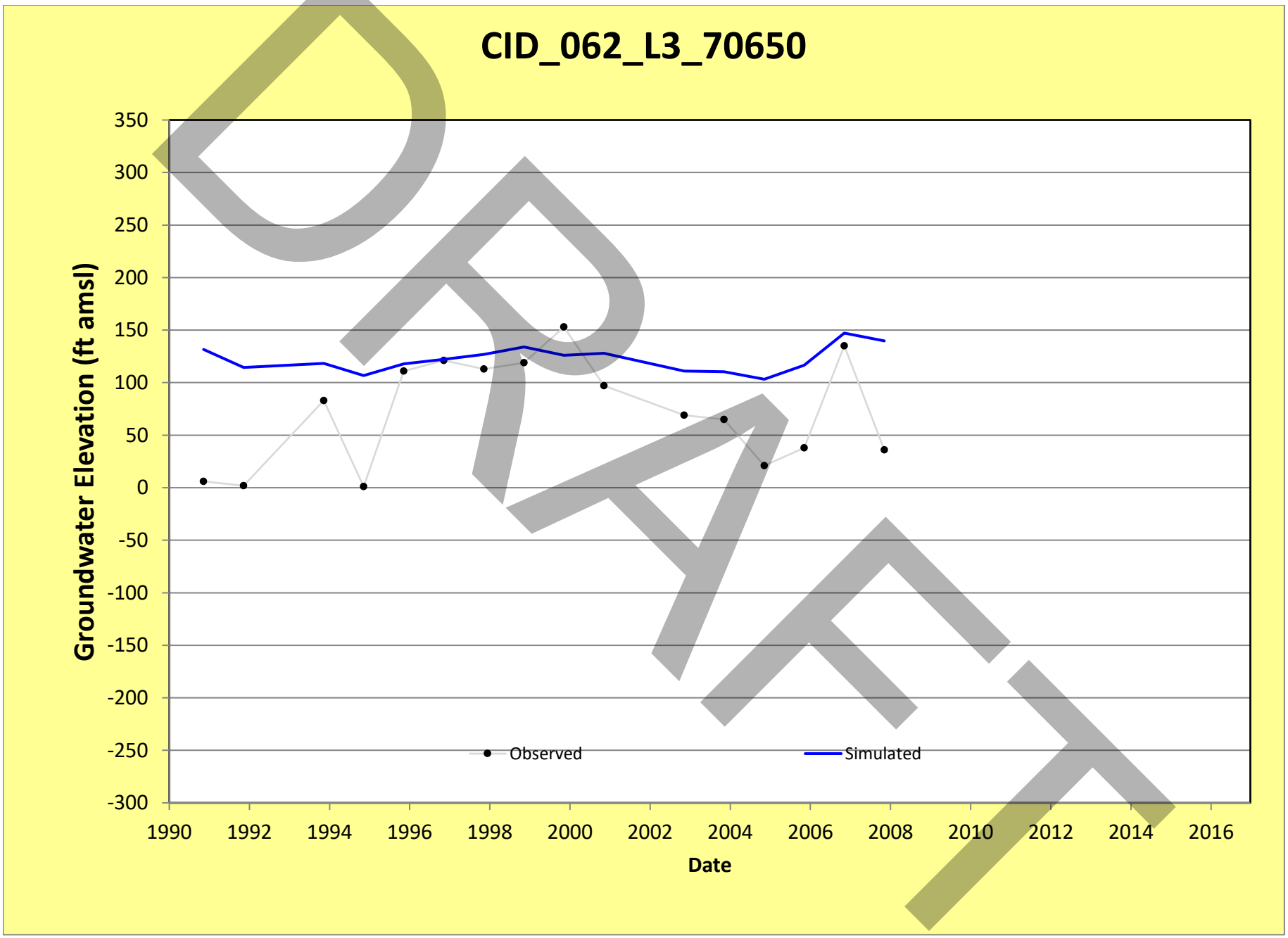
Date
Observed
Simulated
DRAFT


CID_062_L3_70650
Groundwater Elevation (ft amsl)
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300
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50
0
-50
-100
-150
-200
-250
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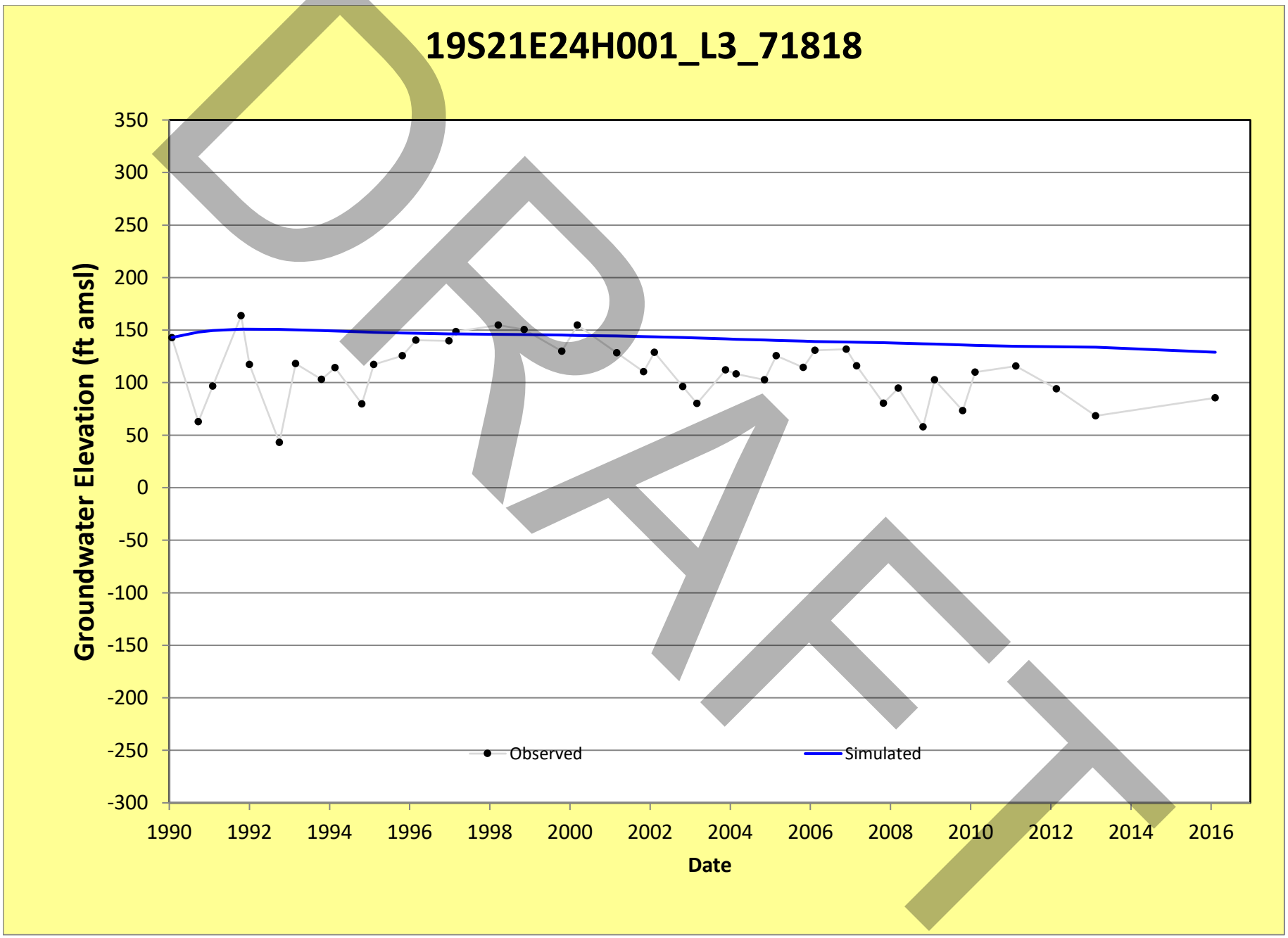
Date
Observed
Simulated
DRAFT


19S21E24H001_L3_71818
Groundwater Elevation (ft amsl)
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300
250
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100
50
0
-50
-100
-150
-200
-250
-300
1990
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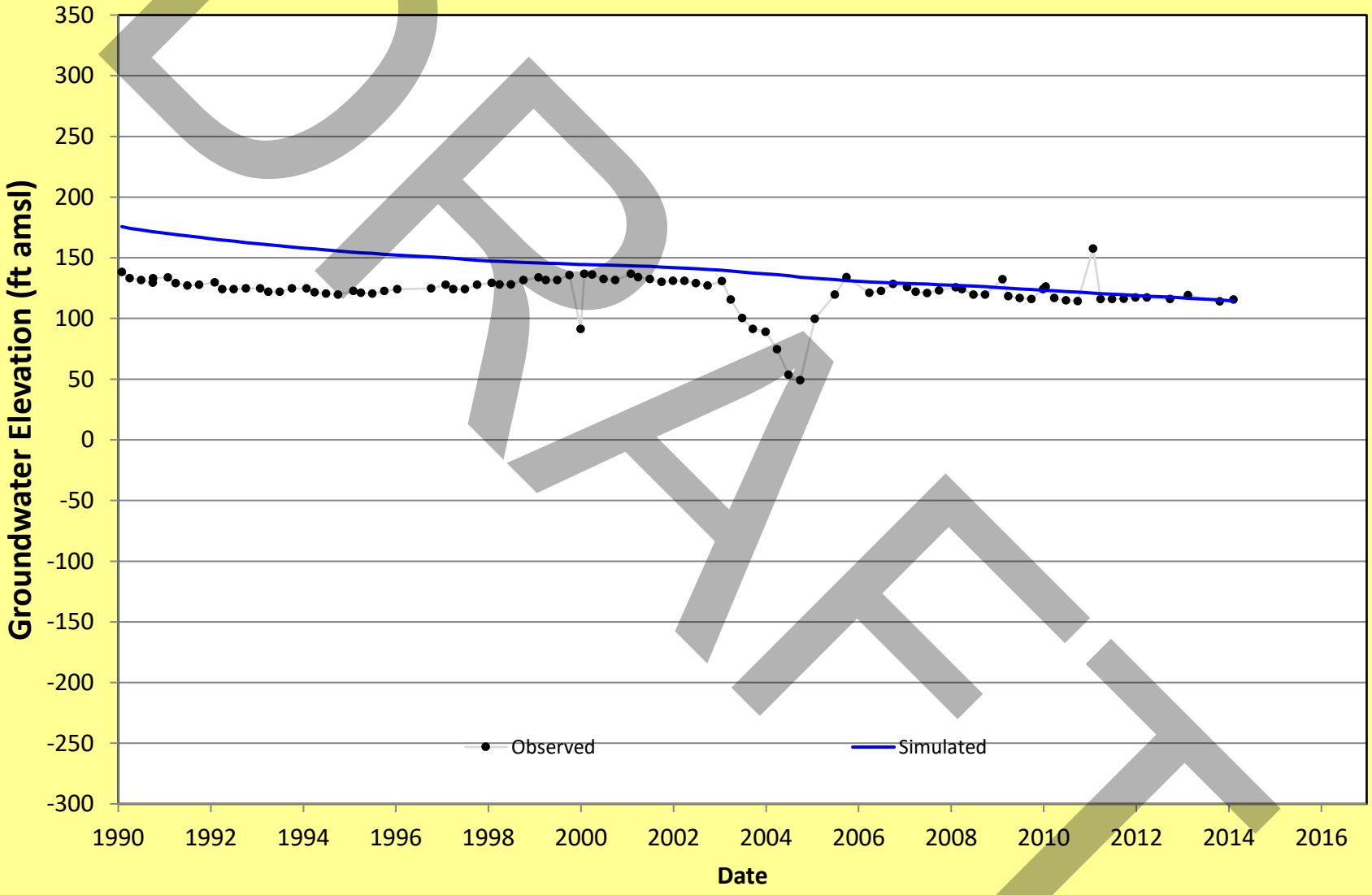
Date
Observed
Simulated
DRAFT

23S24E16R003_L3_71972



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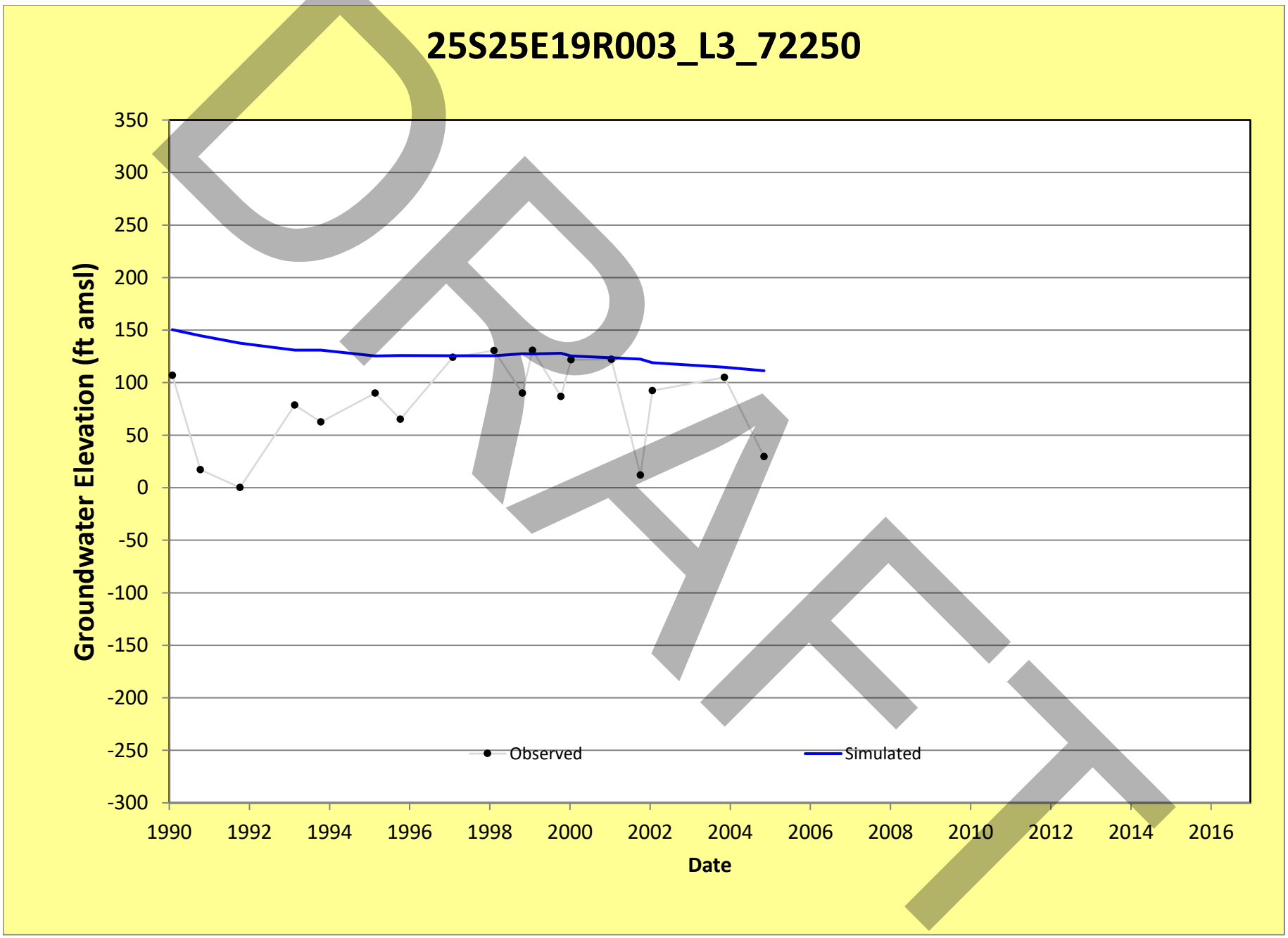
25S25E19R003_L3_72250
Groundwater Elevation (ft amsl)
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300
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200
150
100
50
0
-50
-100
-150
-200
-250
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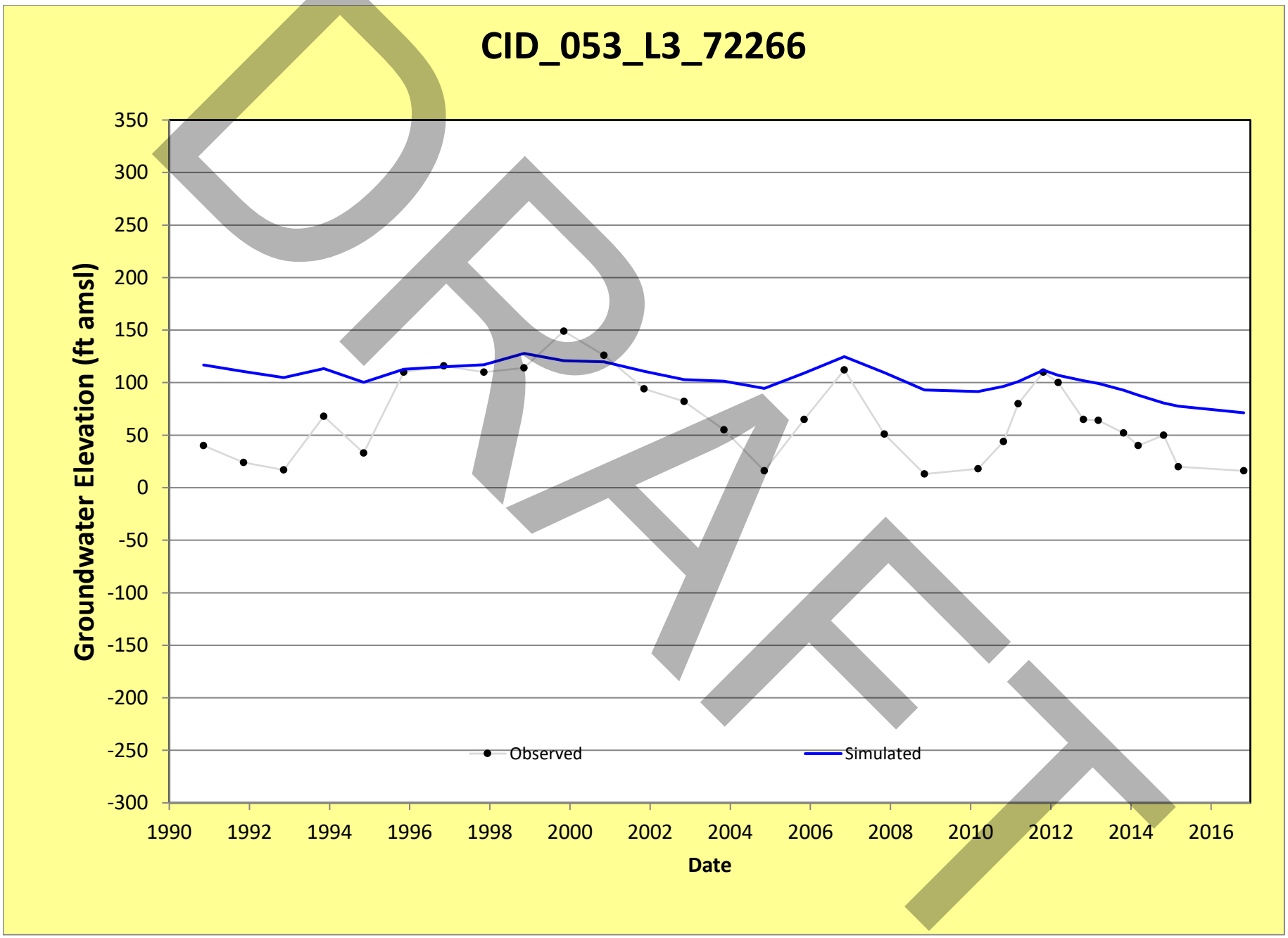
Date
Observed
Simulated
DRAFT


CID_053_L3_72266
Groundwater Elevation (ft amsl)
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200
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100
50
0
-50
-100
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-200
-250
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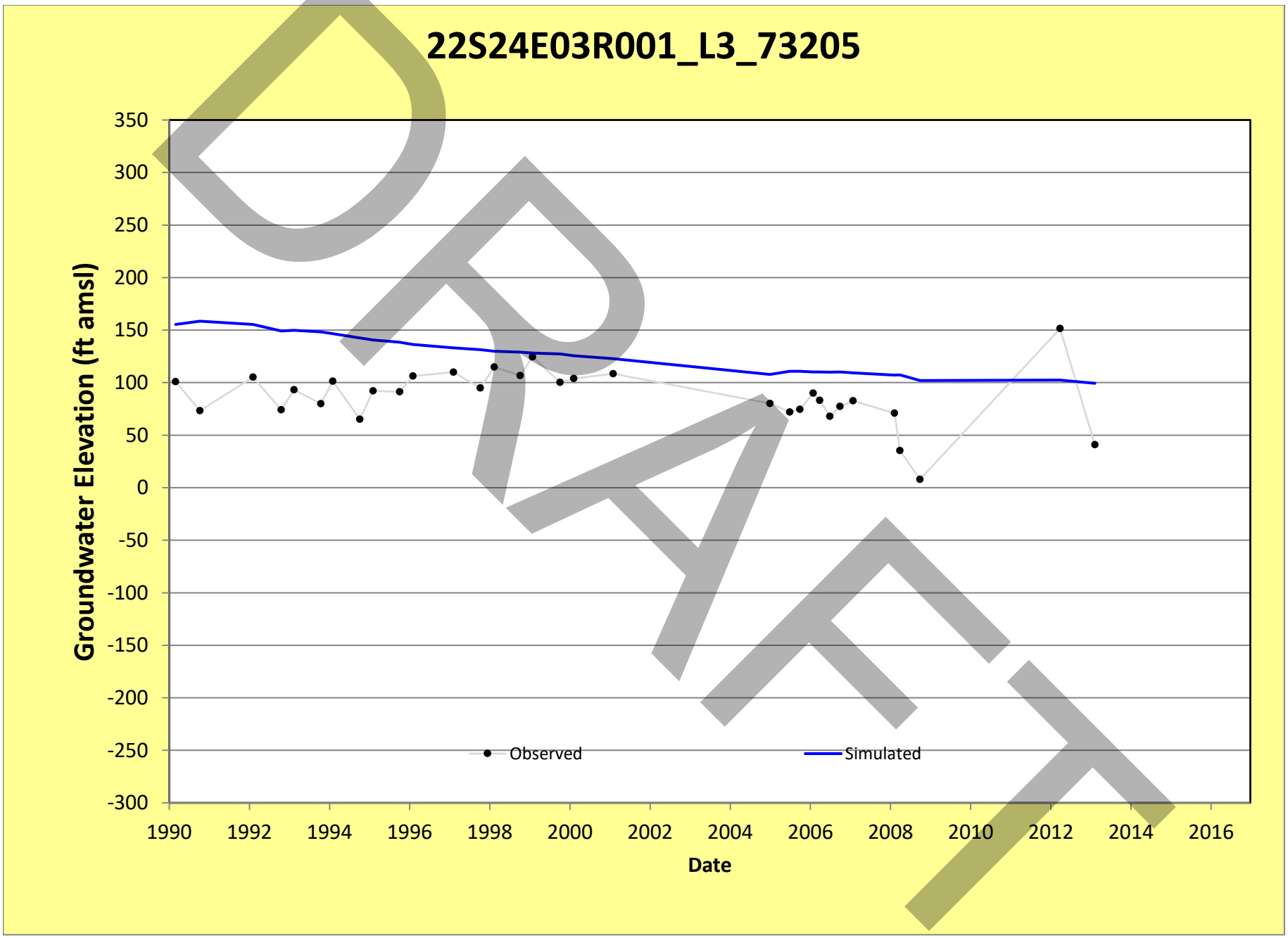
Date
Observed
Simulated
DRAFT


22S24E03R001_L3_73205
Groundwater Elevation (ft amsl)
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250
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150
100
50
0
-50
-100
-150
-200
-250
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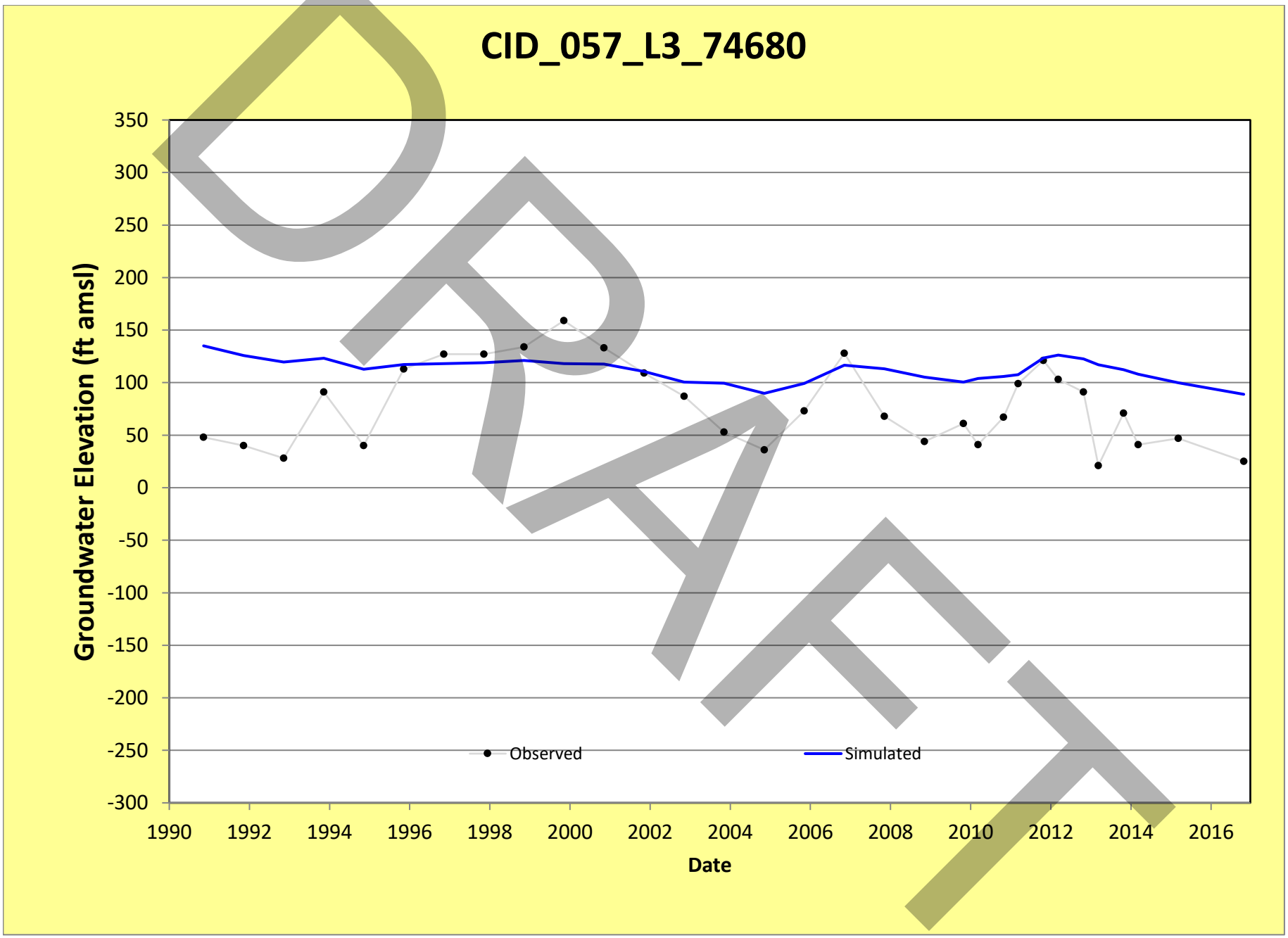
Date
Observed
Simulated
DRAFT


CID_057_L3_74680
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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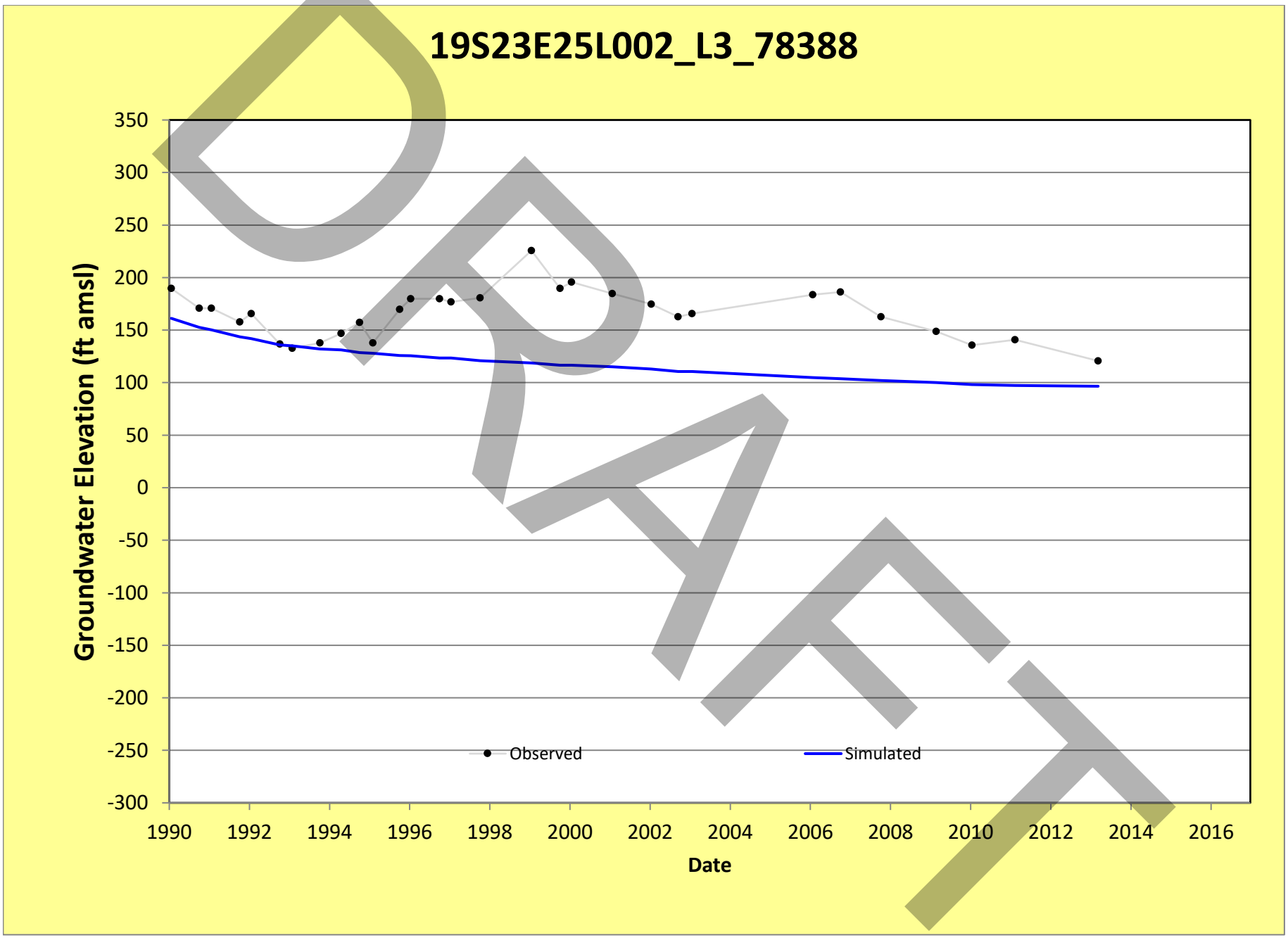
Date
Observed
Simulated
DRAFT


19S23E25L002_L3_78388
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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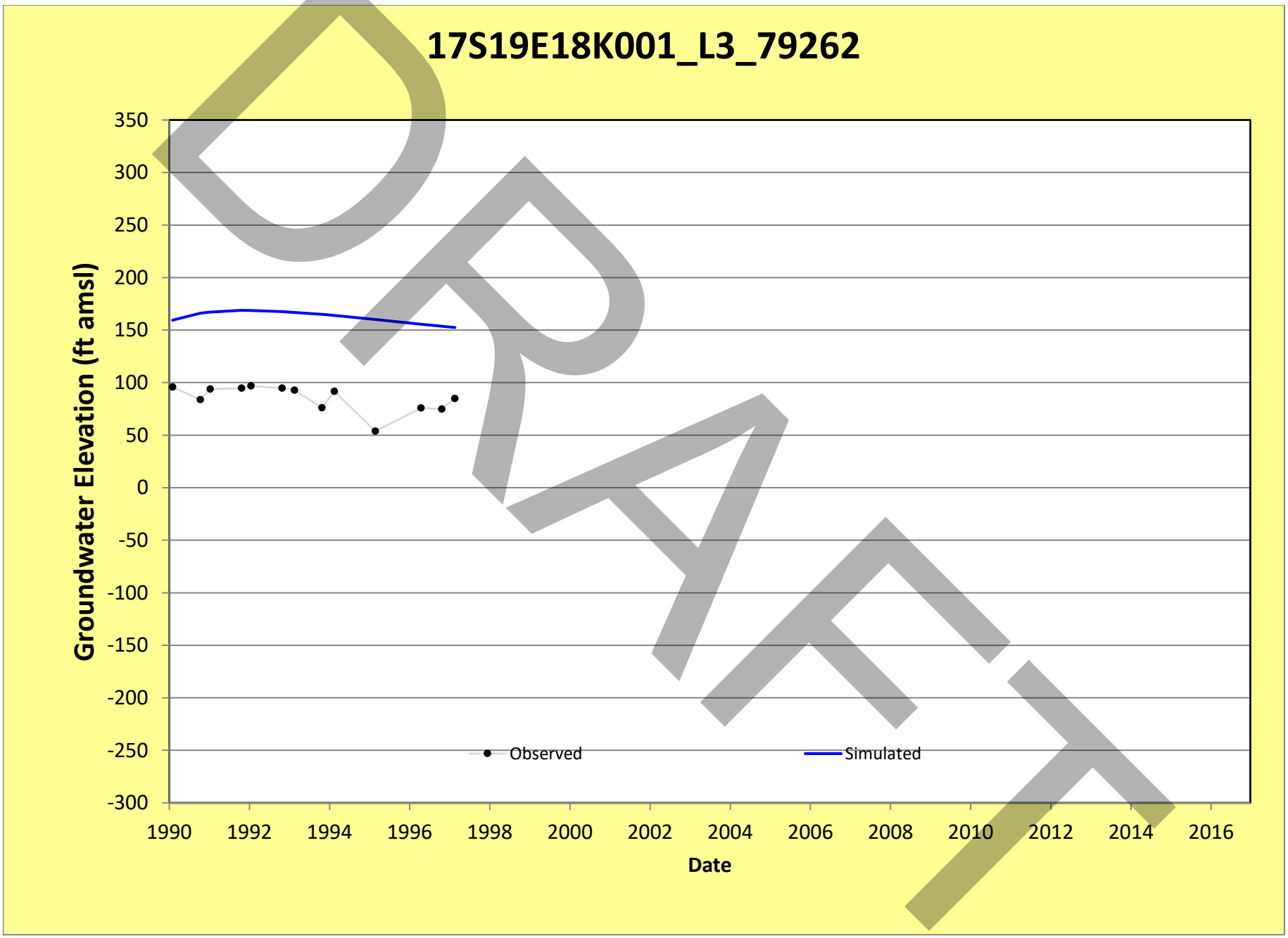
Date
Observed
Simulated
DRAFT


17S19E18K001_L3_79262
Groundwater Elevation (ft amsl)
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150
100
50
0
-50
-100
-150
-200
-250
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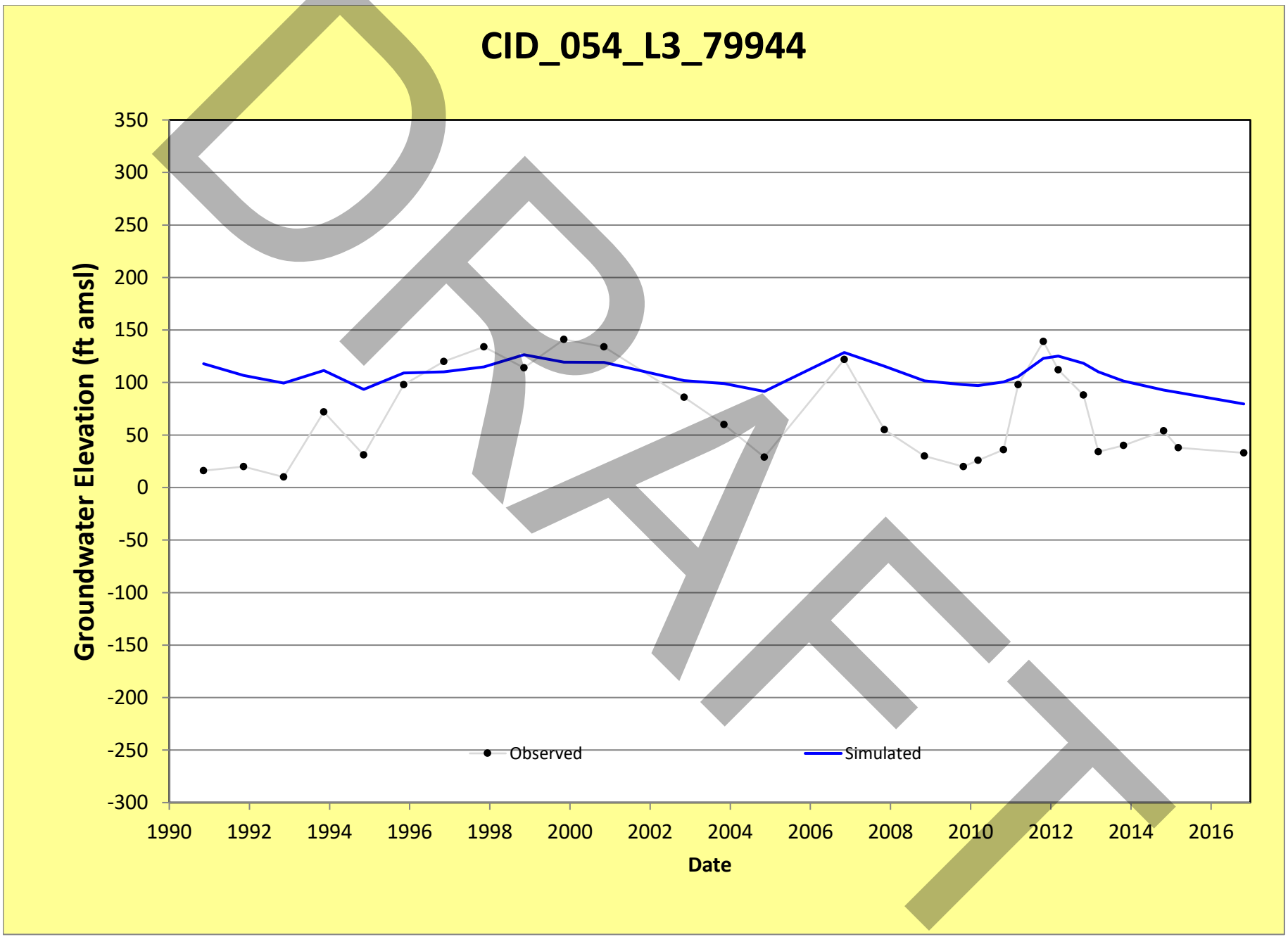
Date
Observed
Simulated
DRAFT


CID_054_L3_79944
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
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-300
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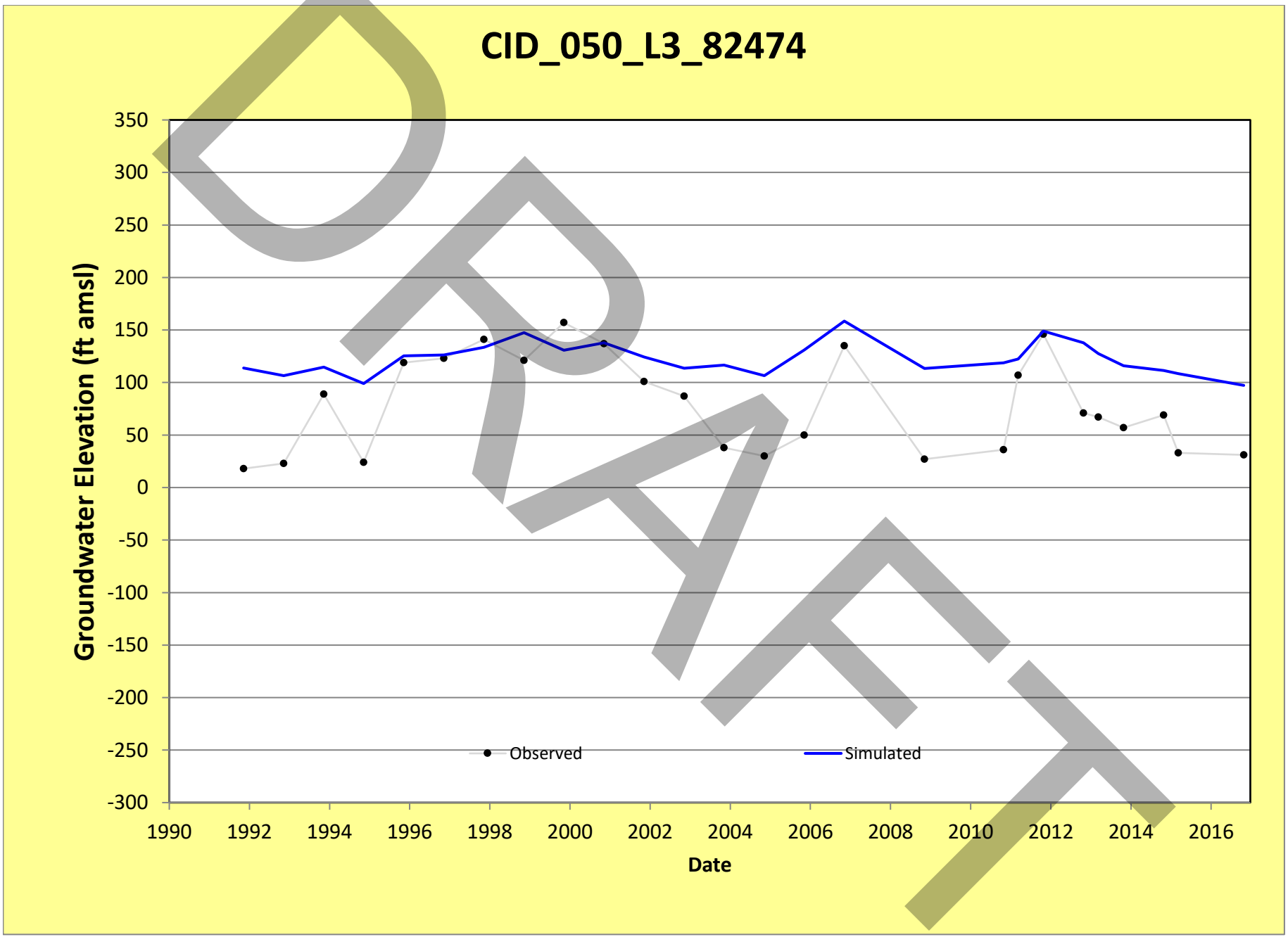
Date
Observed
Simulated
DRAFT


CID_050_L3_82474
Groundwater Elevation (ft amsl)
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100
50
0
-50
-100
-150
-200
-250
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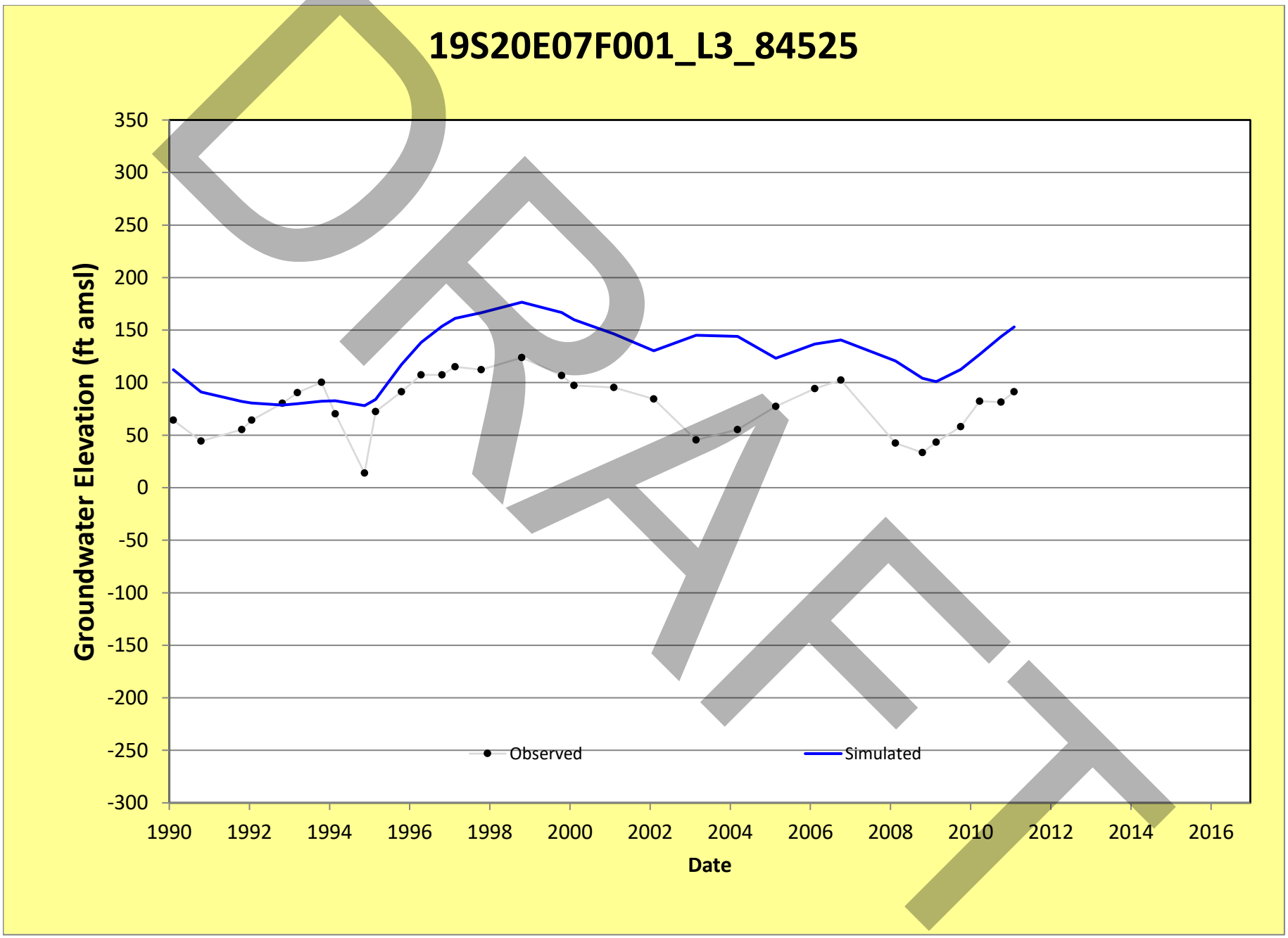
Date
Observed
Simulated
DRAFT


19S20E07F001_L3_84525
Groundwater Elevation (ft amsl)
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-50
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-150
-200
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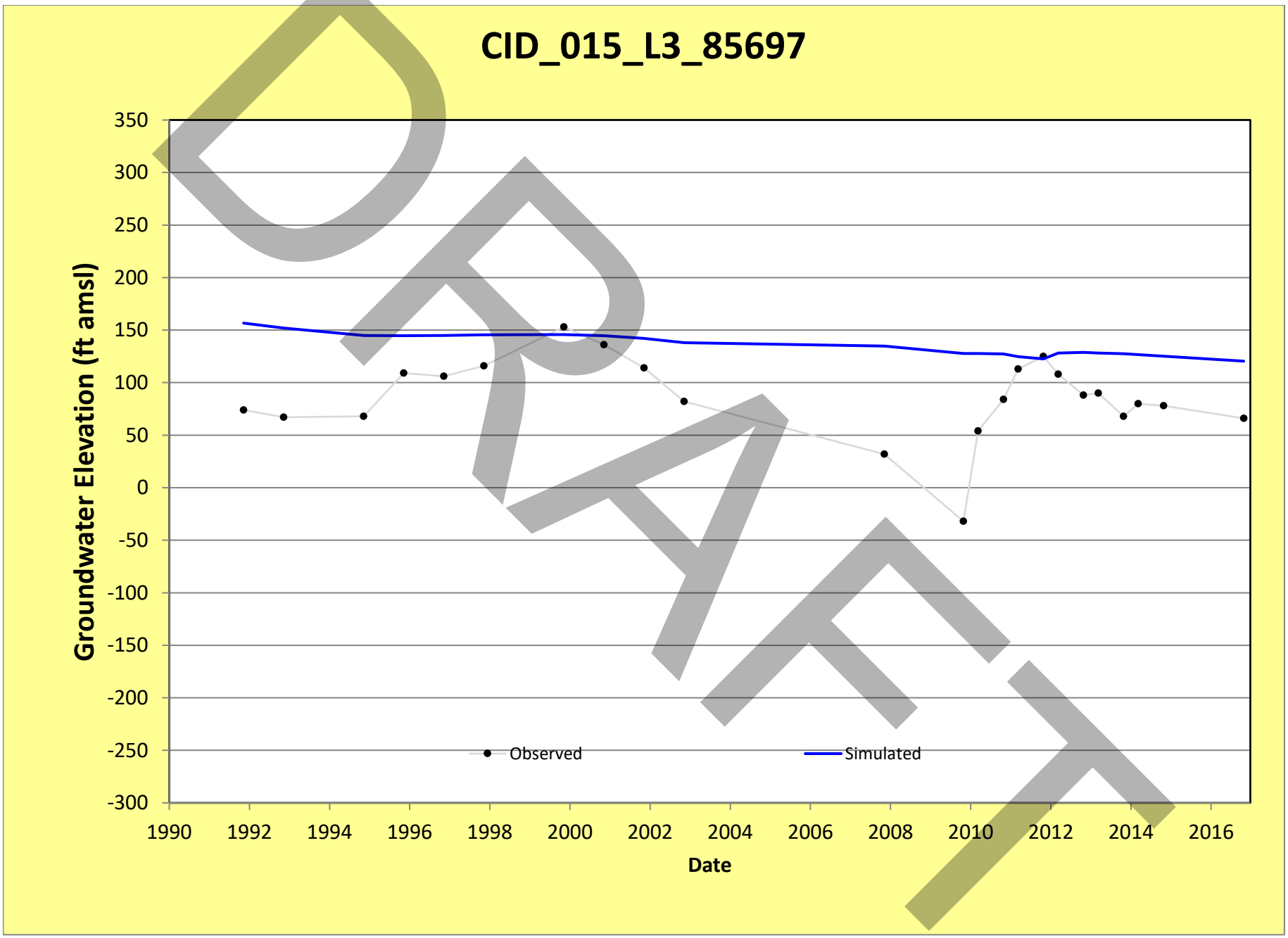
Date
Observed
Simulated
DRAFT


CID_015_L3_85697
Groundwater Elevation (ft amsl)
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Observed
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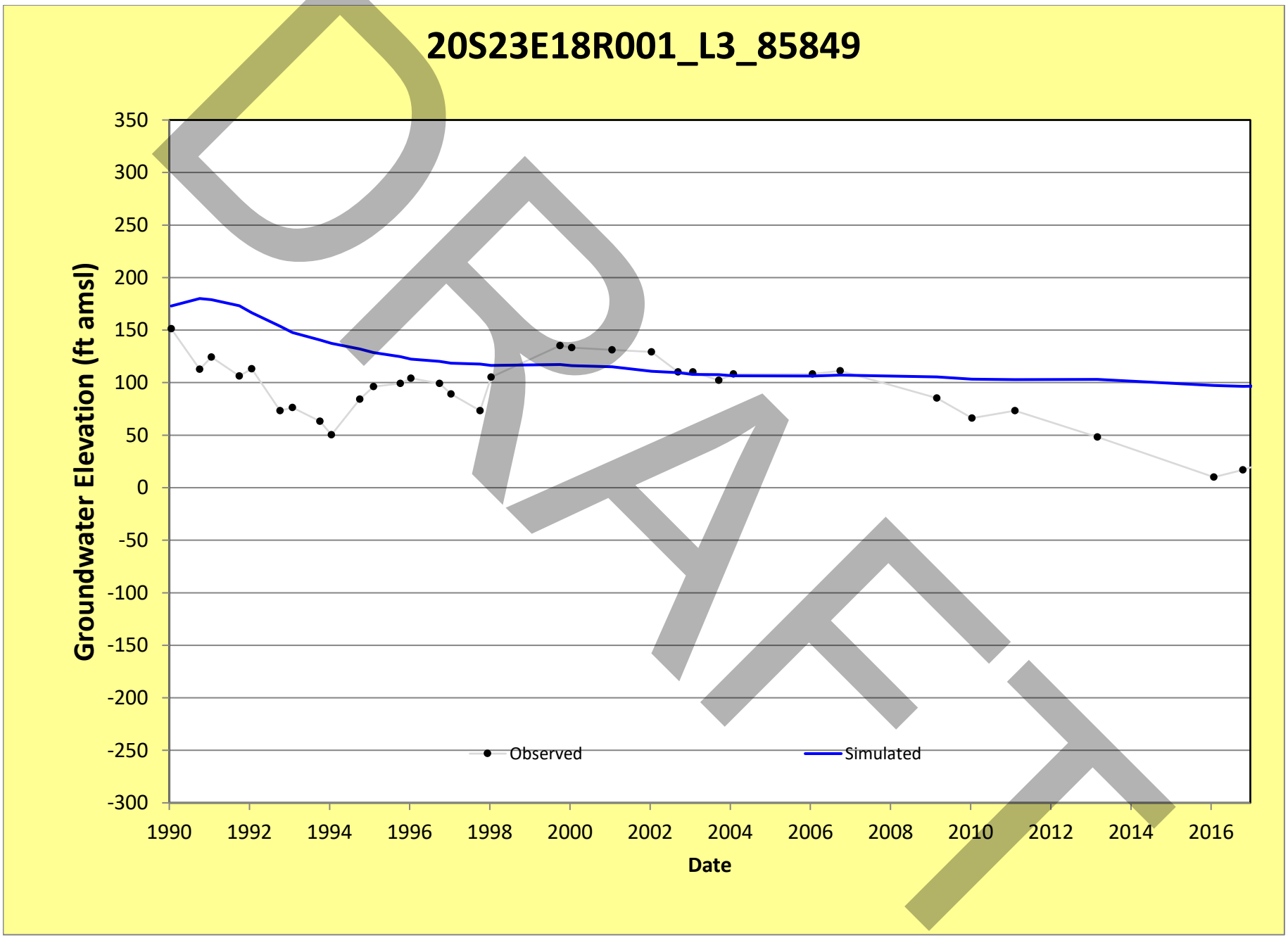
20S23E18R001_L3_85849
Groundwater Elevation (ft amsl)
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150
100
50
0
-50
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-150
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-300
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Observed
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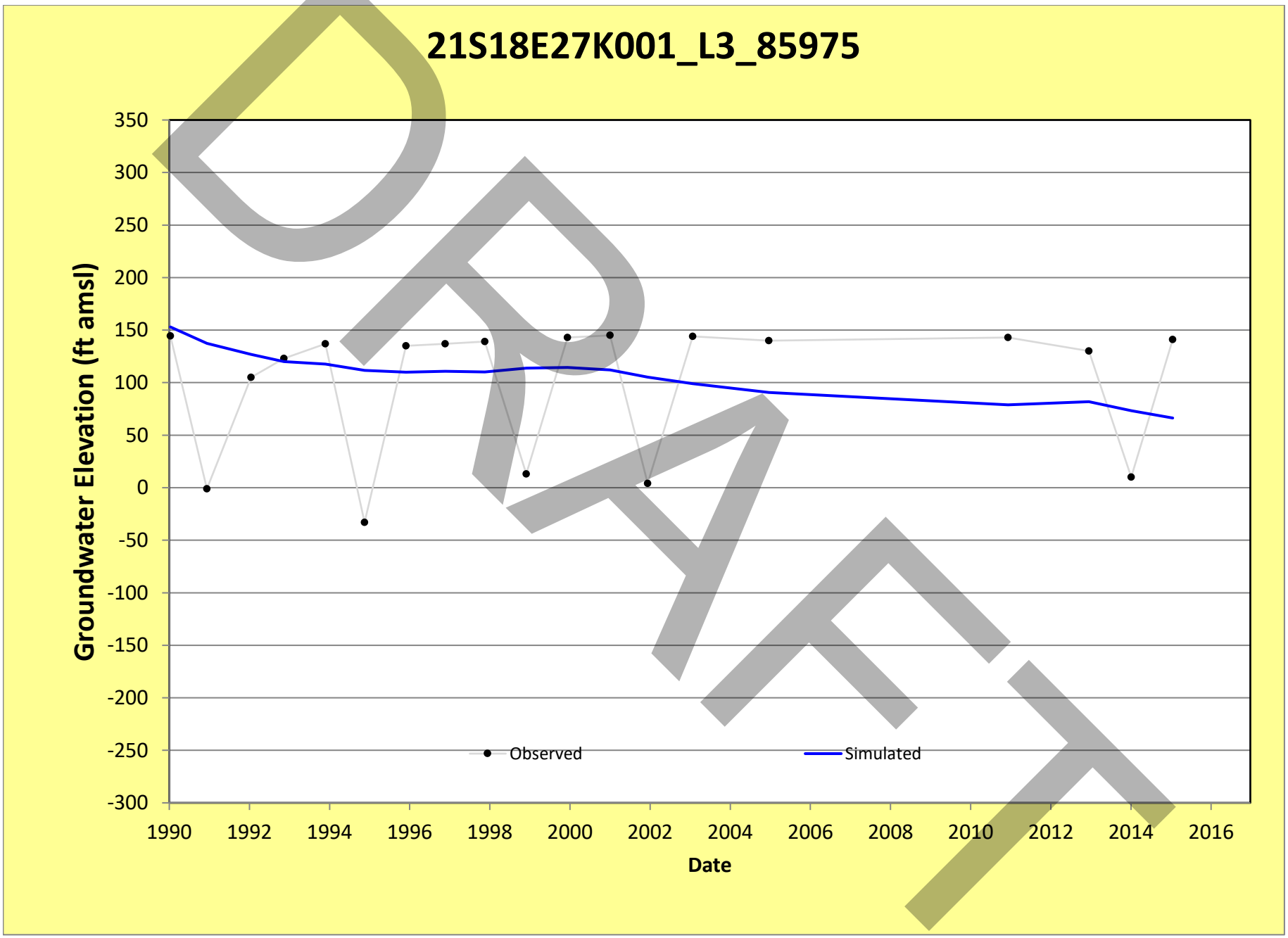
DRAFT


21S18E27K001_L3_85975
Groundwater Elevation (ft amsl)
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150
100
50
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-50
-100
-150
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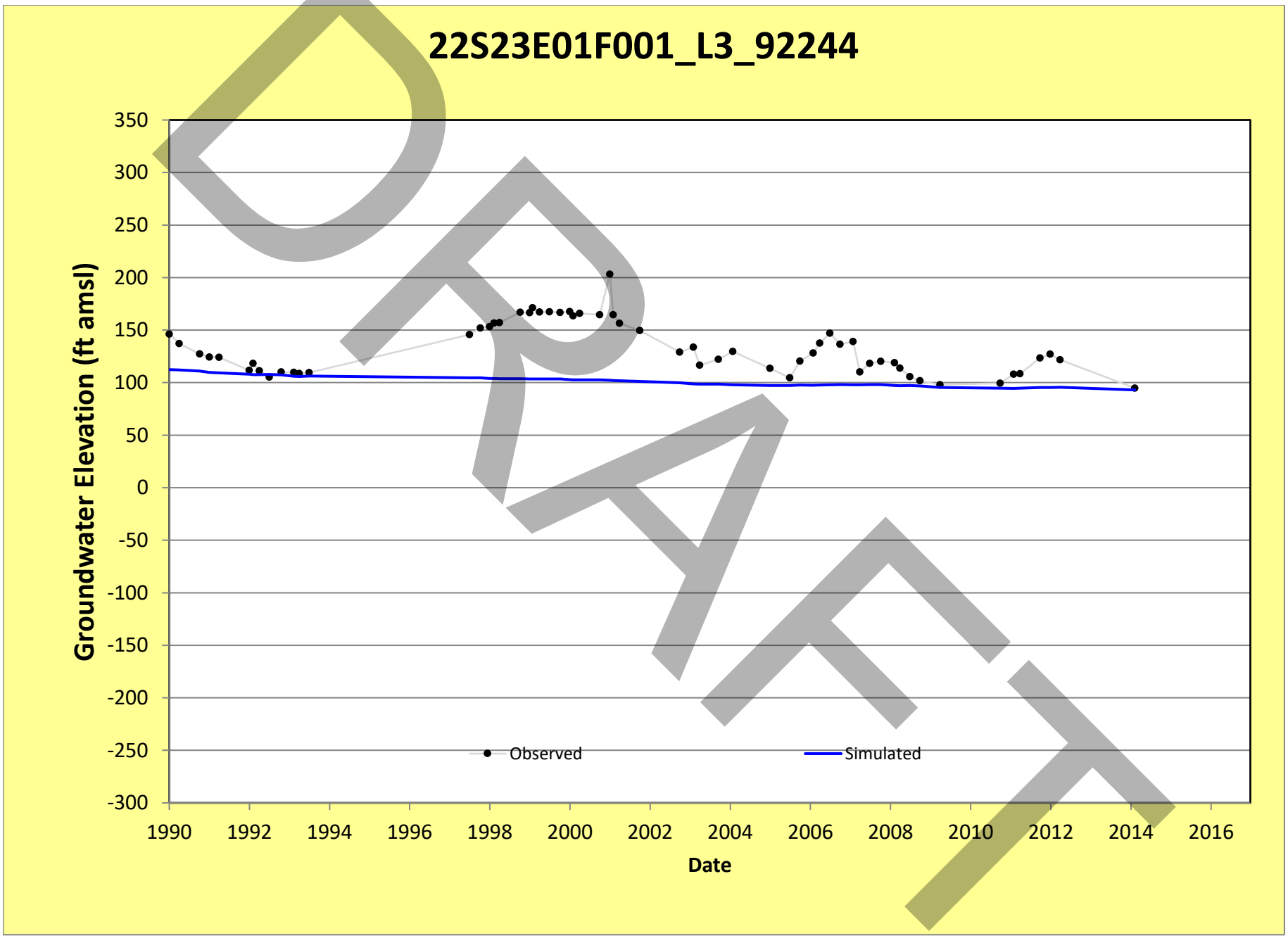
Date
Observed
Simulated
DRAFT


22S23E01F001_L3_92244
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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1990
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Date
Observed
Simulated
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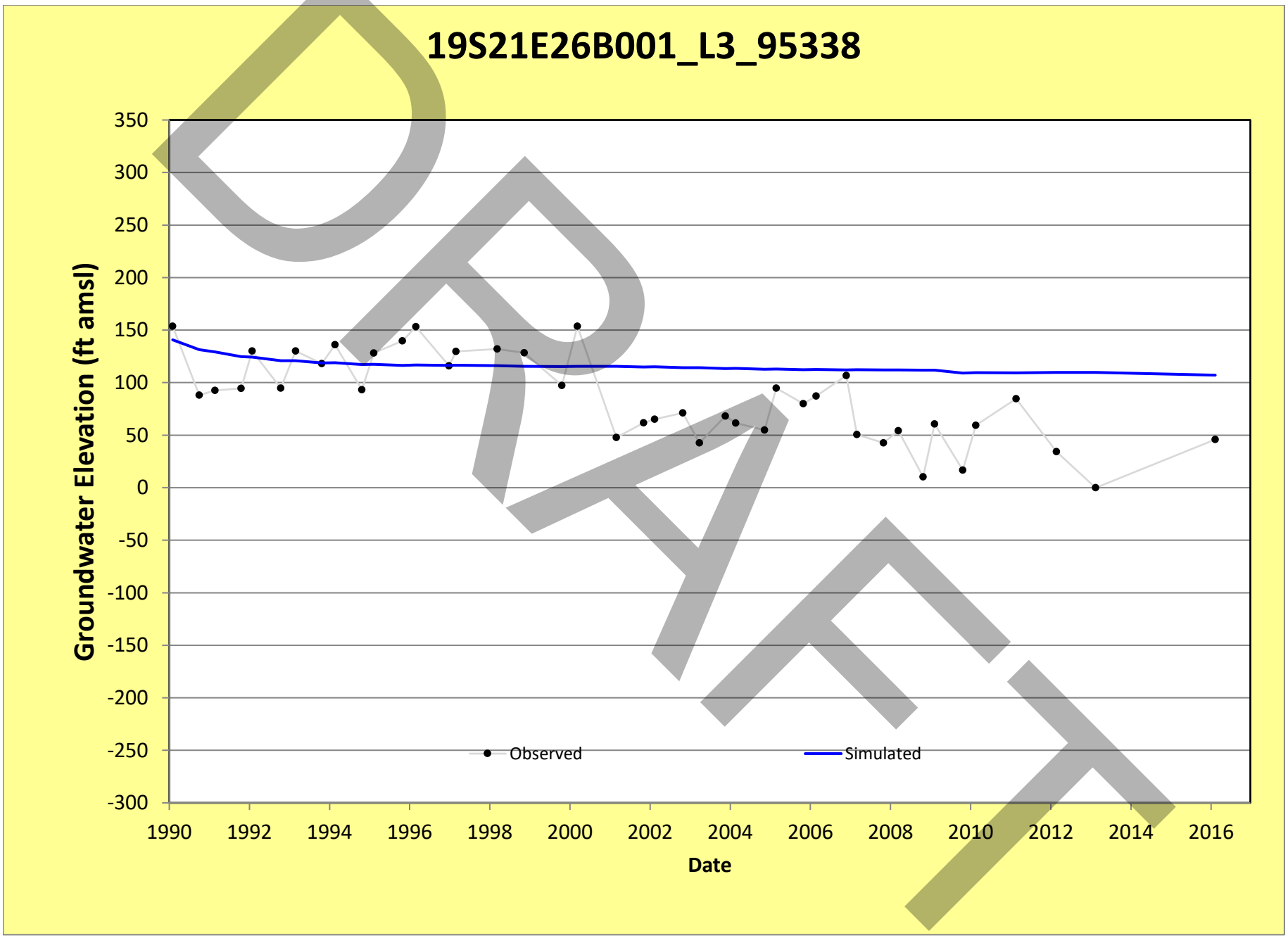
19S21E26B001_L3_95338
Groundwater Elevation (ft amsl)
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200
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-50
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-200
-250
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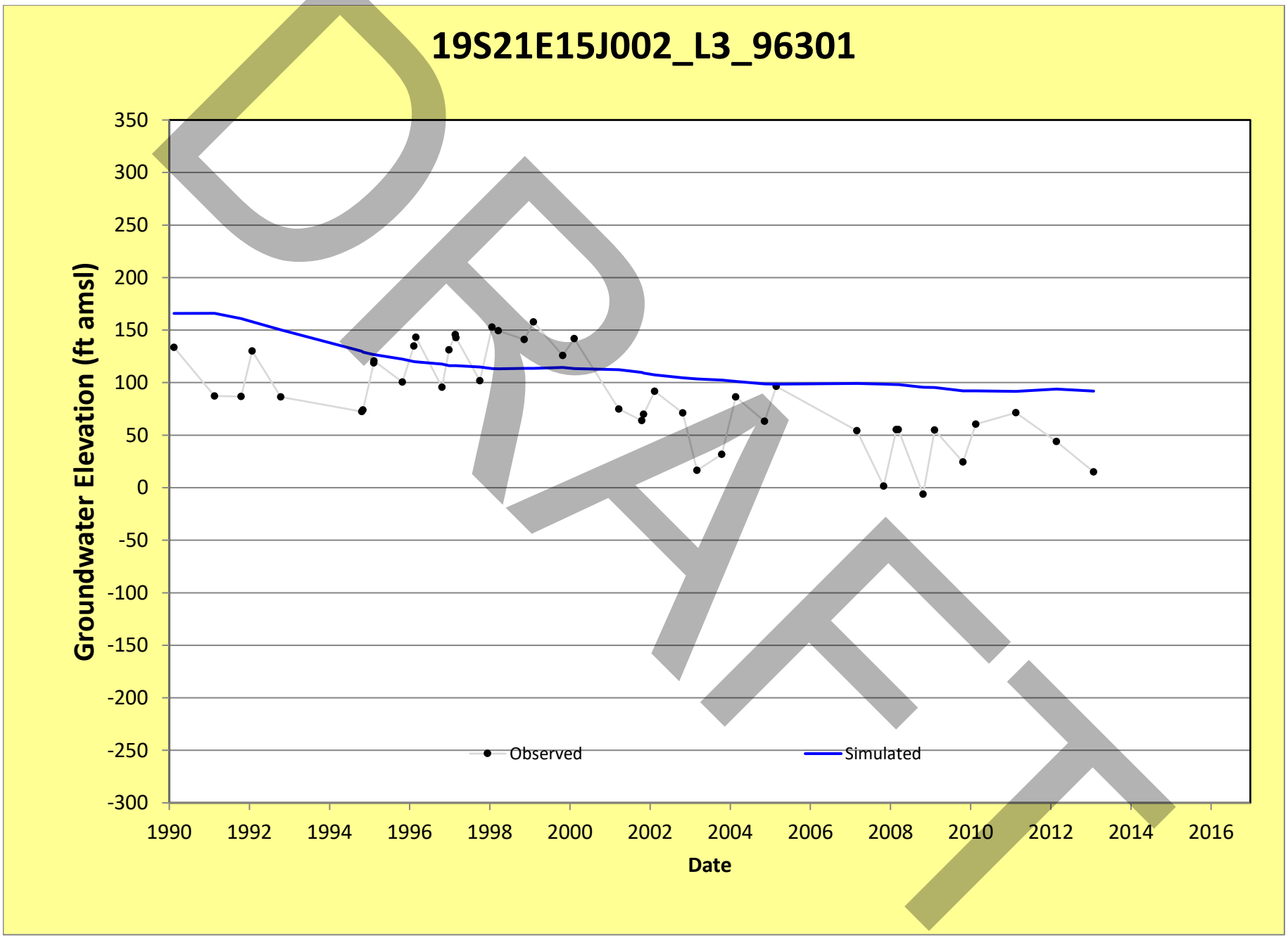
19S21E15J002_L3_96301
Groundwater Elevation (ft amsl)
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250
200
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0
-50
-100
-150
-200
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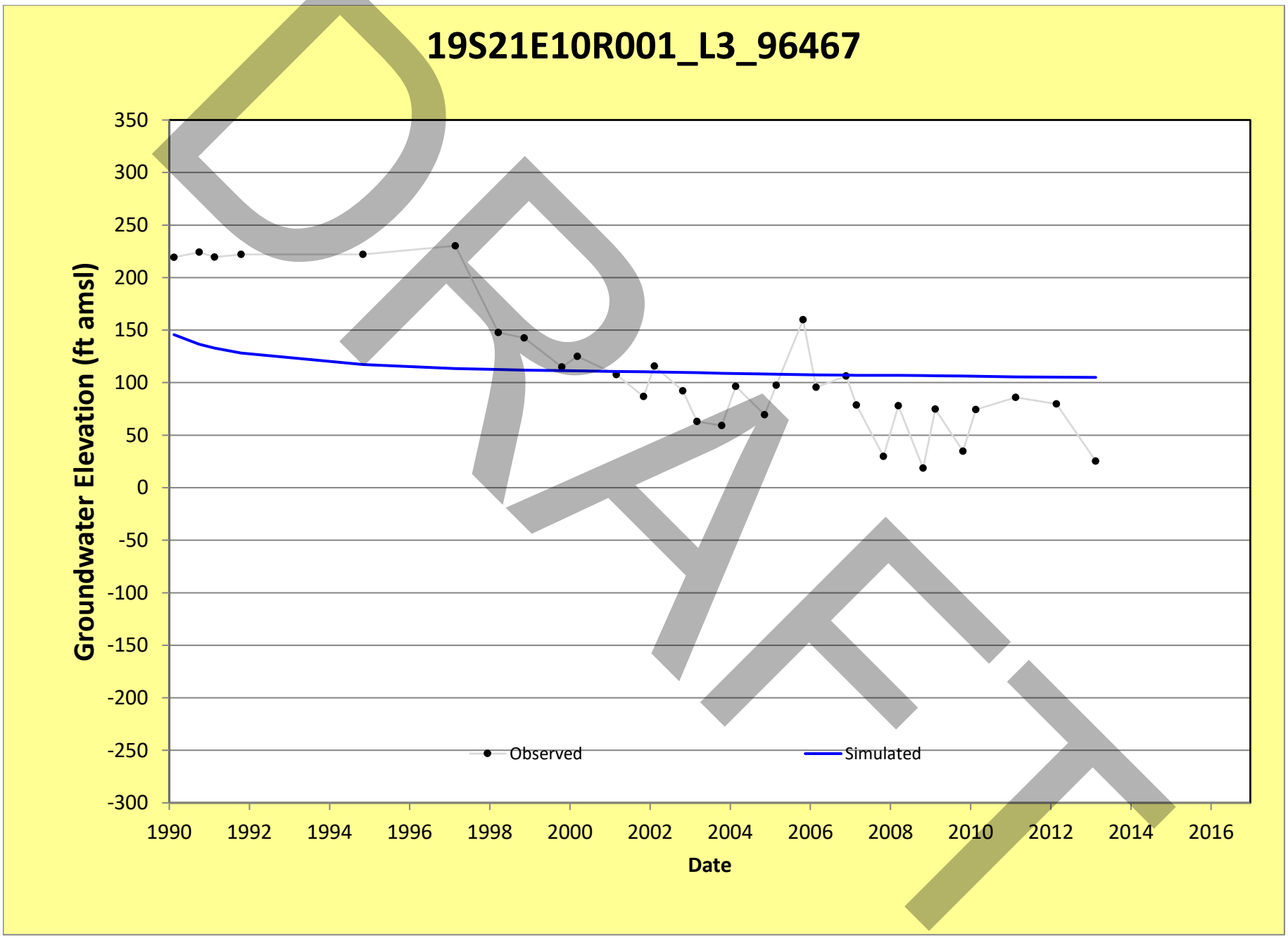
19S21E10R001_L3_96467
Groundwater Elevation (ft amsl)
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300
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100
50
0
-50
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-150
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-300
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Observed
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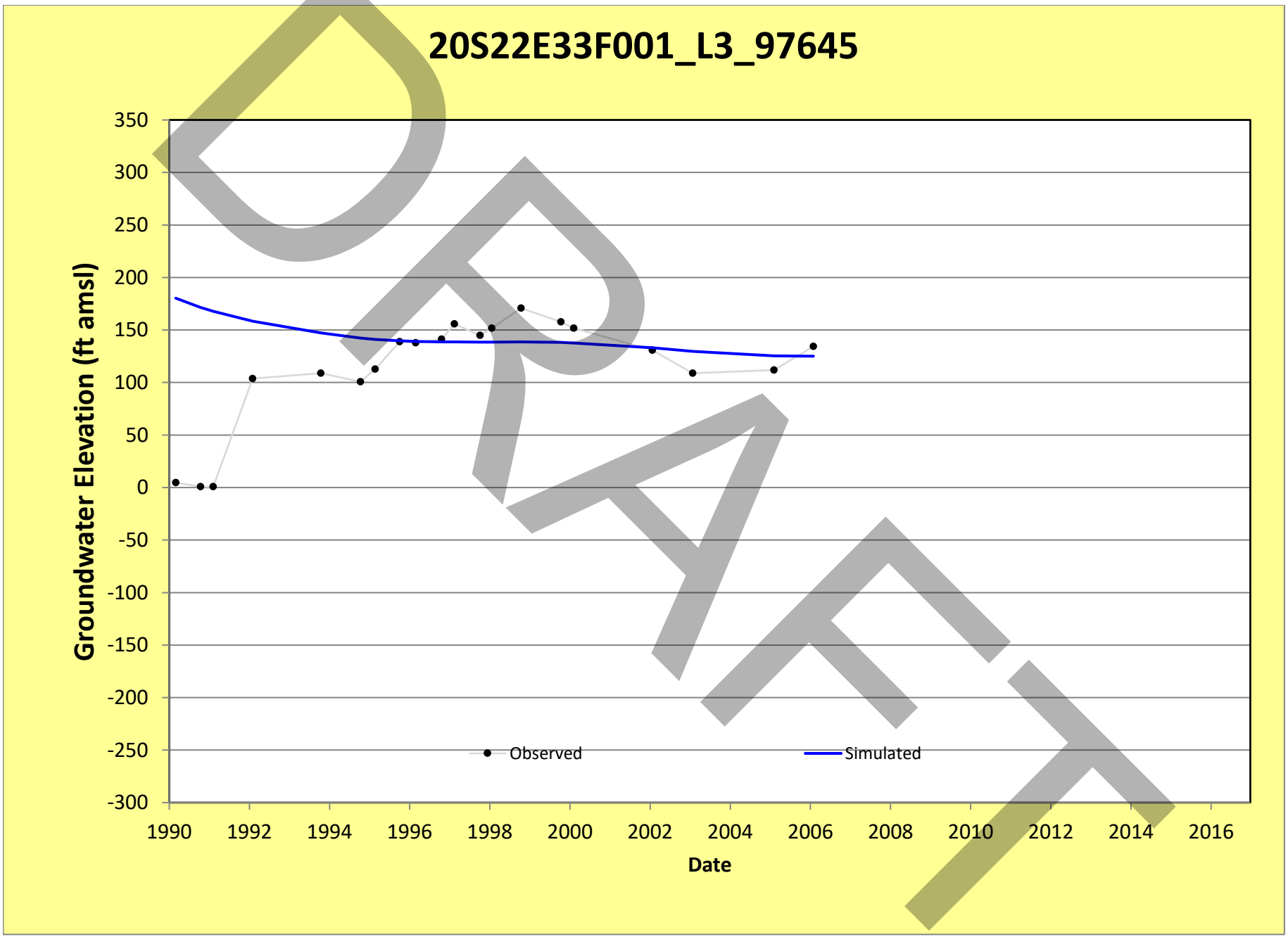
20S22E33F001_L3_97645
Groundwater Elevation (ft amsl)
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300
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200
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100
50
0
-50
-100
-150
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-250
-300
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Observed
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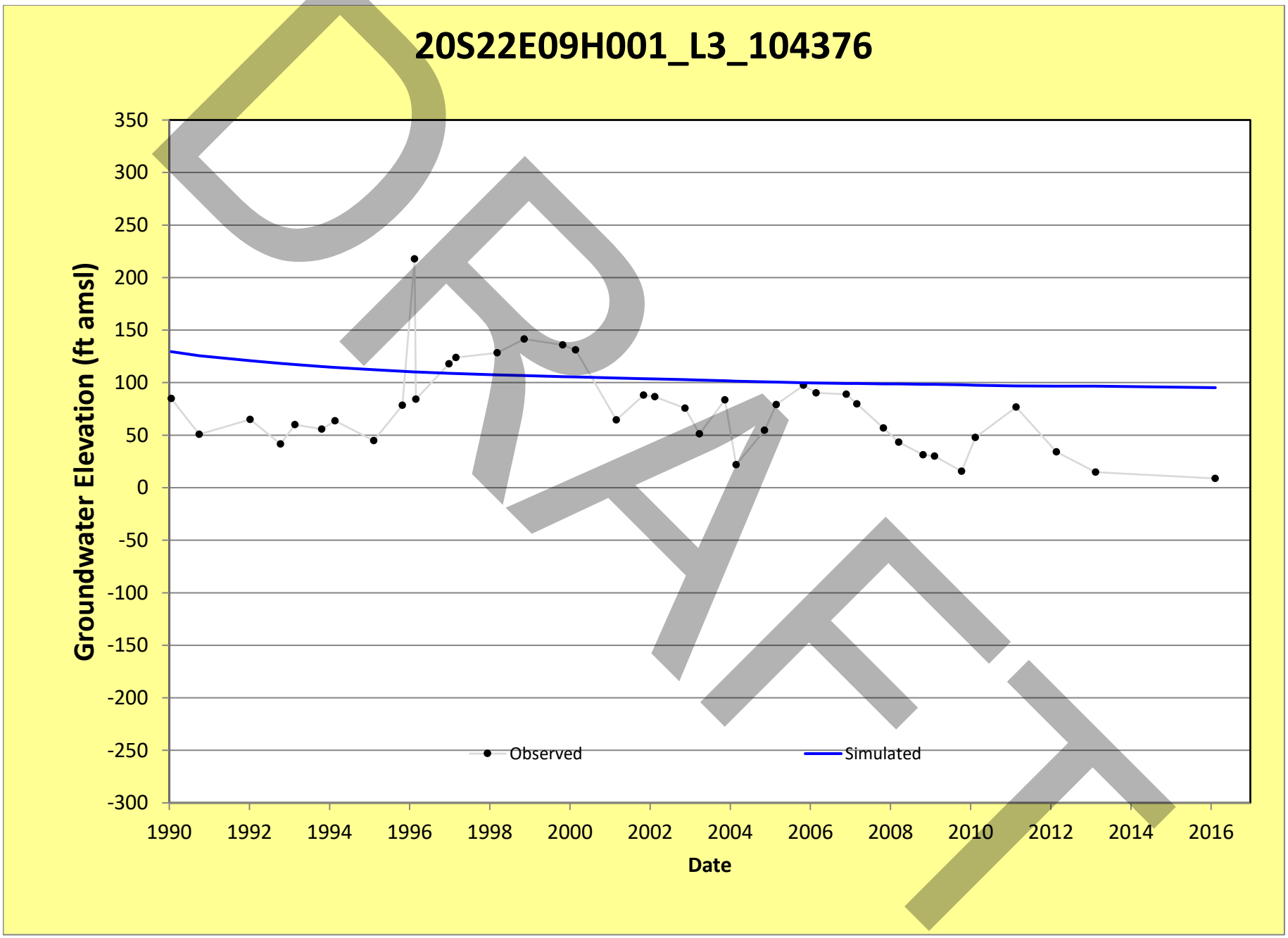
20S22E09H001_L3_104376
Groundwater Elevation (ft amsl)
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100
50
0
-50
-100
-150
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-250
-300
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Date
Observed
Simulated
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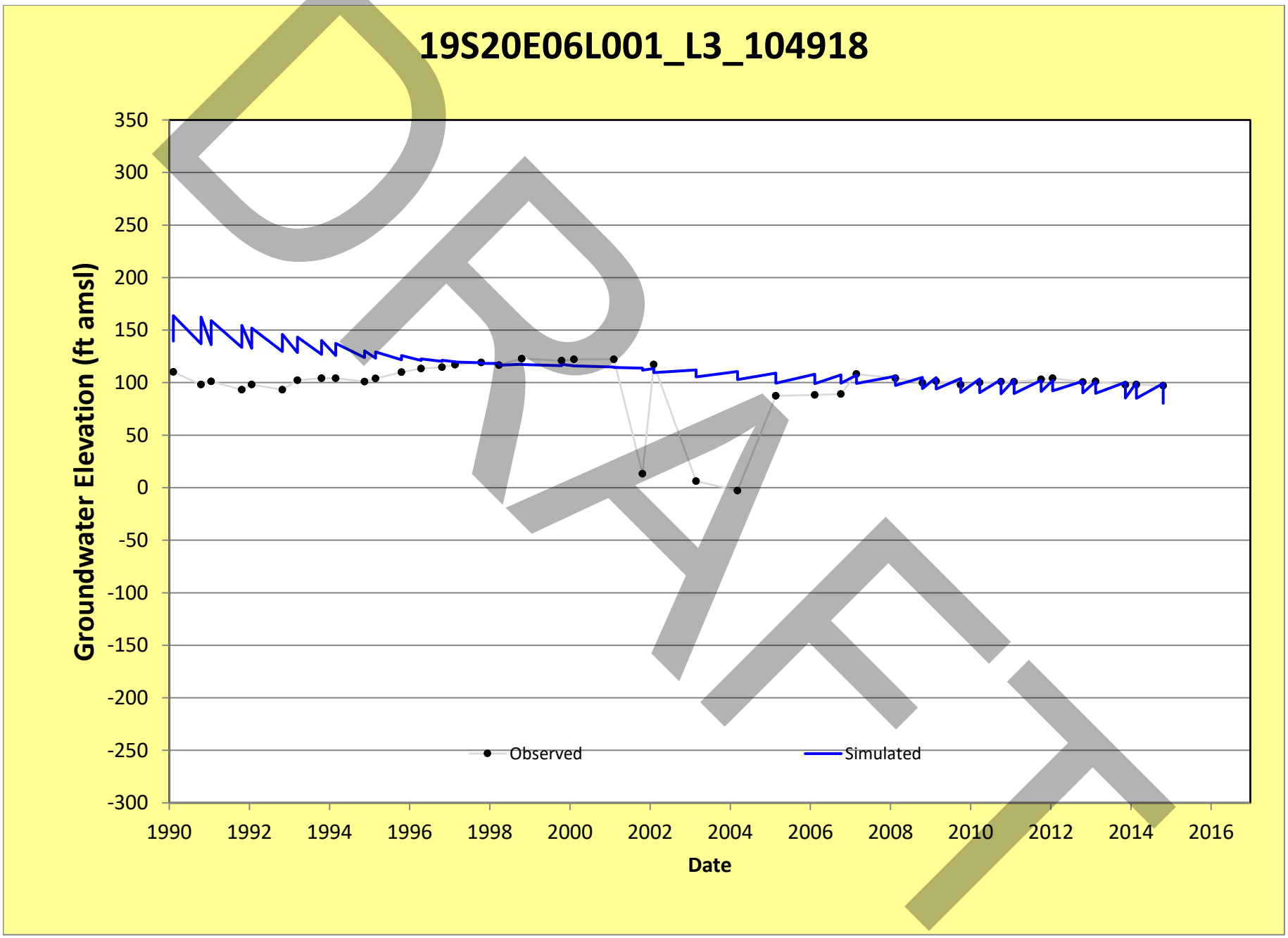
19S20E06L001_L3_104918
Groundwater Elevation (ft amsl)
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250
200
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100
50
0
-50
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-150
-200
-250
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Date
Observed
Simulated
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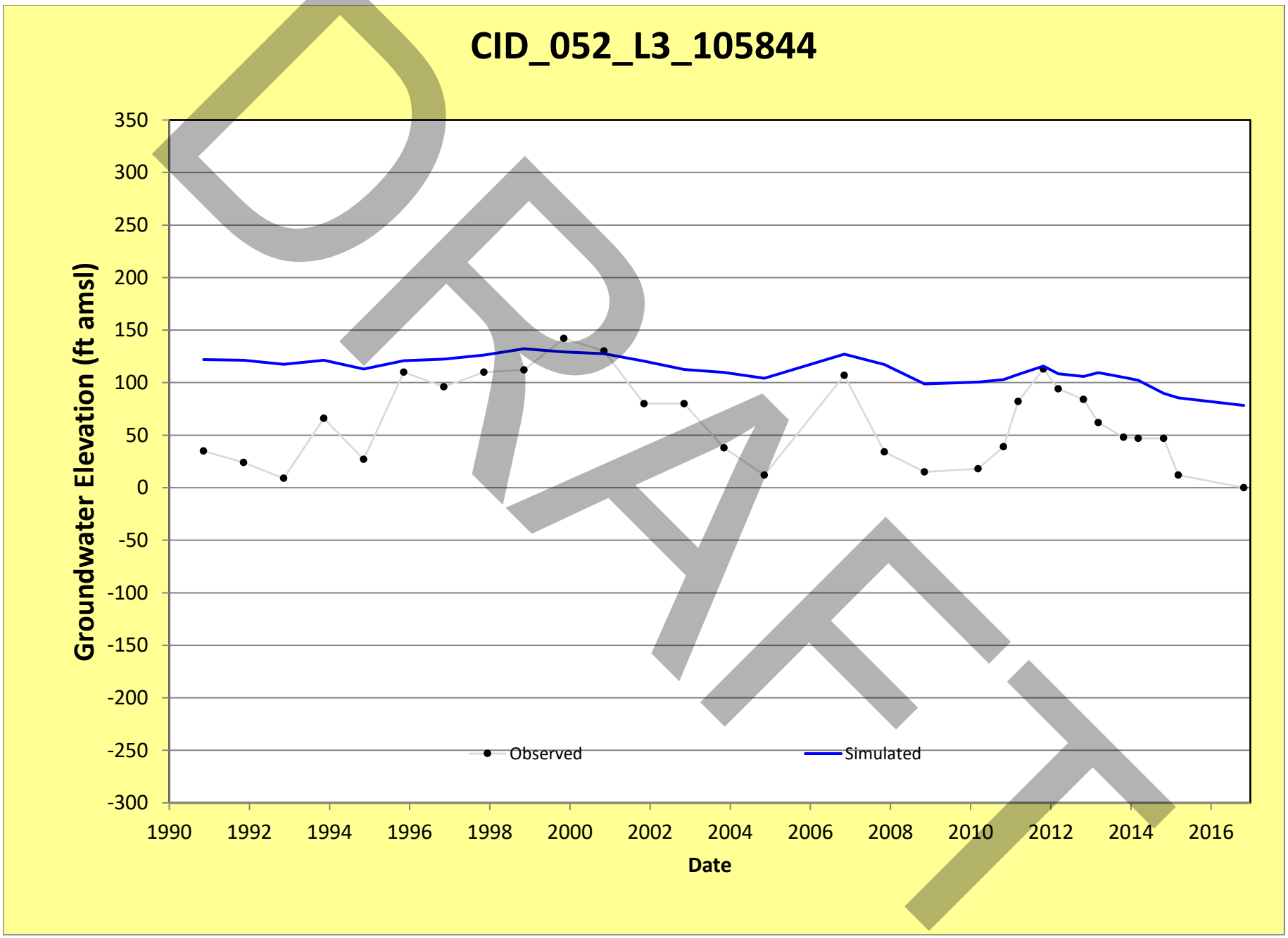
CID_052_L3_105844
Groundwater Elevation (ft amsl)
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250
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50
0
-50
-100
-150
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Observed
Simulated
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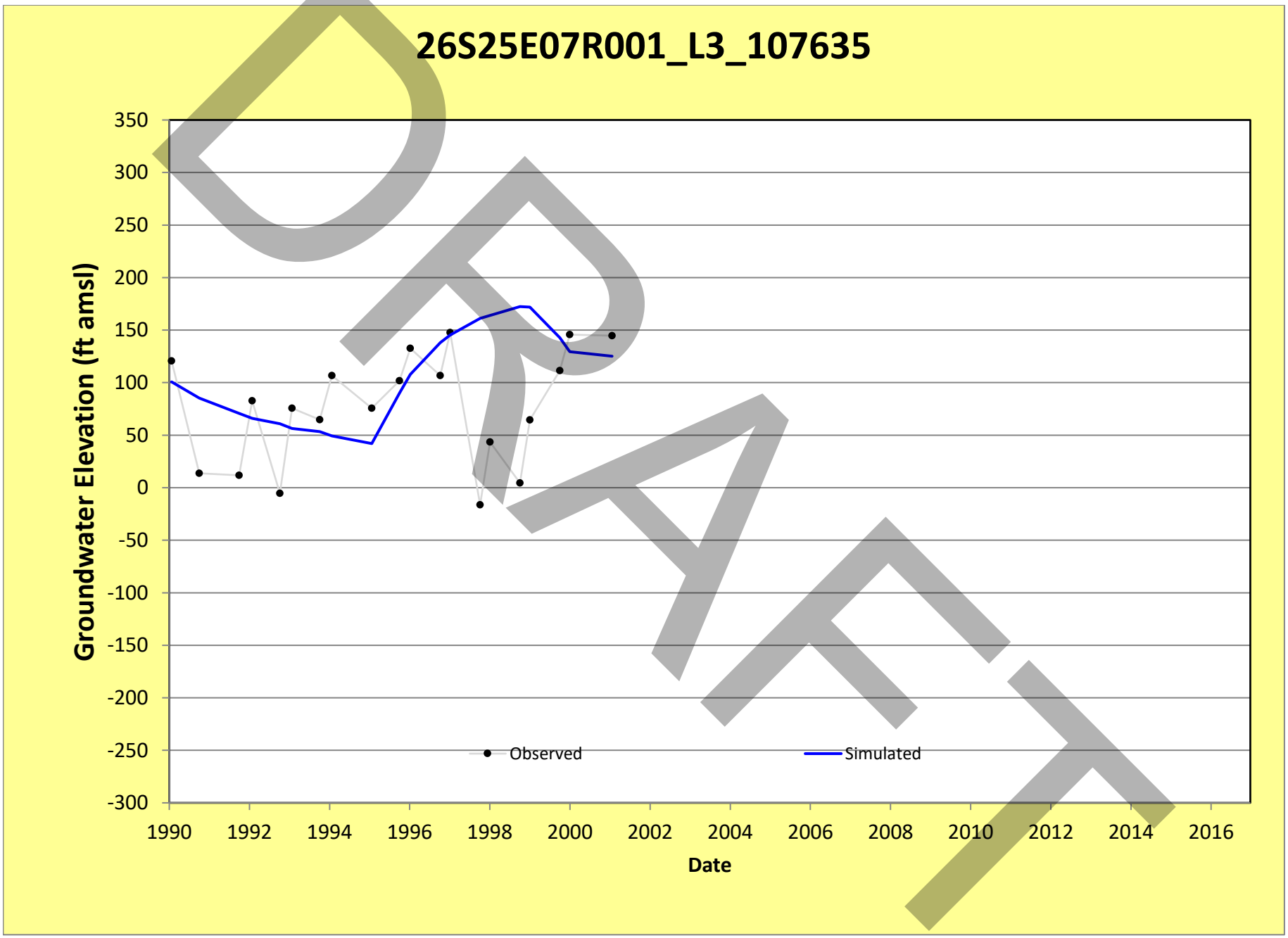
26S25E07R001_L3_107635
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
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-150
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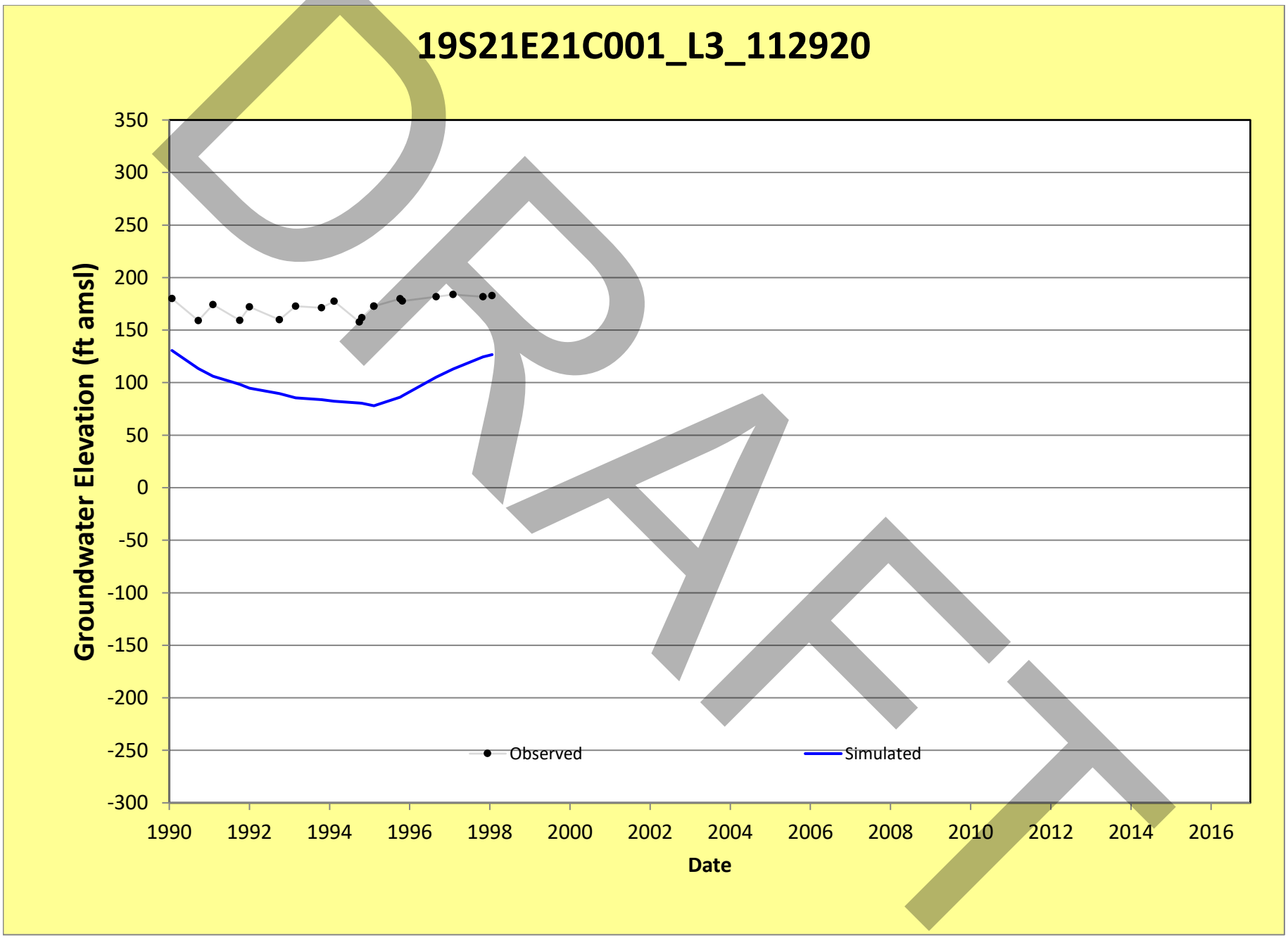
Date
Observed
Simulated
DRAFT


19S21E21C001_L3_112920
Groundwater Elevation (ft amsl)
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300
250
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100
50
0
-50
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-150
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-300
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Observed
Simulated
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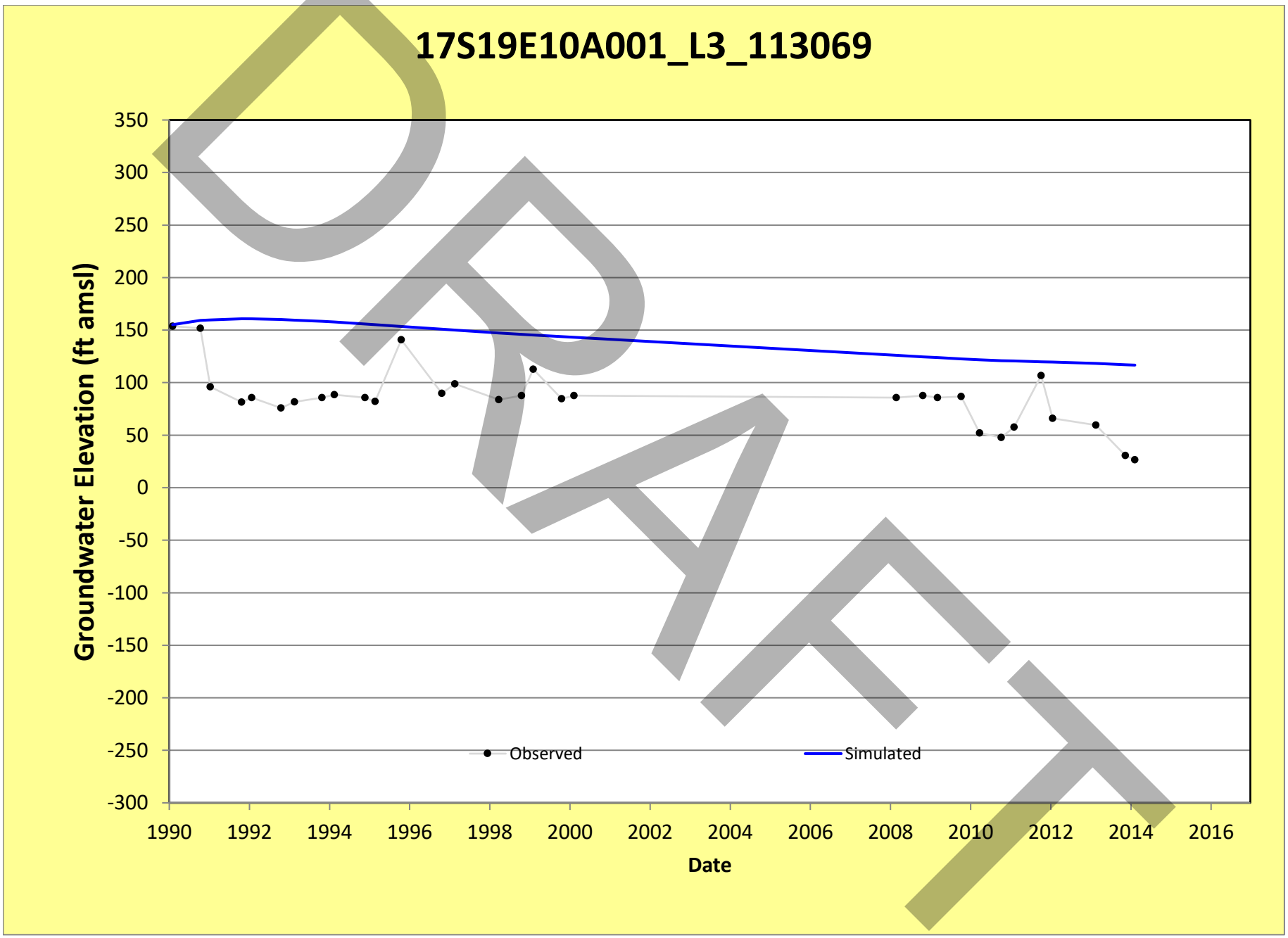
17S19E10A001_L3_113069
Groundwater Elevation (ft amsl)
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100
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-50
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-150
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Date
Observed
Simulated
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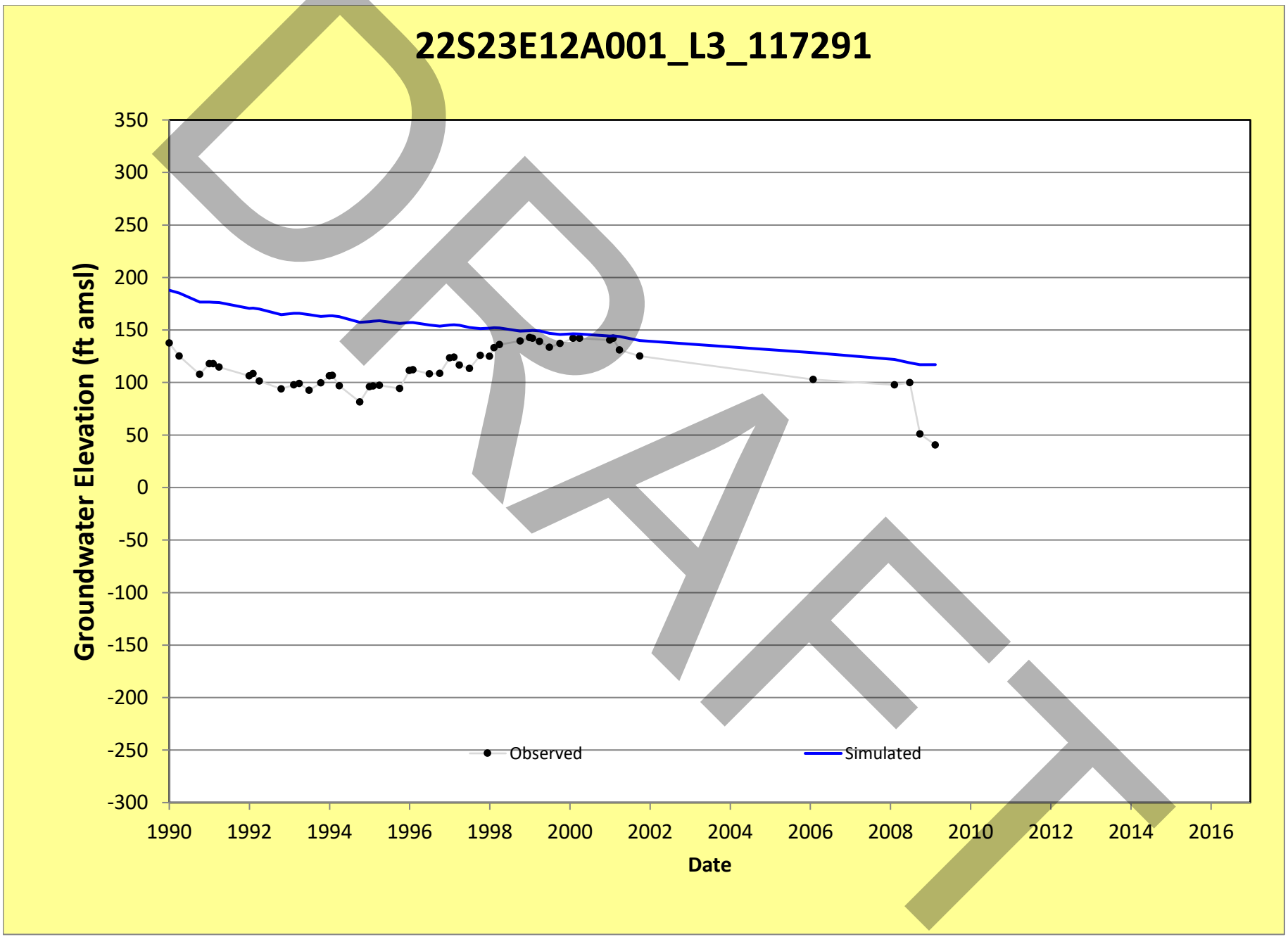
22S23E12A001_L3_117291
Groundwater Elevation (ft amsl)
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50
0
-50
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-150
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Date
Observed
Simulated
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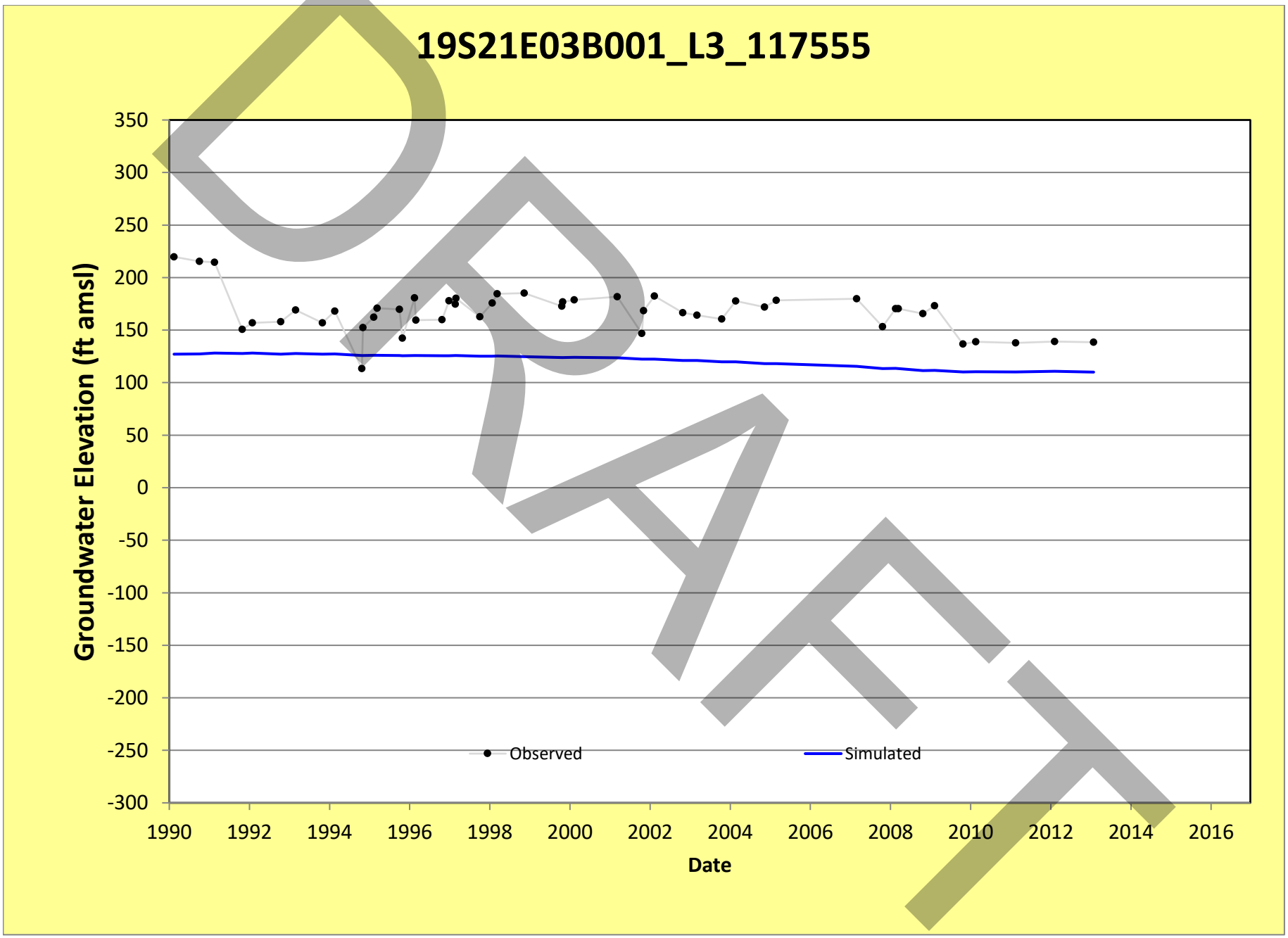
19S21E03B001_L3_117555
Groundwater Elevation (ft amsl)
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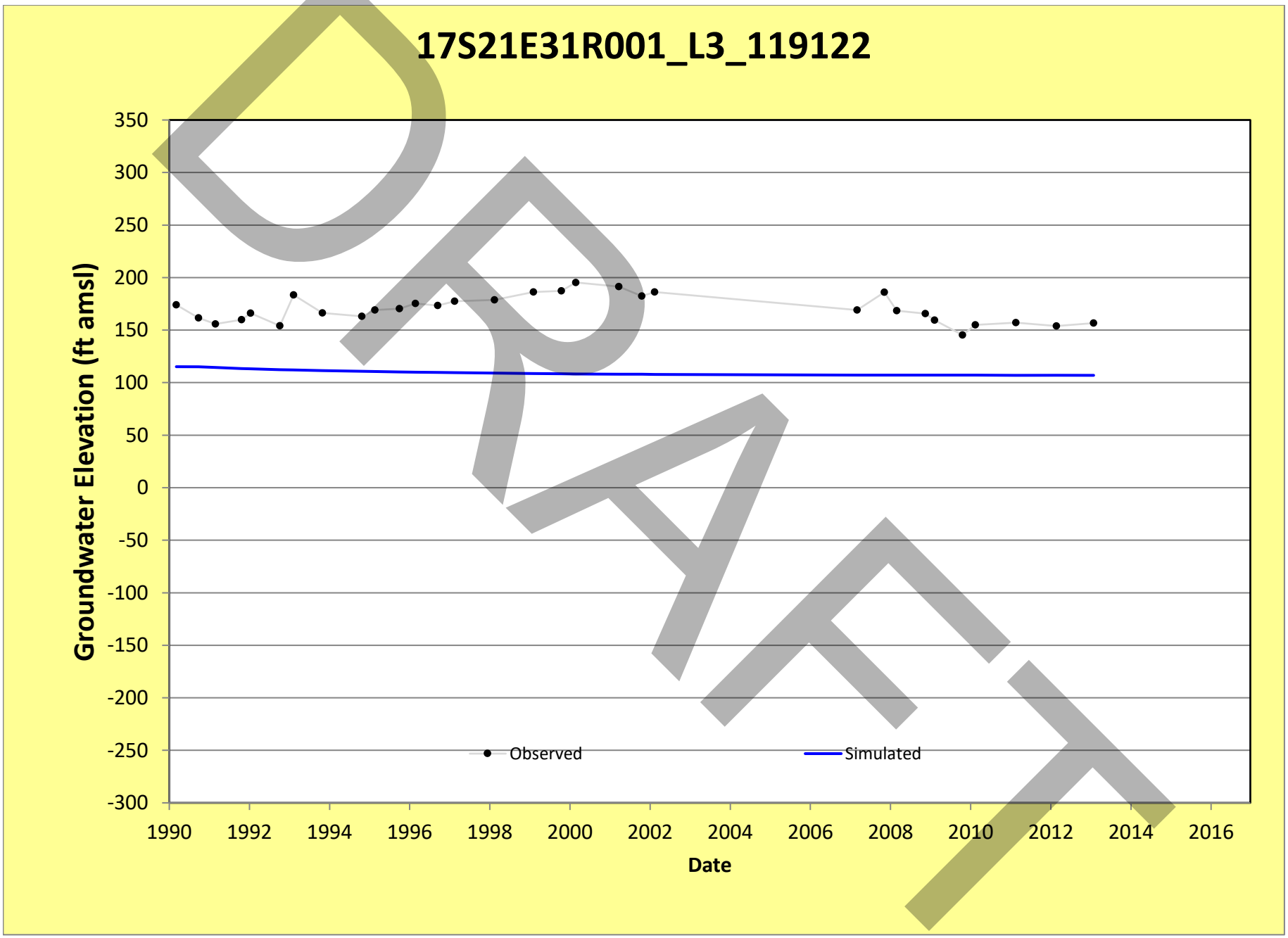
Date
Observed
Simulated
DRAFT


17S21E31R001_L3_119122
Groundwater Elevation (ft amsl)
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-150
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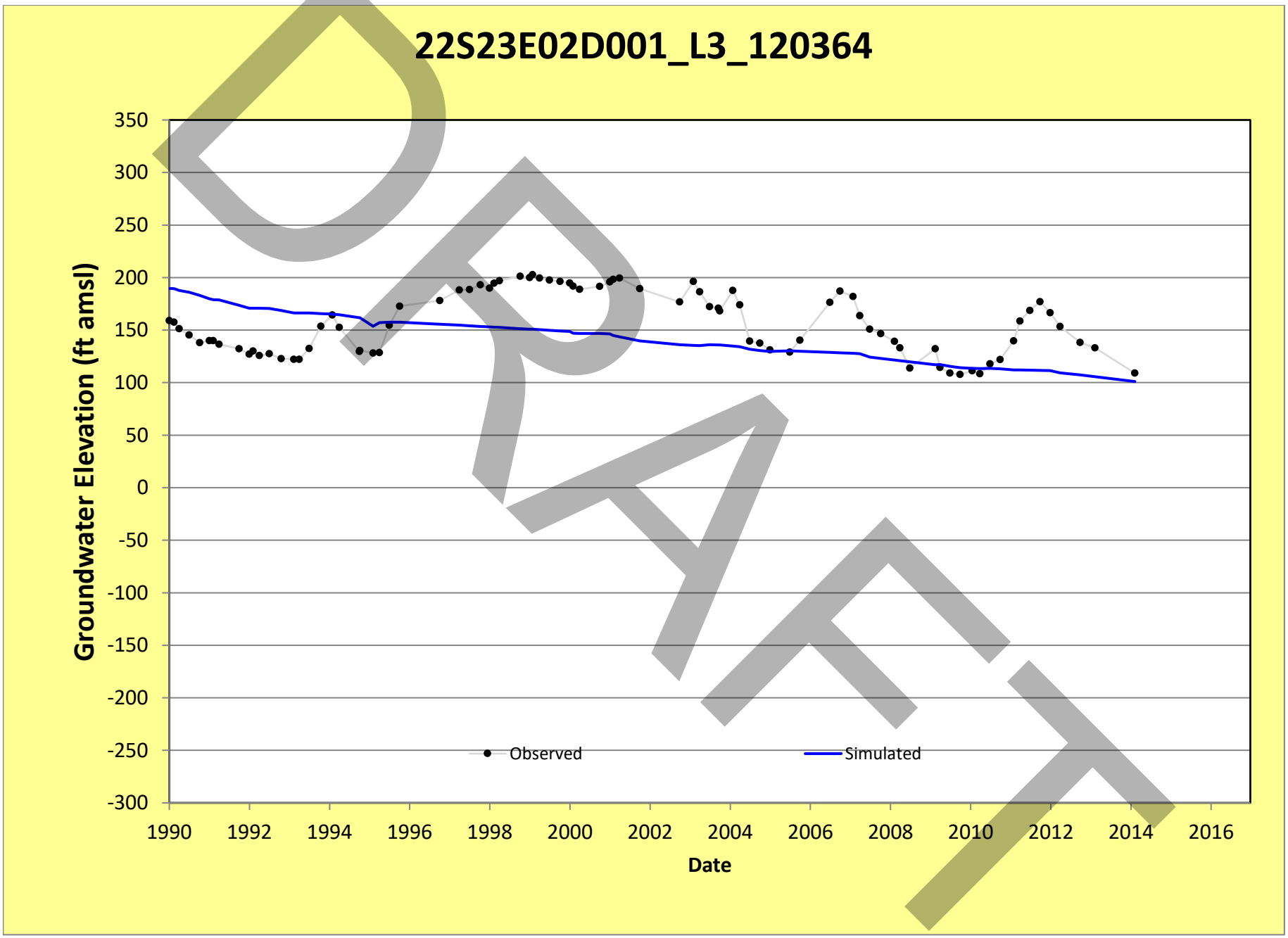
Date
Observed
Simulated
DRAFT


22S23E02D001_L3_120364
Groundwater Elevation (ft amsl)
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50
0
-50
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-150
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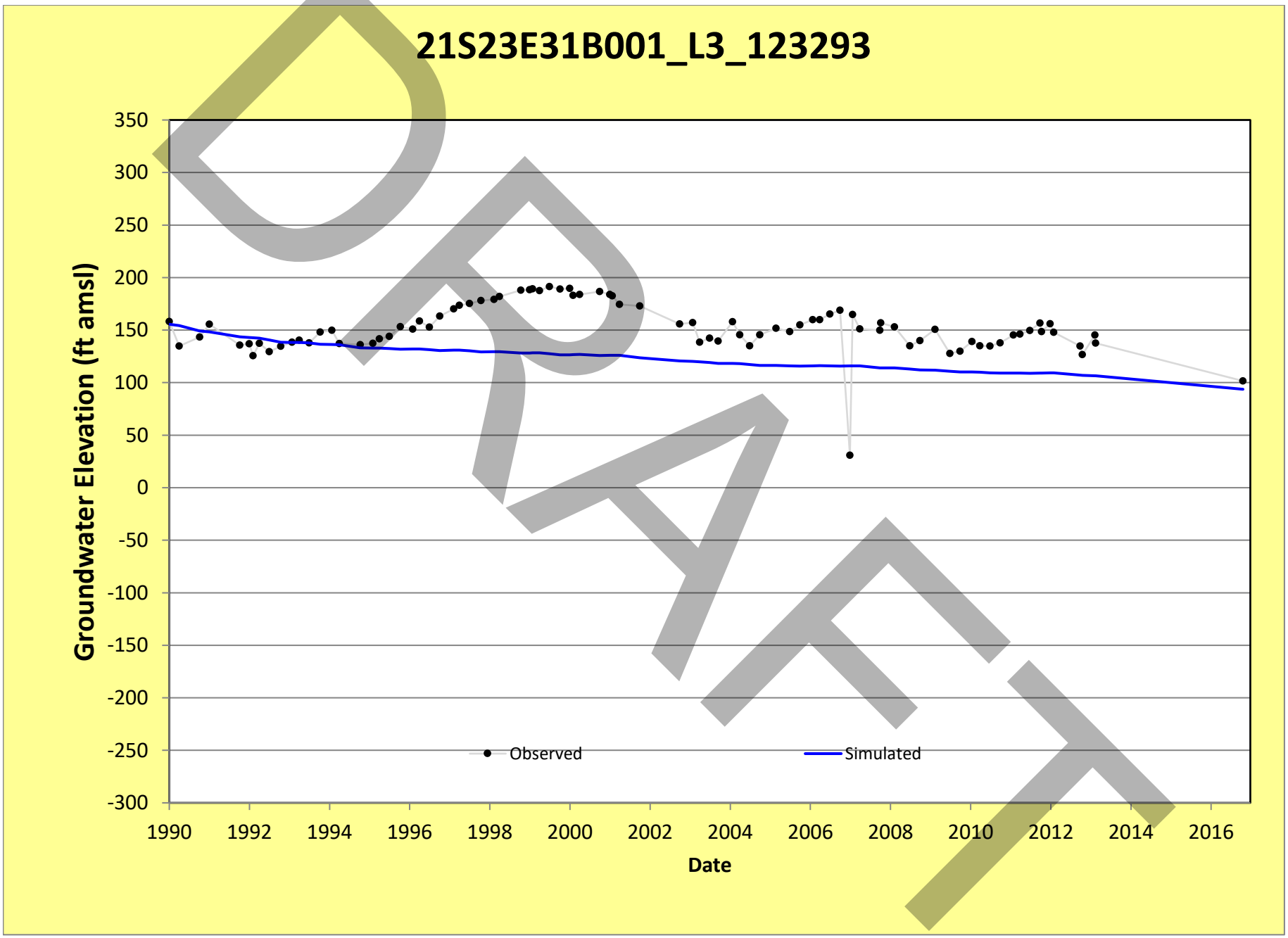
Observed
Simulated
DRAFT


21S23E31B001_L3_123293
Groundwater Elevation (ft amsl)
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-50
-100
-150
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-250
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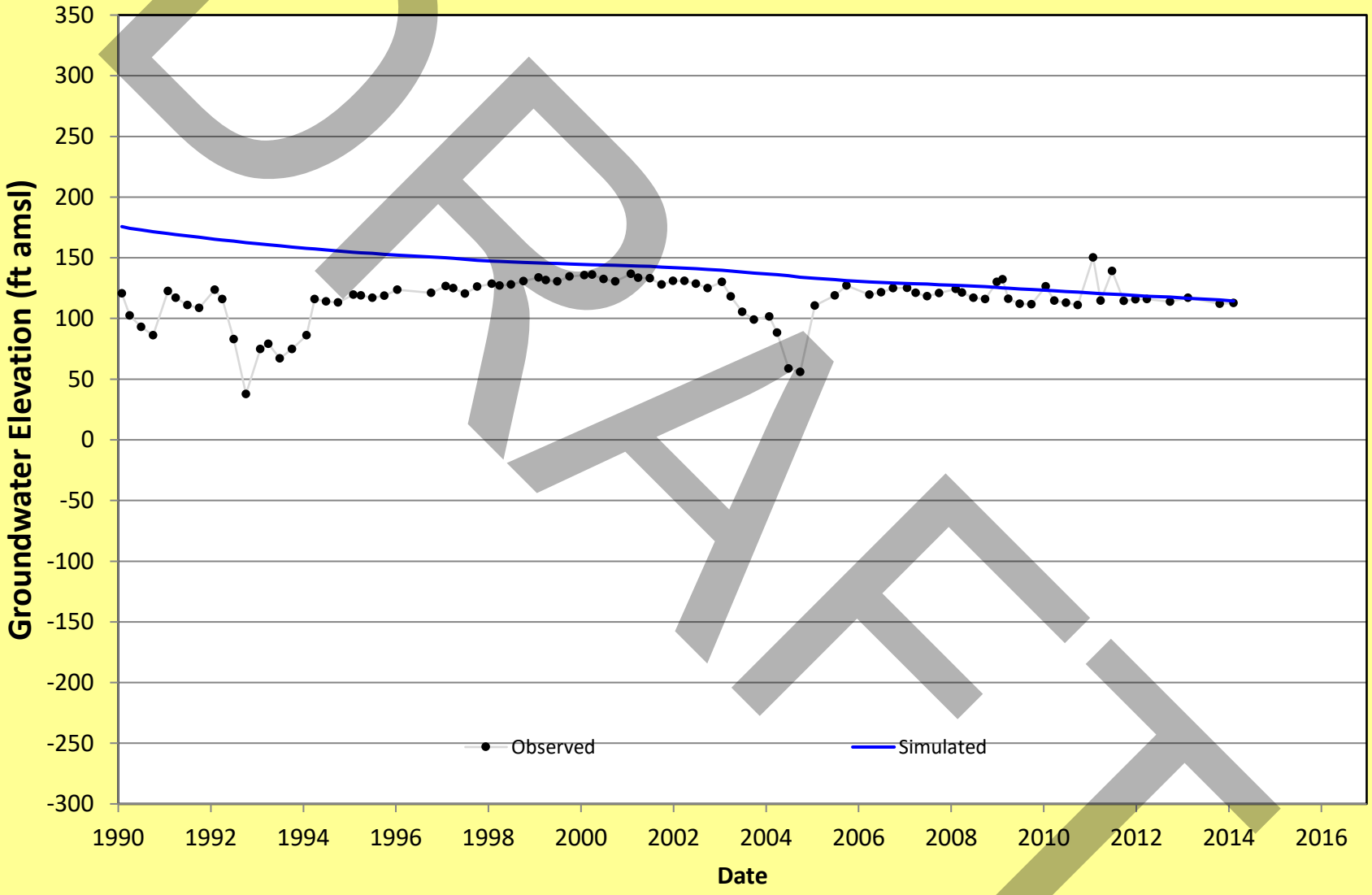
Observed
Simulated
DRAFT

23S24E16R004_L3_134479



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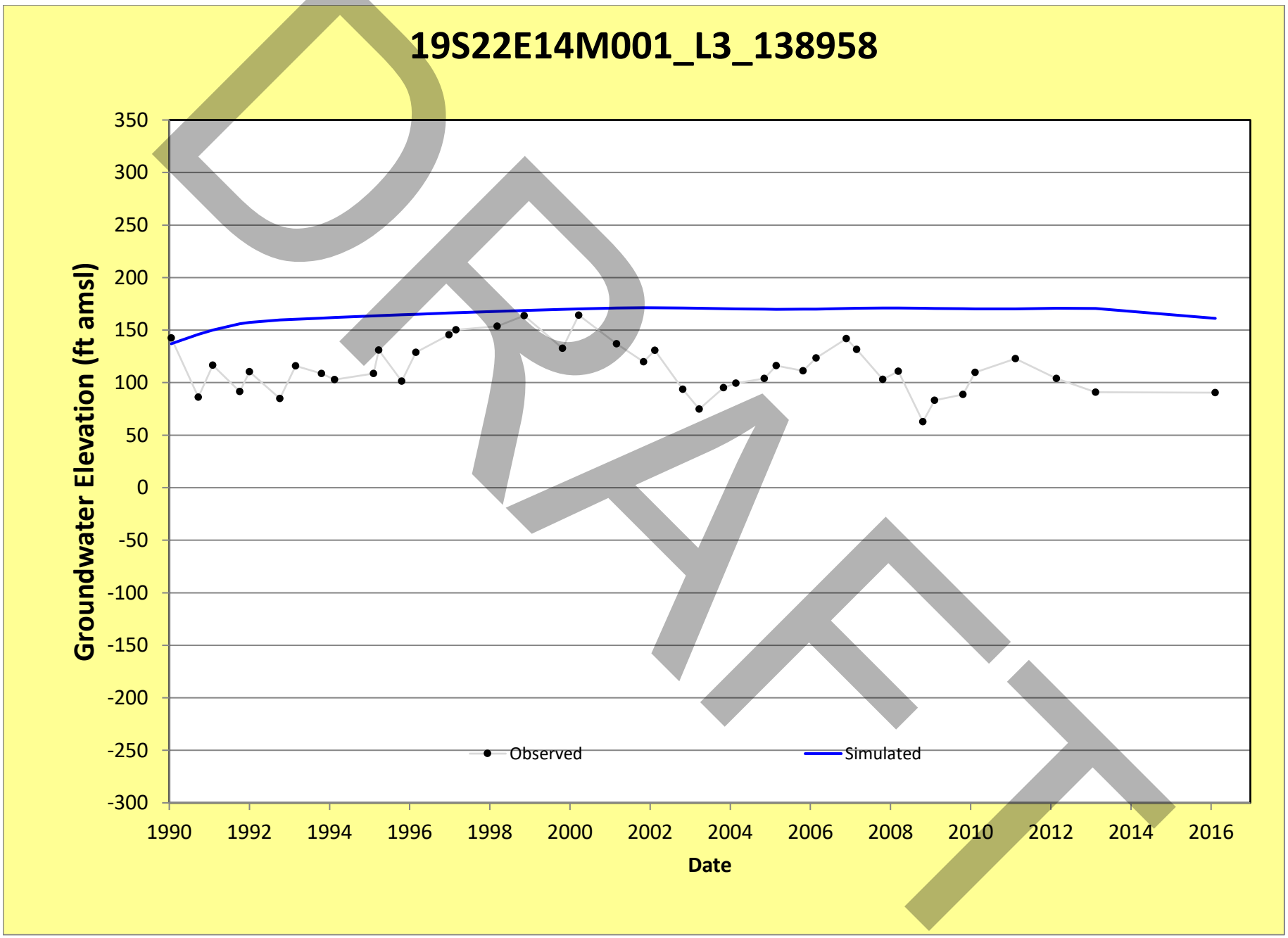
19S22E14M001_L3_138958
Groundwater Elevation (ft amsl)
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200
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50
0
-50
-100
-150
-200
-250
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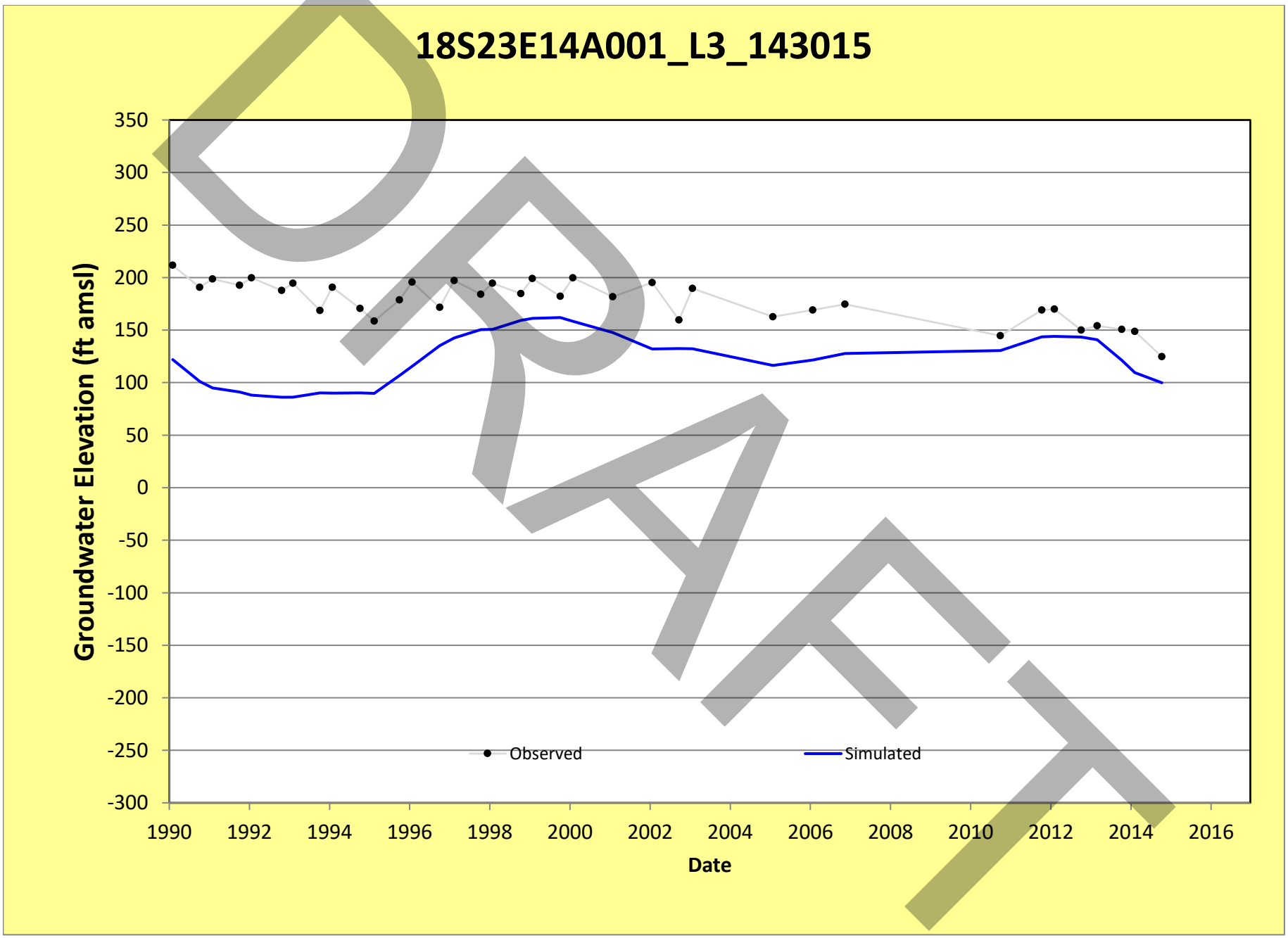
Date
Observed
Simulated
DRAFT


18S23E14A001_L3_143015
Groundwater Elevation (ft amsl)
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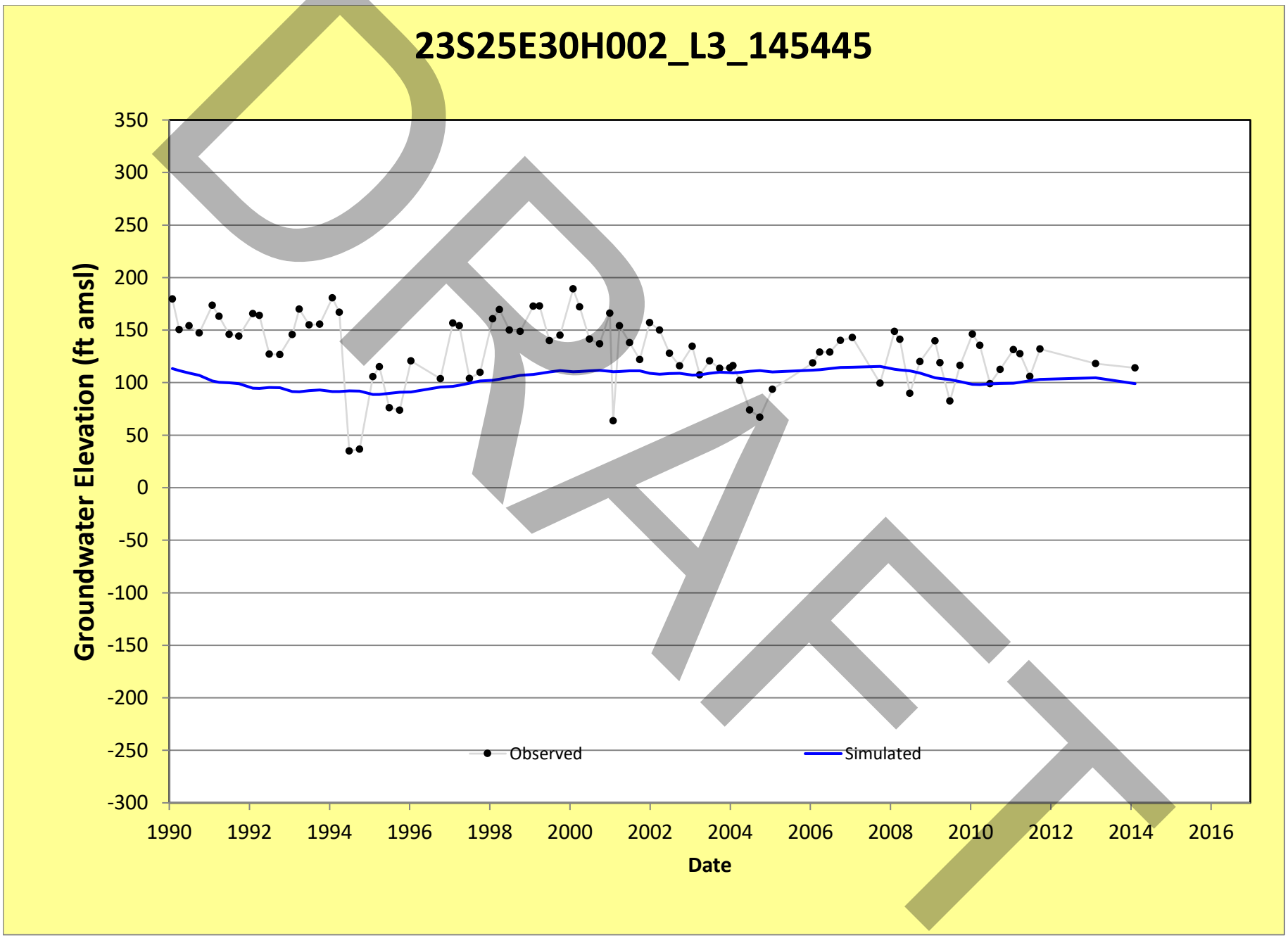
Observed
Simulated
DRAFT


23S25E30H002_L3_145445
Groundwater Elevation (ft amsl)
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Observed
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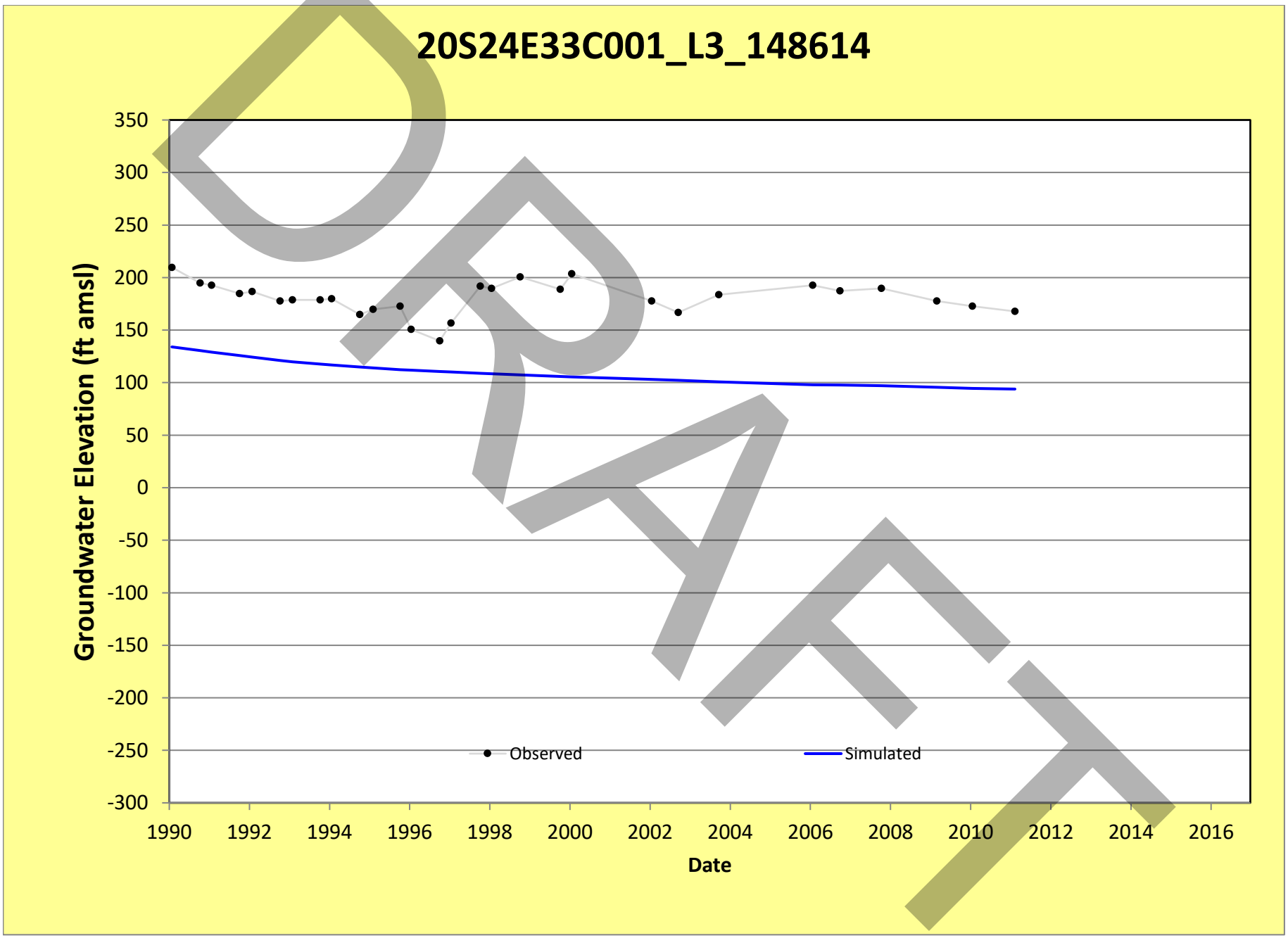
20S24E33C001_L3_148614
Groundwater Elevation (ft amsl)
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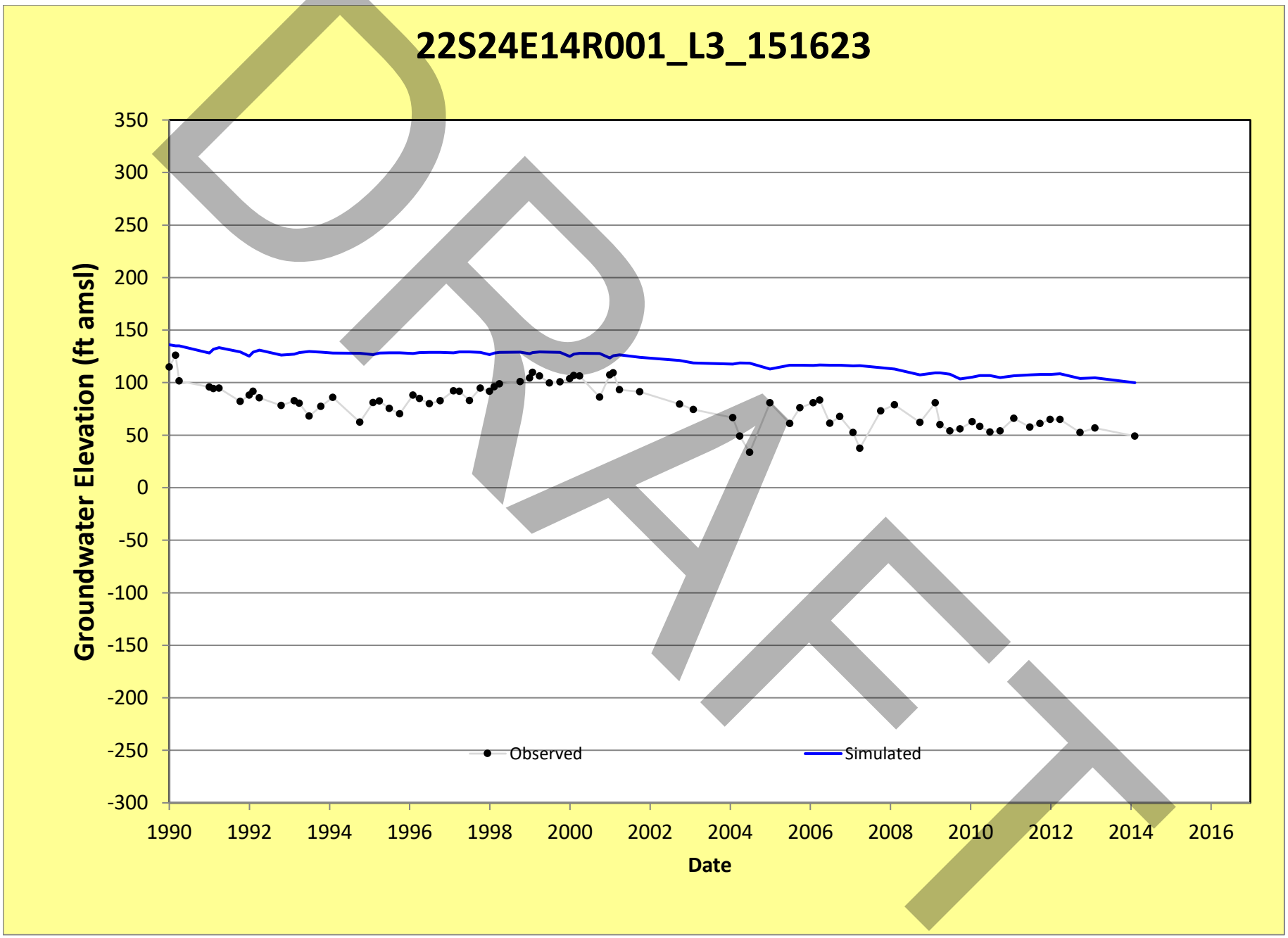
Observed
Simulated
DRAFT


22S24E14R001_L3_151623
Groundwater Elevation (ft amsl)
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-150
-200
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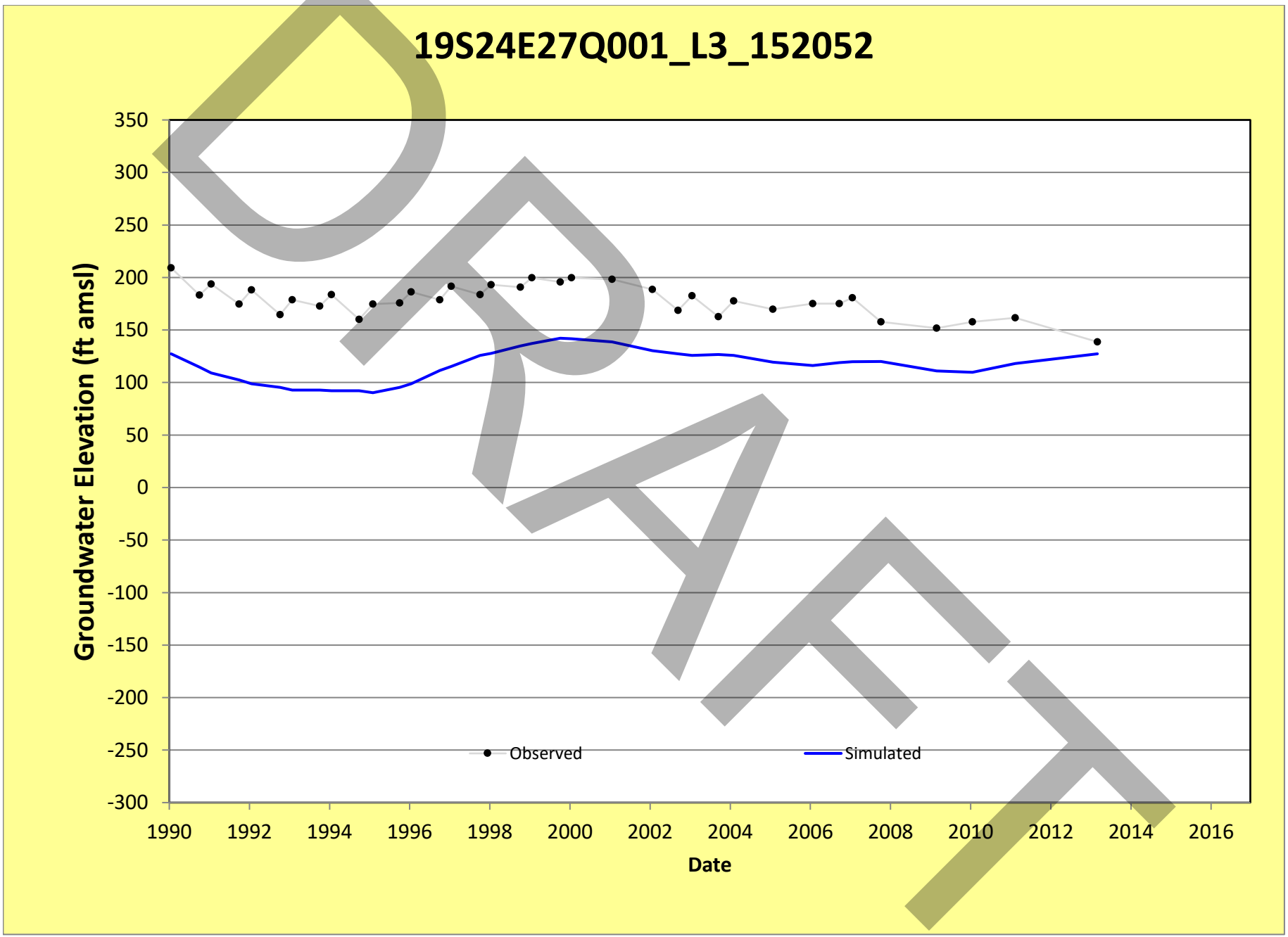
Date
Observed
Simulated
DRAFT


19S24E27Q001_L3_152052
Groundwater Elevation (ft amsl)
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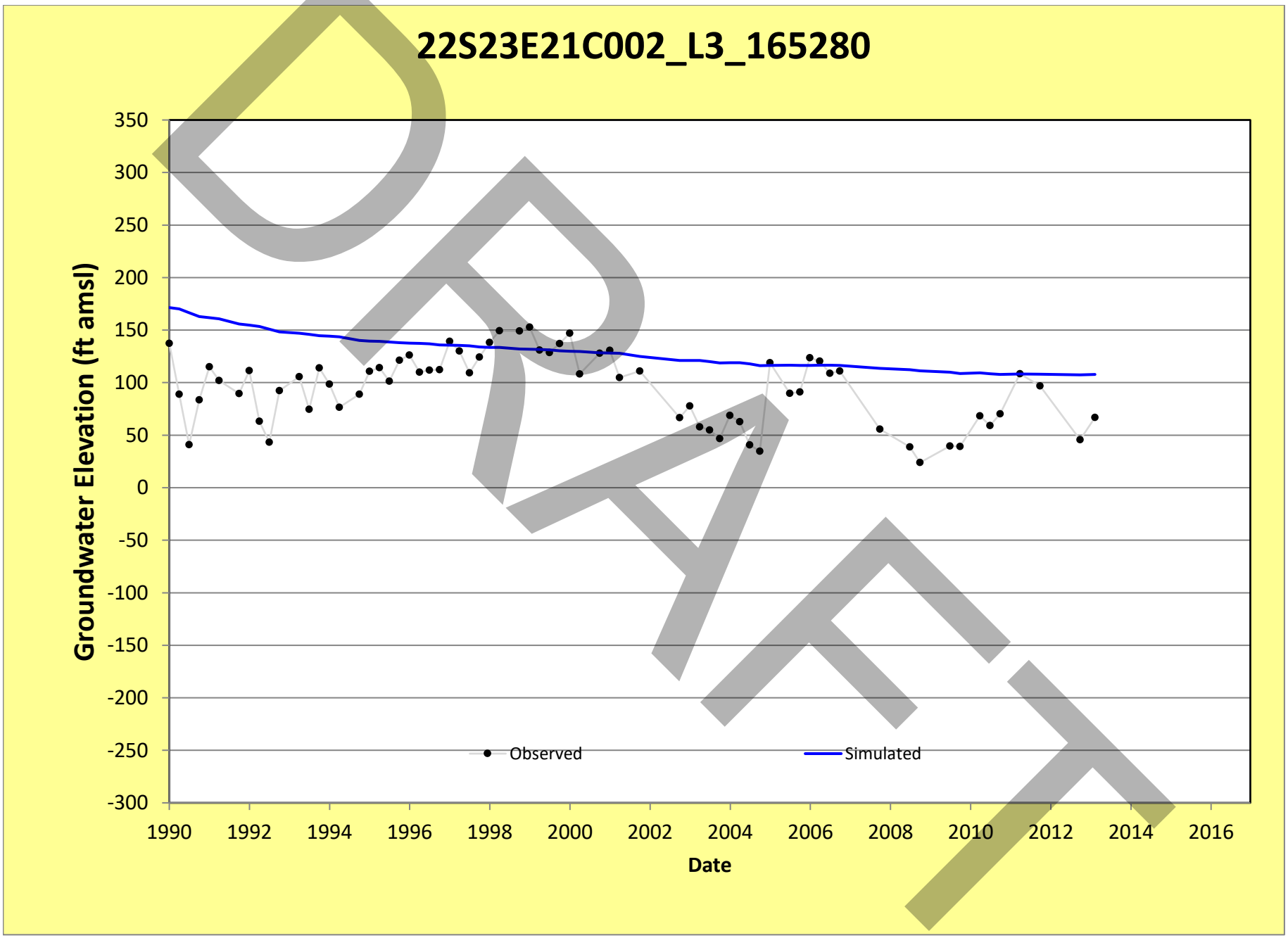
Observed
Simulated
DRAFT


22S23E21C002_L3_165280
Groundwater Elevation (ft amsl)
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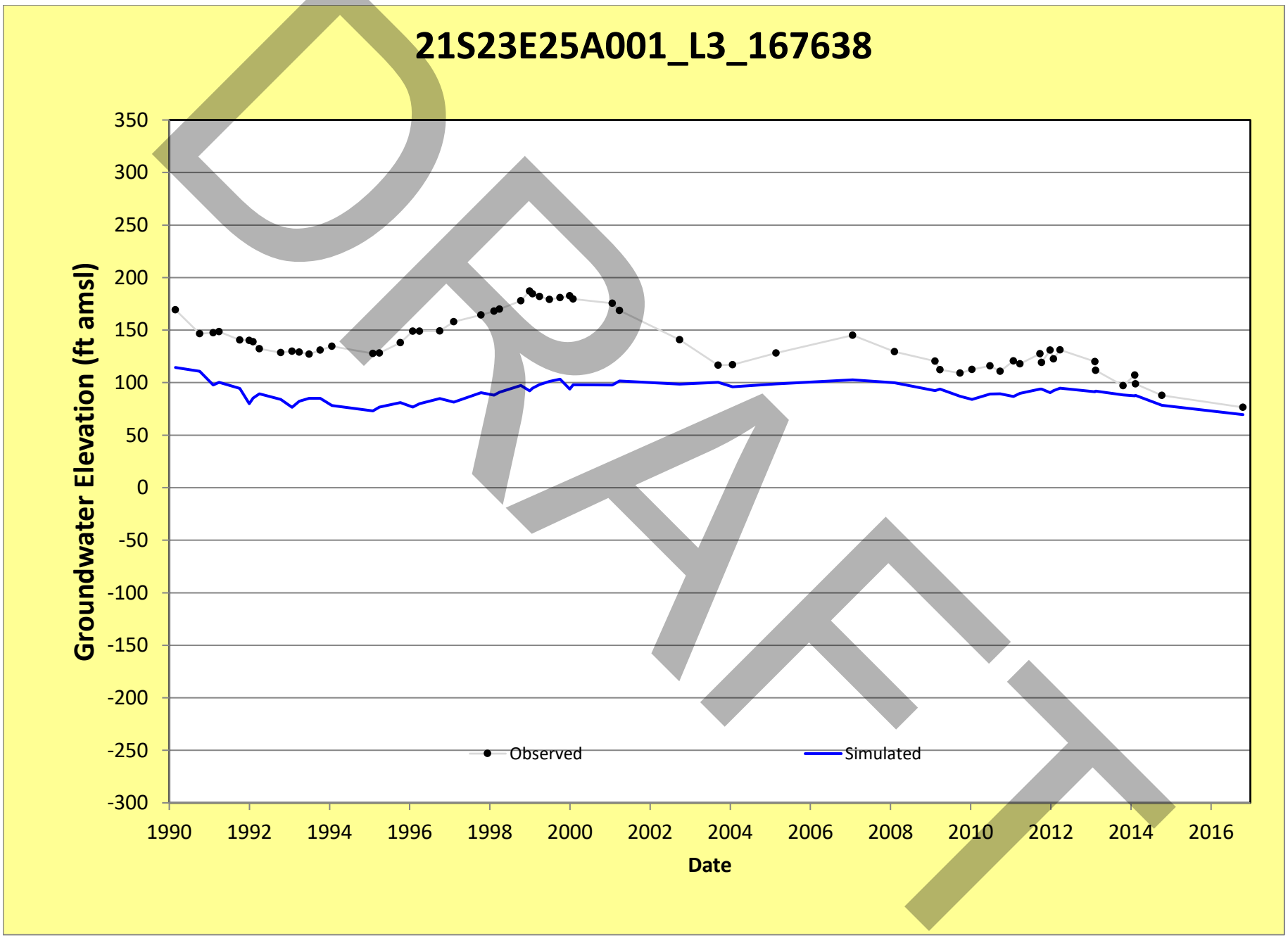
Observed
Simulated
DRAFT


21S23E25A001_L3_167638
Groundwater Elevation (ft amsl)
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-50
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1990
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Observed
Simulated
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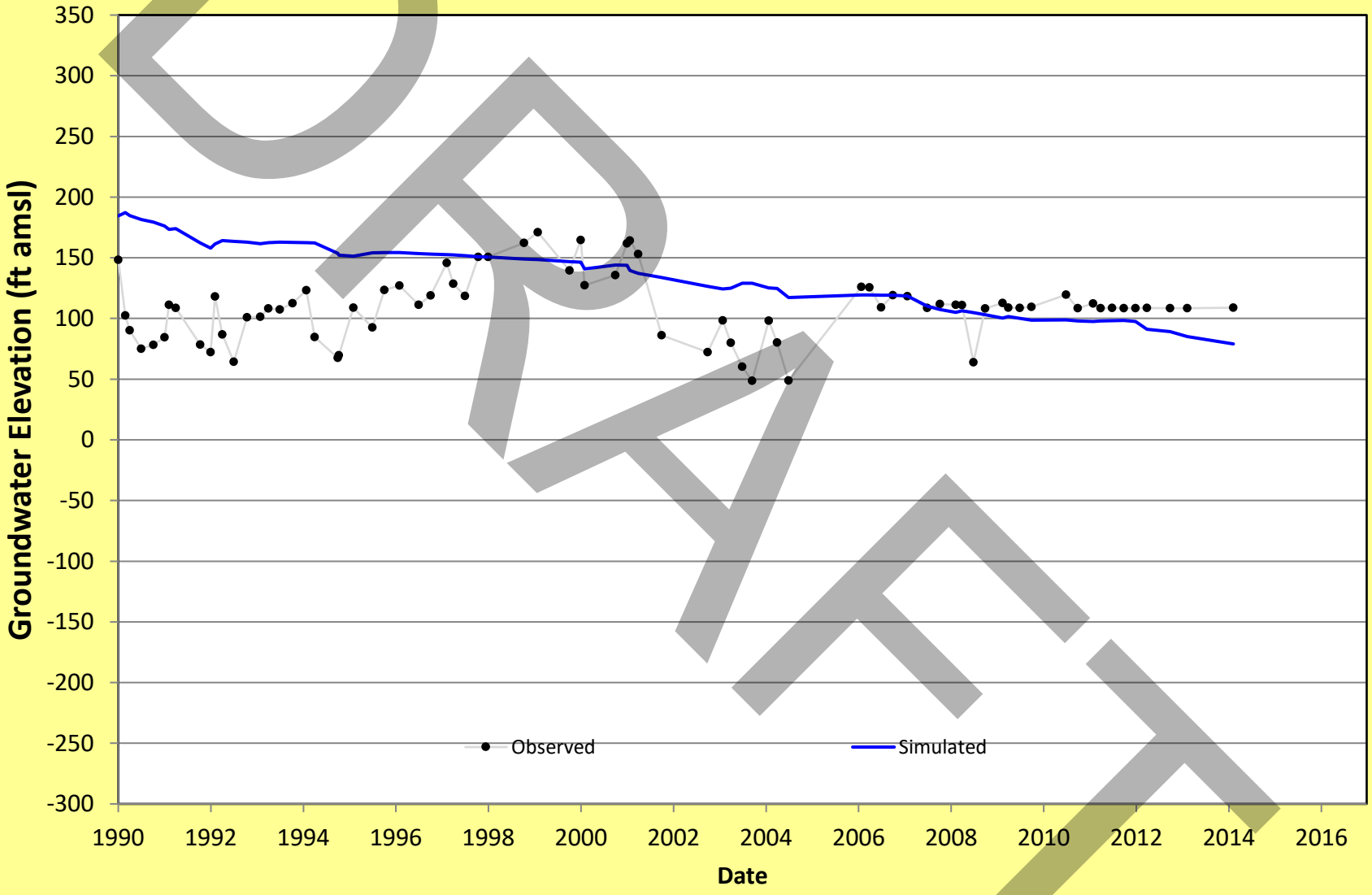
21S24E31D002_L3_171982



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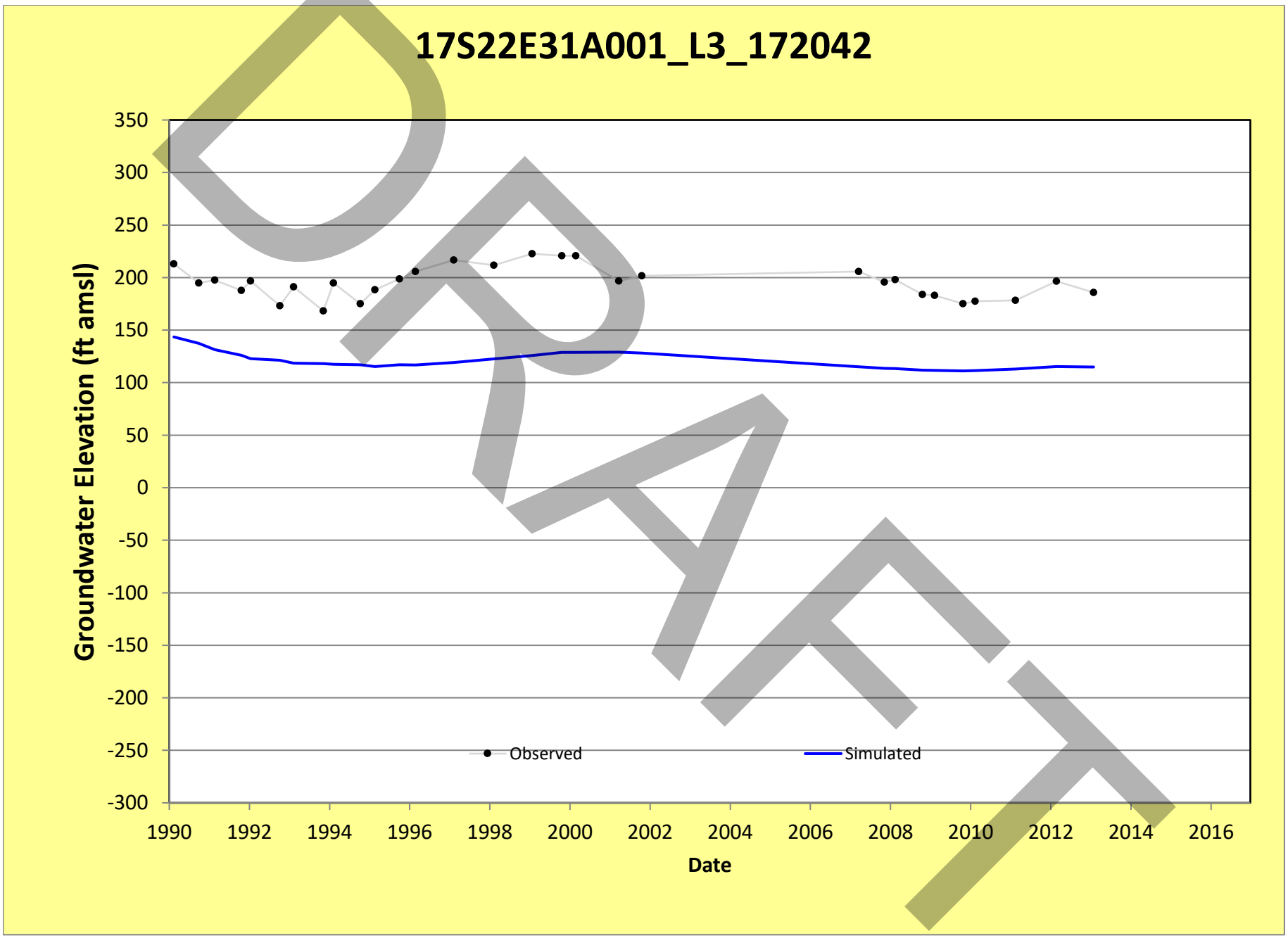
17S22E31A001_L3_172042
Groundwater Elevation (ft amsl)
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50
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-50
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-150
-200
-250
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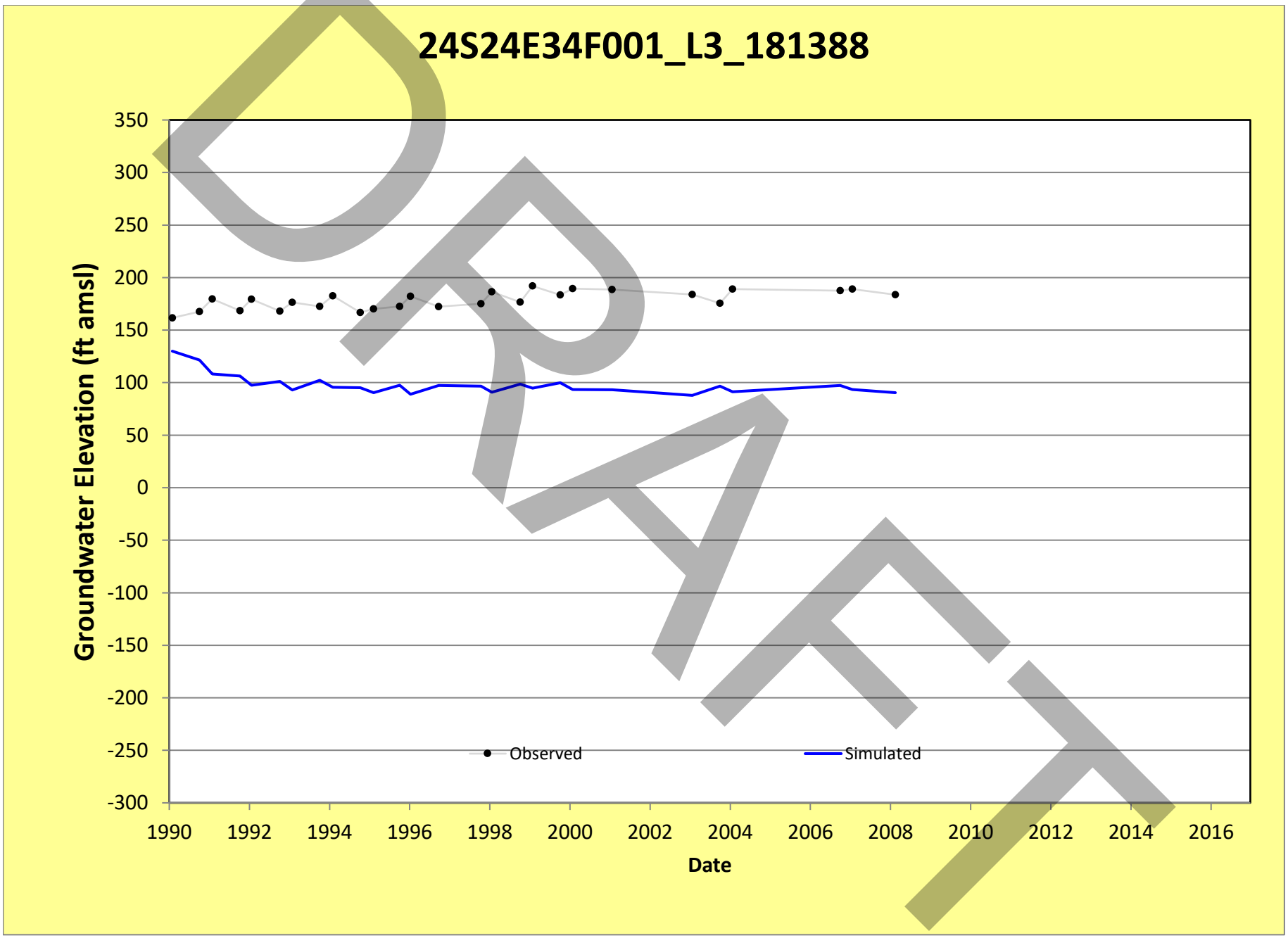
Date
Observed
Simulated
DRAFT


24S24E34F001_L3_181388
Groundwater Elevation (ft amsl)
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100
50
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-50
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-150
-200
-250
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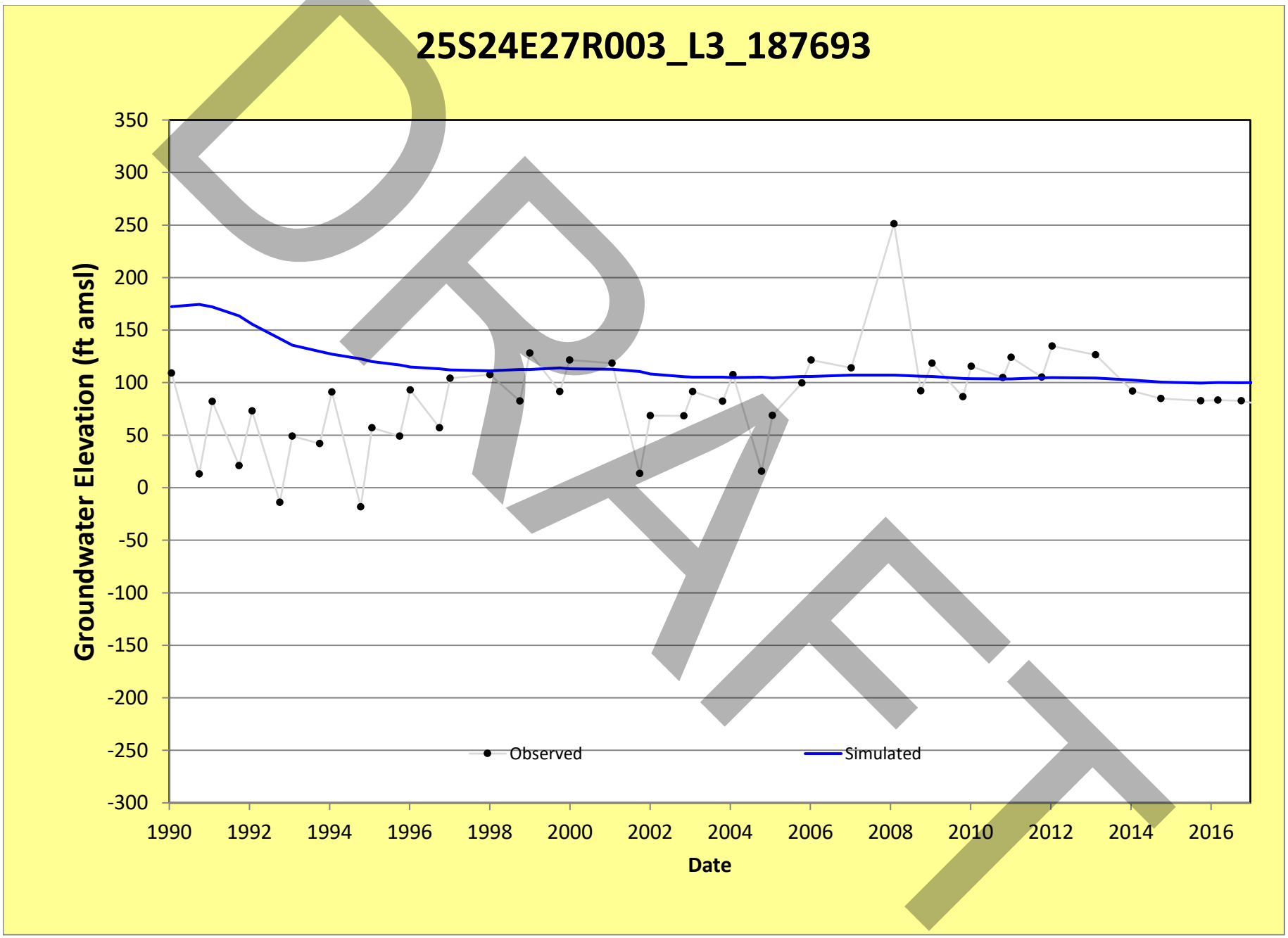
Date
Observed
Simulated
DRAFT


25S24E27R003_L3_187693
Groundwater Elevation (ft amsl)
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-200
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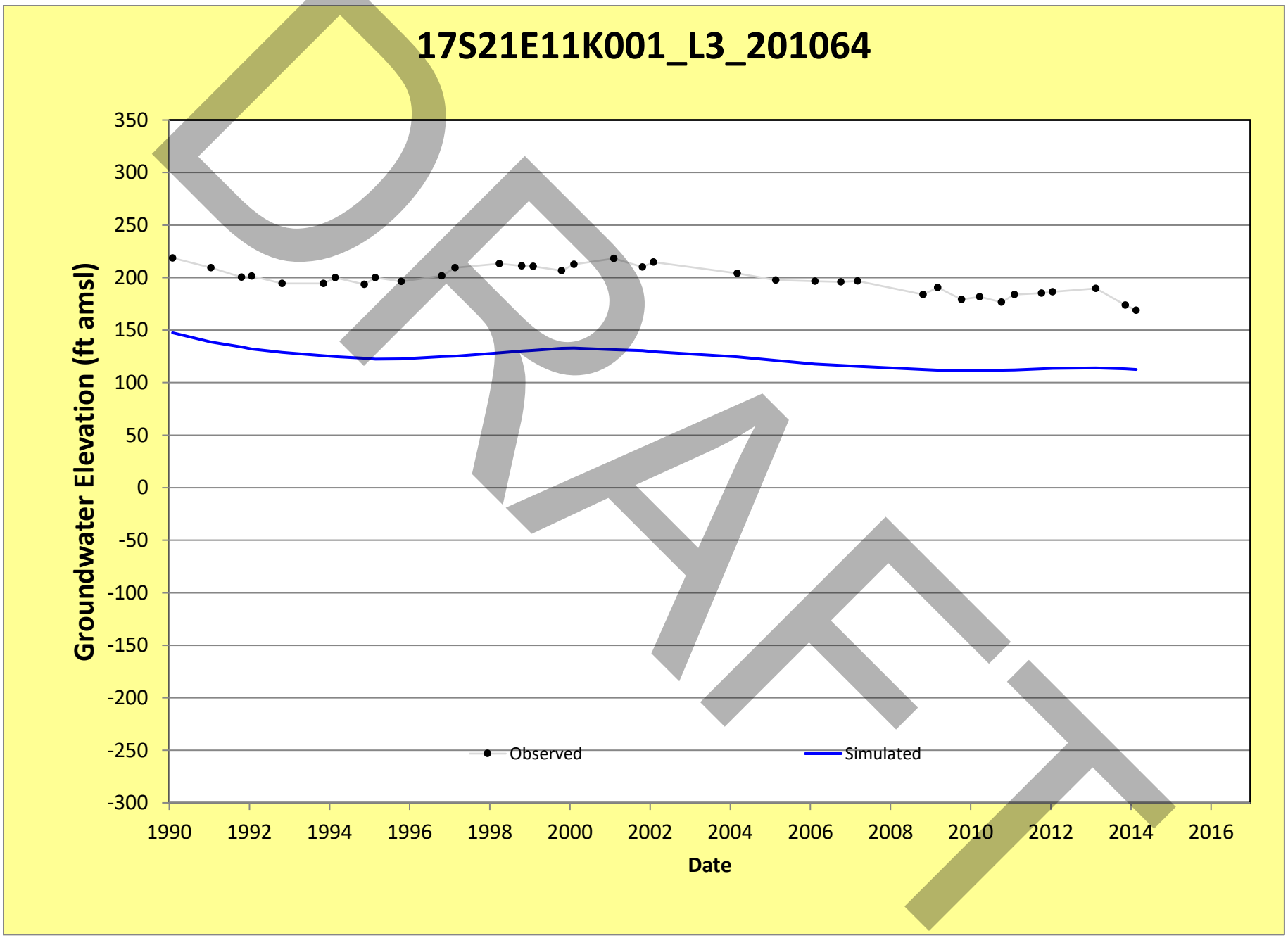
Observed
Simulated
DRAFT


17S21E11K001_L3_201064
Groundwater Elevation (ft amsl)
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-200
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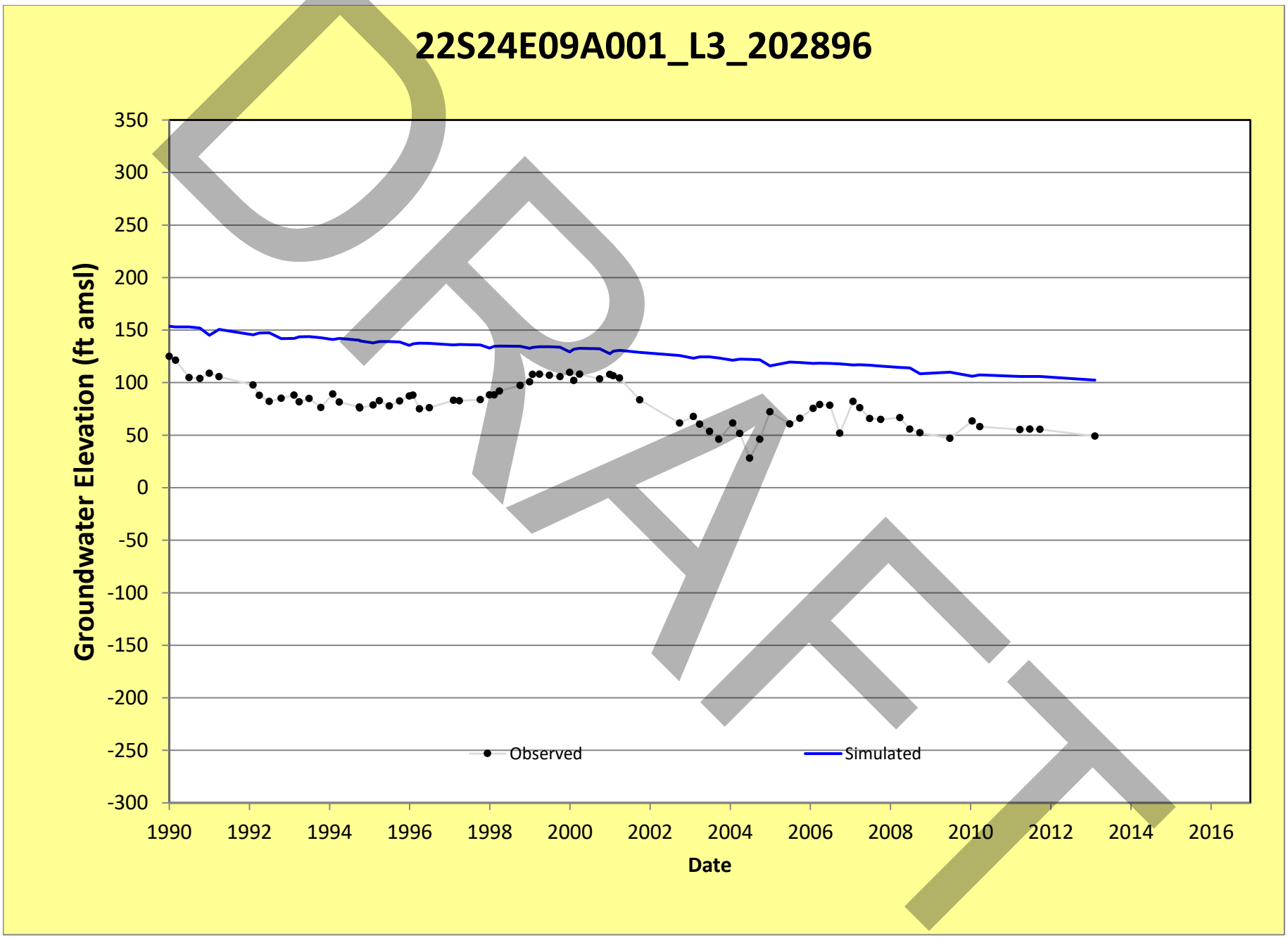
Date
Observed
Simulated
DRAFT


22S24E09A001_L3_202896
Groundwater Elevation (ft amsl)
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-150
-200
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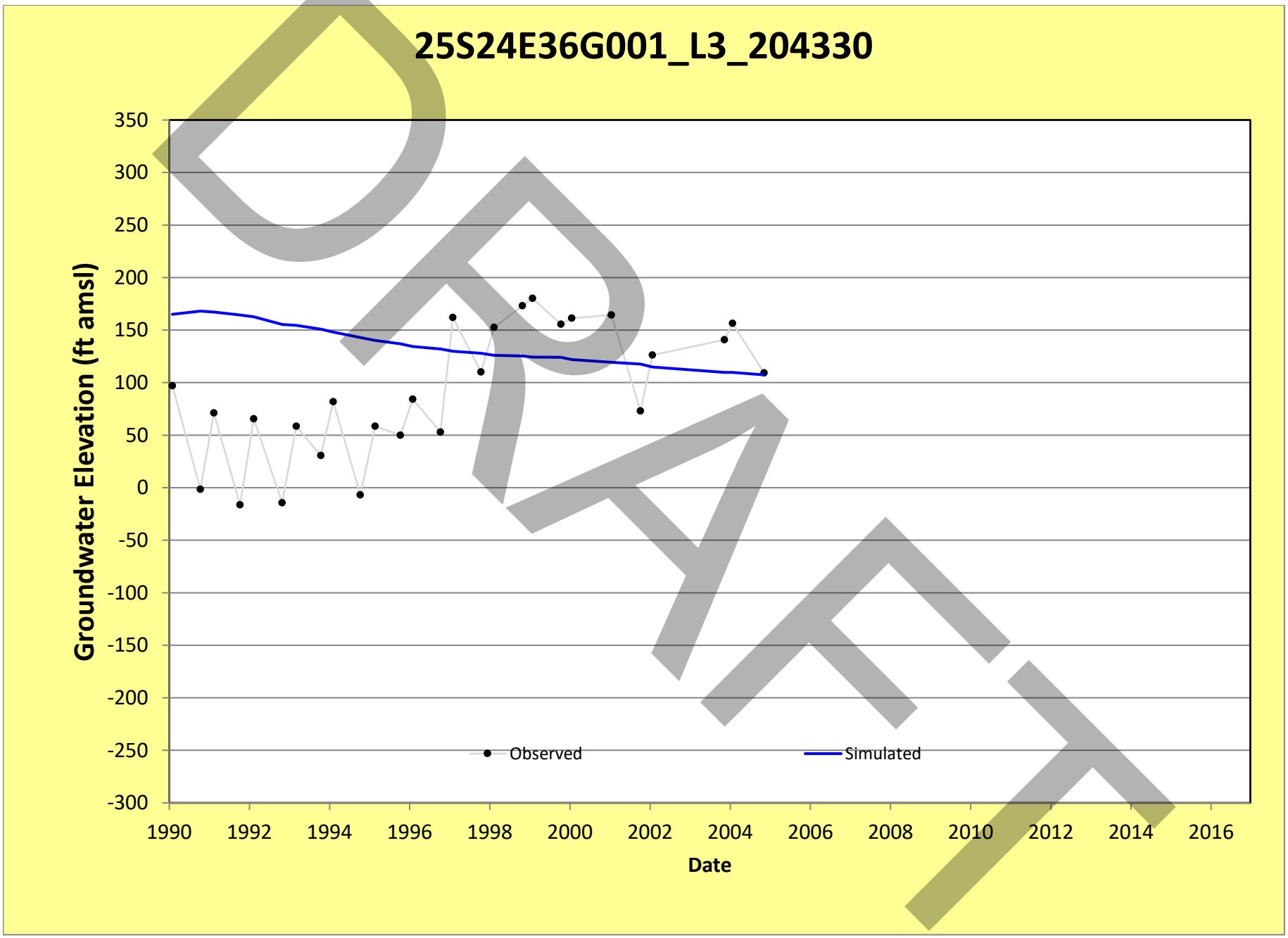
Date
Observed
Simulated
DRAFT


25S24E36G001_L3_204330
Groundwater Elevation (ft amsl)
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200
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Date
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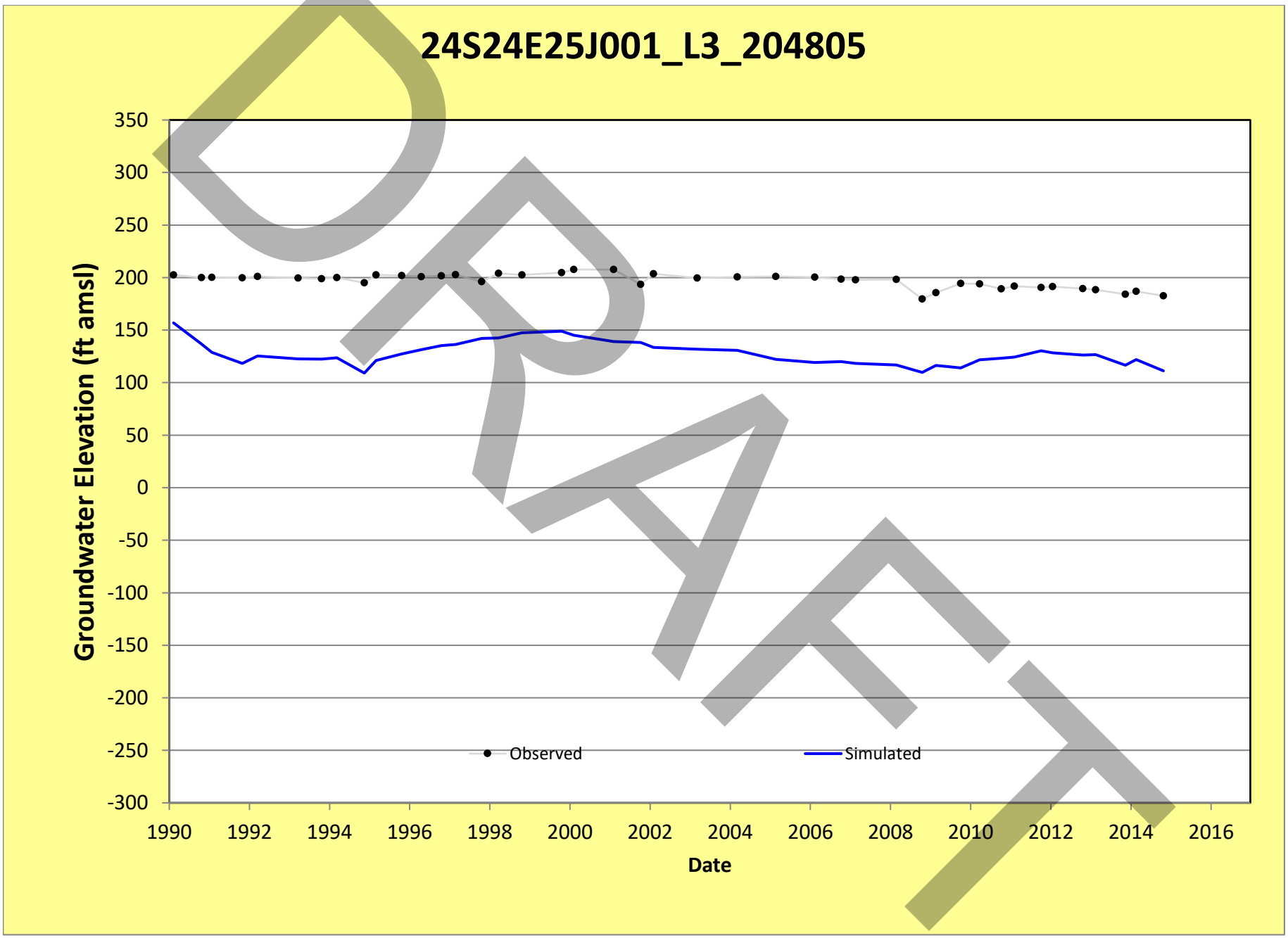
24S24E25J001_L3_204805
Groundwater Elevation (ft amsl)
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-200
-250
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Observed
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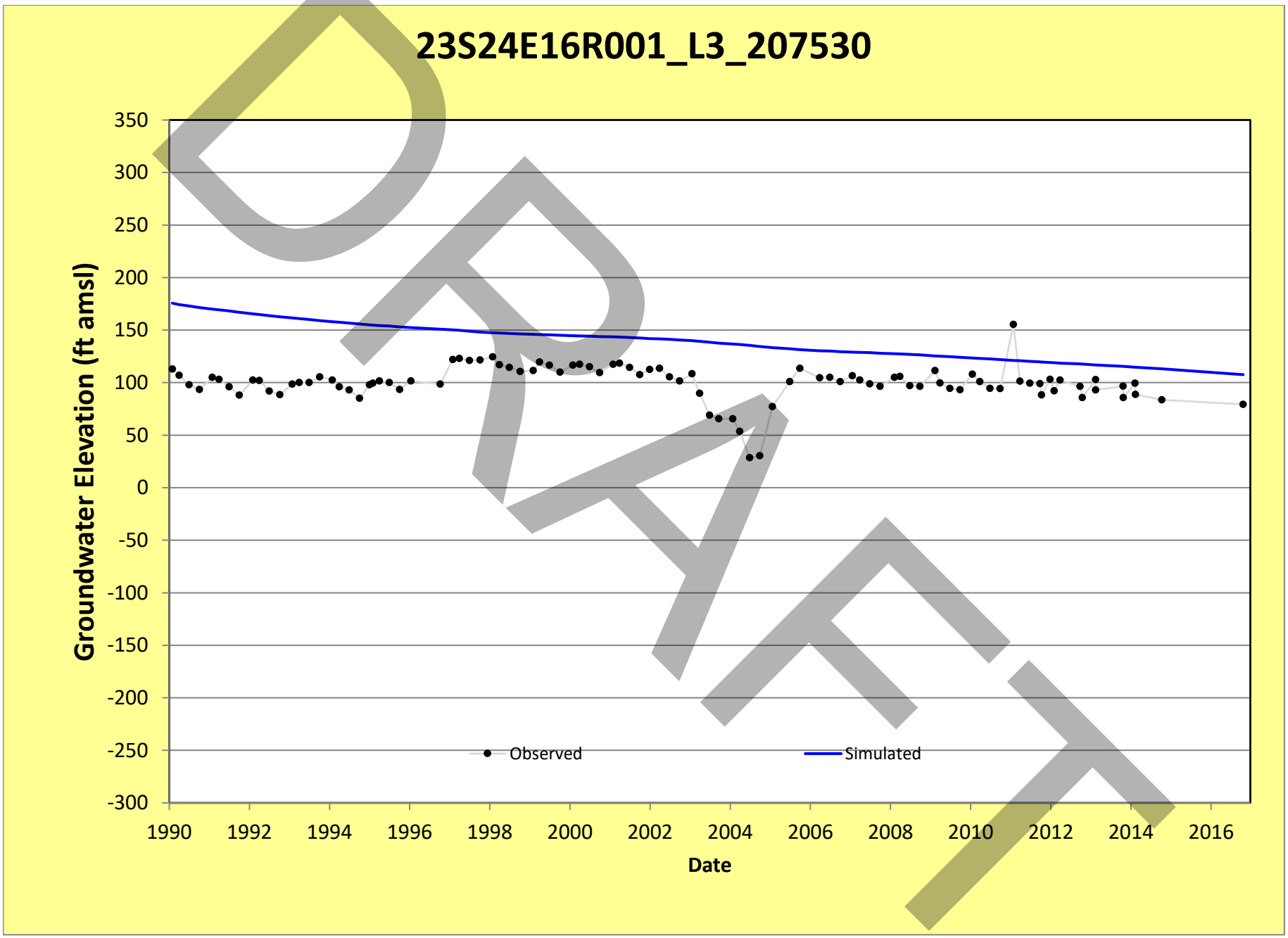
23S24E16R001_L3_207530
Groundwater Elevation (ft amsl)
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-200
-250
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Observed
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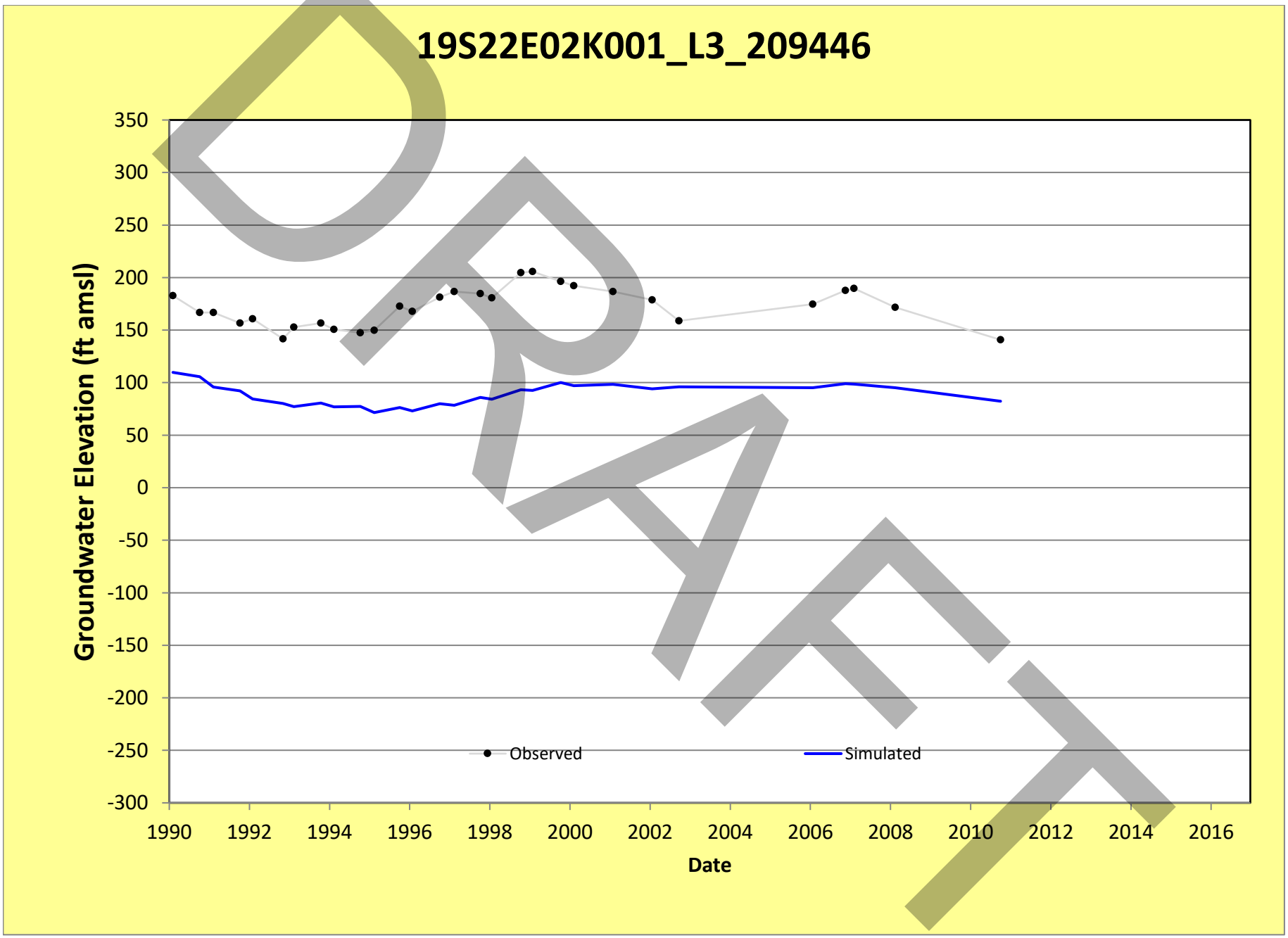
19S22E02K001_L3_209446
Groundwater Elevation (ft amsl)
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-50
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-150
-200
-250
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Date
Observed
Simulated
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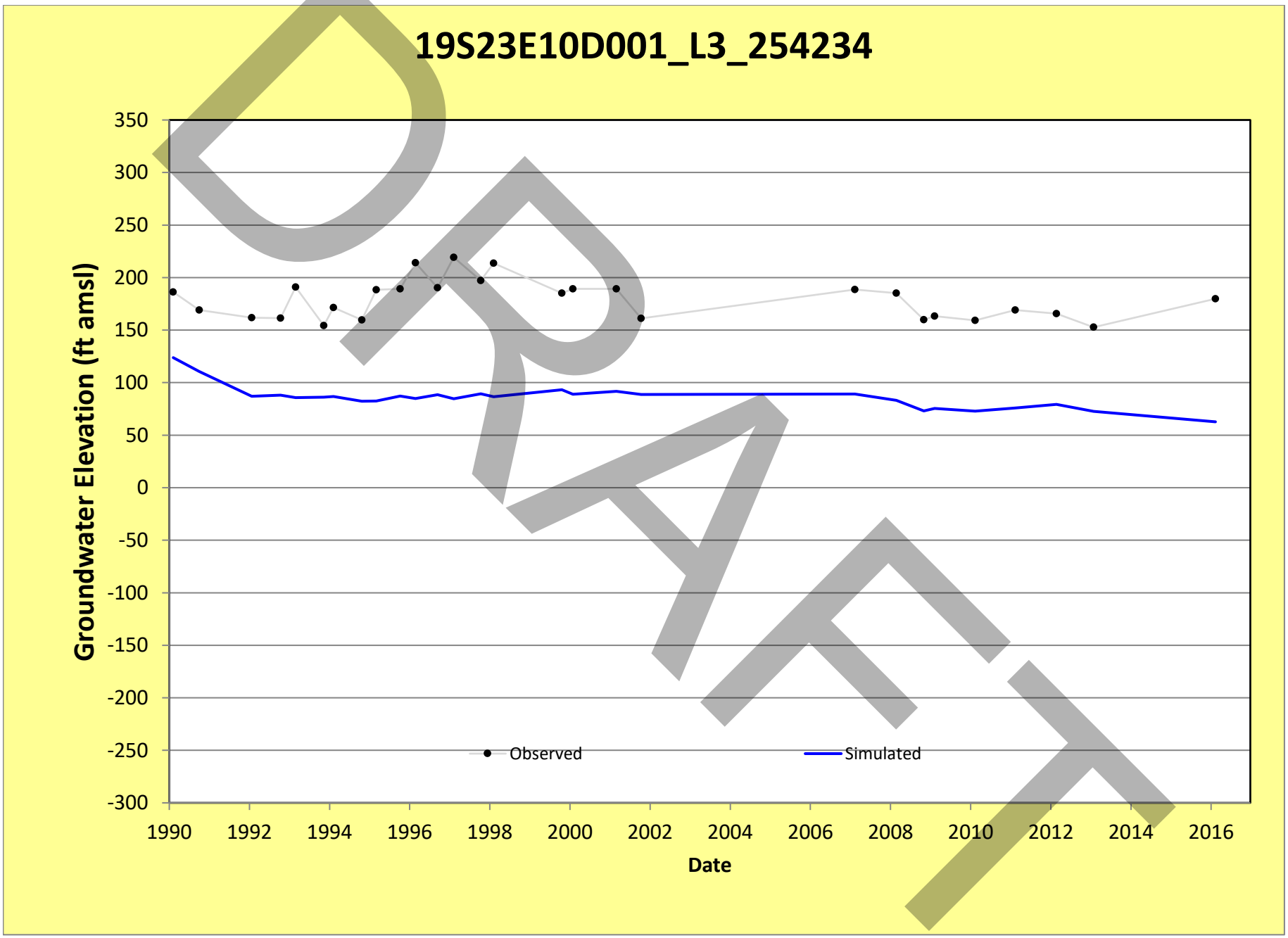
19S23E10D001_L3_254234
Groundwater Elevation (ft amsl)
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200
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0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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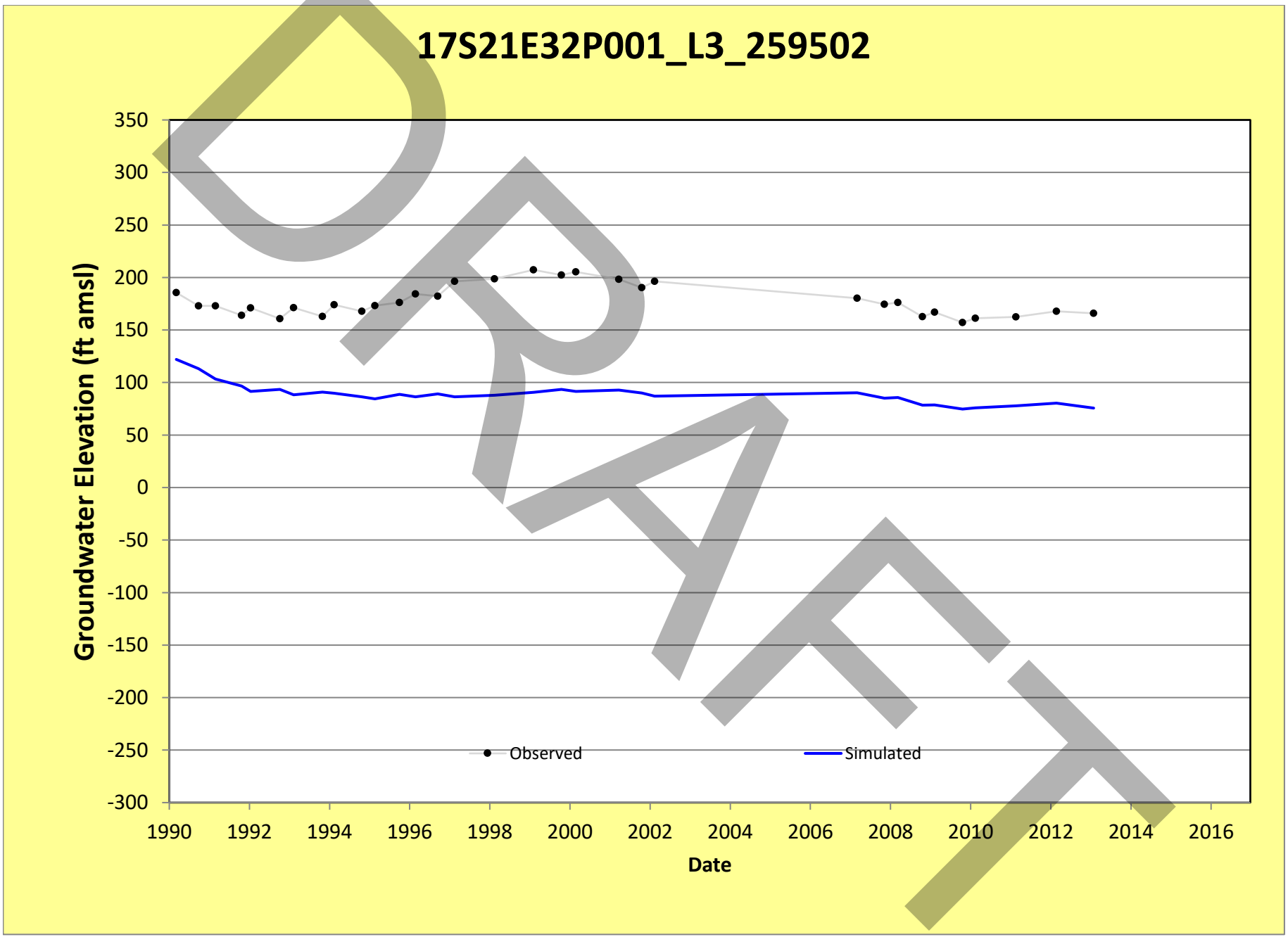
17S21E32P001_L3_259502
Groundwater Elevation (ft amsl)
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300
250
200
150
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50
0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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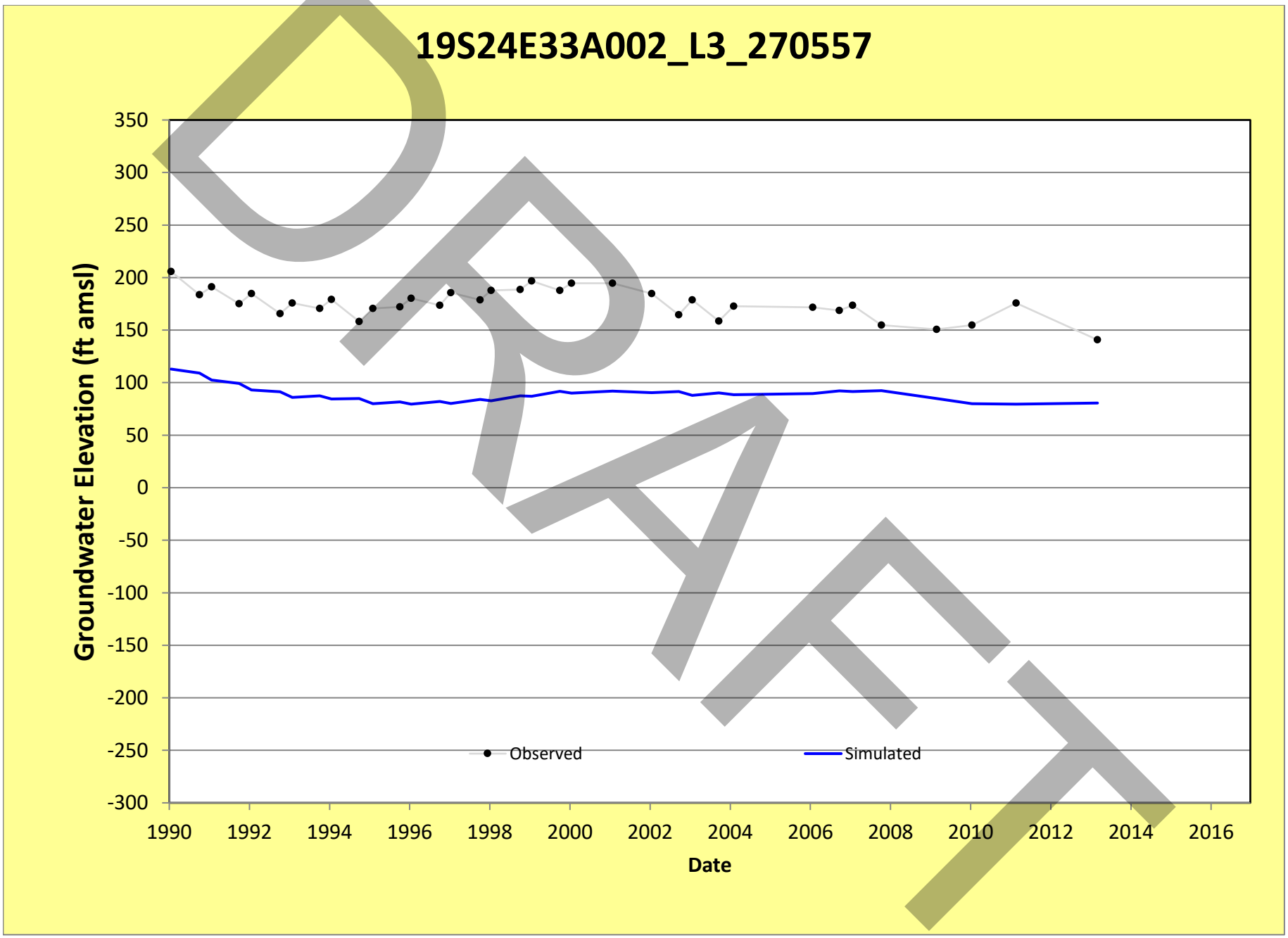
19S24E33A002_L3_270557
Groundwater Elevation (ft amsl)
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300
250
200
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50
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-50
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-150
-200
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-300
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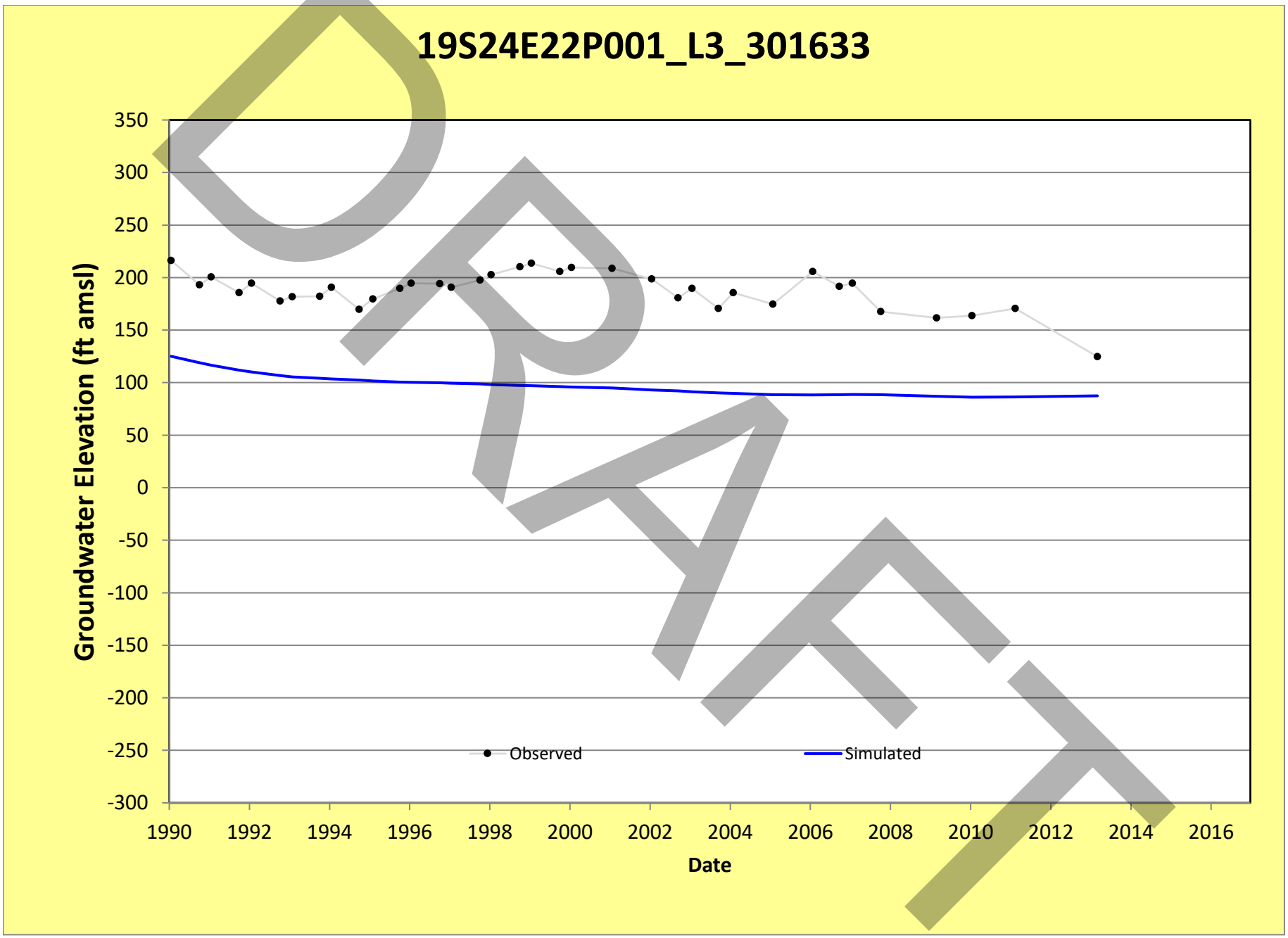
Date
Observed
Simulated
DRAFT


19S24E22P001_L3_301633
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
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-150
-200
-250
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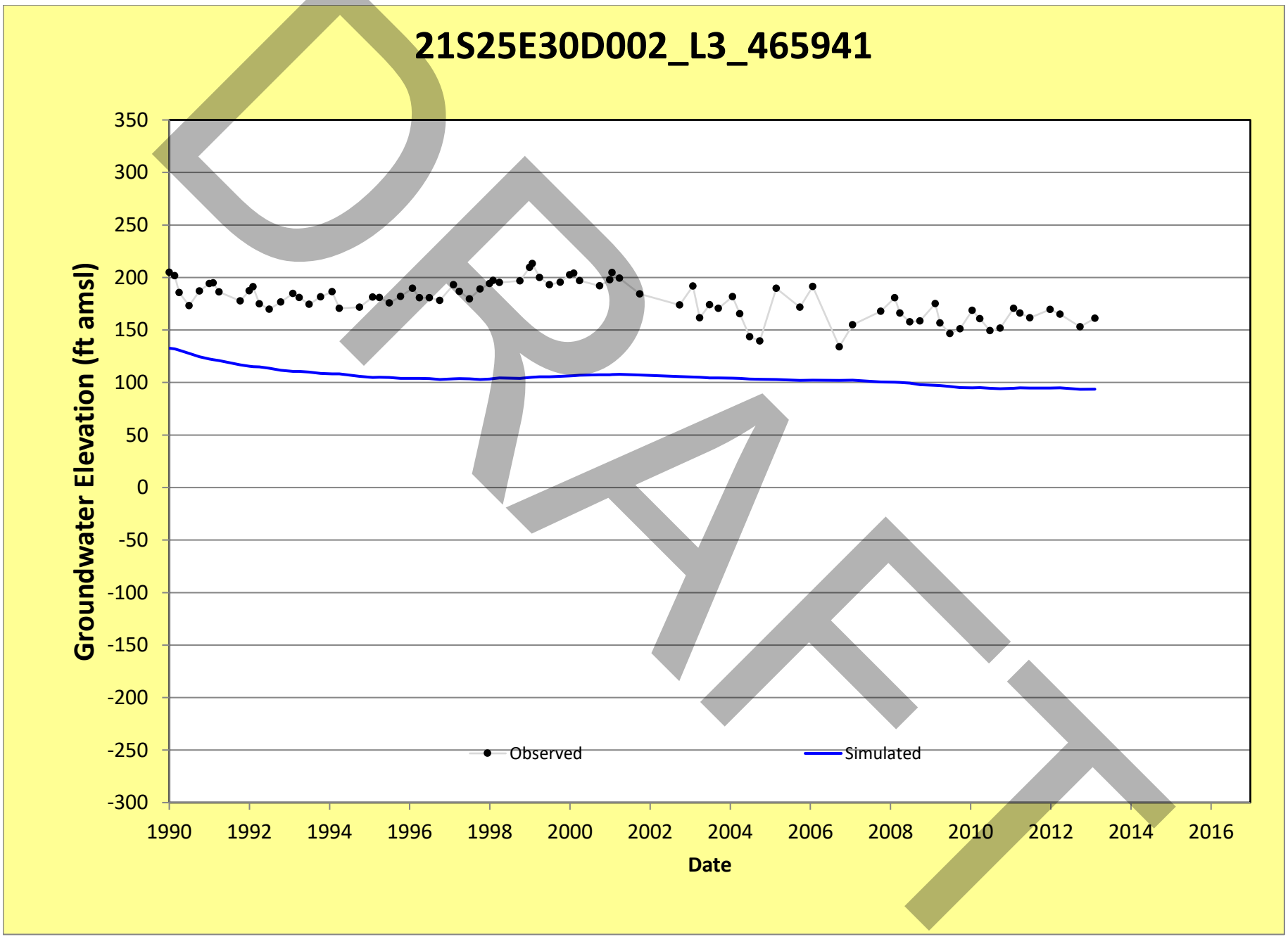
Date
Observed
Simulated
DRAFT


21S25E30D002_L3_465941
Groundwater Elevation (ft amsl)
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300
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-50
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Date
Observed
Simulated
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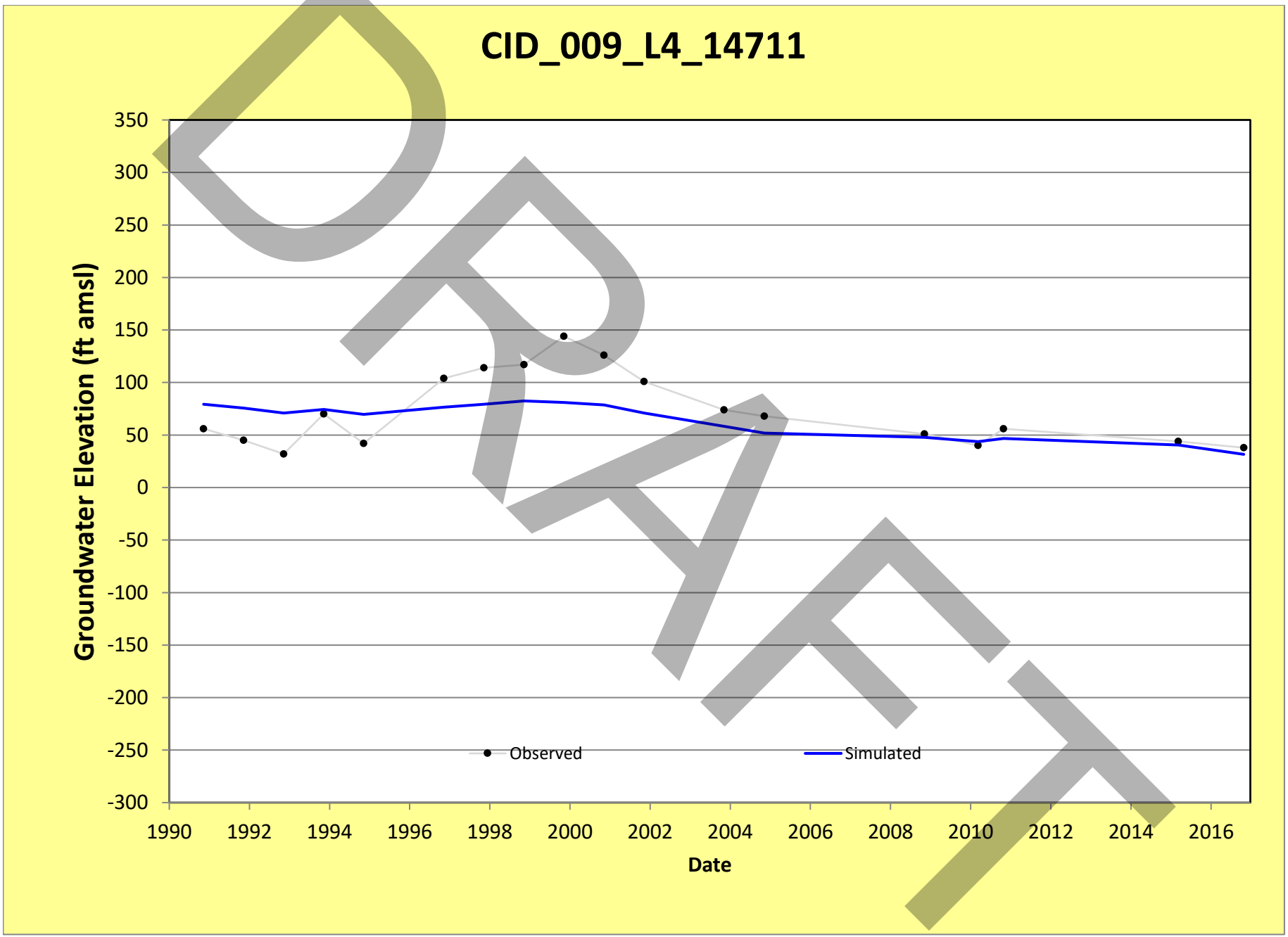
CID_009_L4_14711
Groundwater Elevation (ft amsl)
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300
250
200
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100
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0
-50
-100
-150
-200
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Date
Observed
Simulated
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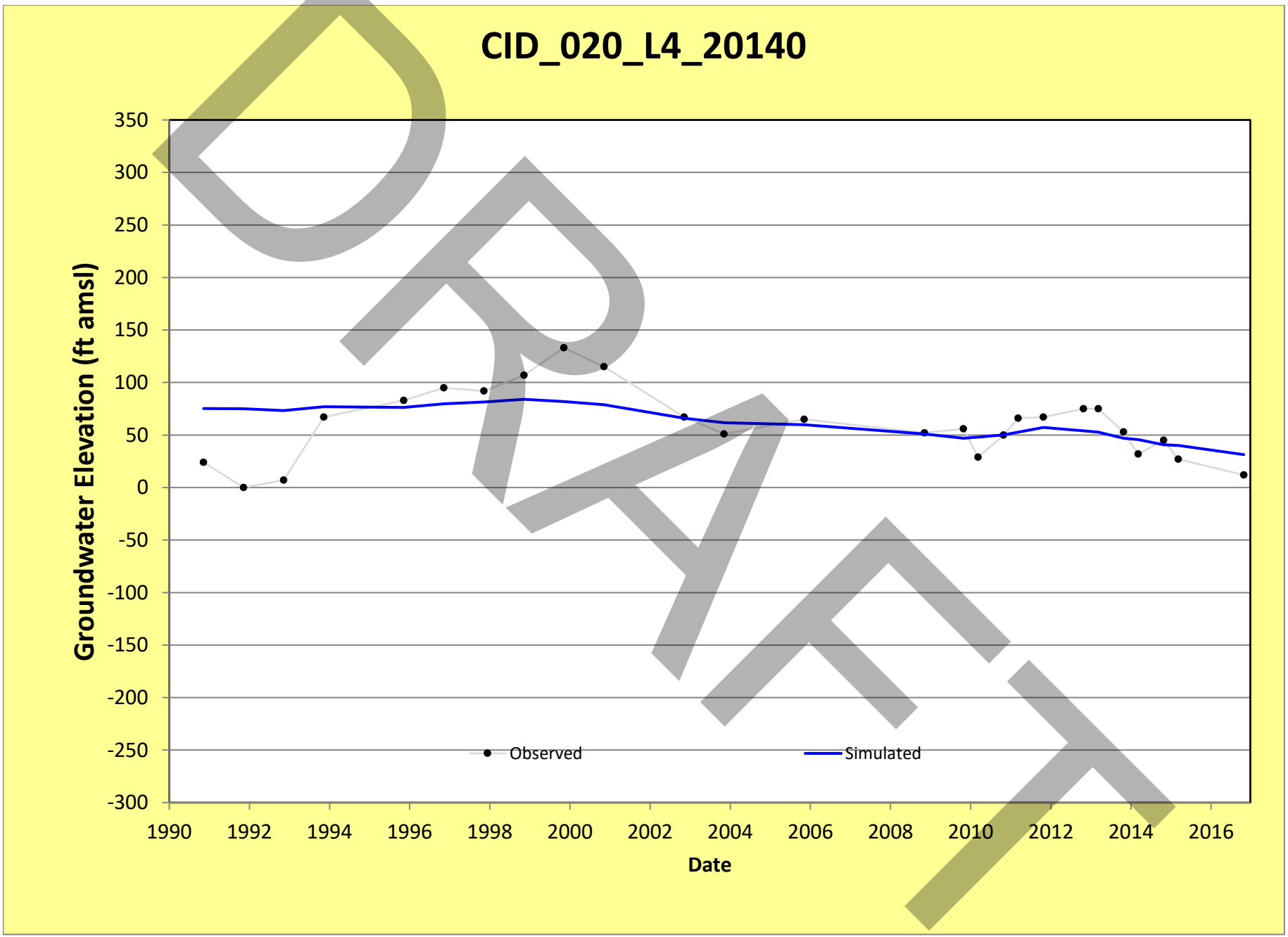
CID_020_L4_20140
Groundwater Elevation (ft amsl)
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250
200
150
100
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0
-50
-100
-150
-200
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Observed
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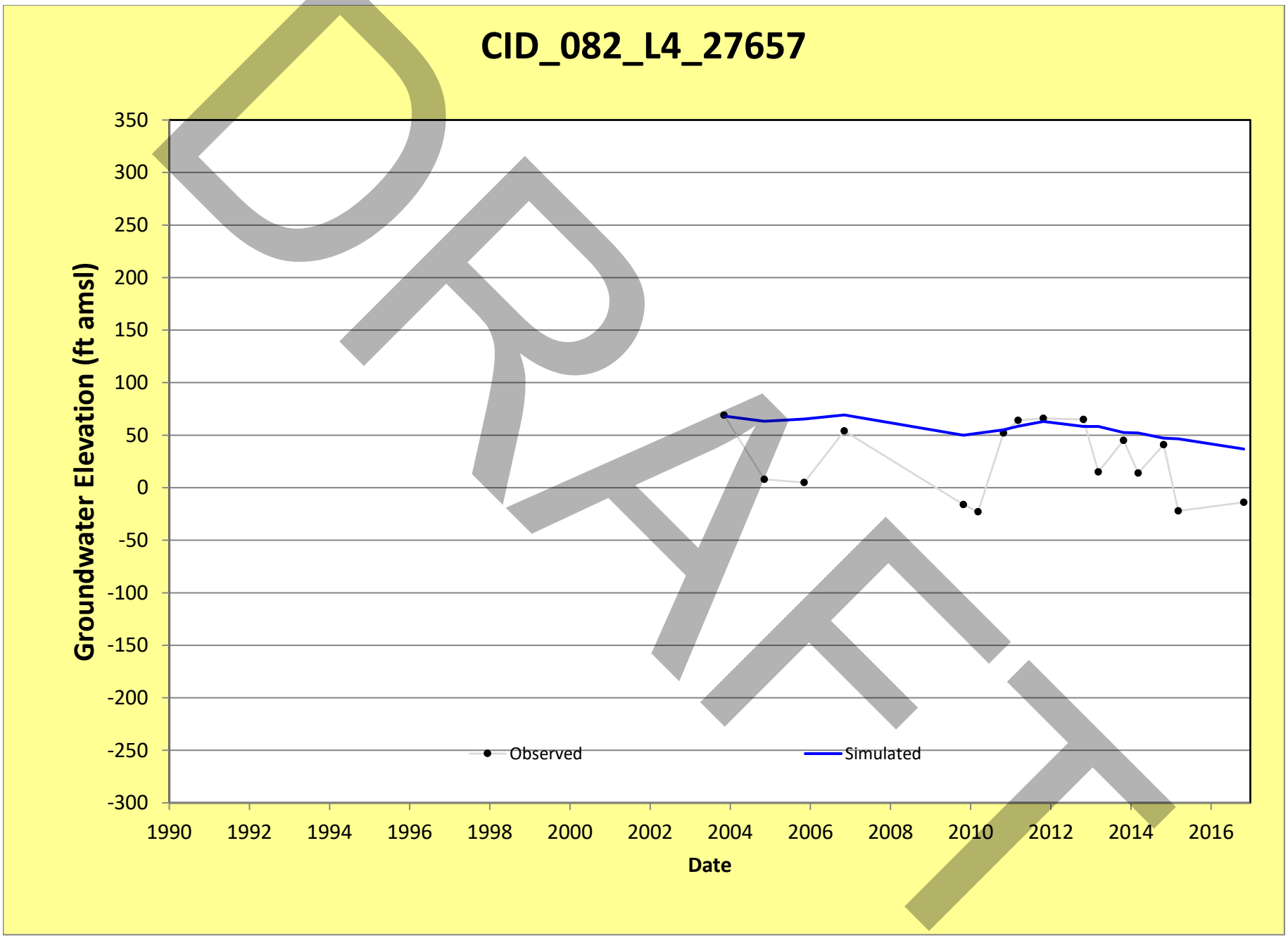
CID_082_L4_27657
Groundwater Elevation (ft amsl)
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-50
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Date
Observed
Simulated
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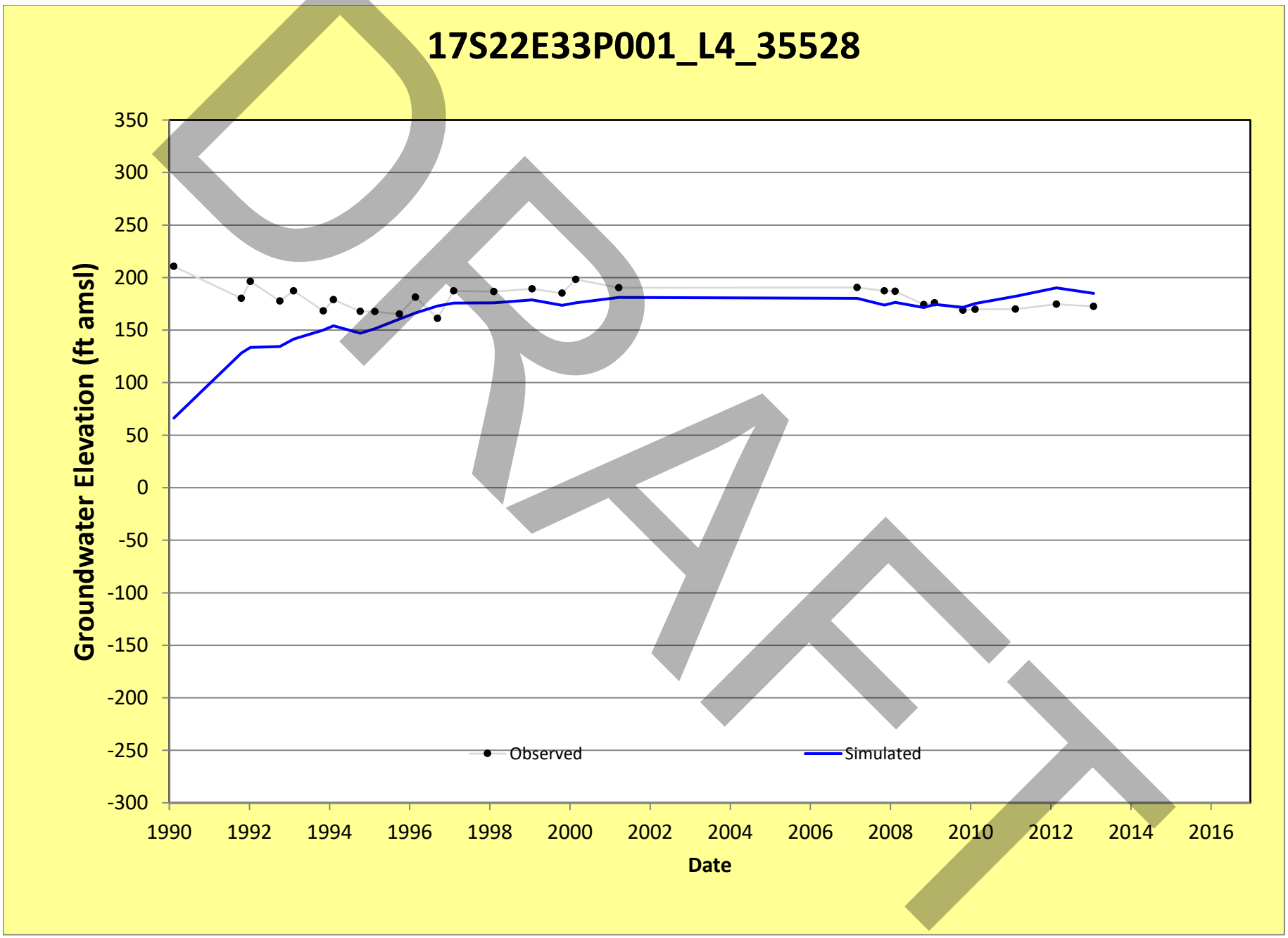
17S22E33P001_L4_35528
Groundwater Elevation (ft amsl)
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100
50
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-50
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-150
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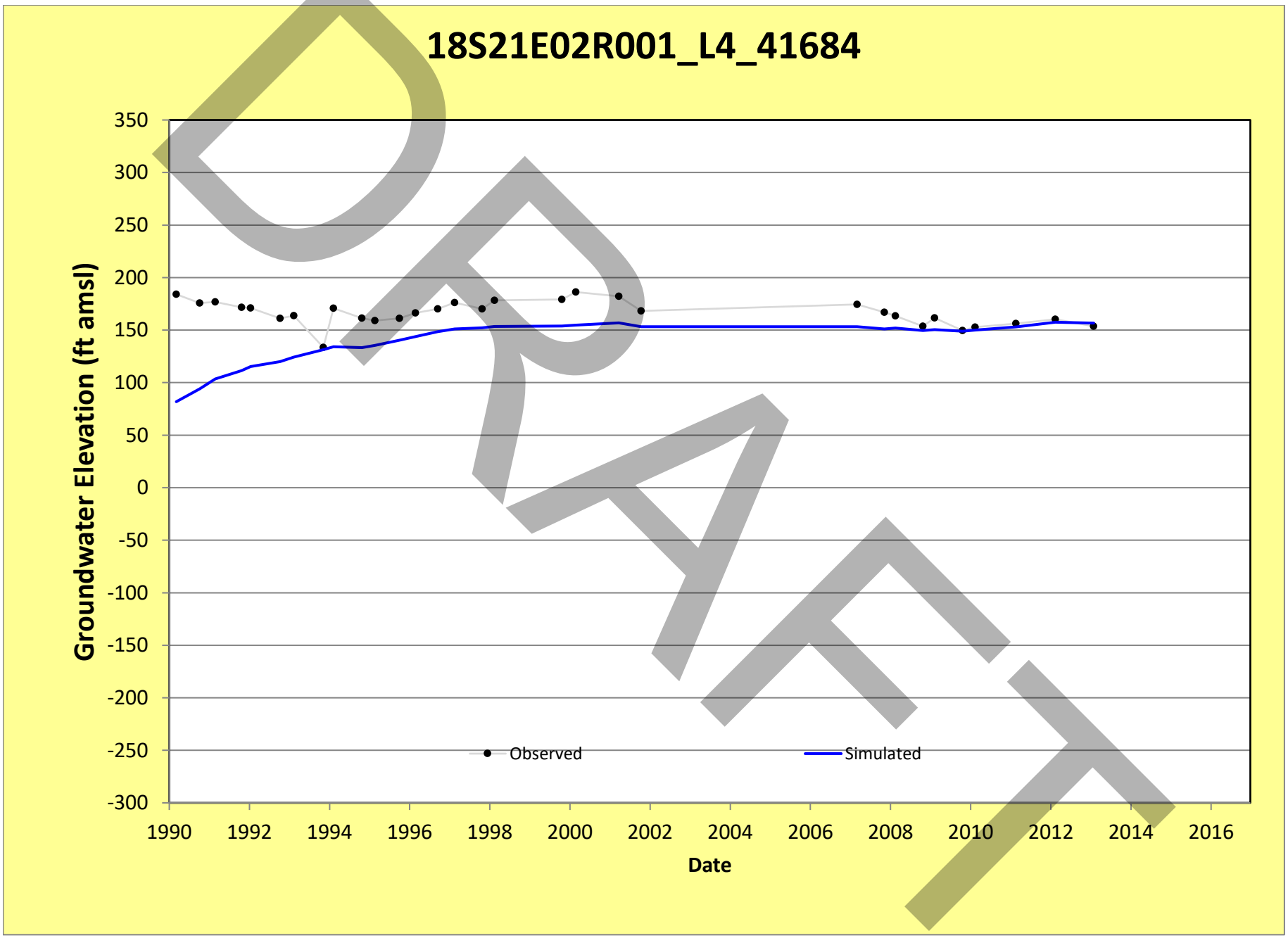
Date
Observed
Simulated
DRAFT


18S21E02R001_L4_41684
Groundwater Elevation (ft amsl)
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-150
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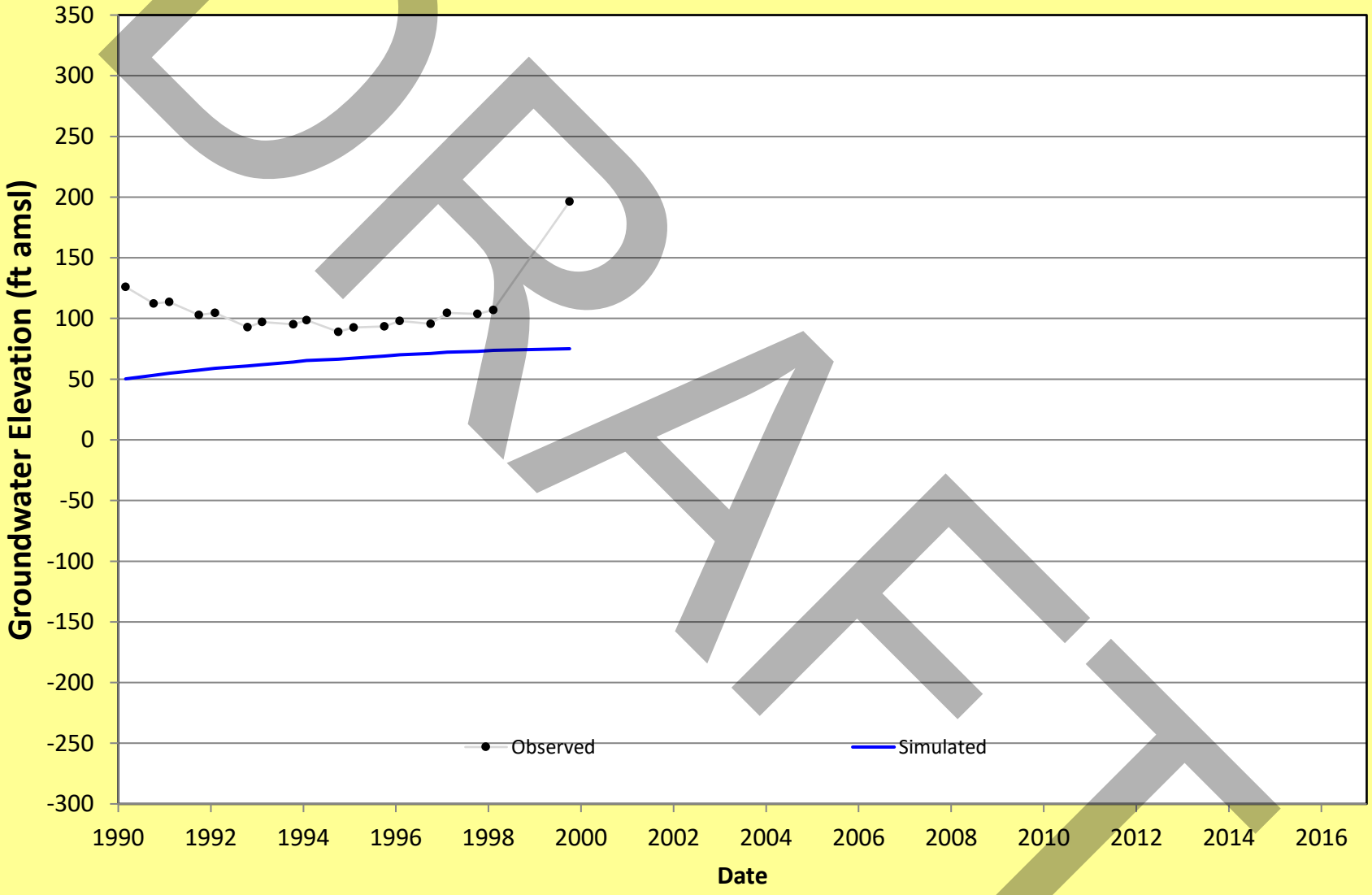
Observed
Simulated
DRAFT

22S23E13R001_L4_42056



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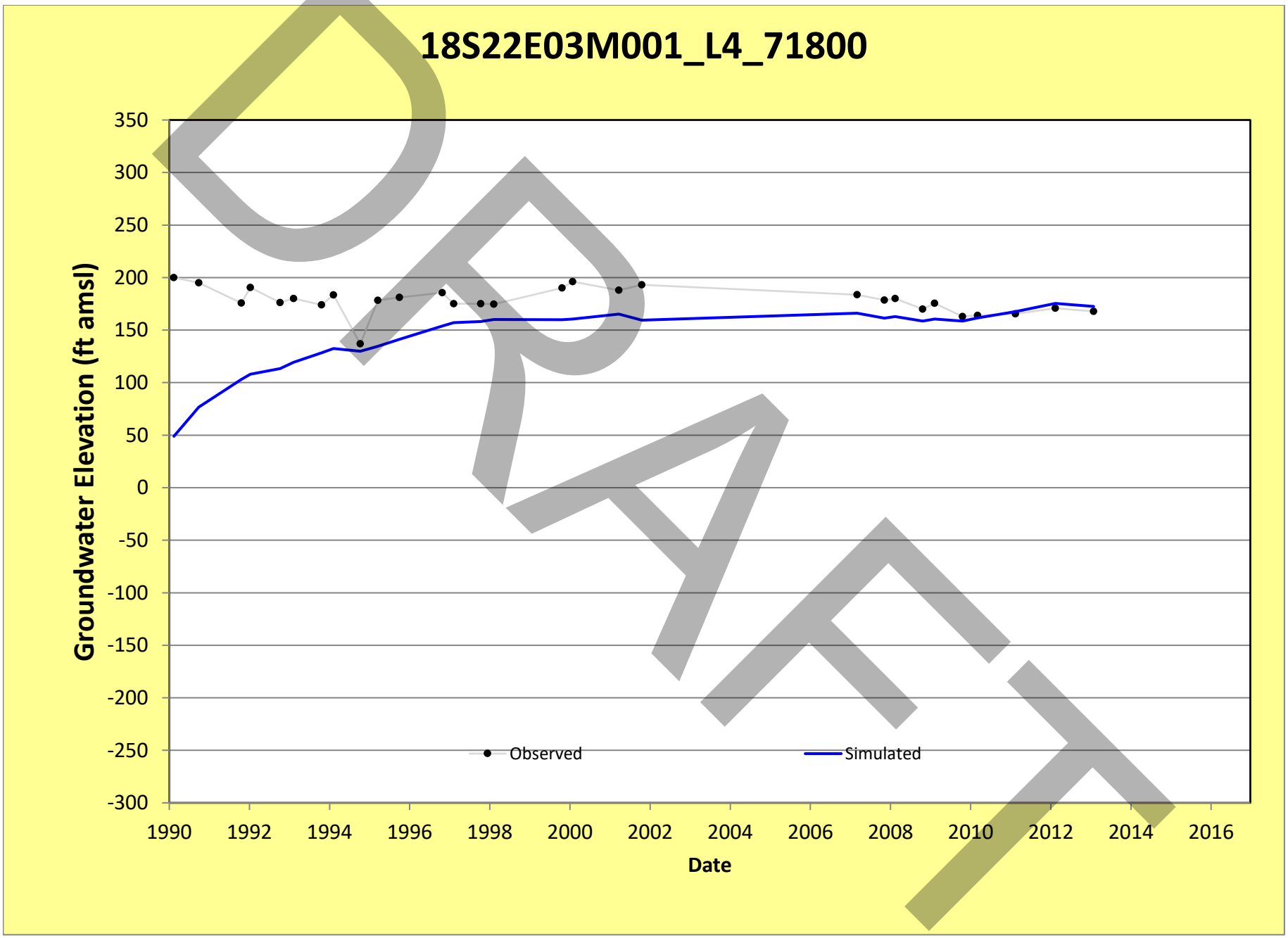
18S22E03M001_L4_71800
Groundwater Elevation (ft amsl)
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100
50
0
-50
-100
-150
-200
-250
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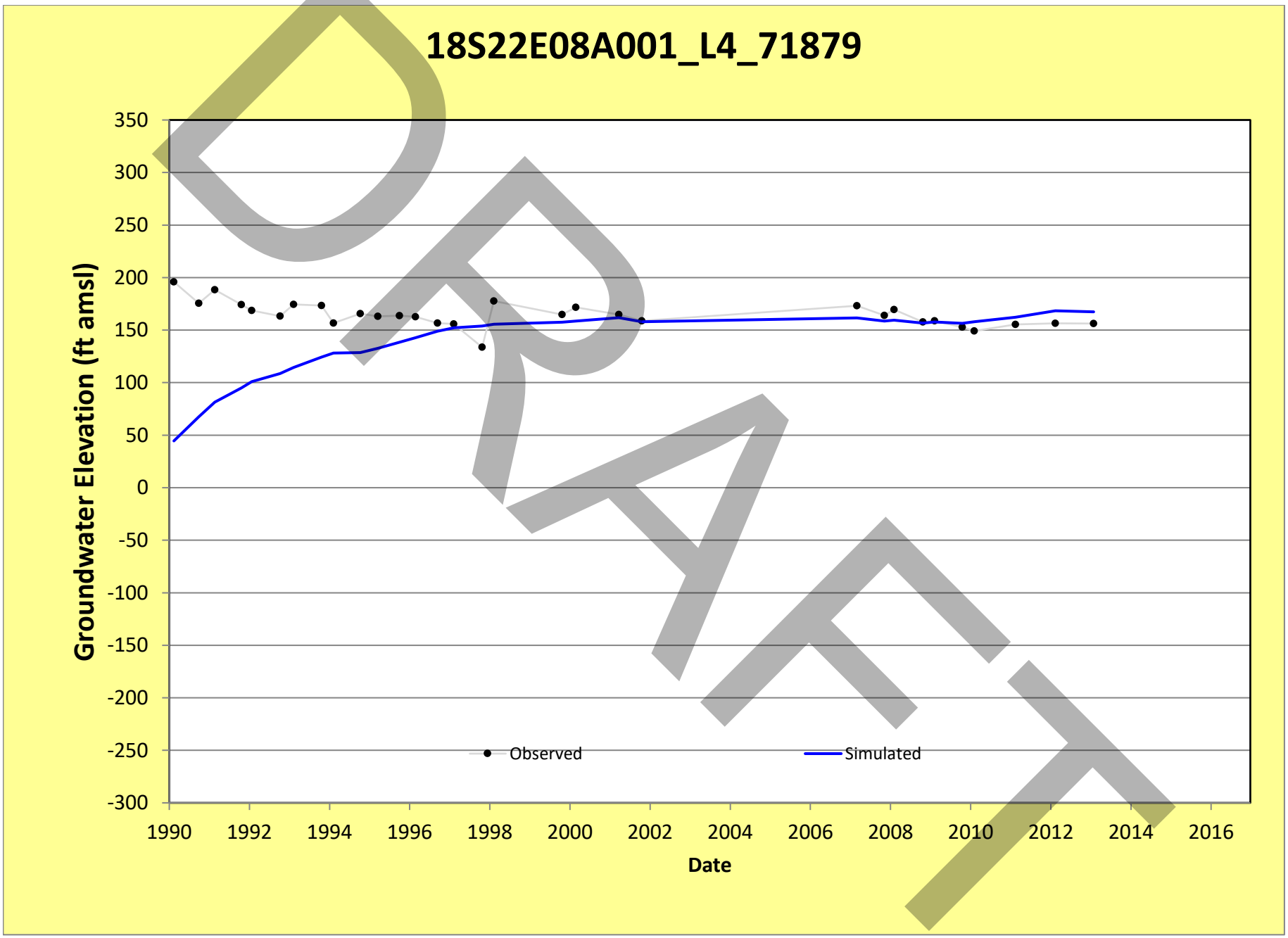
Date
Observed
Simulated
DRAFT


18S22E08A001_L4_71879
Groundwater Elevation (ft amsl)
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100
50
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-50
-100
-150
-200
-250
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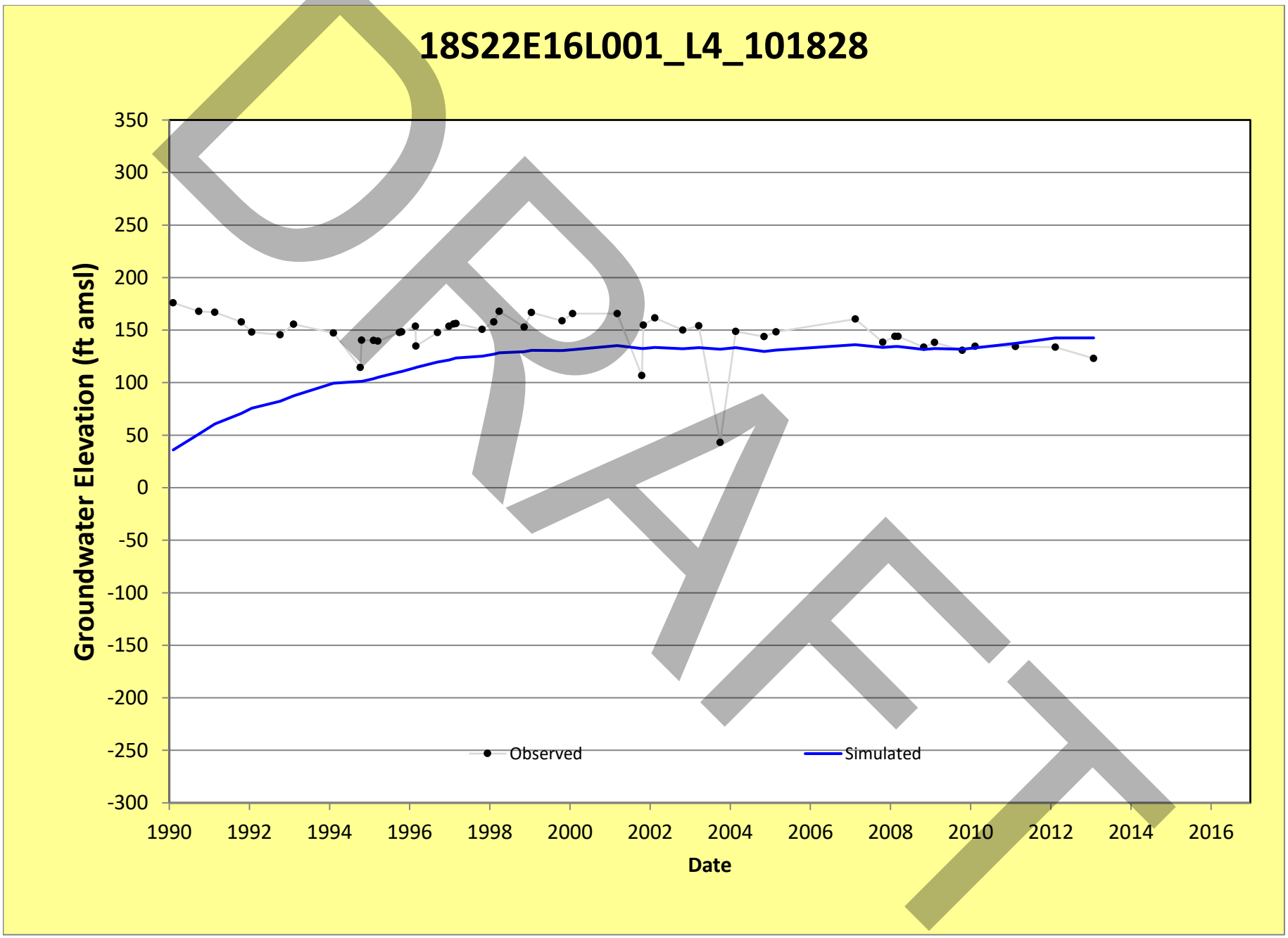
Observed
Simulated
DRAFT


18S22E16L001_L4_101828
Groundwater Elevation (ft amsl)
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-150
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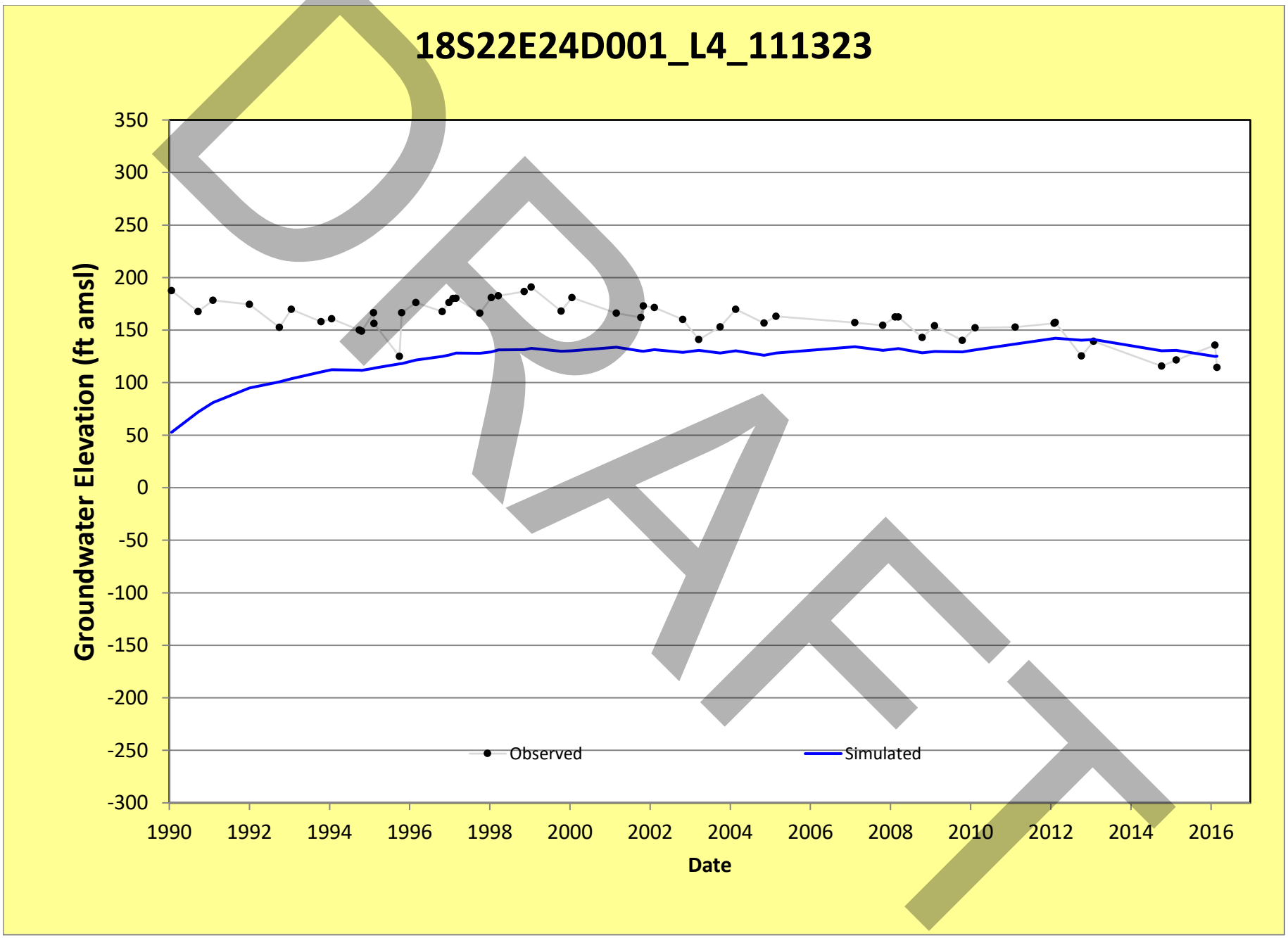
Date
Observed
Simulated
DRAFT


18S22E24D001_L4_111323
Groundwater Elevation (ft amsl)
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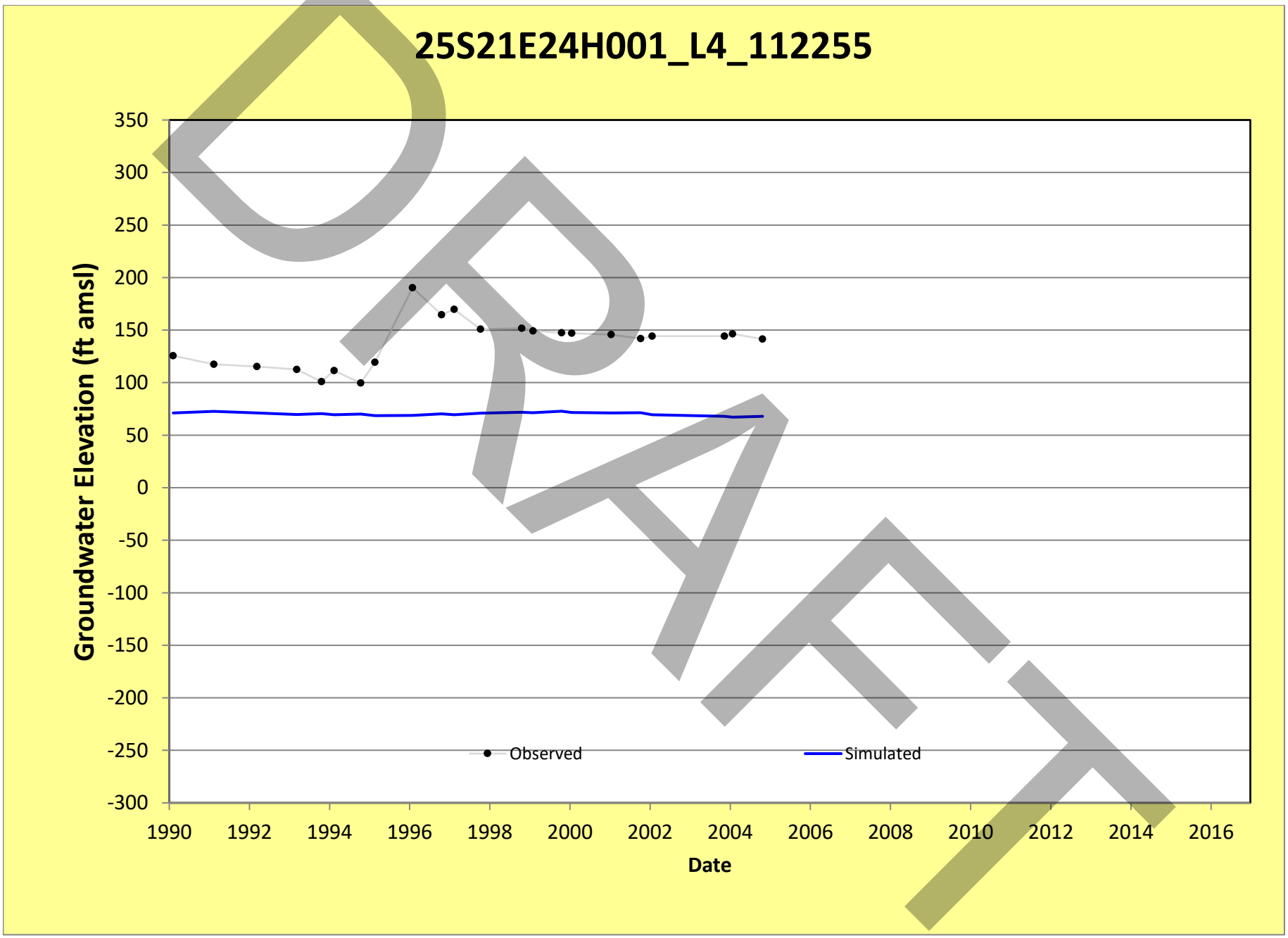
Observed
Simulated
DRAFT


25S21E24H001_L4_112255
Groundwater Elevation (ft amsl)
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200
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100
50
0
-50
-100
-150
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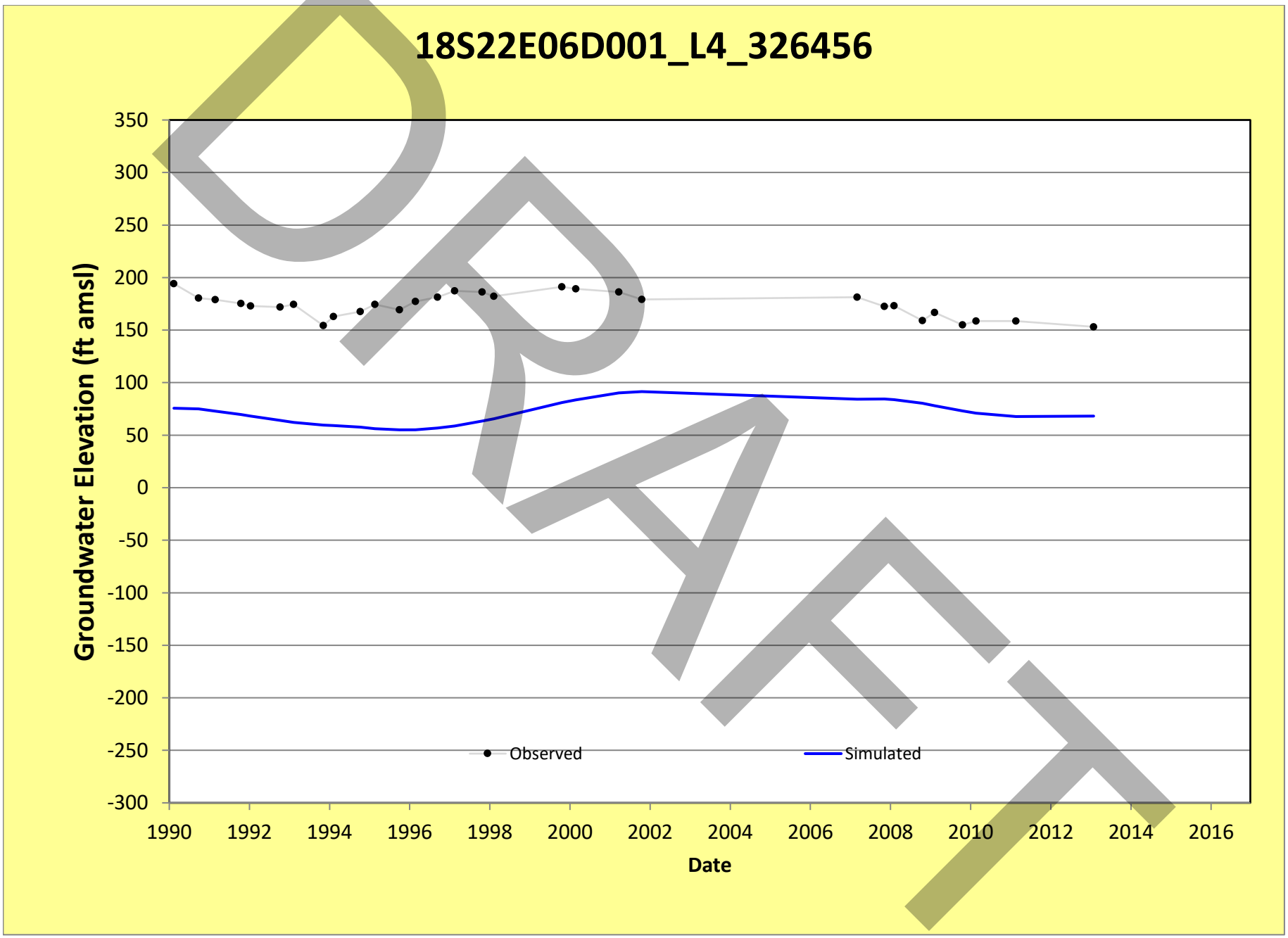
Date
Observed
Simulated
DRAFT


18S22E06D001_L4_326456
Groundwater Elevation (ft amsl)
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100
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-200
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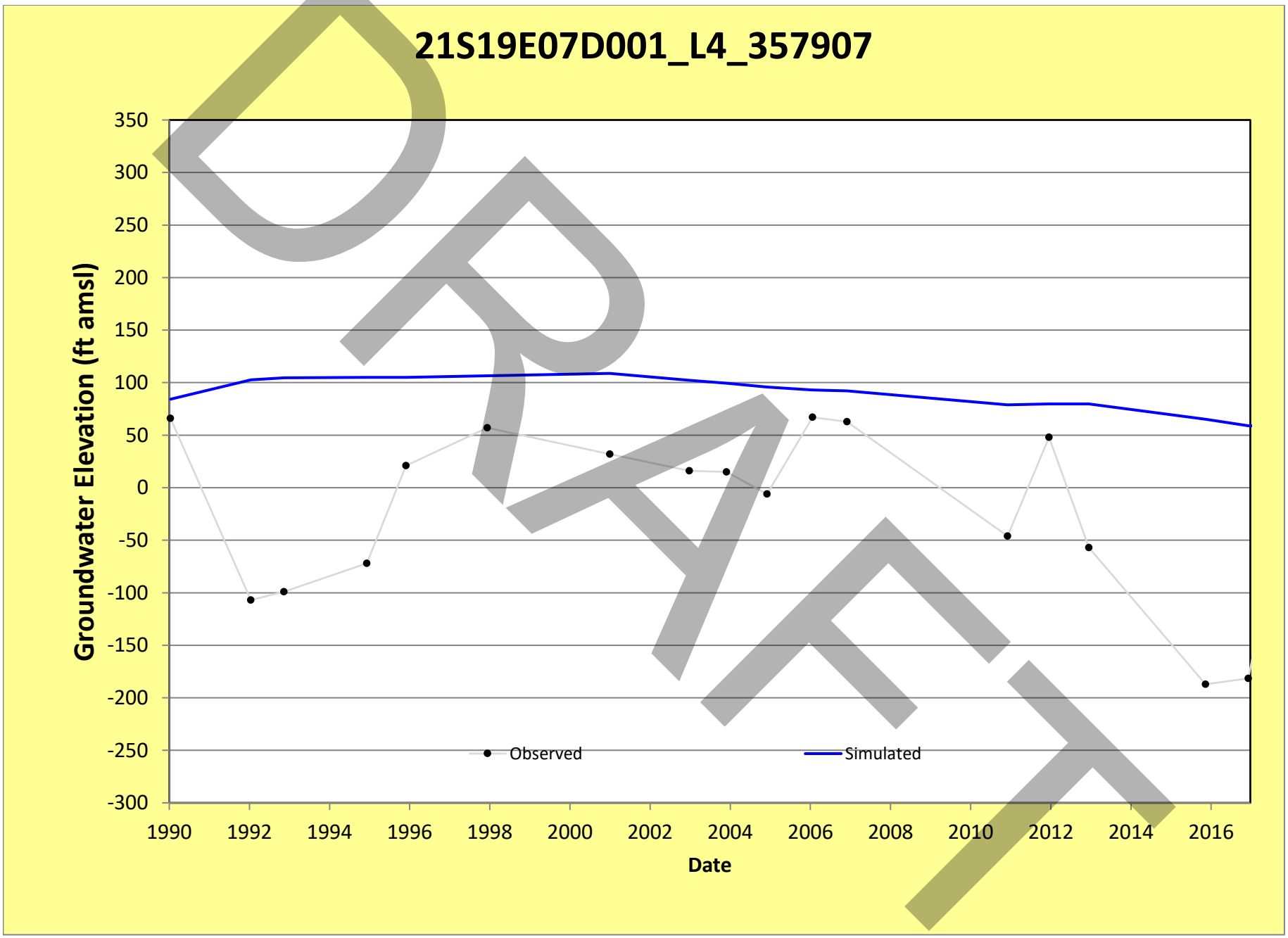
Observed
Simulated
DRAFT


21S19E07D001_L4_357907
Groundwater Elevation (ft amsl)
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100
50
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-50
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-150
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-250
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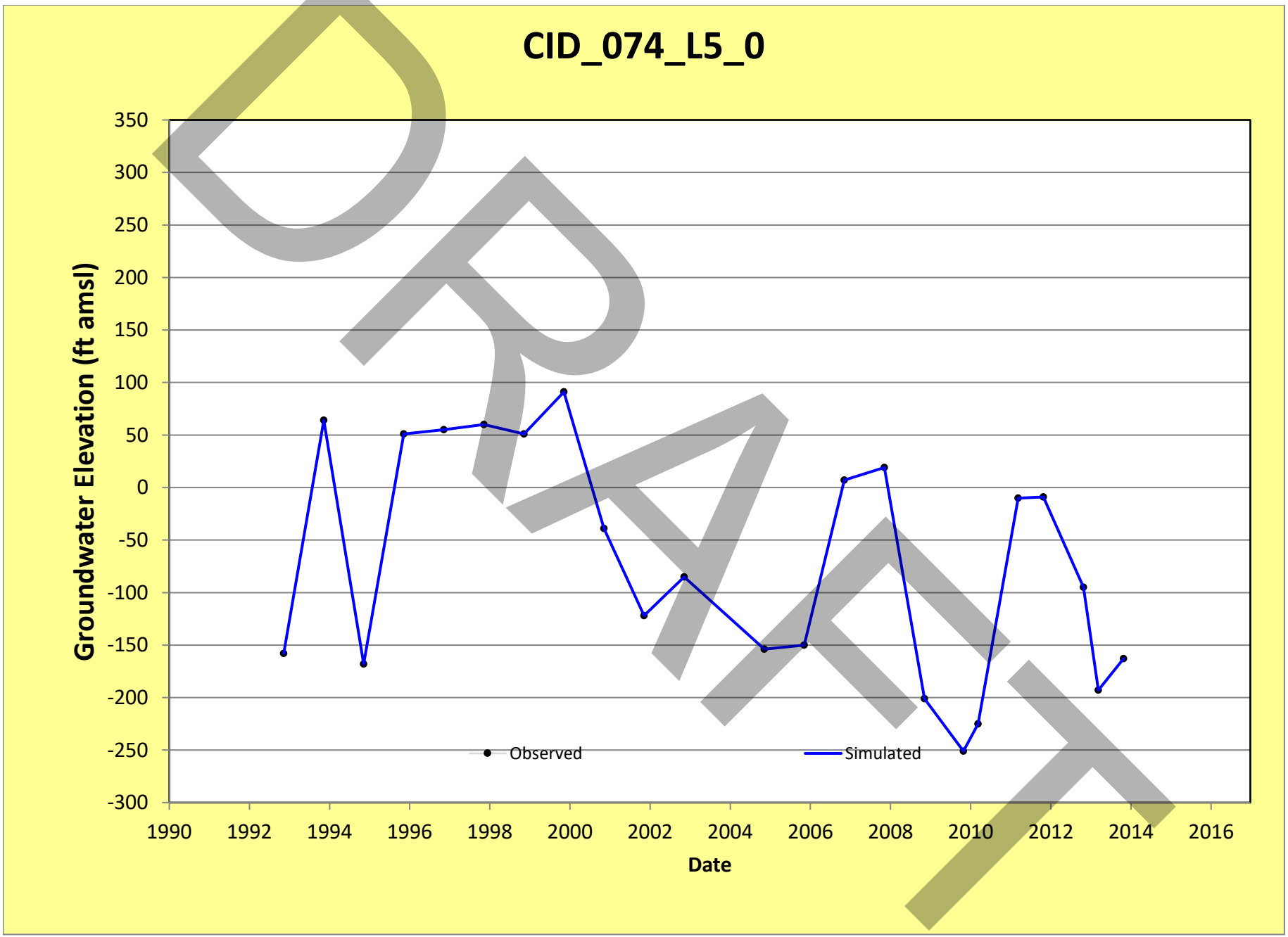
Observed
Simulated
DRAFT


CID_074_L5_0
Groundwater Elevation (ft amsl)
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100
50
0
-50
-100
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-200
-250
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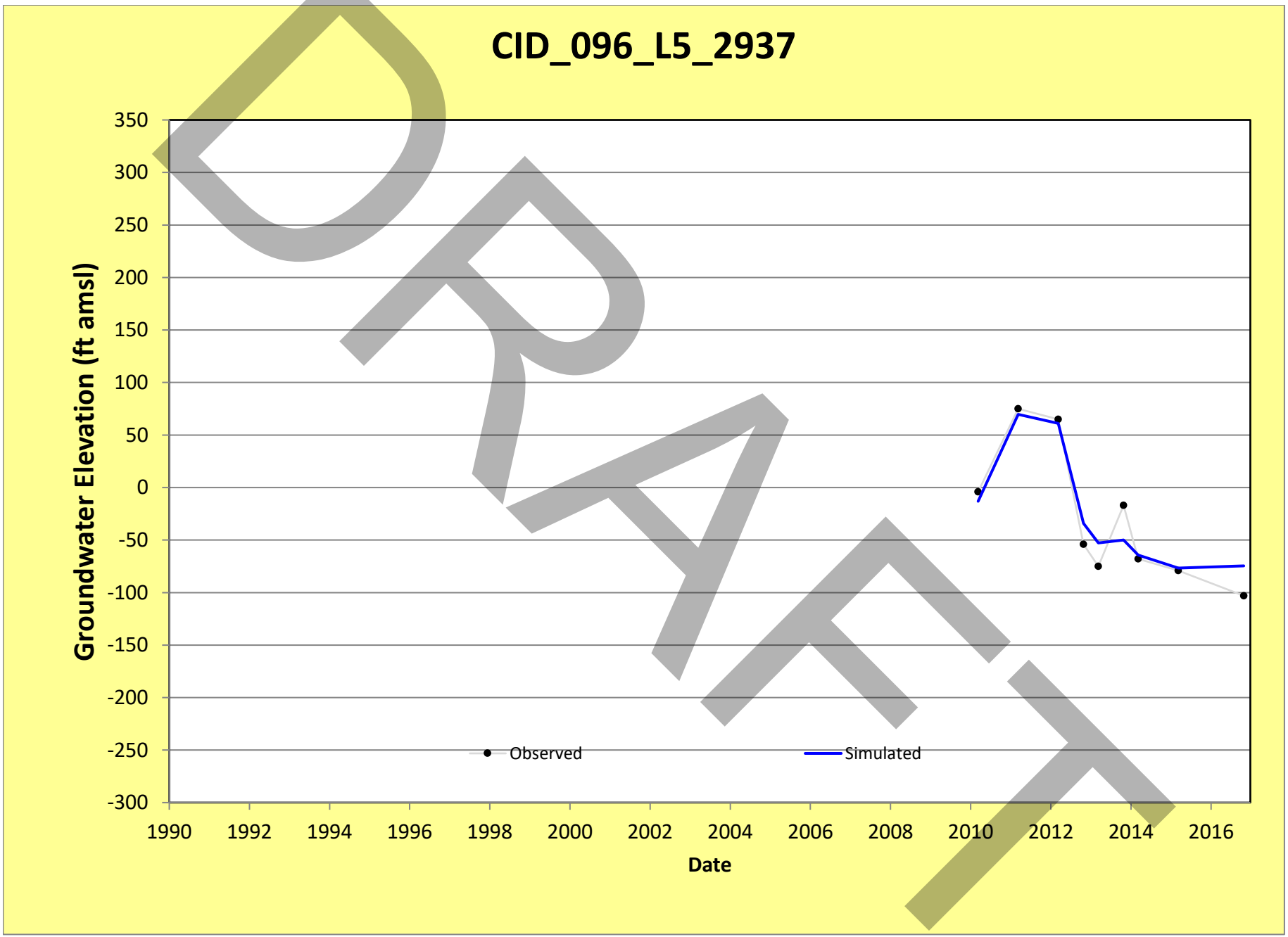
Date
Observed
Simulated
DRAFT


CID_096_L5_2937
Groundwater Elevation (ft amsl)
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-50
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Date
Observed
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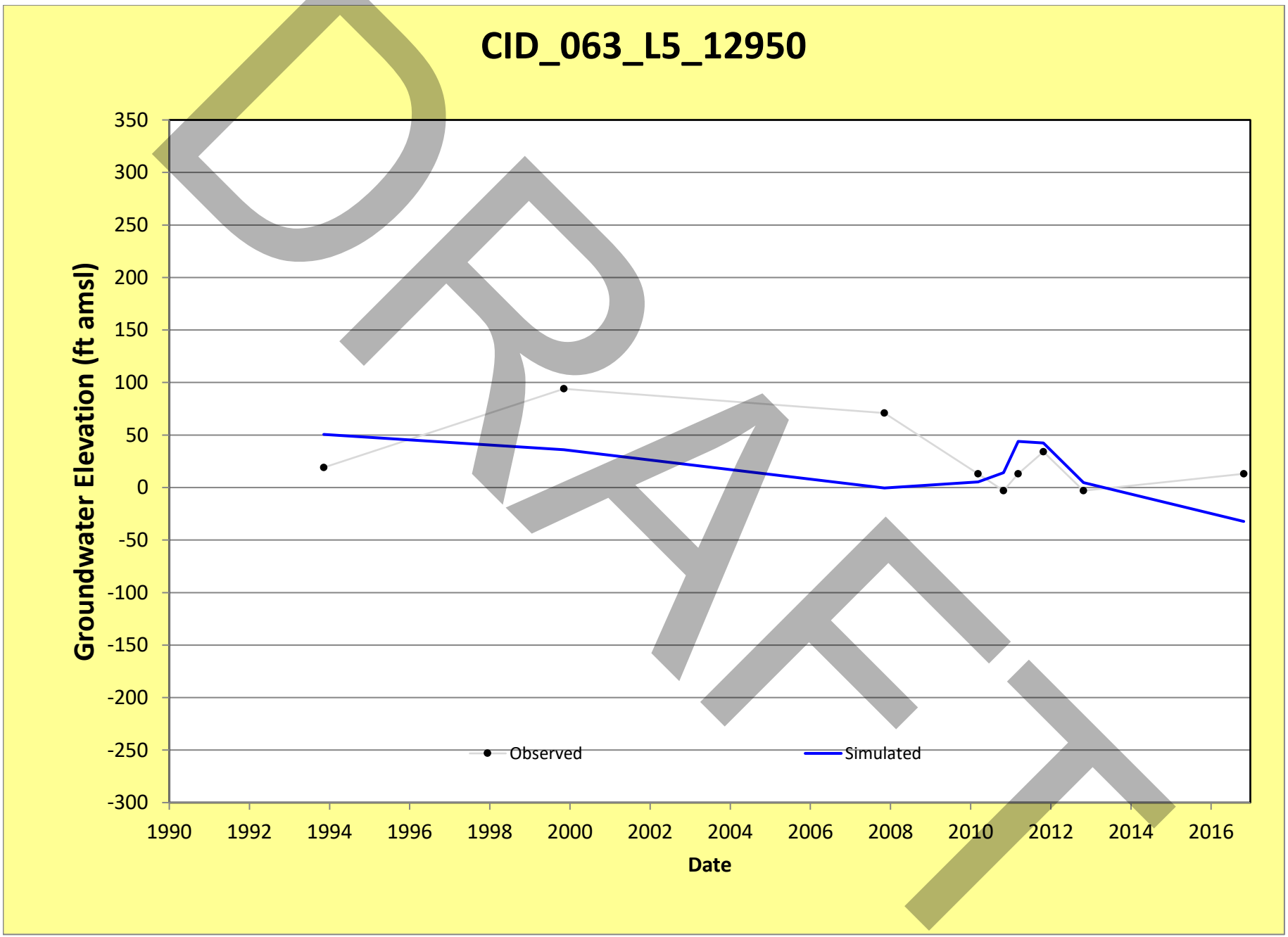
CID_063_L5_12950
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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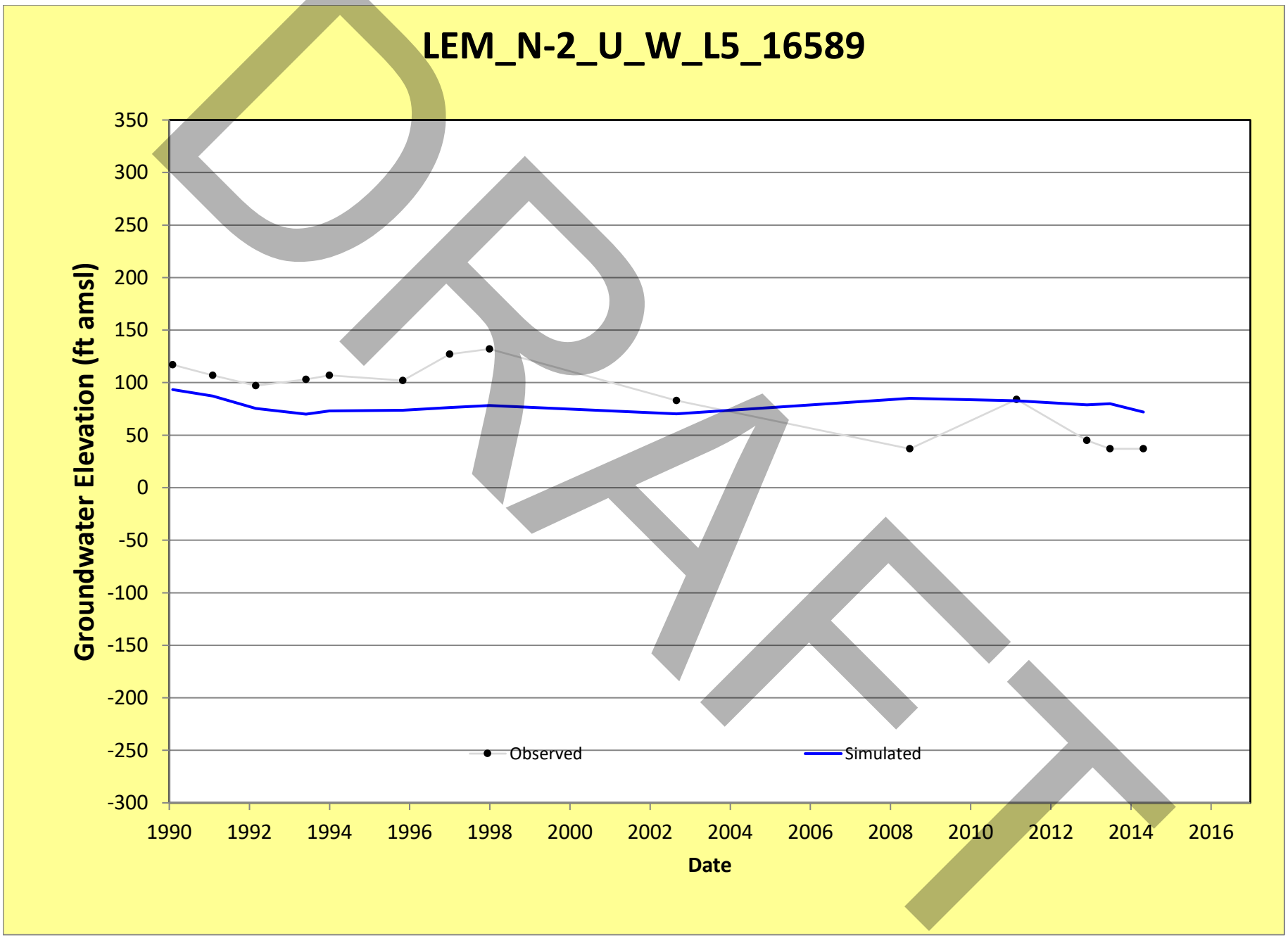
Date
Observed
Simulated
DRAFT


LEM_N-2_U_W_L5_16589
Groundwater Elevation (ft amsl)
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-50
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Date
Observed
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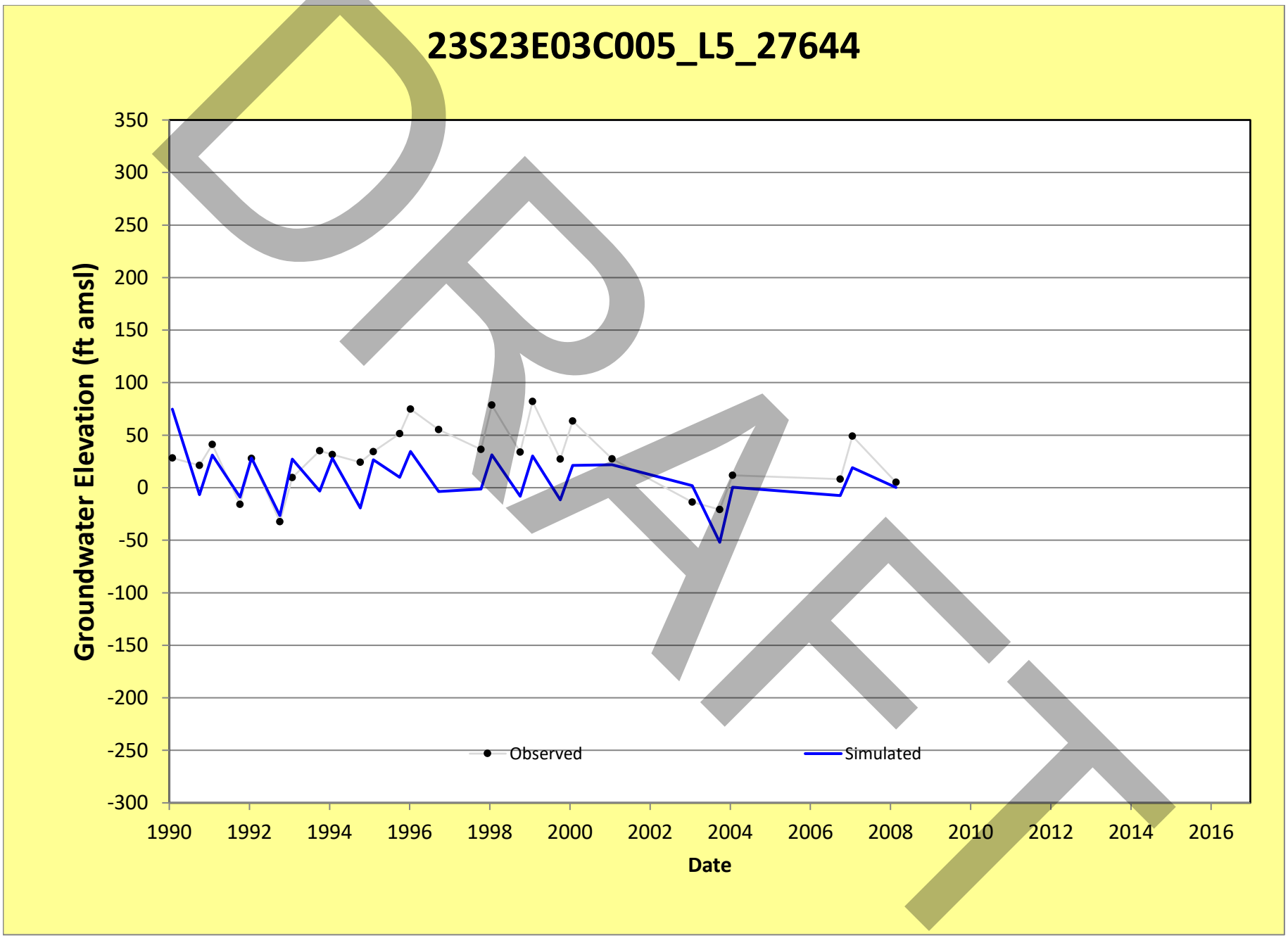
23S23E03C005_L5_27644
Groundwater Elevation (ft amsl)
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-50
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-150
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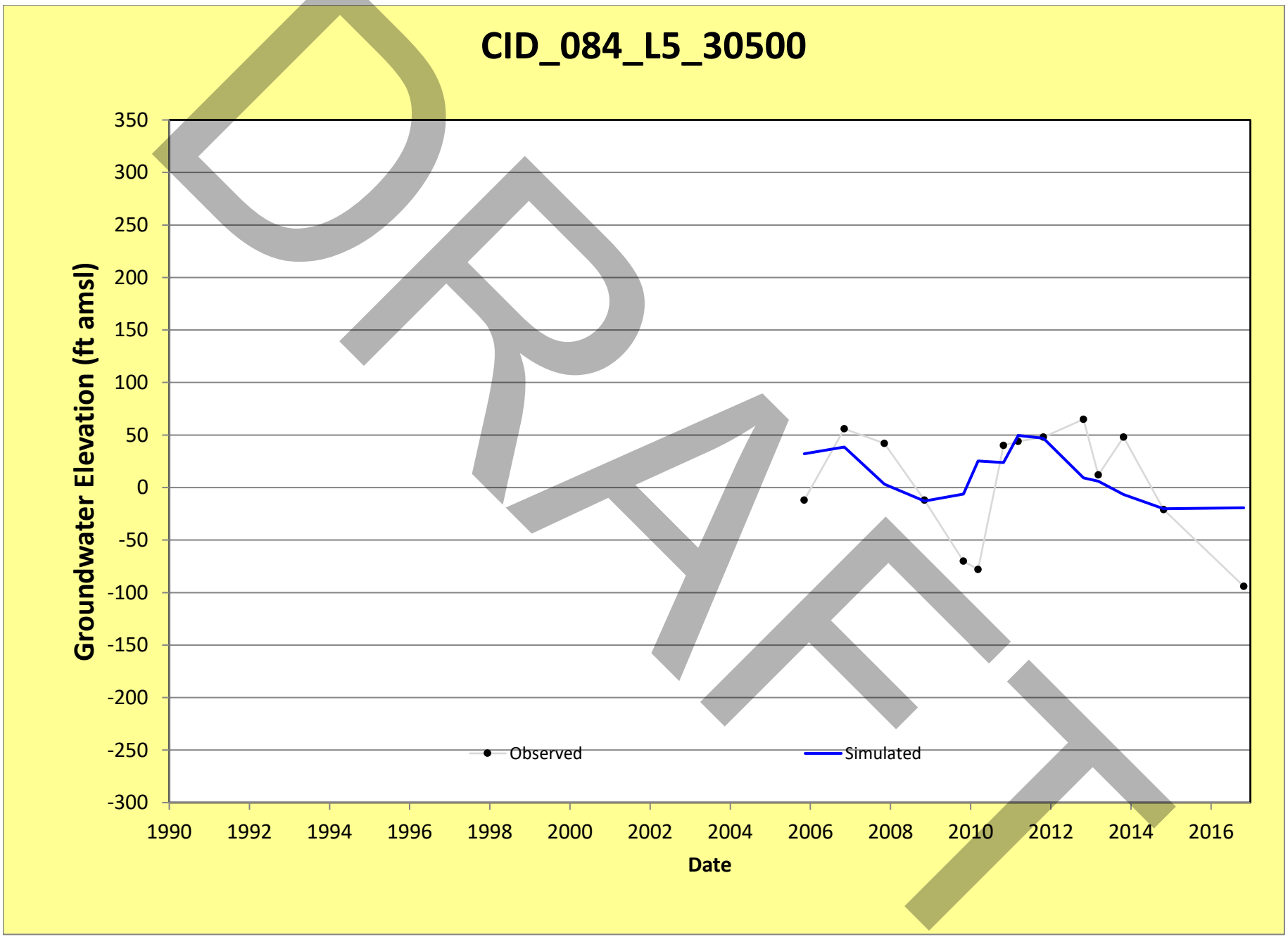
Observed
Simulated
DRAFT


CID_084_L5_30500
Groundwater Elevation (ft amsl)
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Observed
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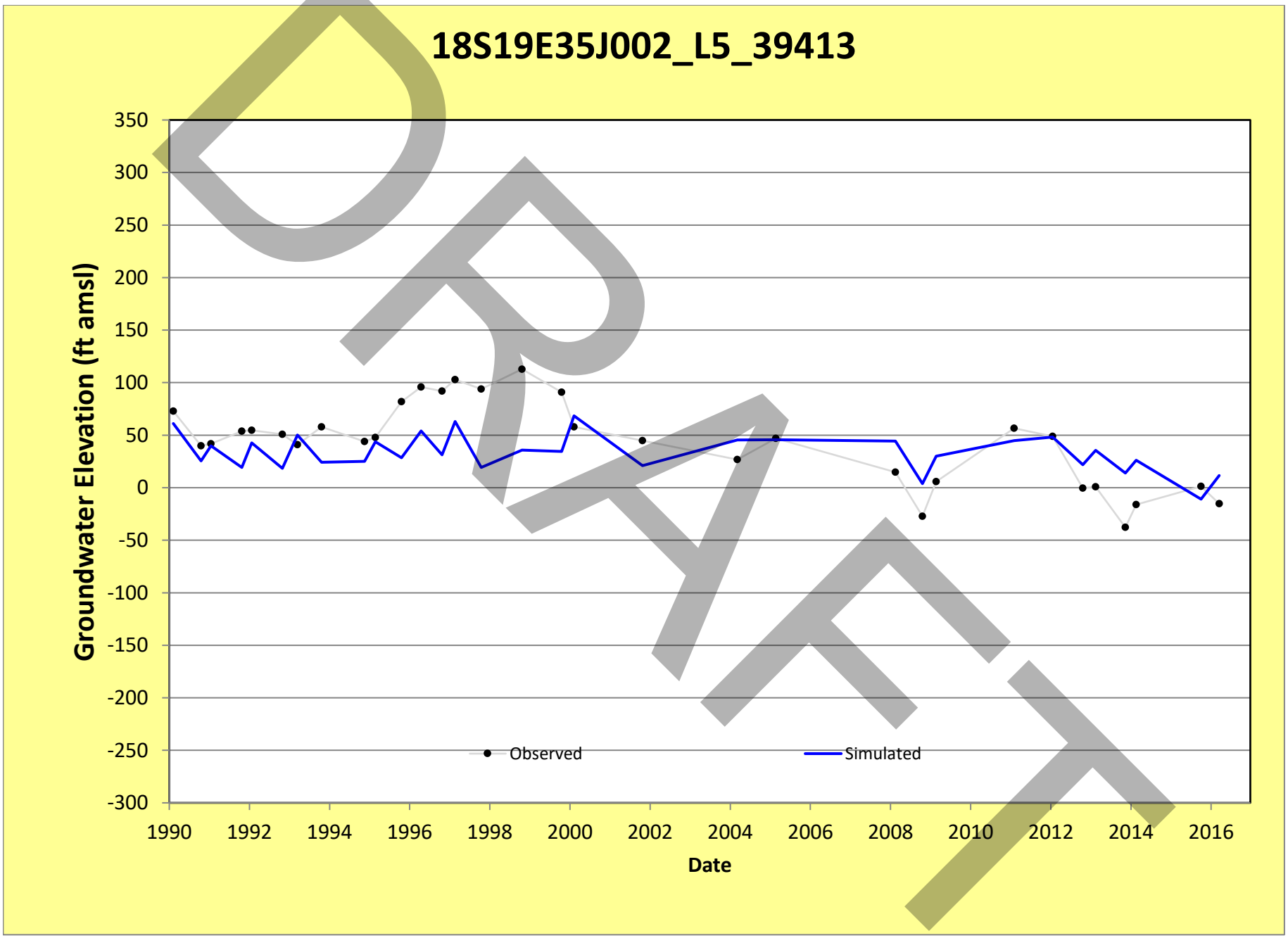
18S19E35J002_L5_39413
Groundwater Elevation (ft amsl)
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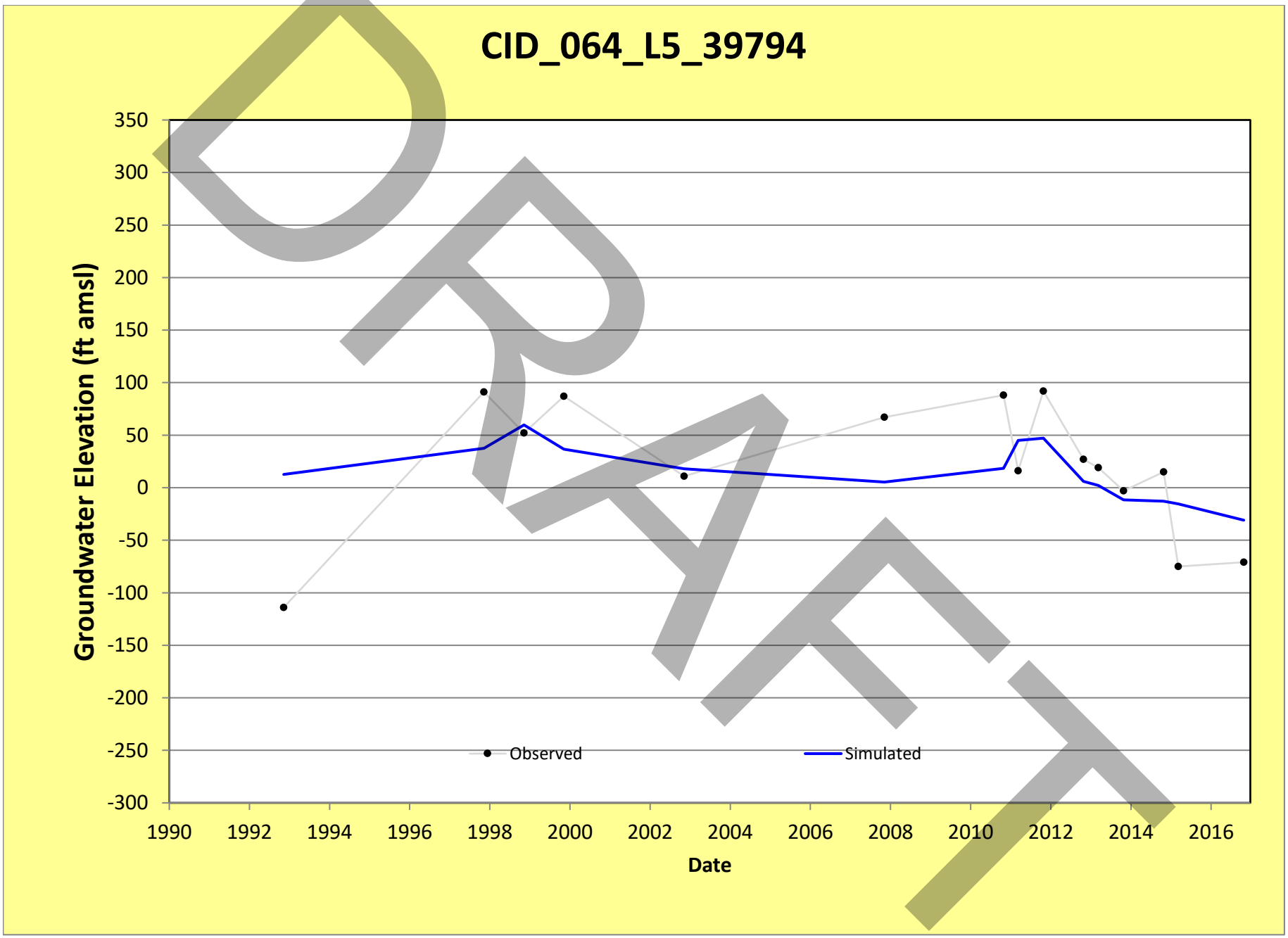
Observed
Simulated
DRAFT


CID_064_L5_39794
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
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-200
-250
-300
1990
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Date
Observed
Simulated
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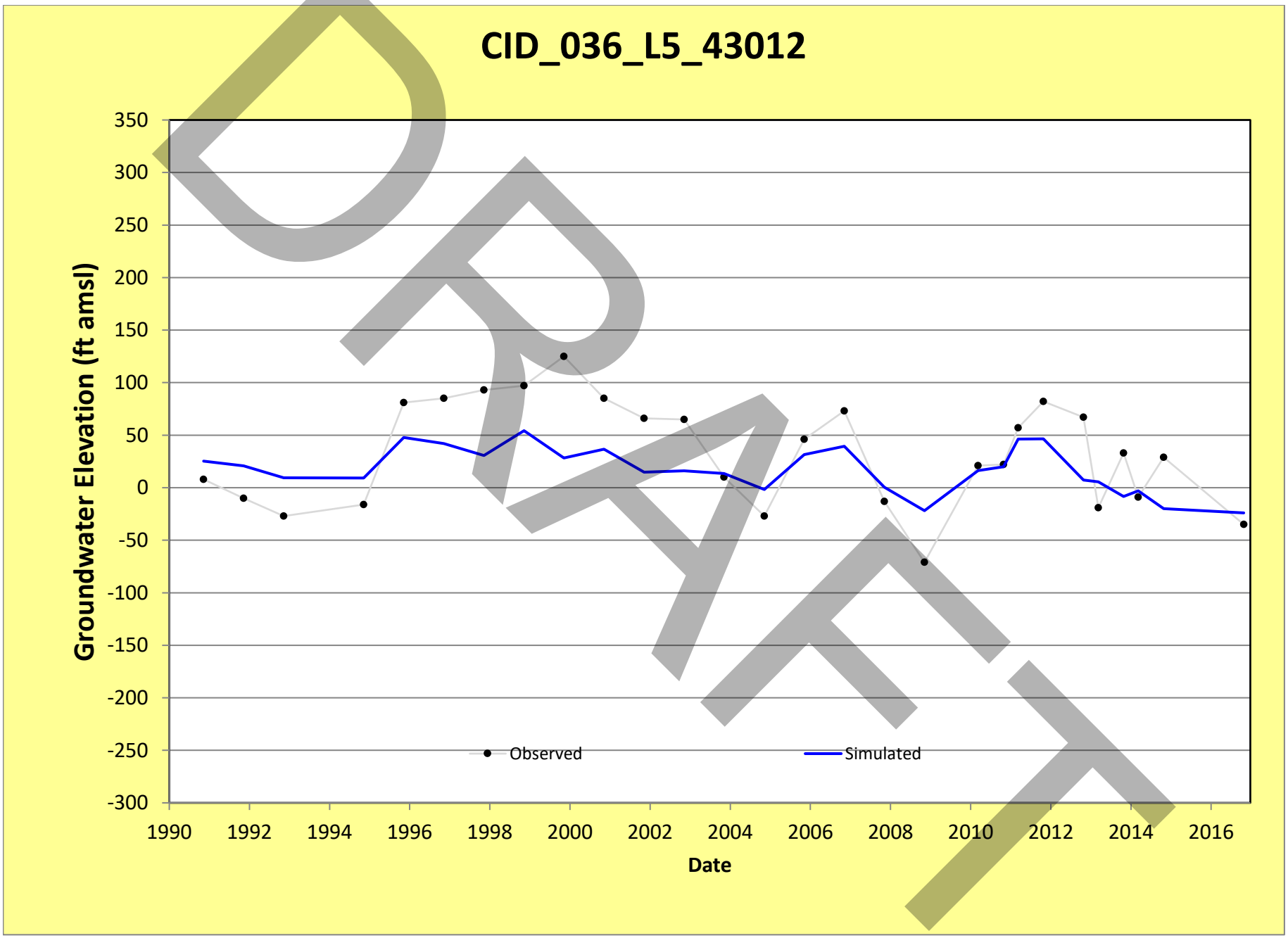
CID_036_L5_43012
Groundwater Elevation (ft amsl)
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250
200
150
100
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-200
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Date
Observed
Simulated

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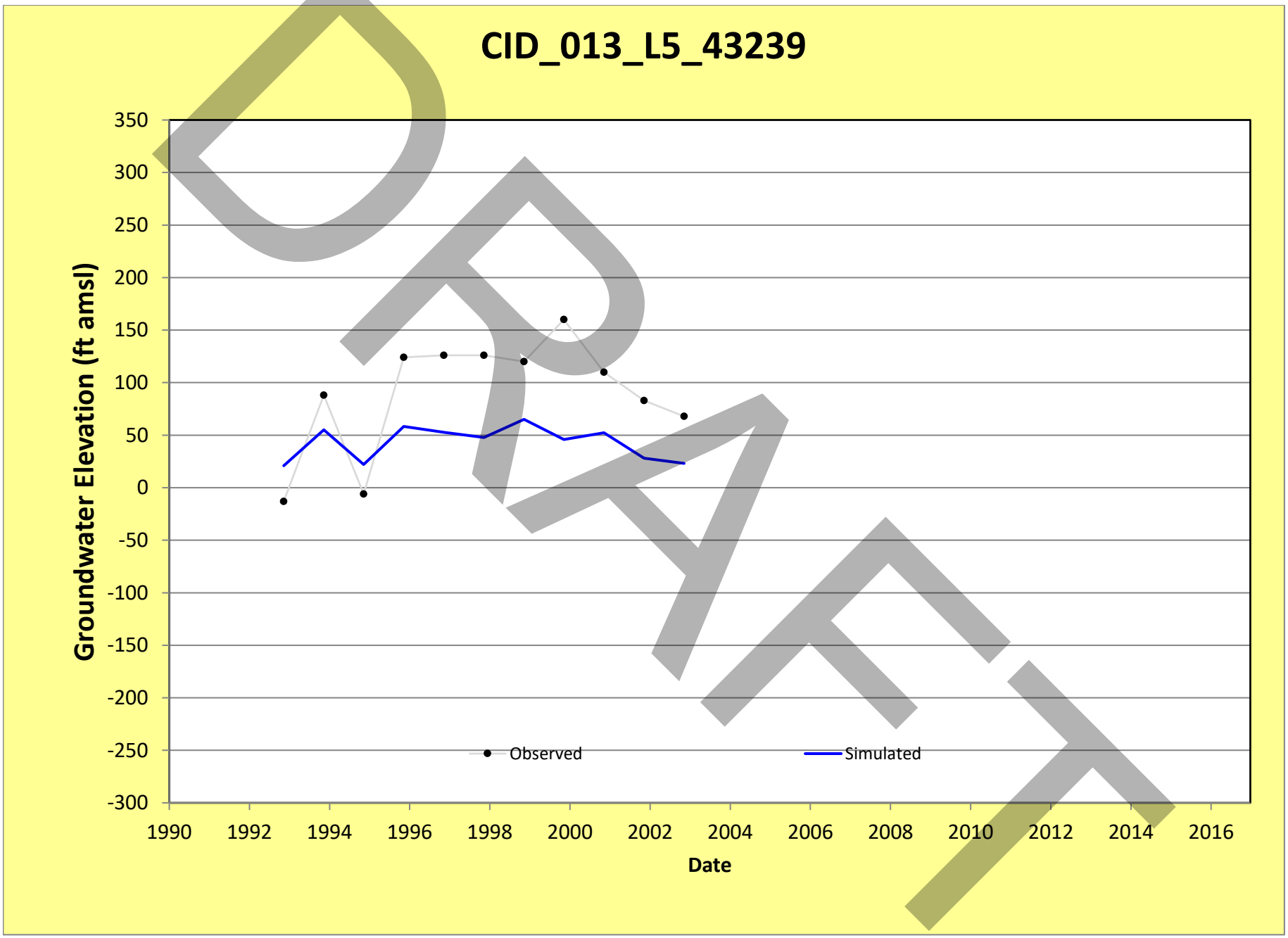
CID_013_L5_43239
Groundwater Elevation (ft amsl)
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250
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100
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-50
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-200
-250
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Observed
Simulated
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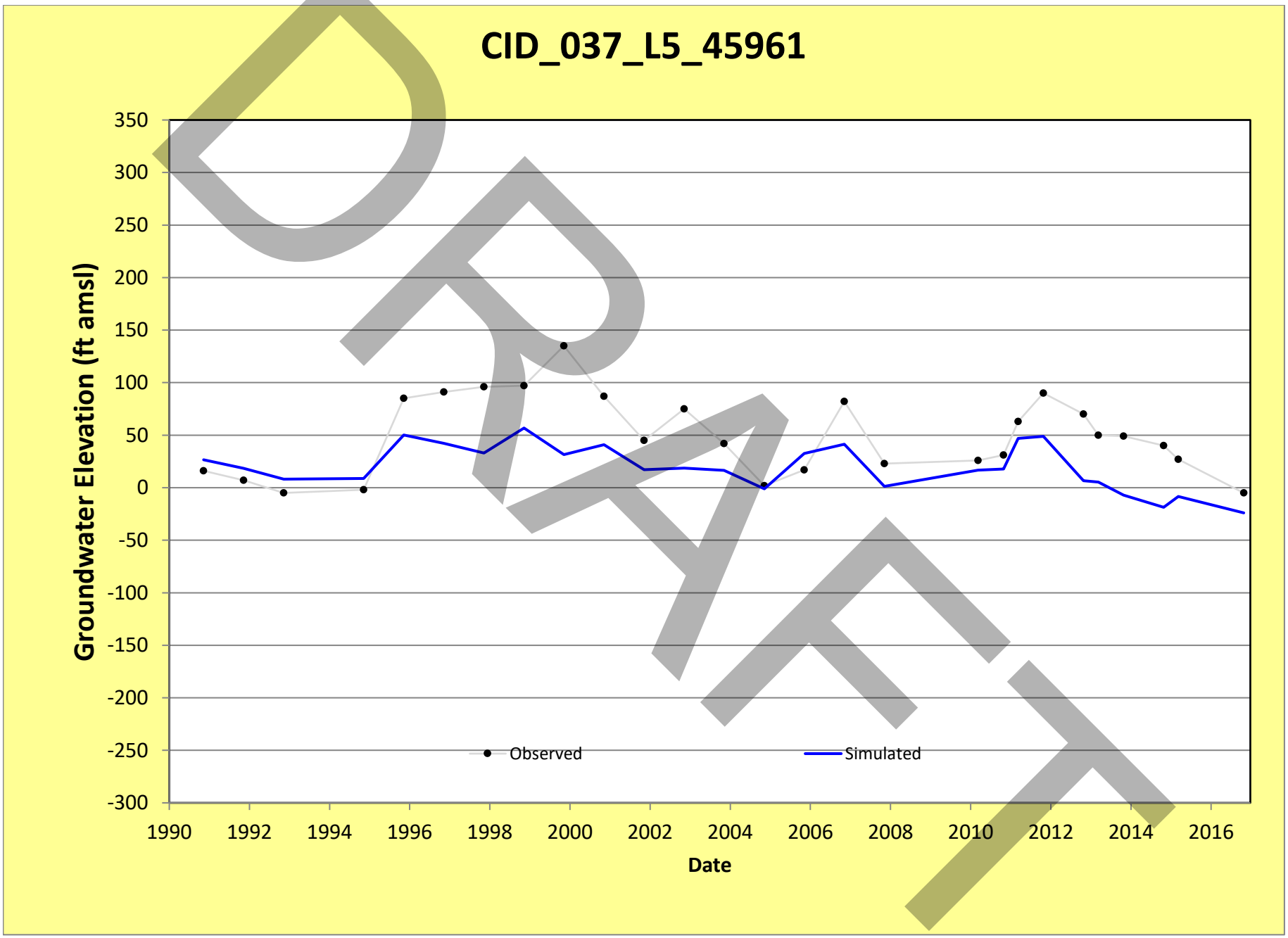
CID_037_L5_45961
Groundwater Elevation (ft amsl)
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200
150
100
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0
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-200
-250
-300
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Date
Observed
Simulated
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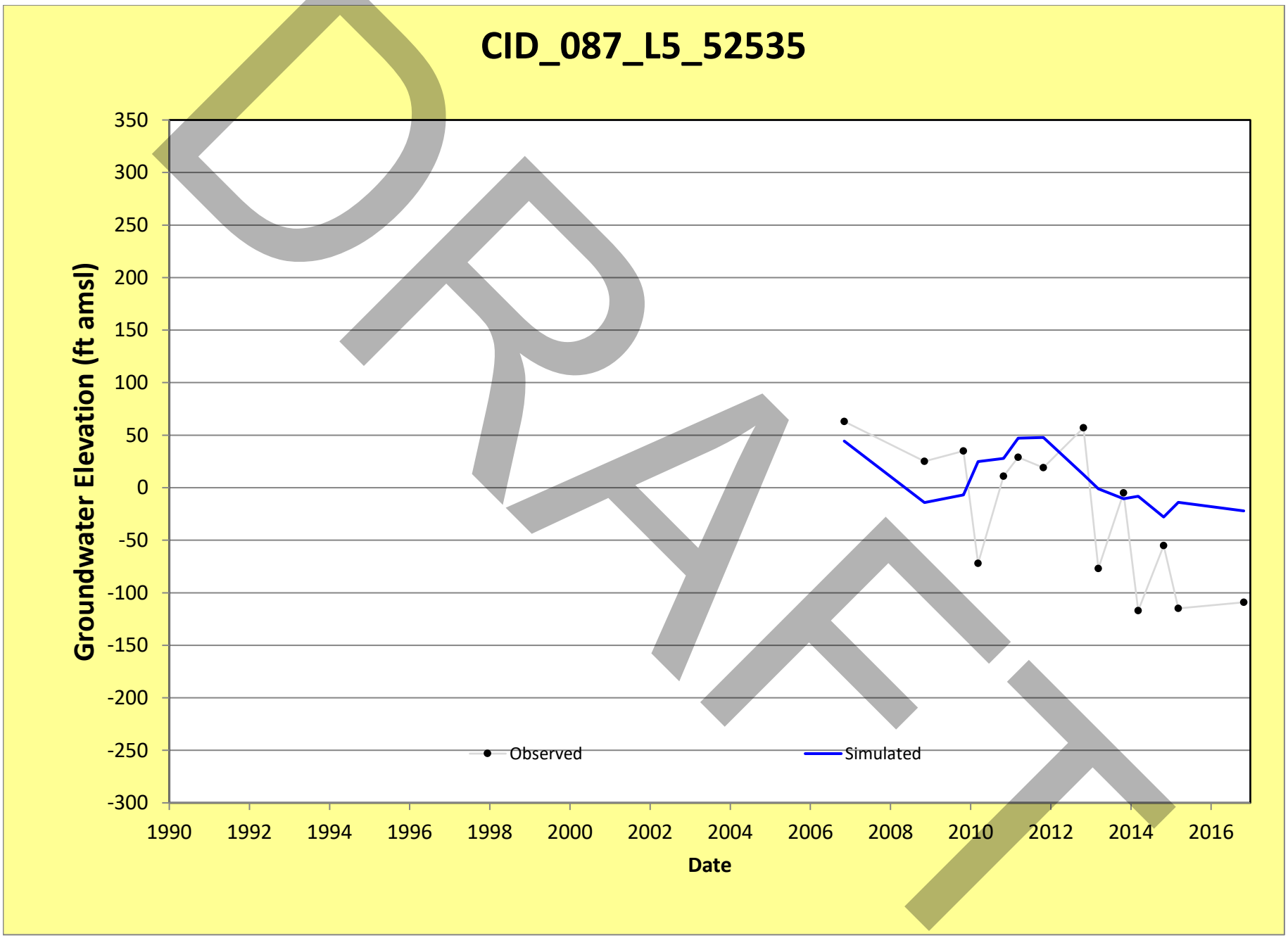
CID_087_L5_52535
Groundwater Elevation (ft amsl)
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150
100
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0
-50
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-200
-250
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Observed
Simulated
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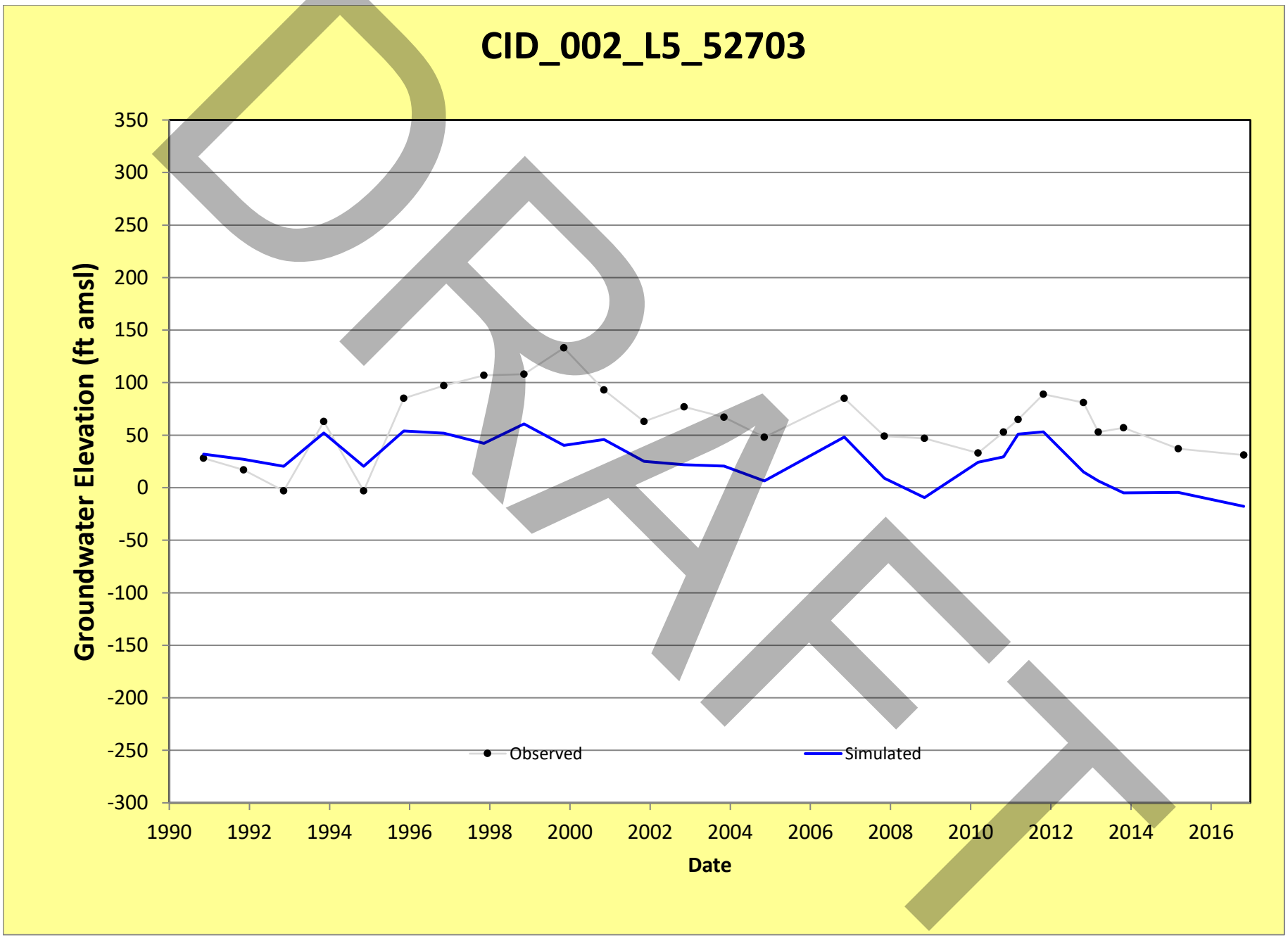
CID_002_L5_52703
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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Observed
Simulated
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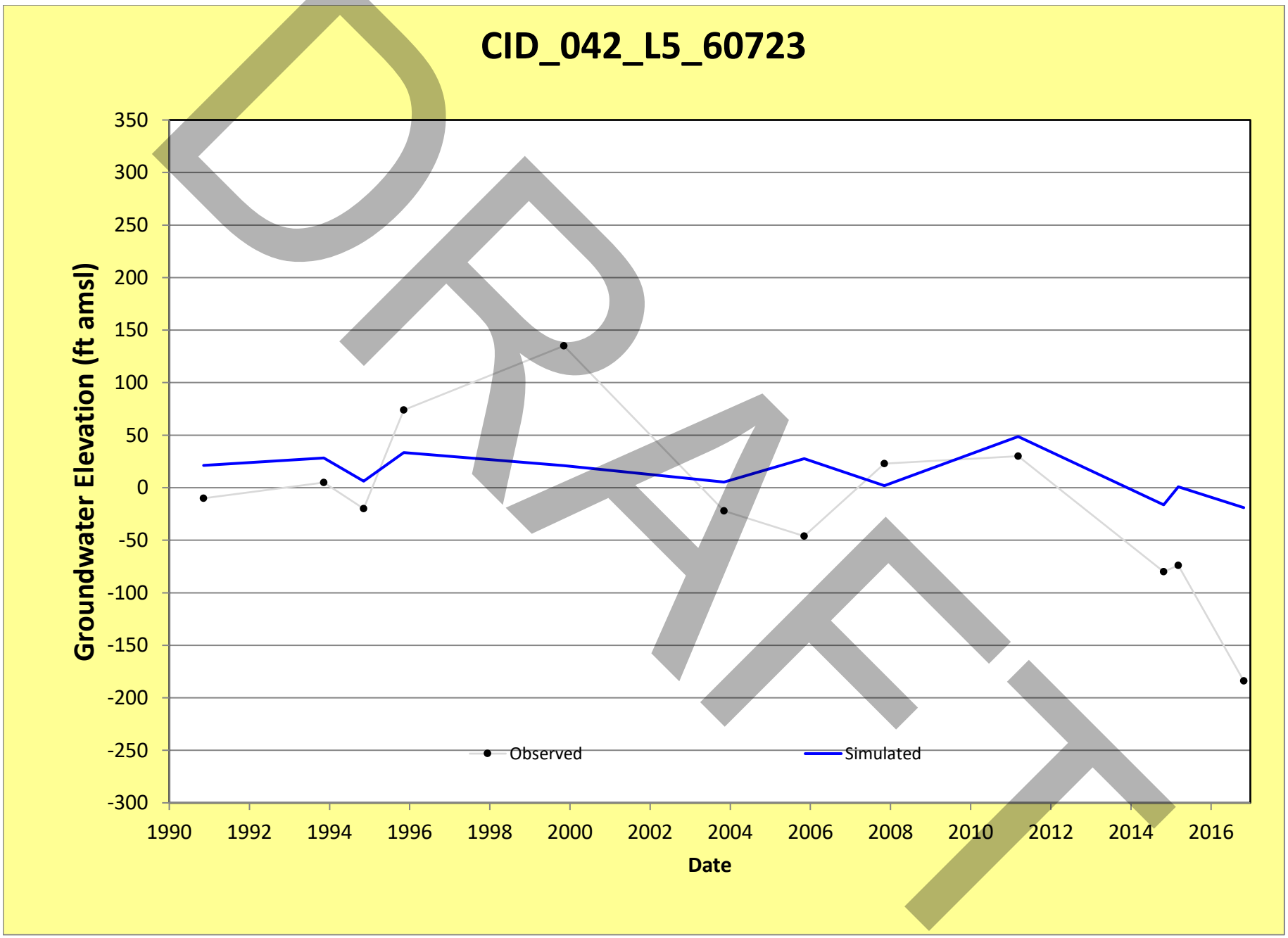
CID_042_L5_60723
Groundwater Elevation (ft amsl)
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250
200
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100
50
0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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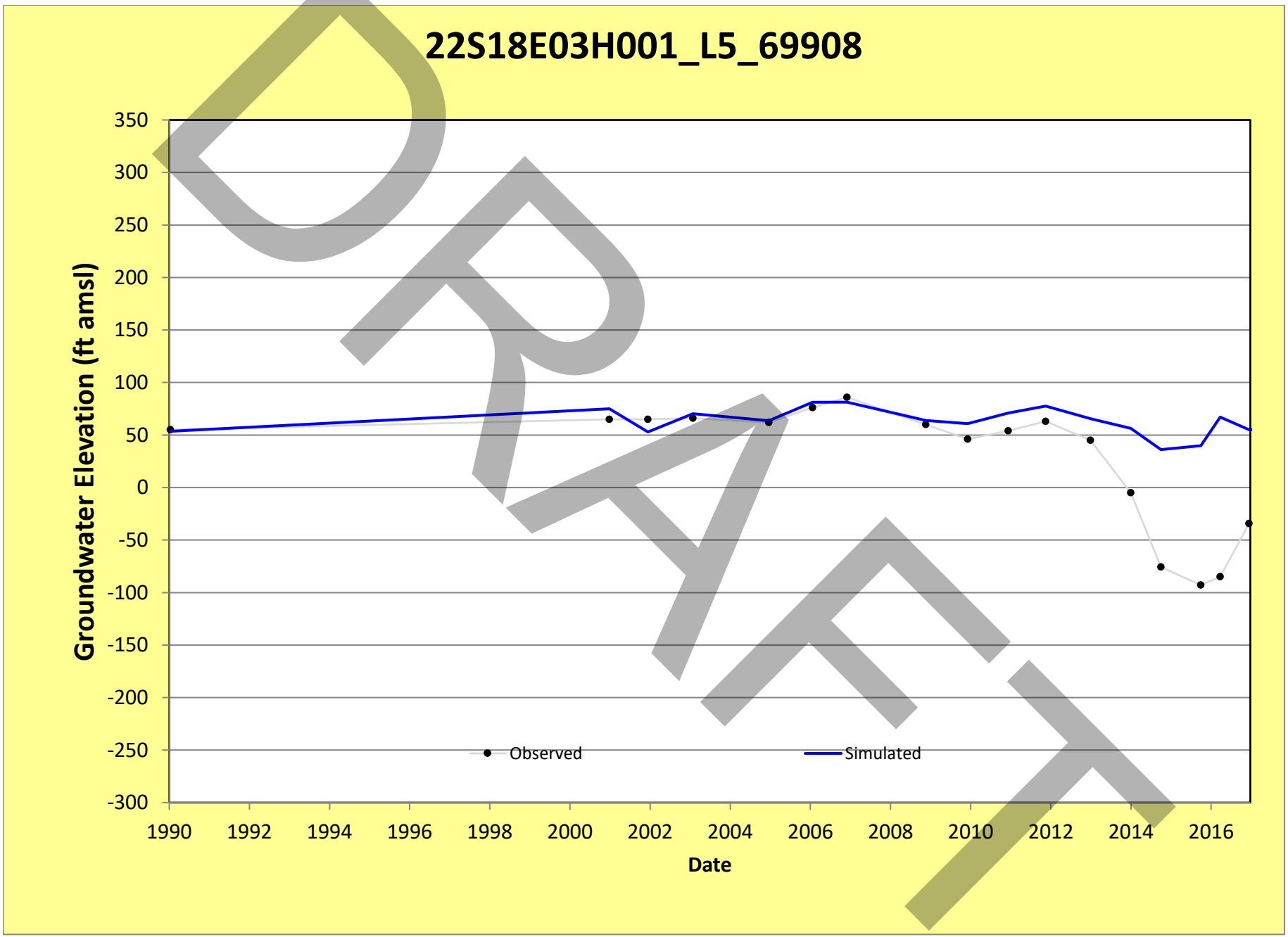
22S18E03H001_L5_69908
Groundwater Elevation (ft amsl)
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100
50
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-50
-100
-150
-200
-250
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Observed
Simulated
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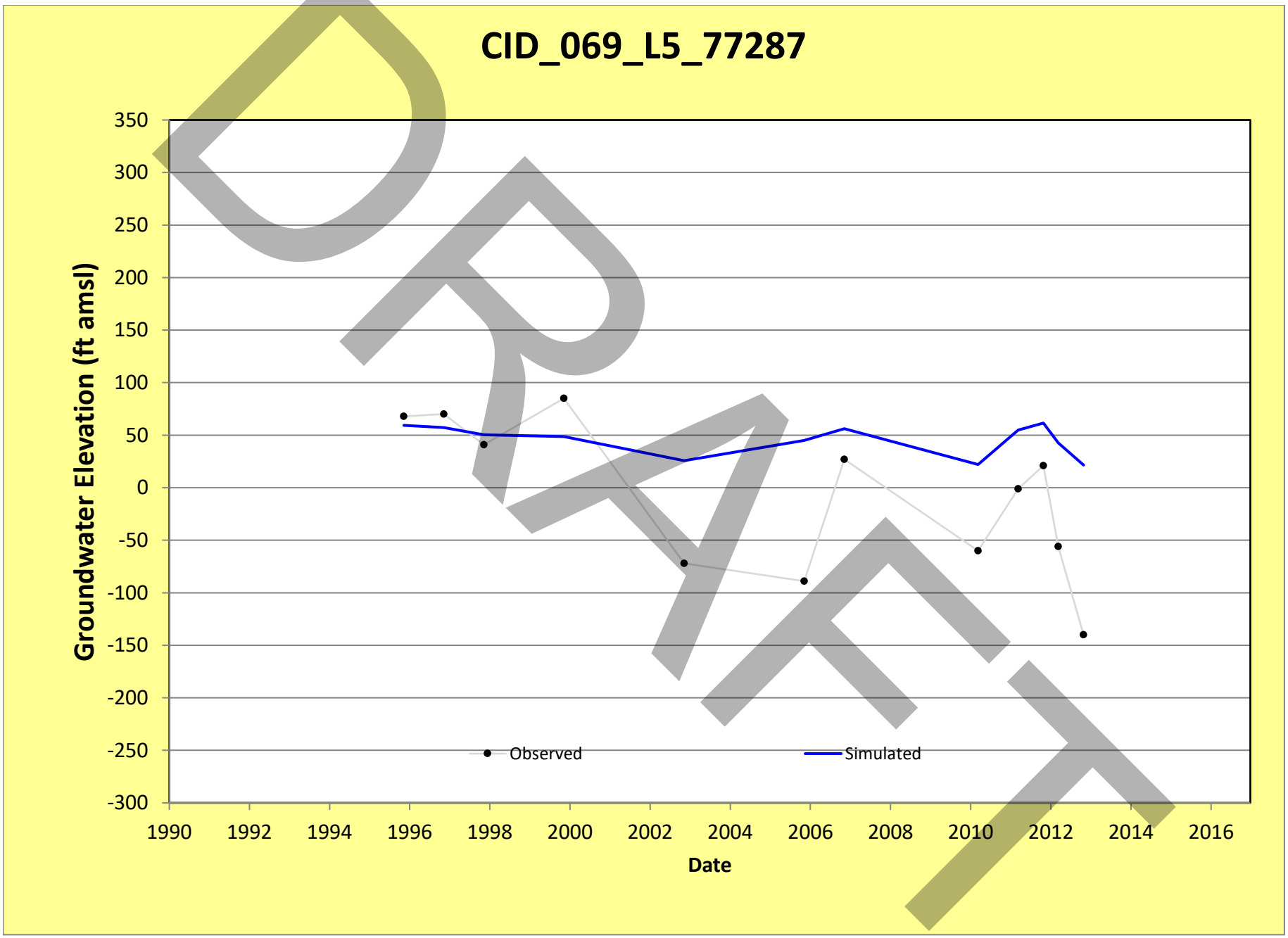
CID_069_L5_77287
Groundwater Elevation (ft amsl)
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-50
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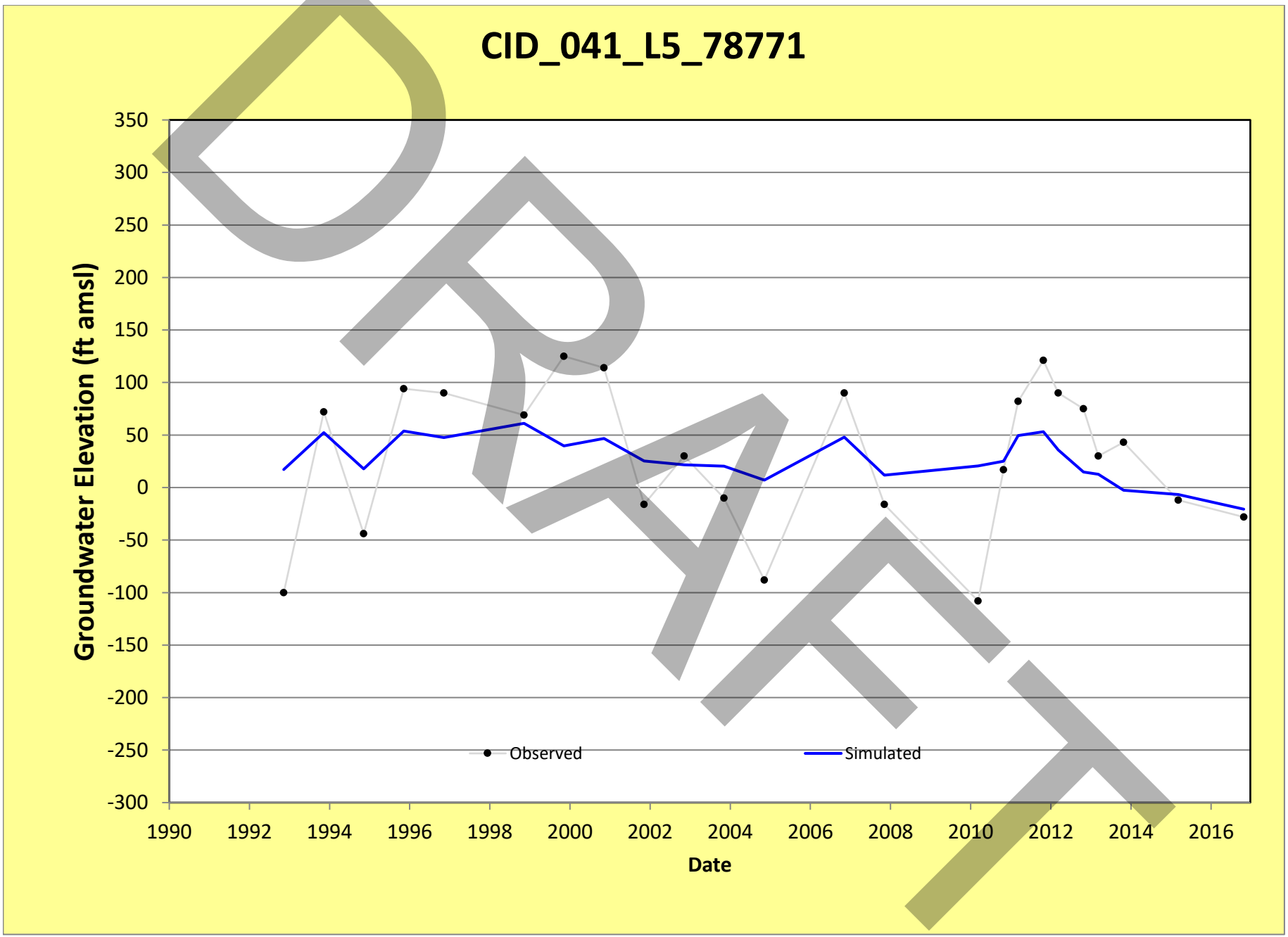
Date
Observed
Simulated
DRAFT


CID_041_L5_78771
Groundwater Elevation (ft amsl)
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100
50
0
-50
-100
-150
-200
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Date
Observed
Simulated
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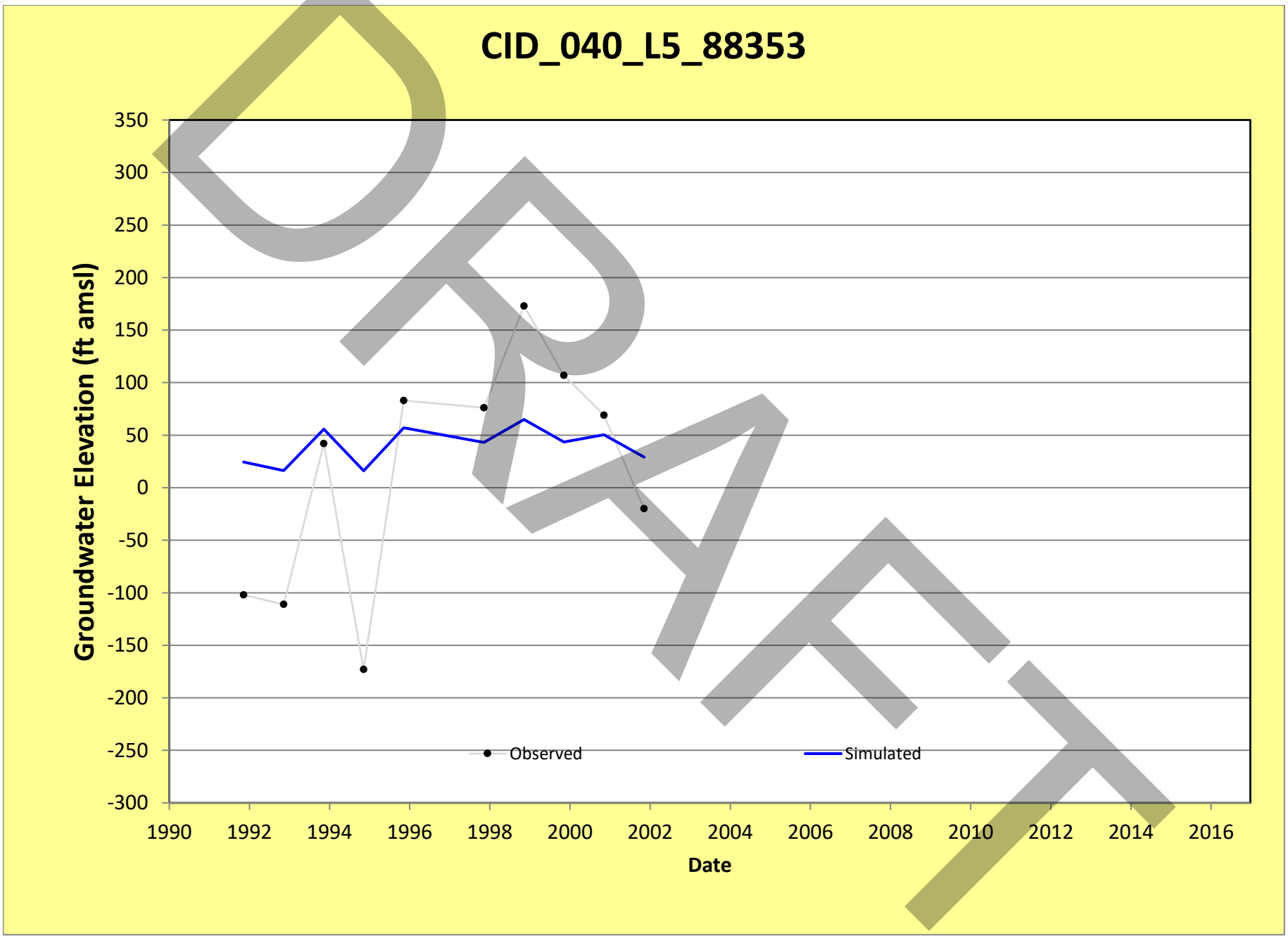
CID_040_L5_88353
Groundwater Elevation (ft amsl)
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100
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0
-50
-100
-150
-200
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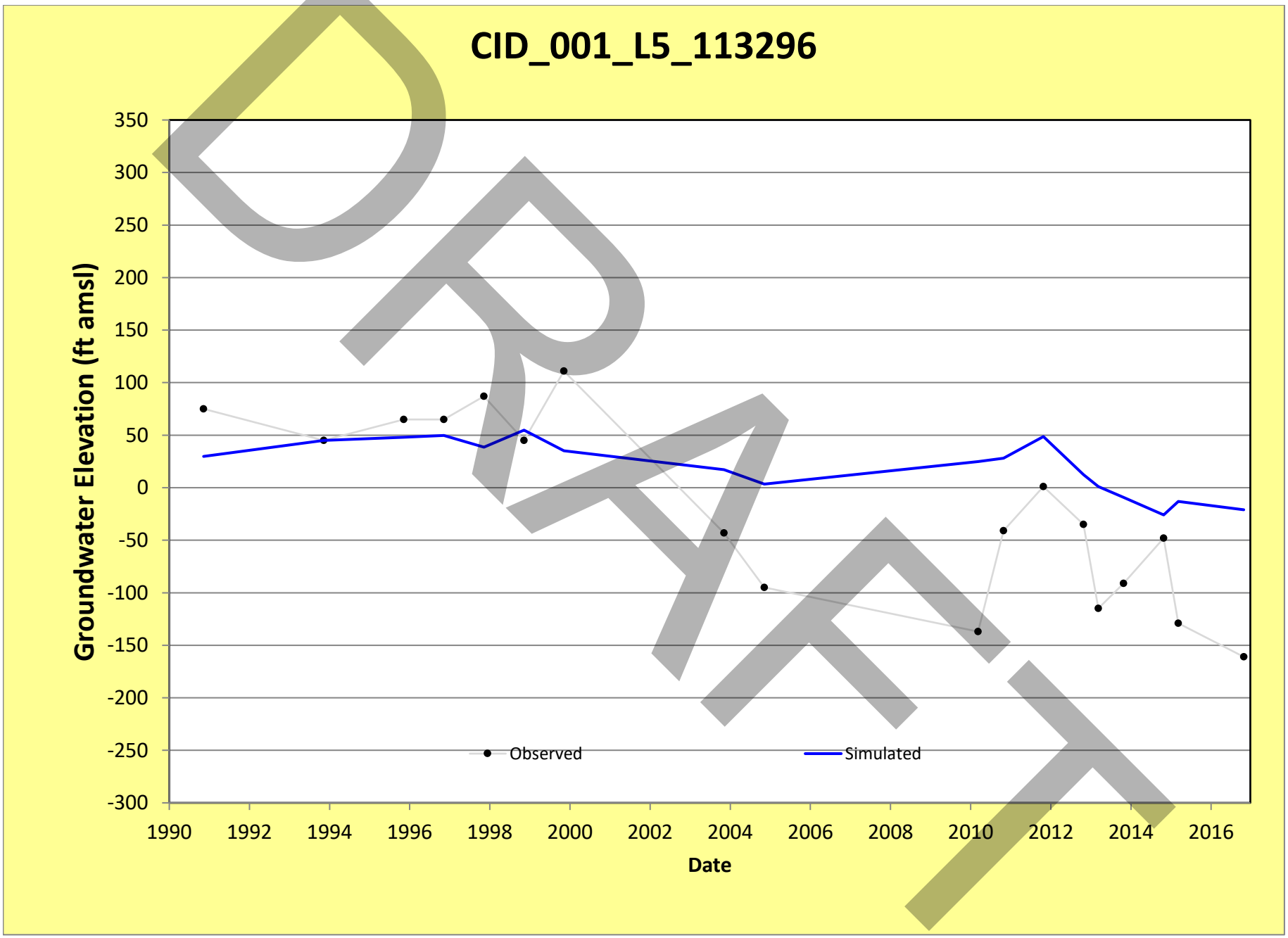
Observed
Simulated
DRAFT


CID_001_L5_113296
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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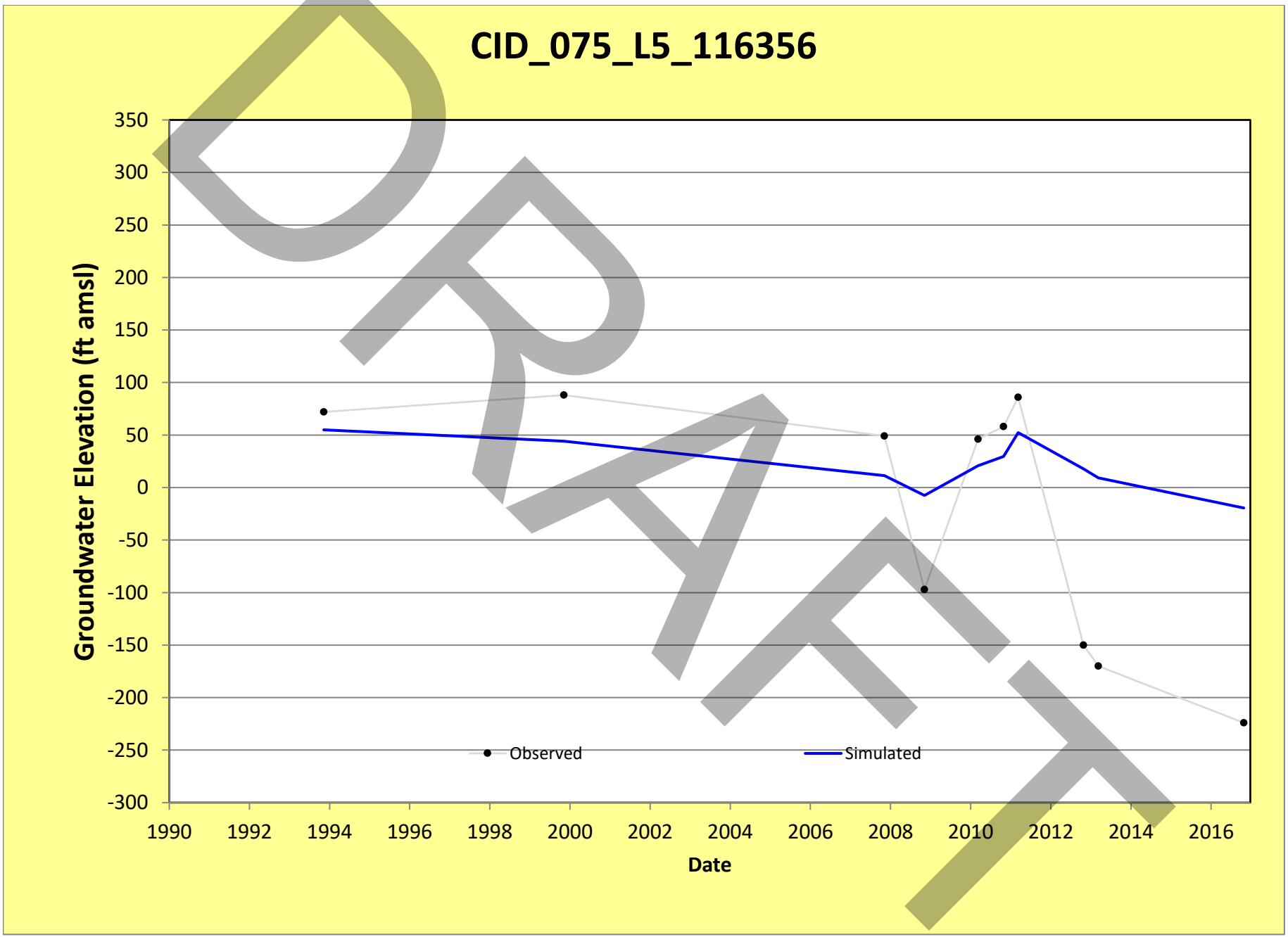
Observed
Simulated
DRAFT


CID_075_L5_116356
Groundwater Elevation (ft amsl)
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-50
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Date
Observed
Simulated
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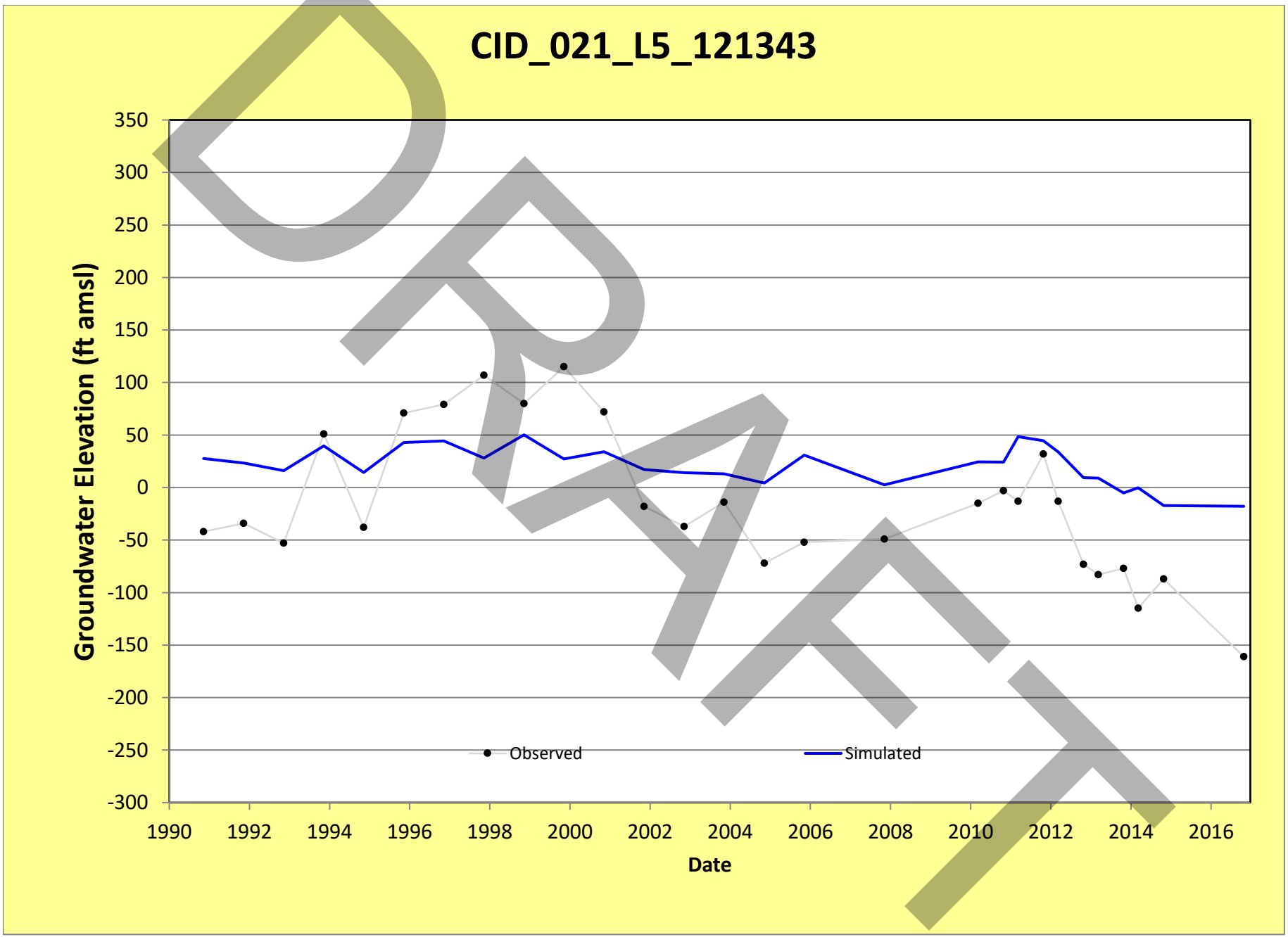
CID_021_L5_121343
Groundwater Elevation (ft amsl)
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300
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50
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-50
-100
-150
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Date
Observed
Simulated
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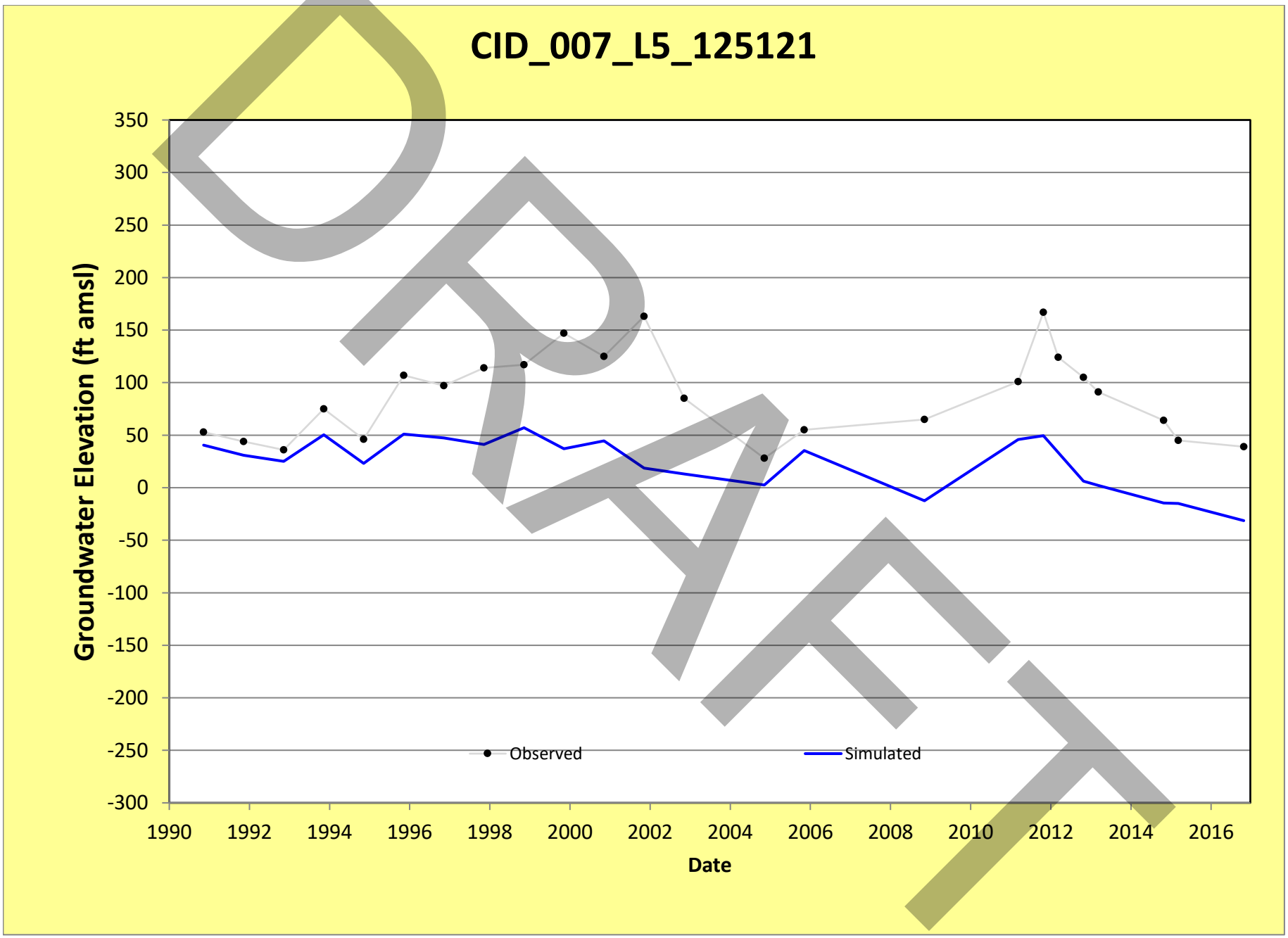
CID_007_L5_125121
Groundwater Elevation (ft amsl)
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Observed
Simulated
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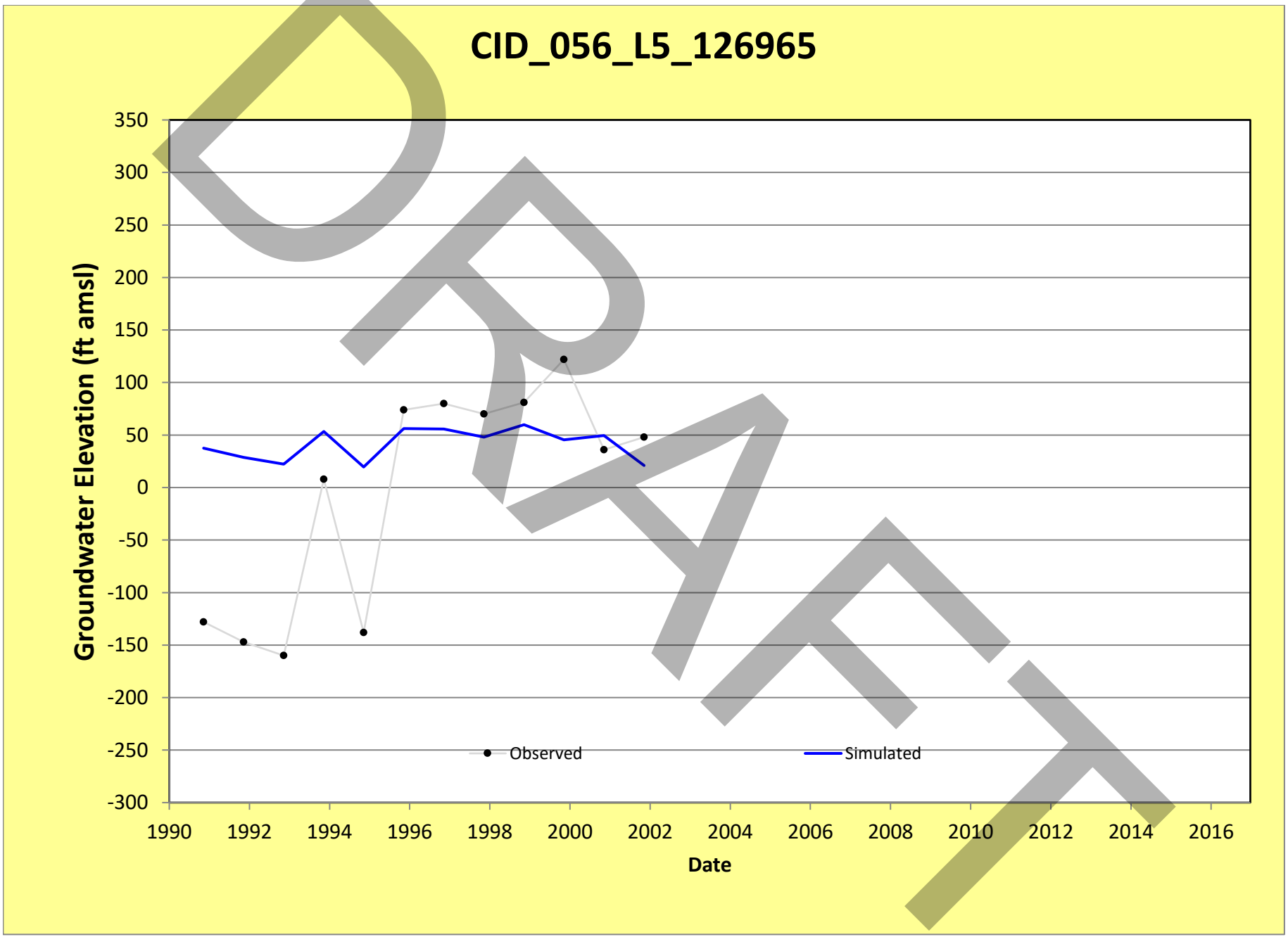
CID_056_L5_126965
Groundwater Elevation (ft amsl)
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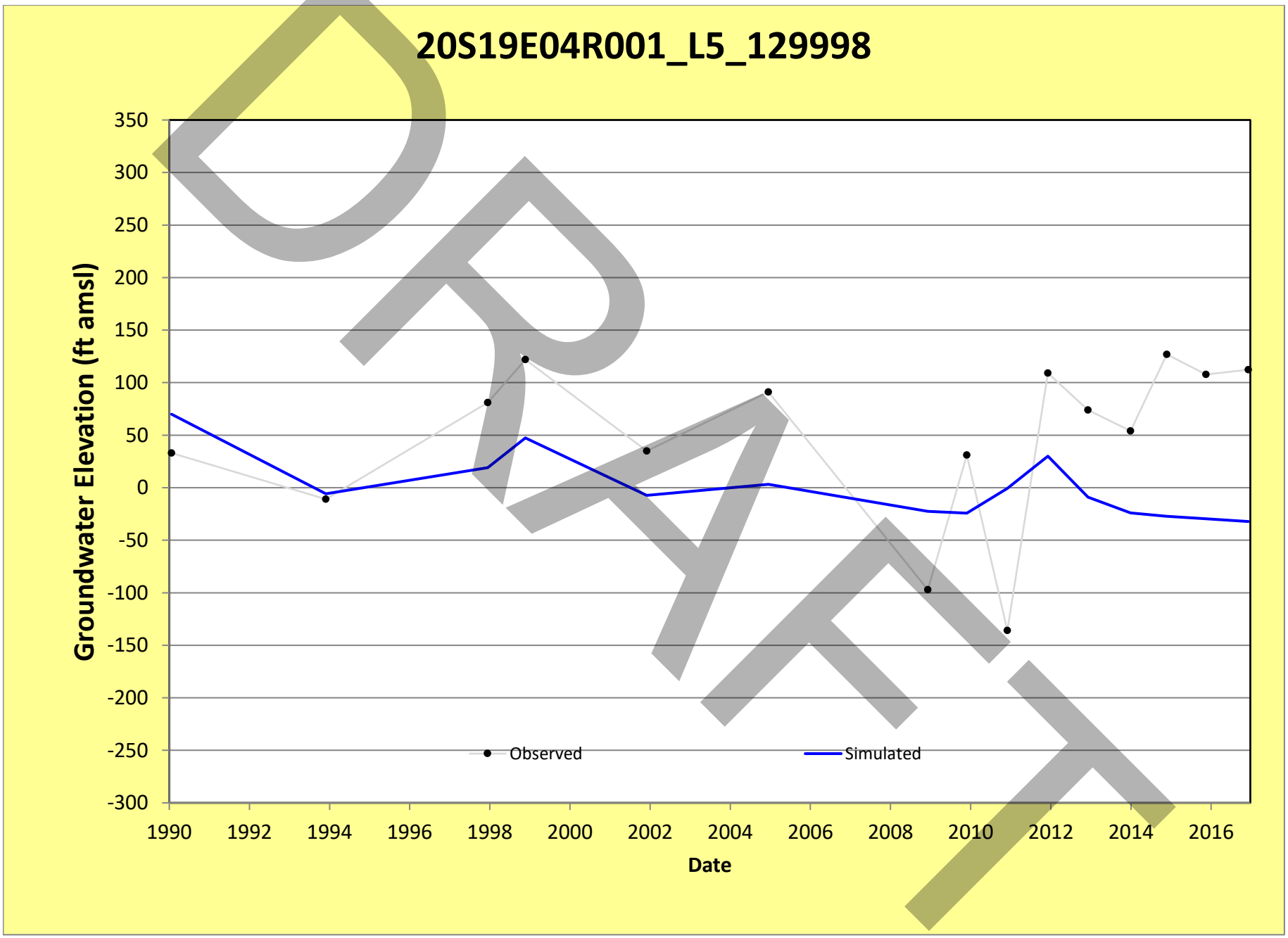
Observed
Simulated
DRAFT


20S19E04R001_L5_129998
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100
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-150
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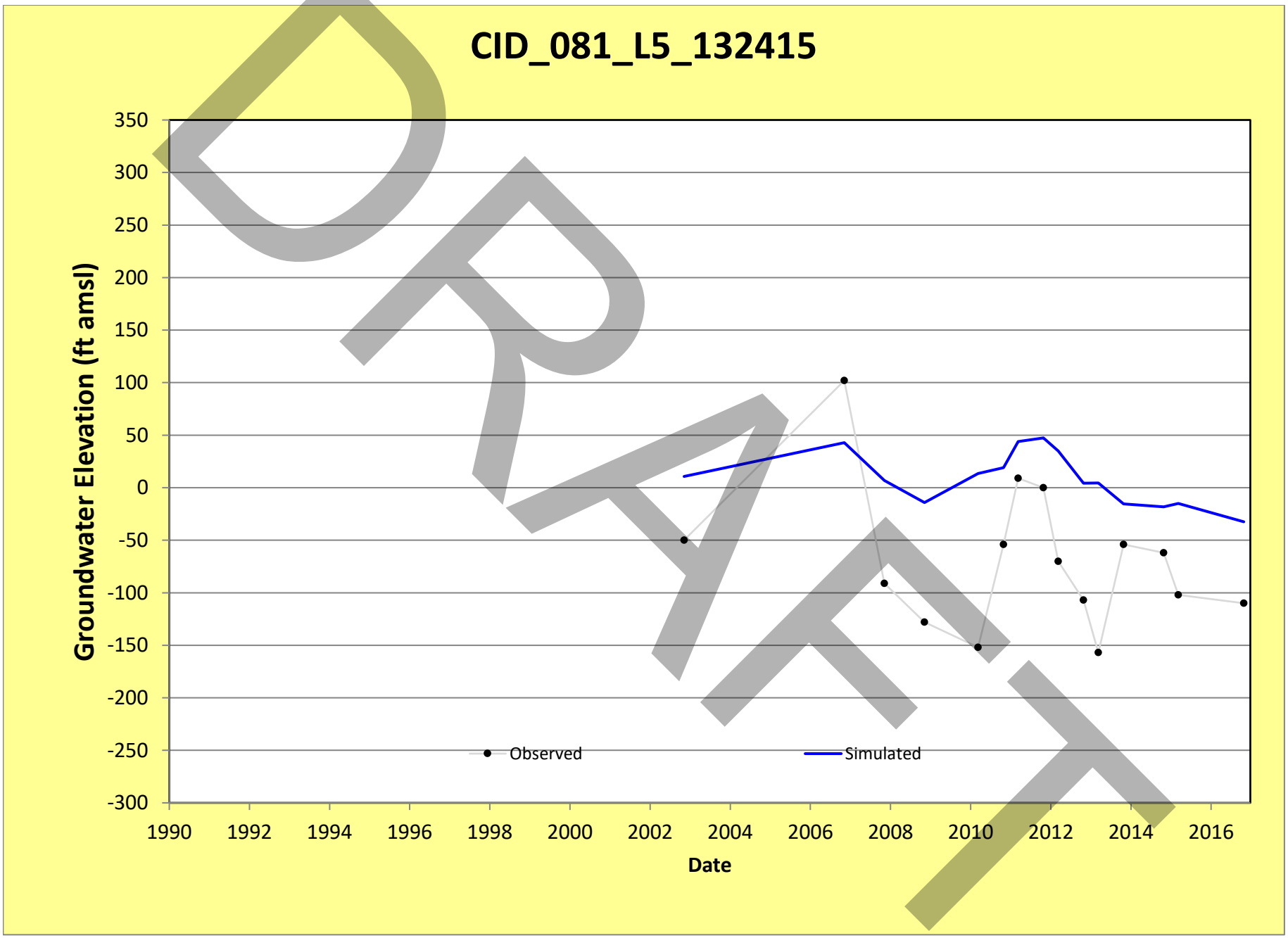
CID_081_L5_132415
Groundwater Elevation (ft amsl)
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Observed
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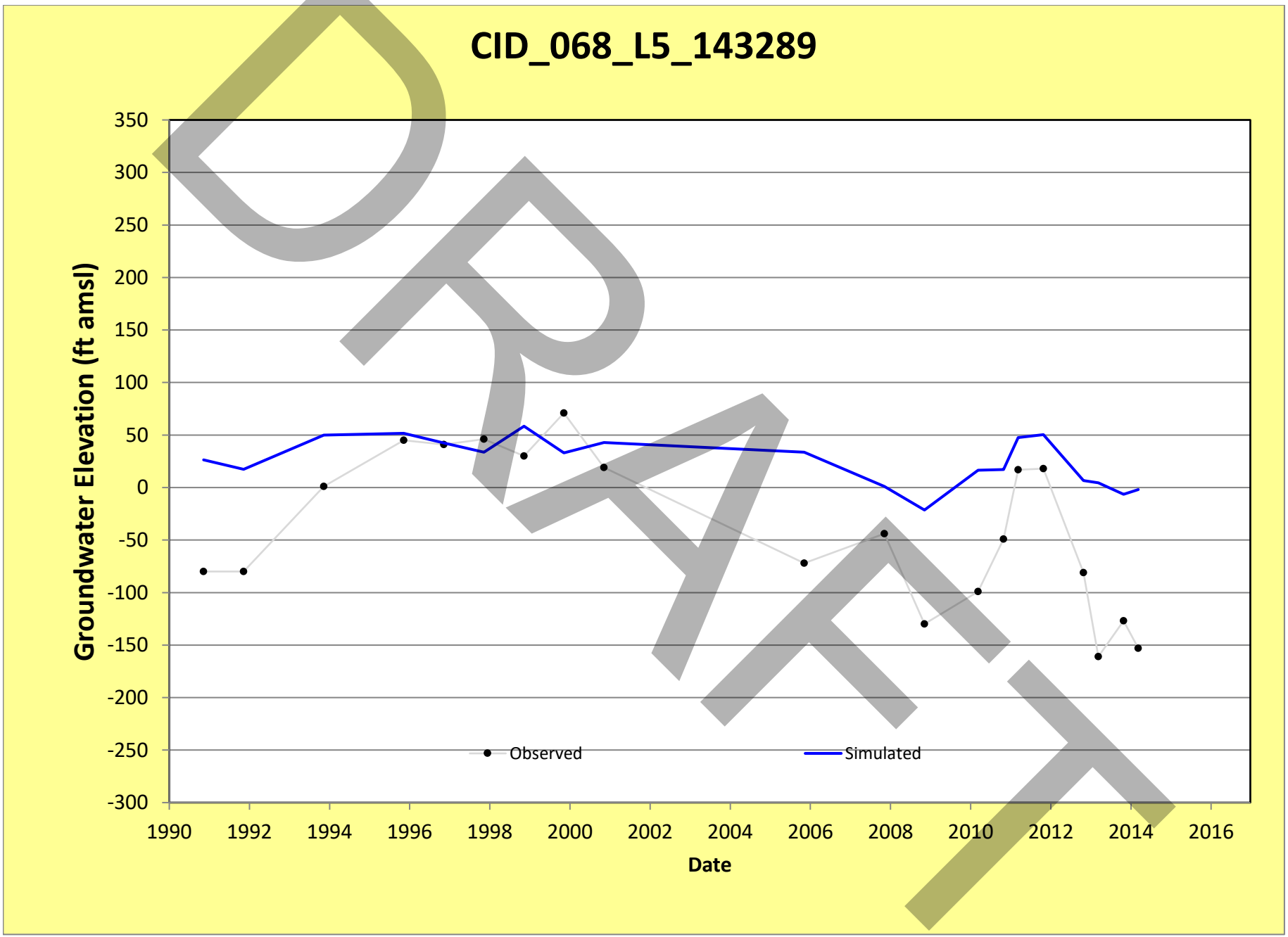
CID_068_L5_143289
Groundwater Elevation (ft amsl)
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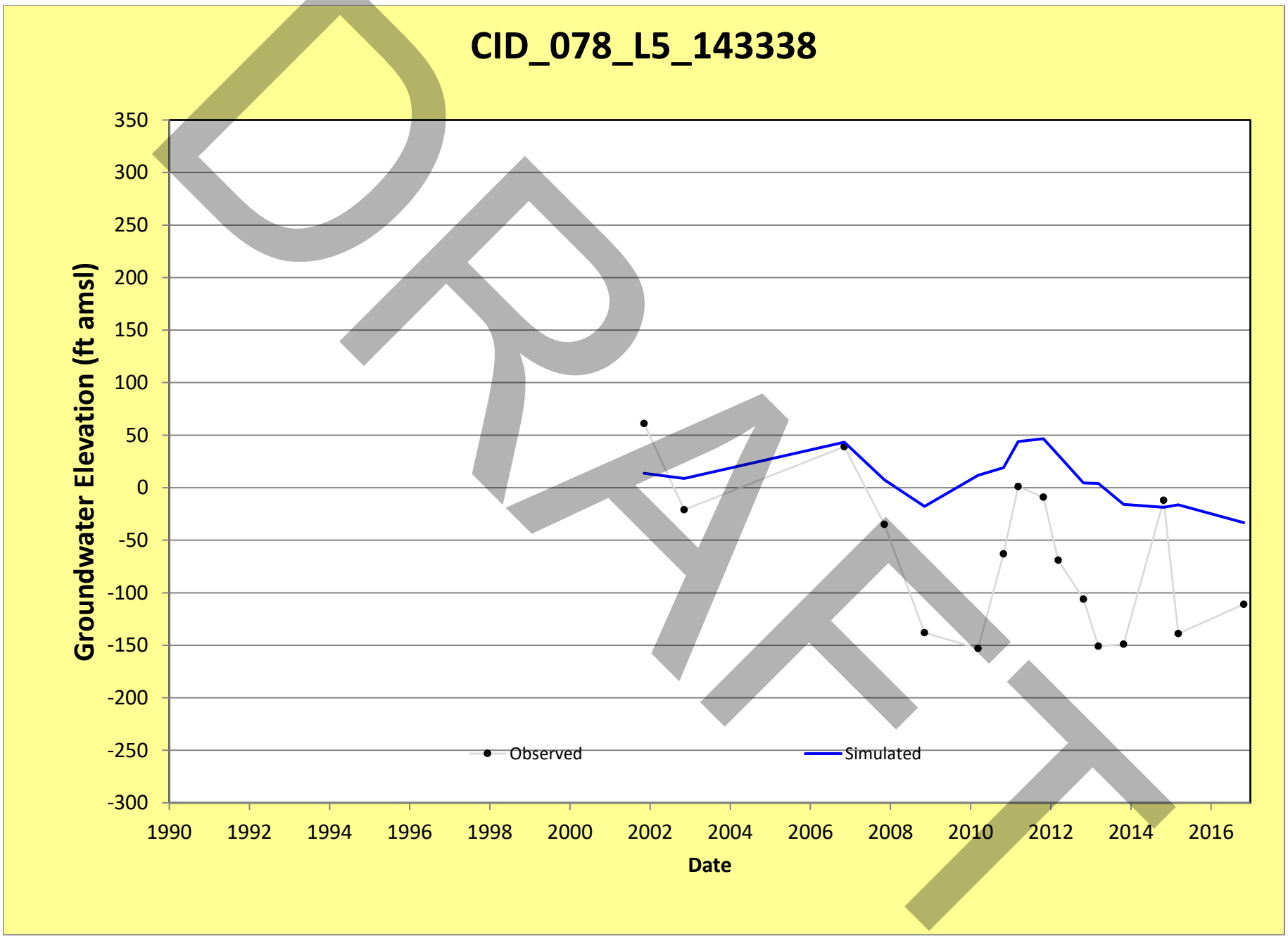
Observed
Simulated
DRAFT


CID_078_L5_143338
Groundwater Elevation (ft amsl)
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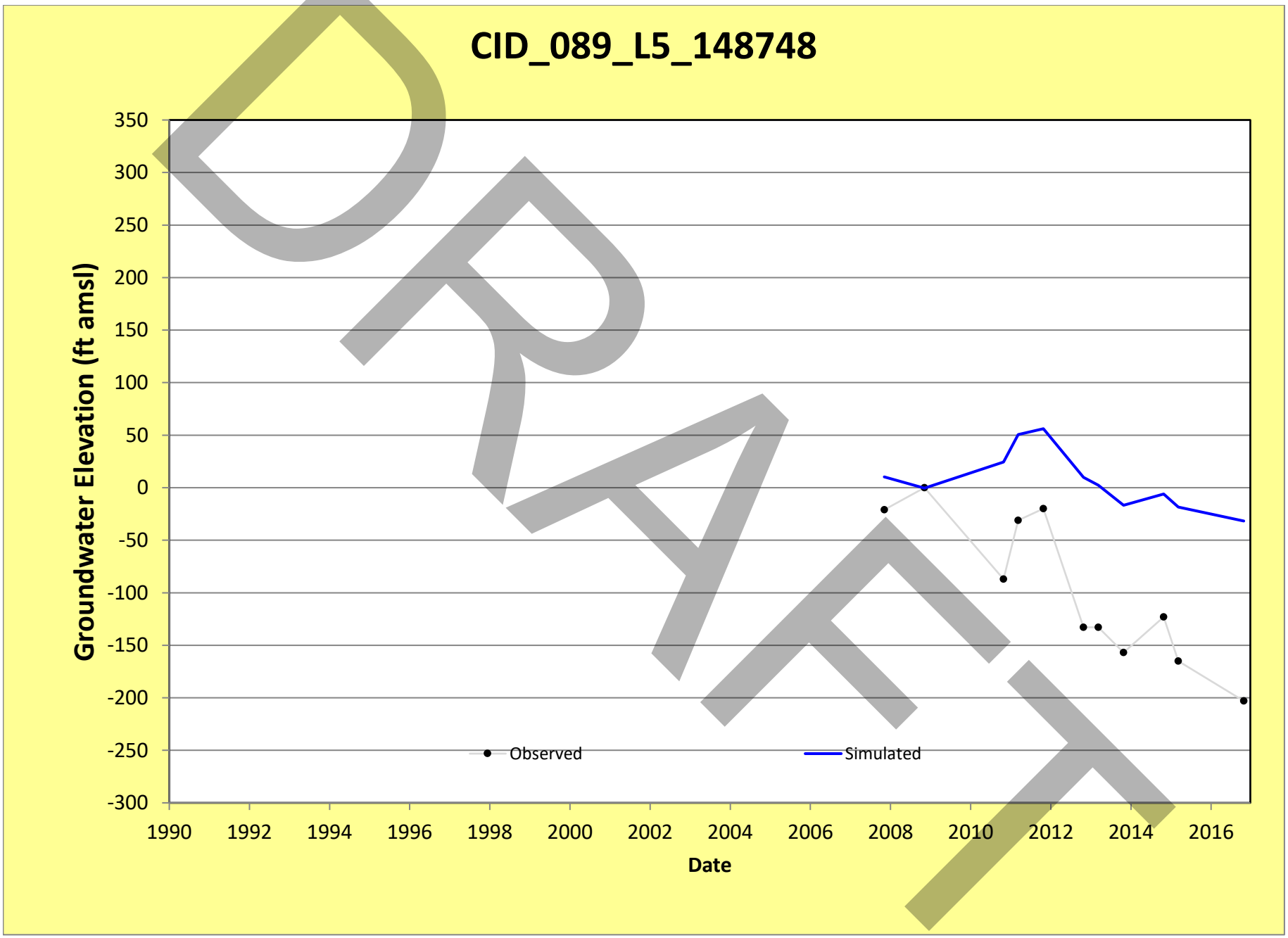
CID_089_L5_148748
Groundwater Elevation (ft amsl)
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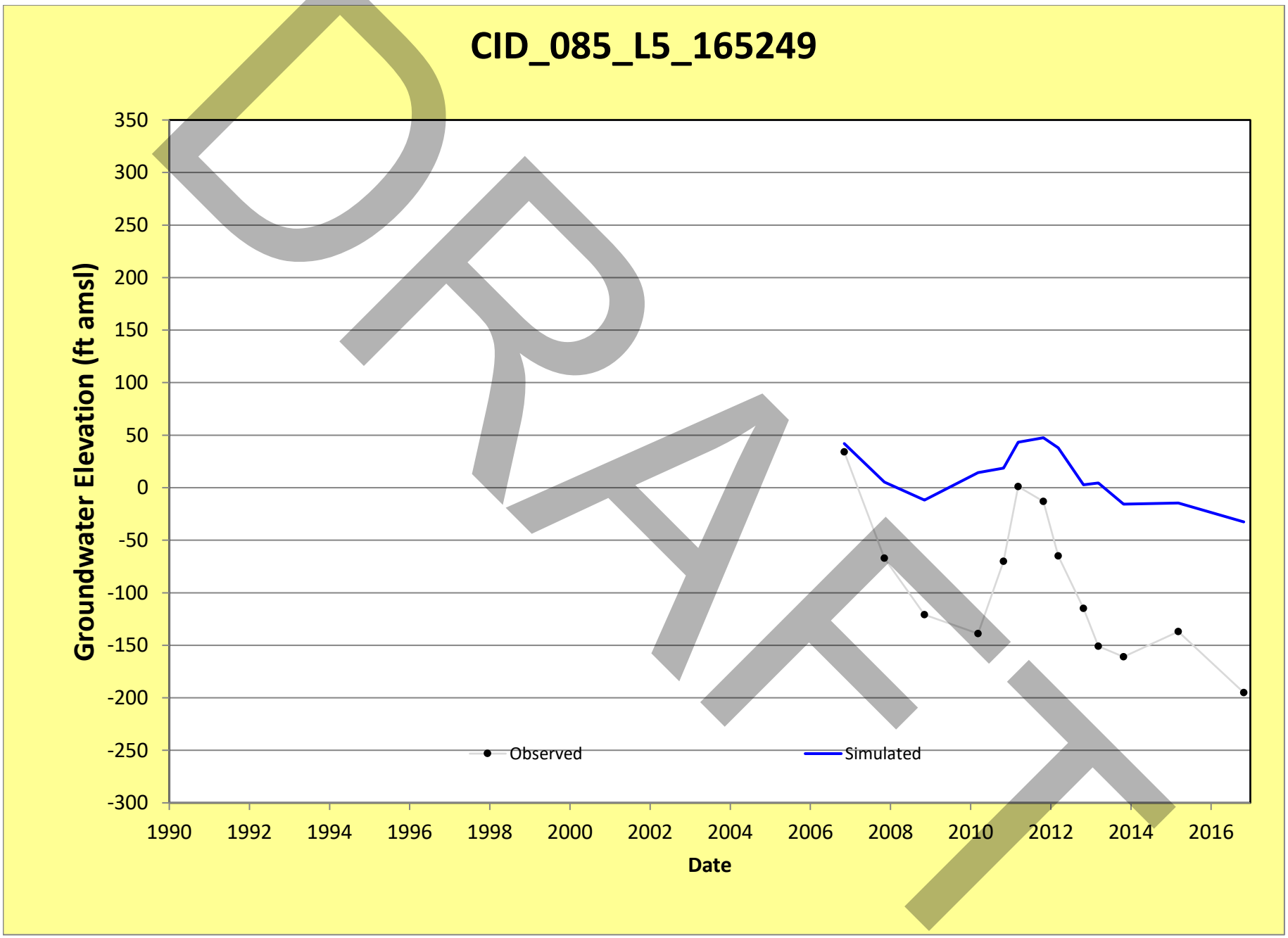
Observed
Simulated
DRAFT


CID_085_L5_165249
Groundwater Elevation (ft amsl)
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Simulated

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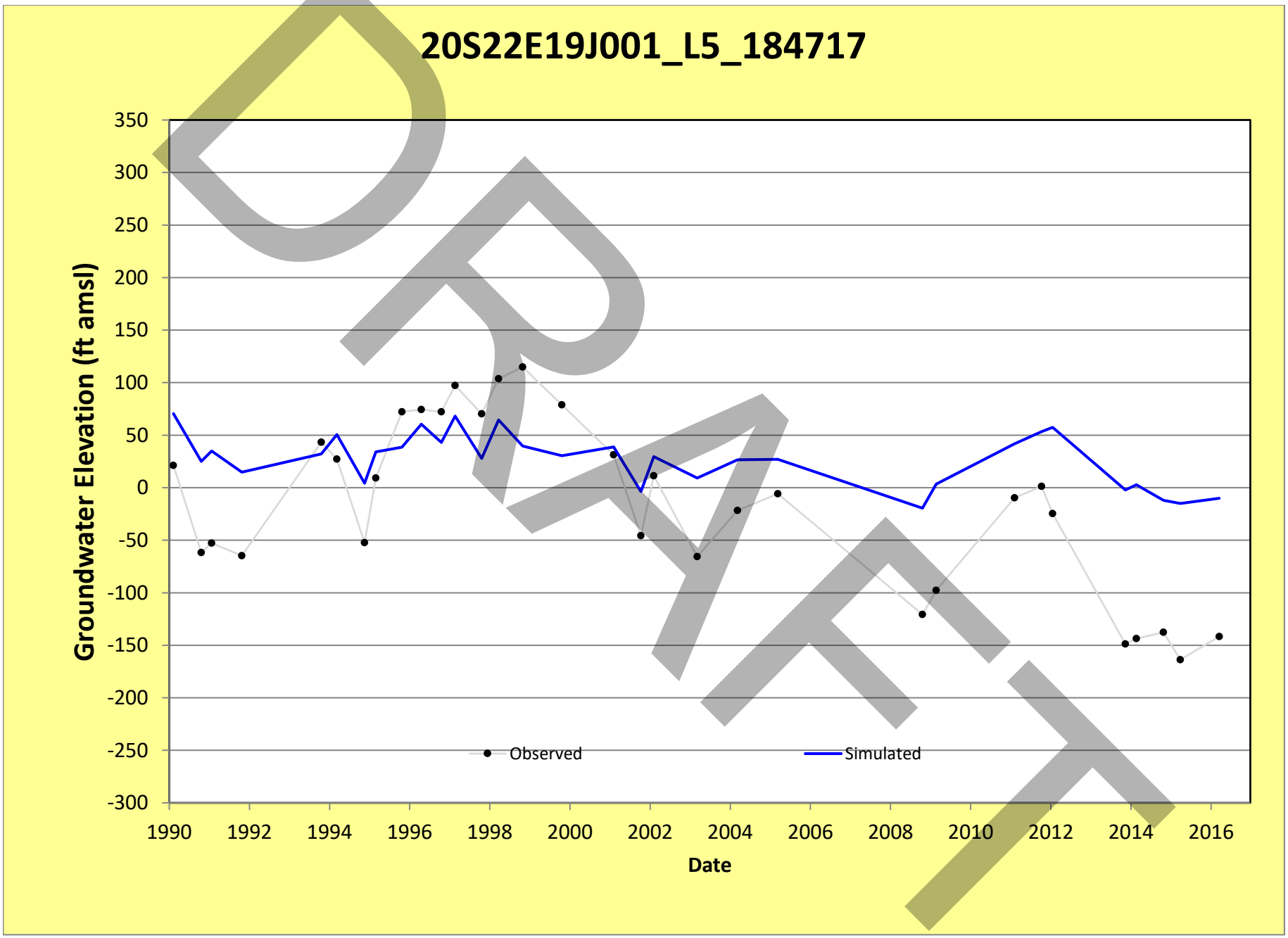
20S22E19J001_L5_184717
Groundwater Elevation (ft amsl)
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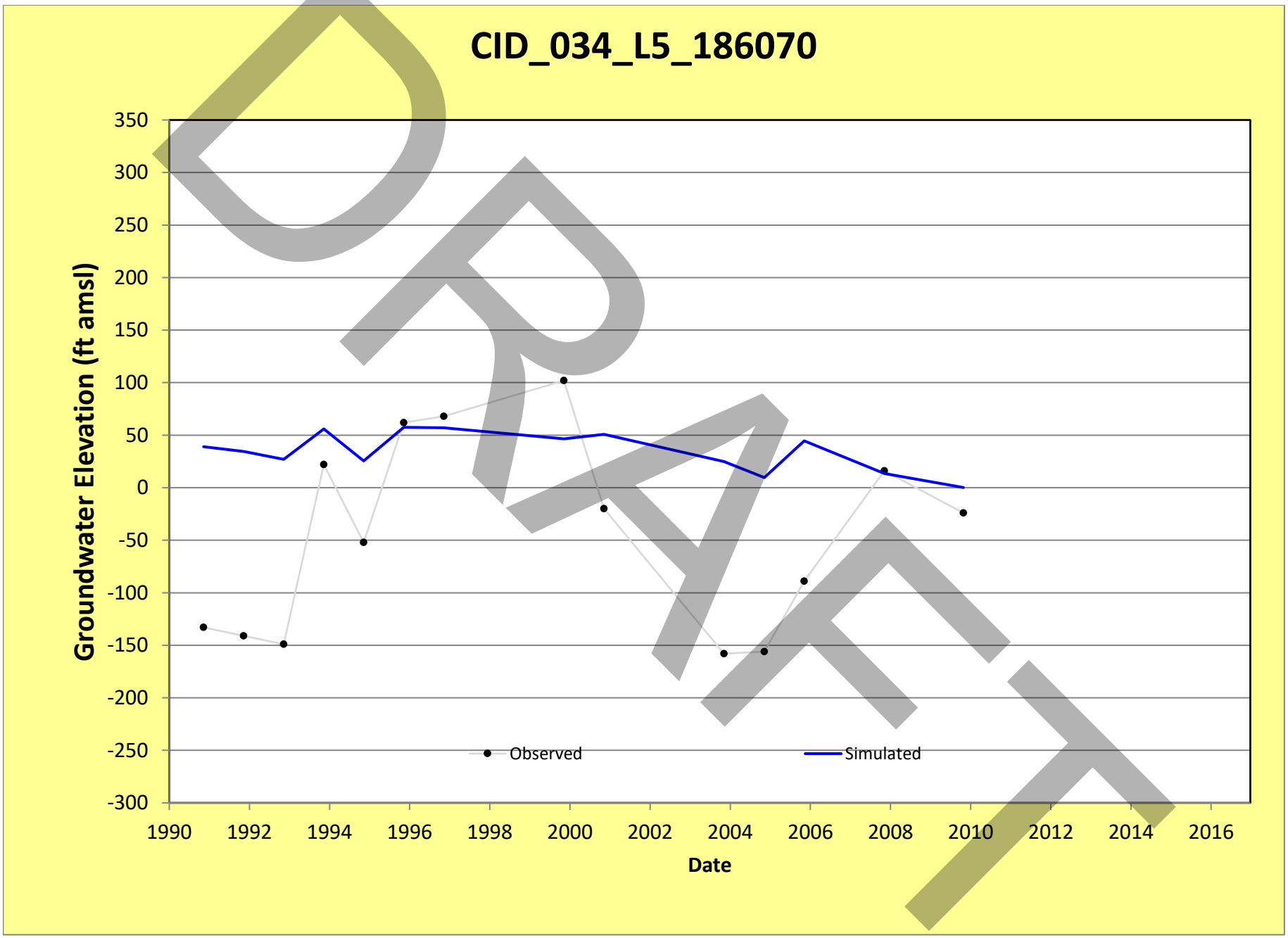
Observed
Simulated
DRAFT


CID_034_L5_186070
Groundwater Elevation (ft amsl)
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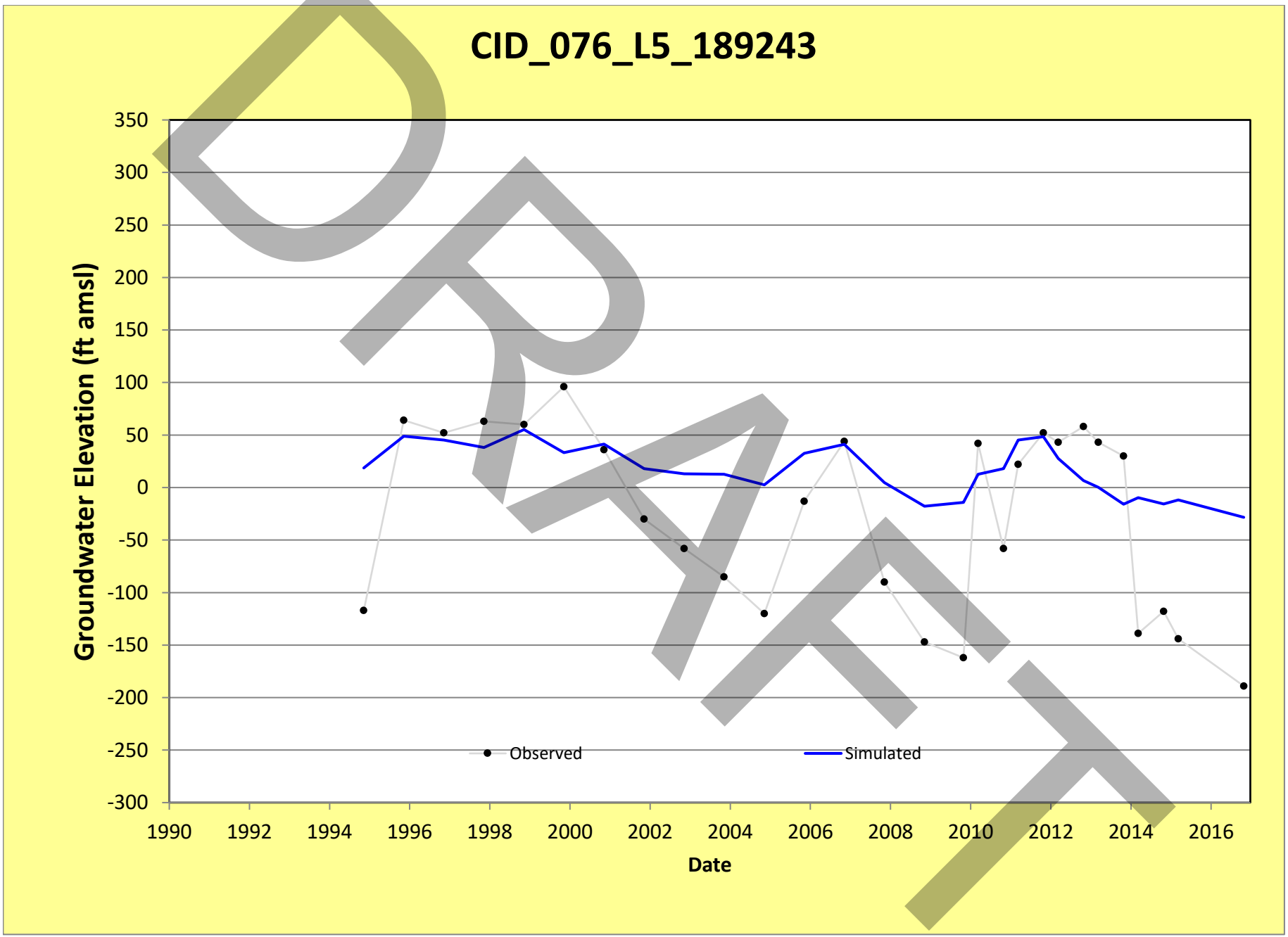
Observed
Simulated
DRAFT


CID_076_L5_189243
Groundwater Elevation (ft amsl)
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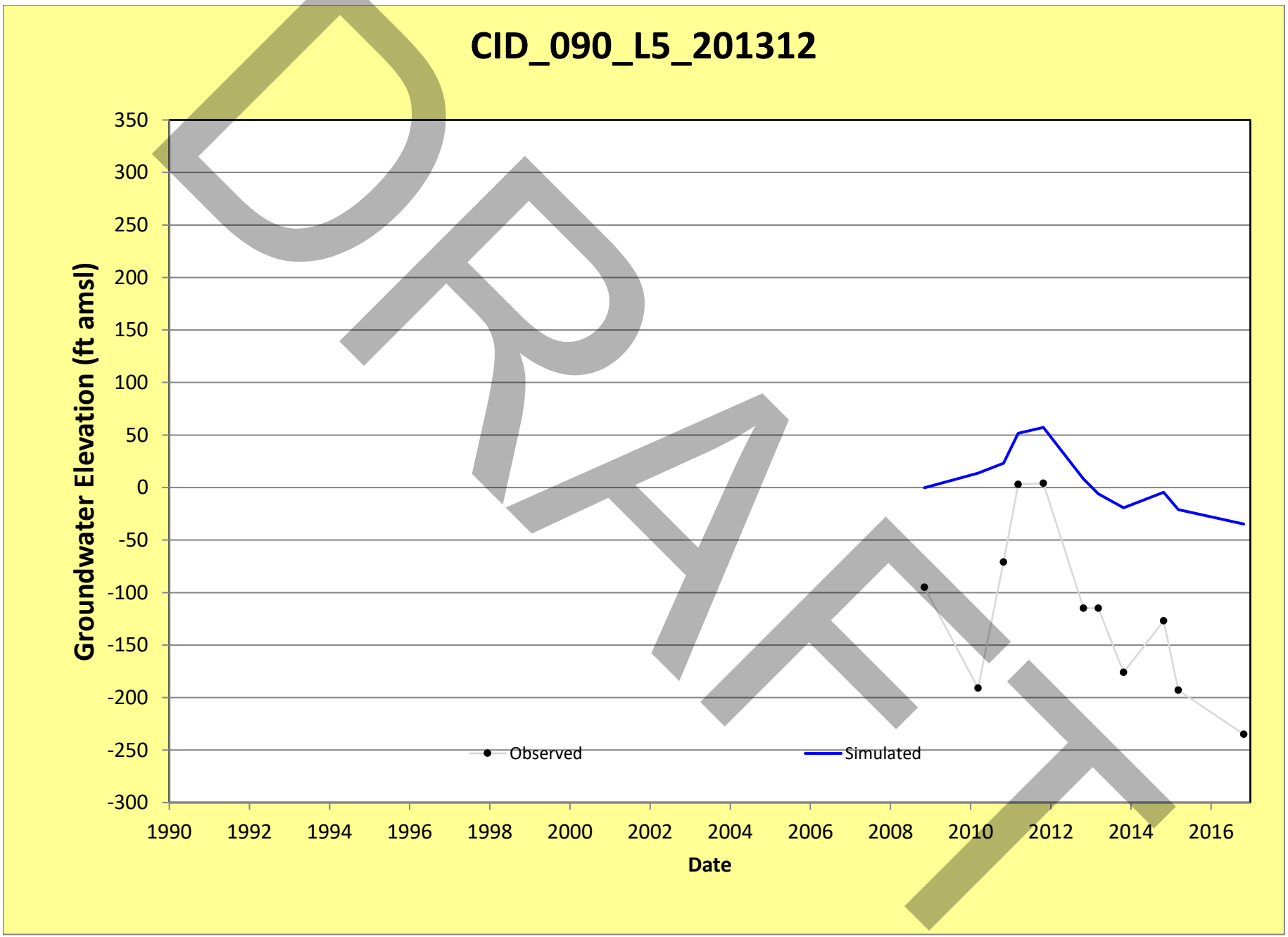
Date
Observed
Simulated
DRAFT


CID_090_L5_201312
Groundwater Elevation (ft amsl)
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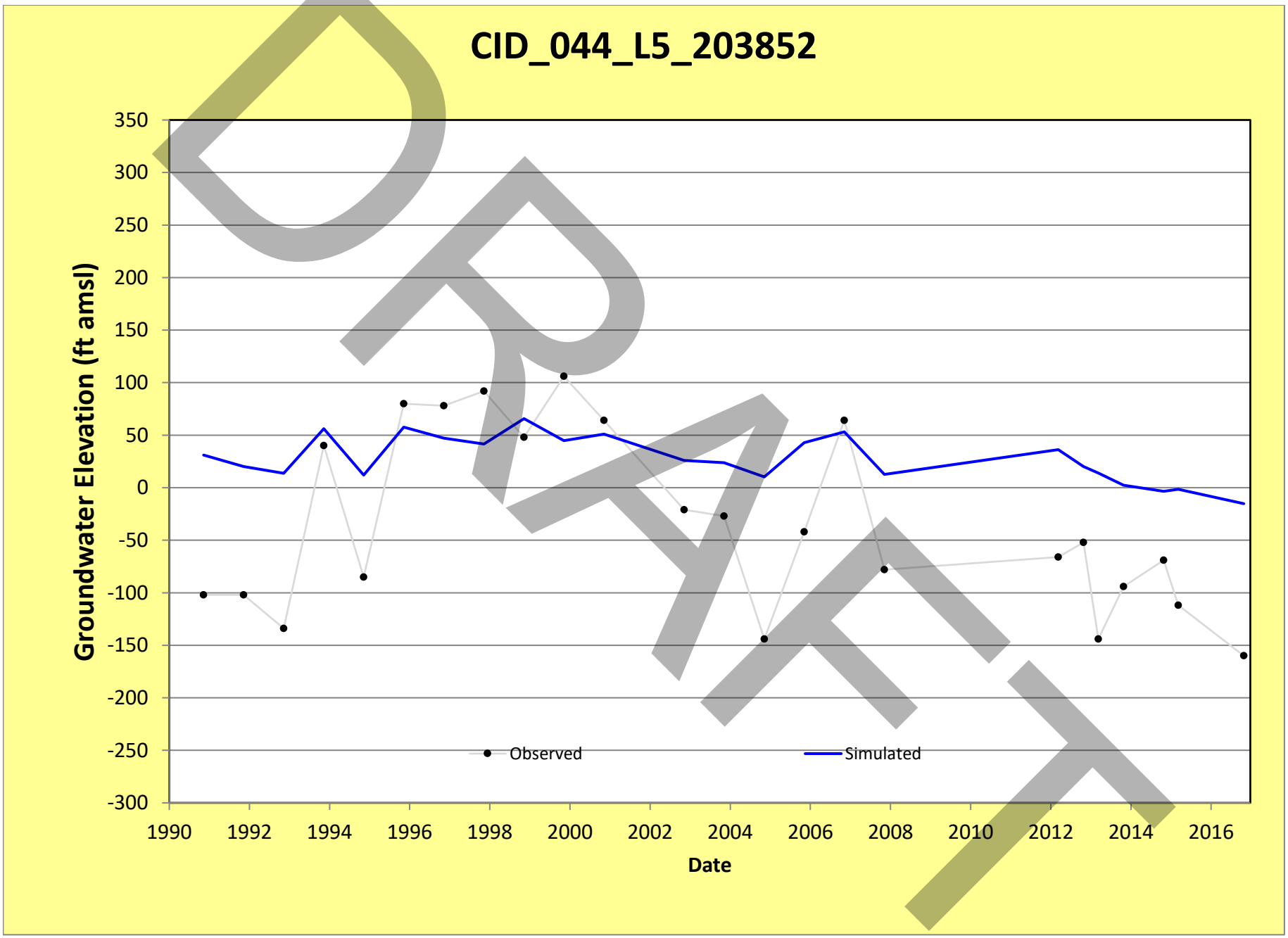
Date
Observed
Simulated
DRAFT


CID_044_L5_203852
Groundwater Elevation (ft amsl)
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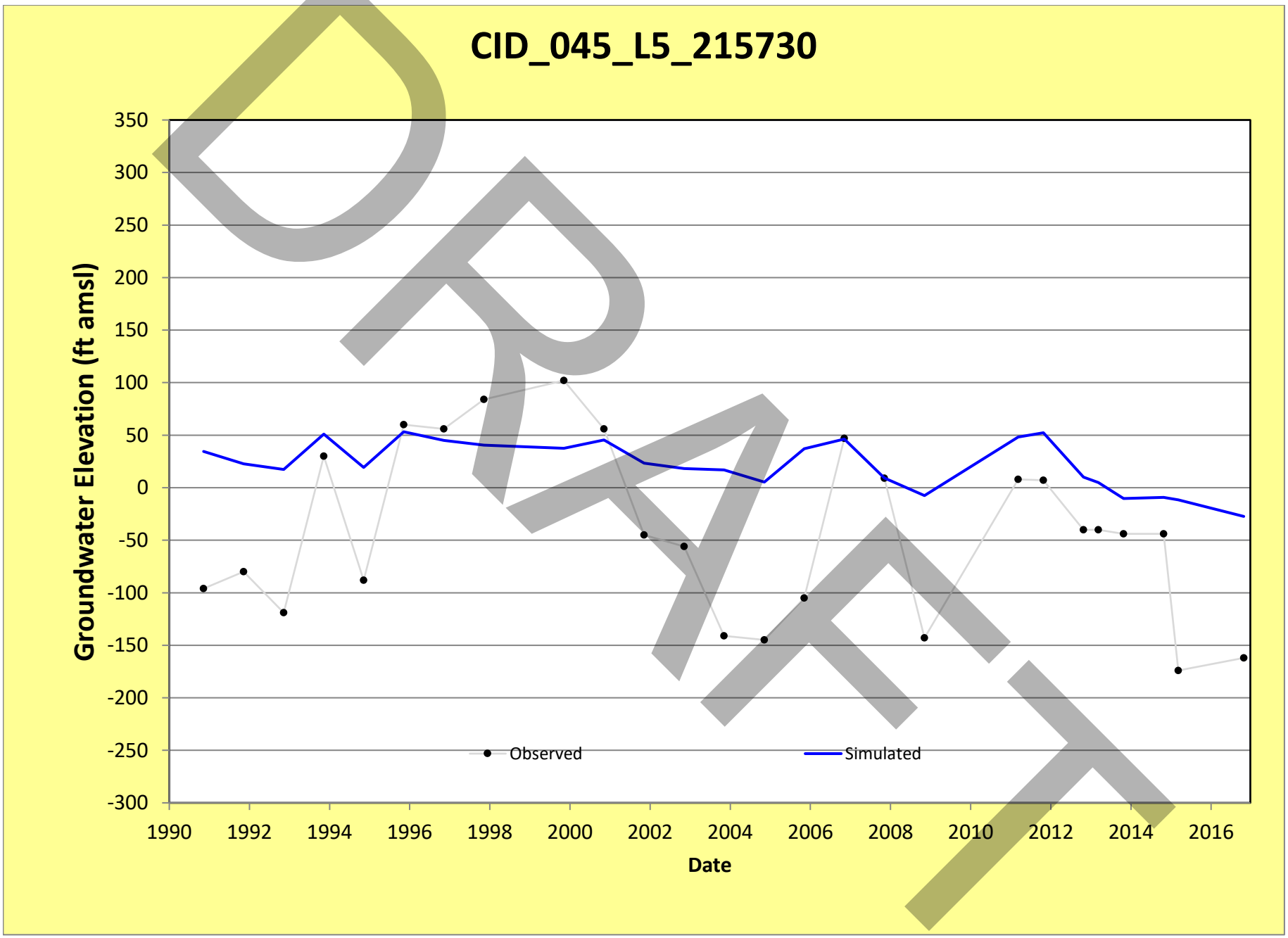
Date
Observed
Simulated
DRAFT


CID_045_L5_215730
Groundwater Elevation (ft amsl)
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-200
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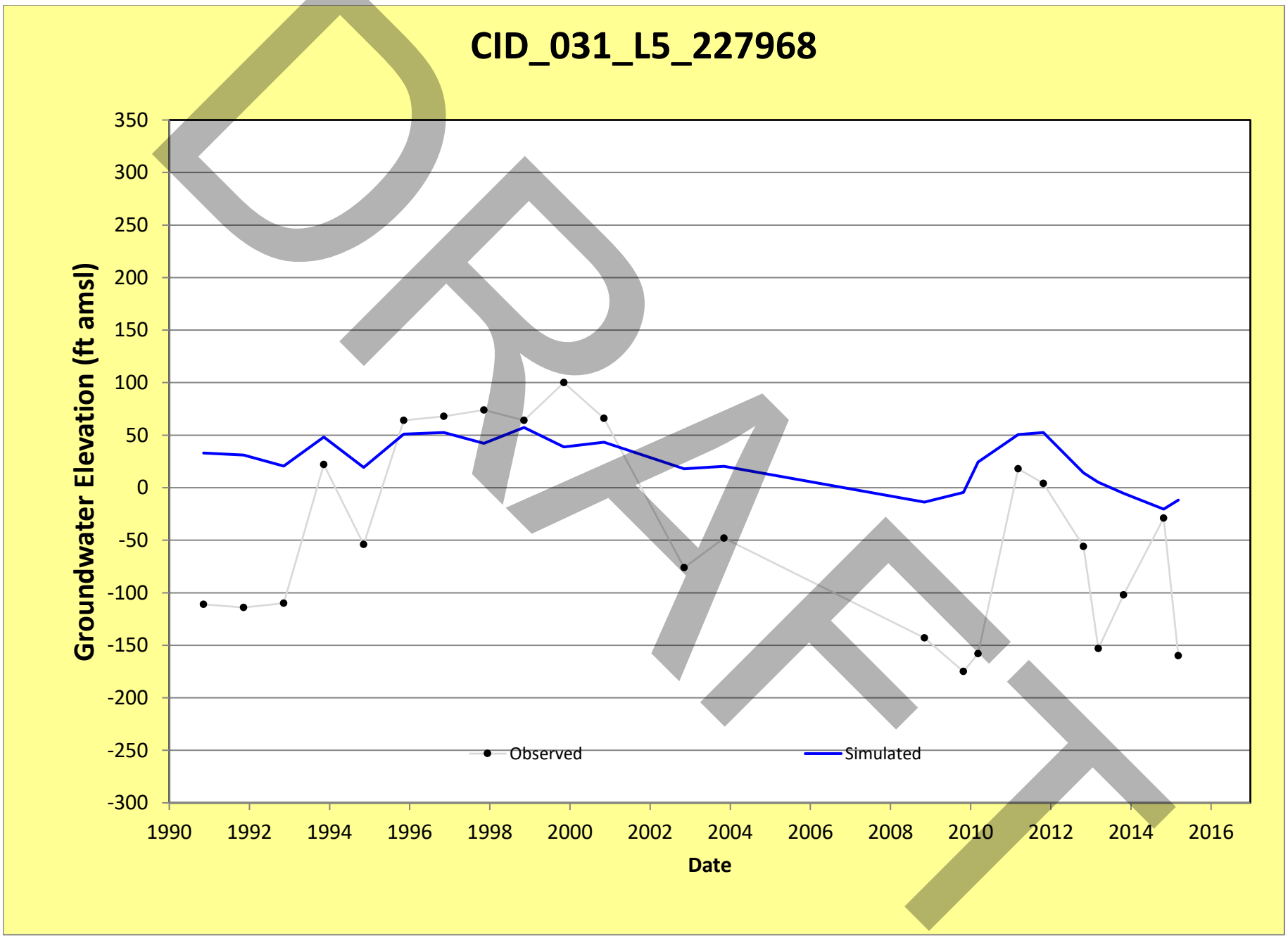
Observed
Simulated
DRAFT


CID_031_L5_227968
Groundwater Elevation (ft amsl)
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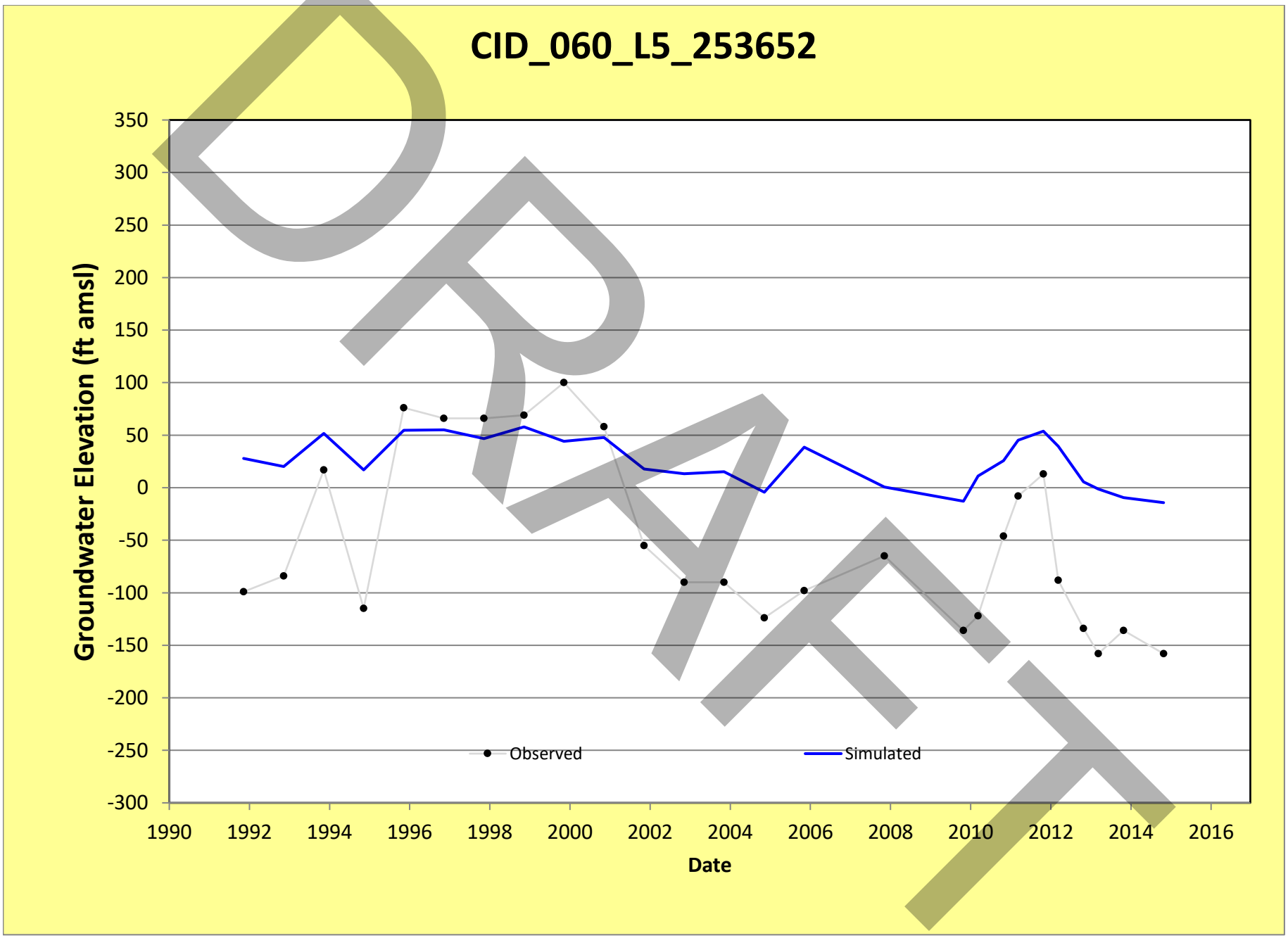
Observed
Simulated
DRAFT


CID_060_L5_253652
Groundwater Elevation (ft amsl)
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100
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-100
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-200
-250
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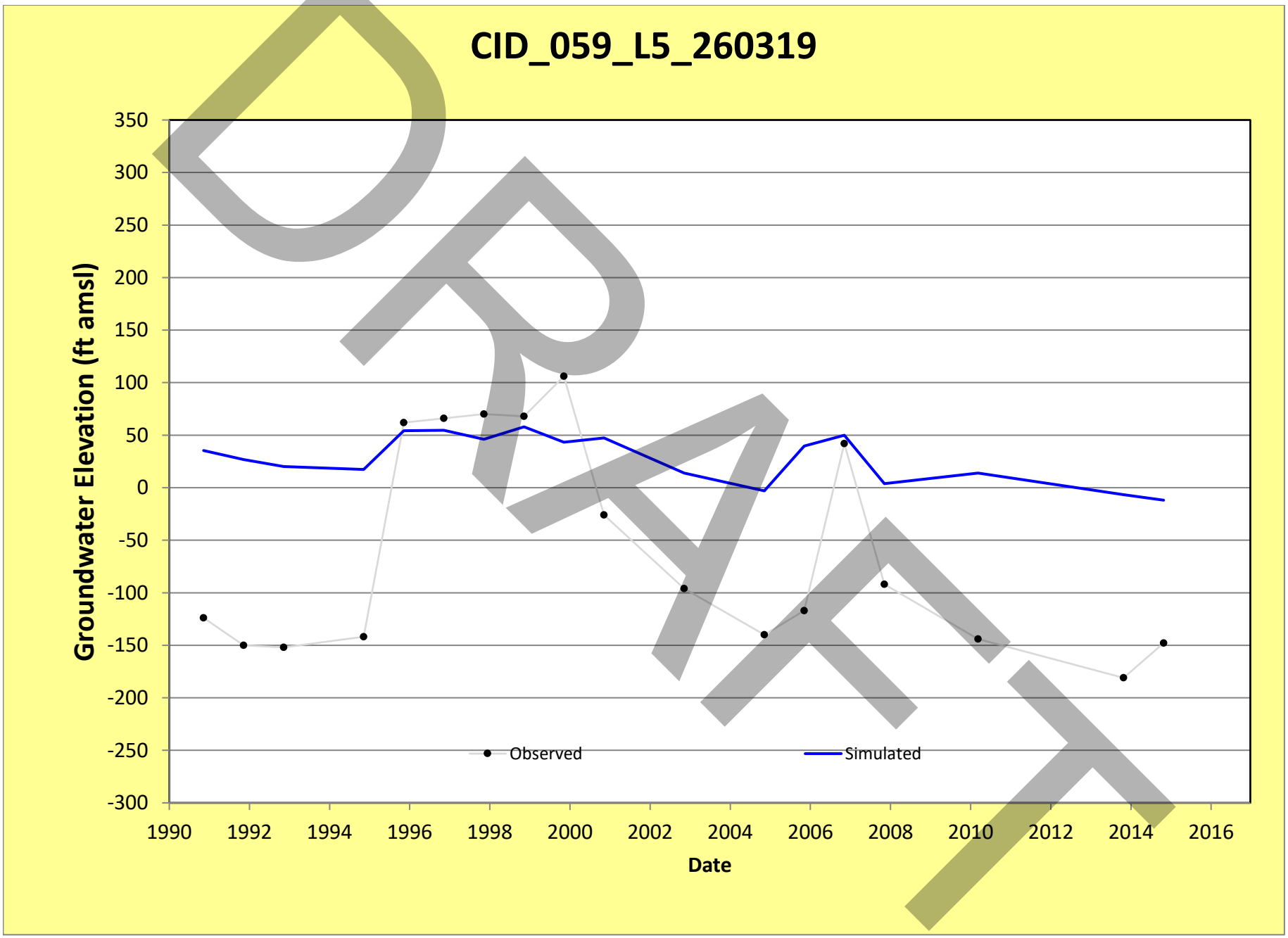
Date
Observed
Simulated
DRAFT


CID_059_L5_260319
Groundwater Elevation (ft amsl)
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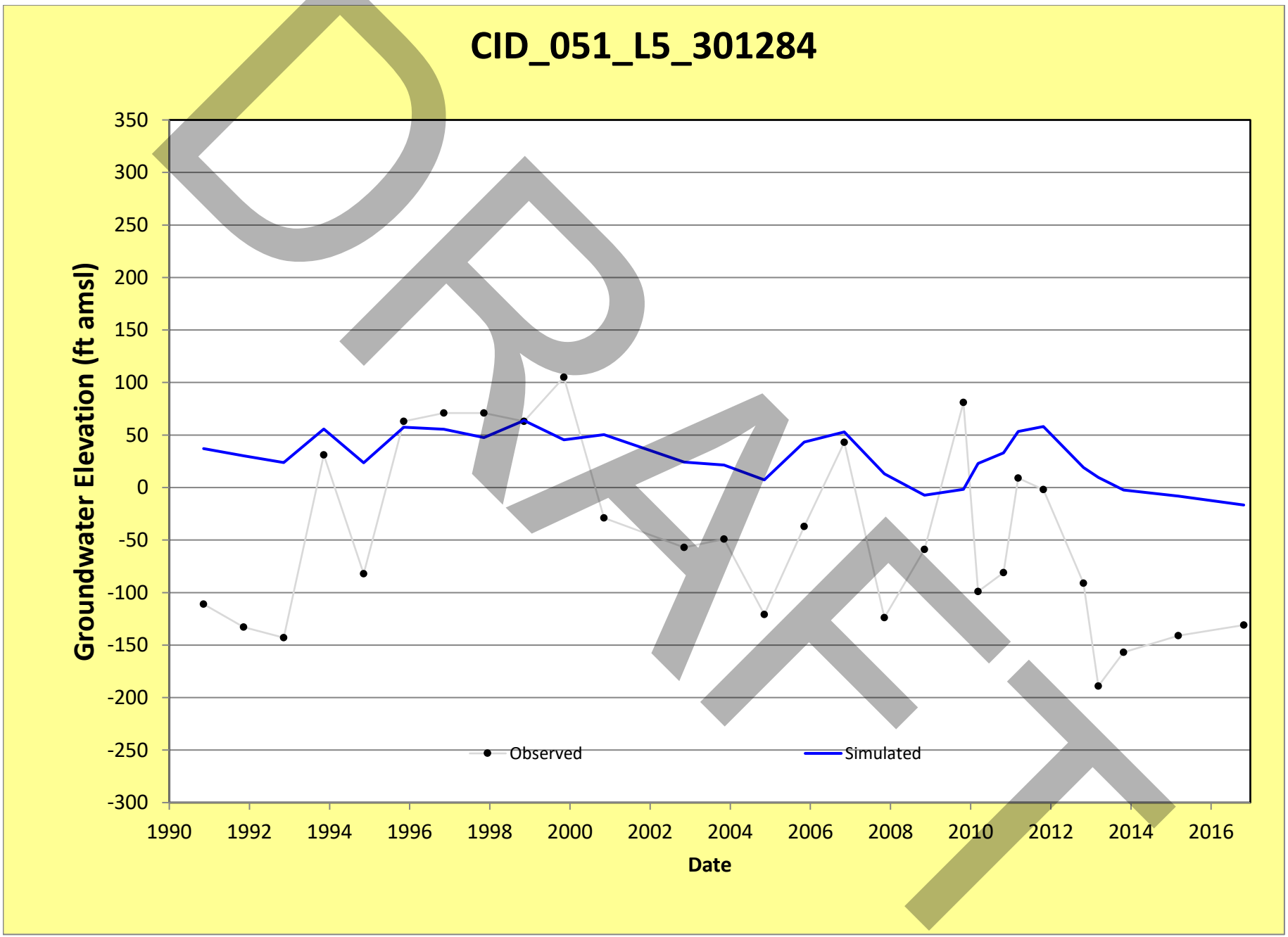
Date
Observed
Simulated
DRAFT


CID_051_L5_301284
Groundwater Elevation (ft amsl)
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300
250
200
150
100
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0
-50
-100
-150
-200
-250
-300
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Date
Observed
Simulated
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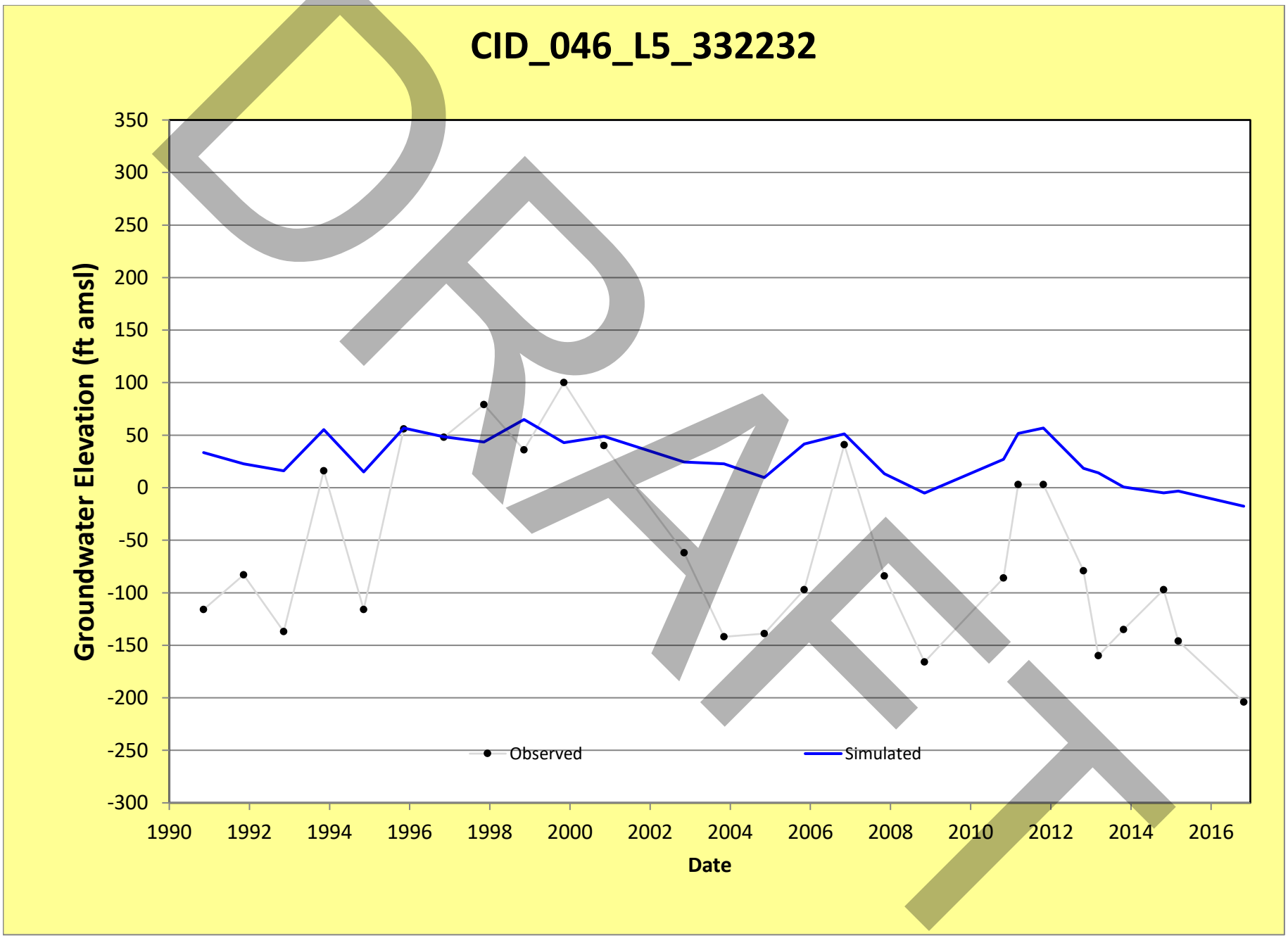
CID_046_L5_332232
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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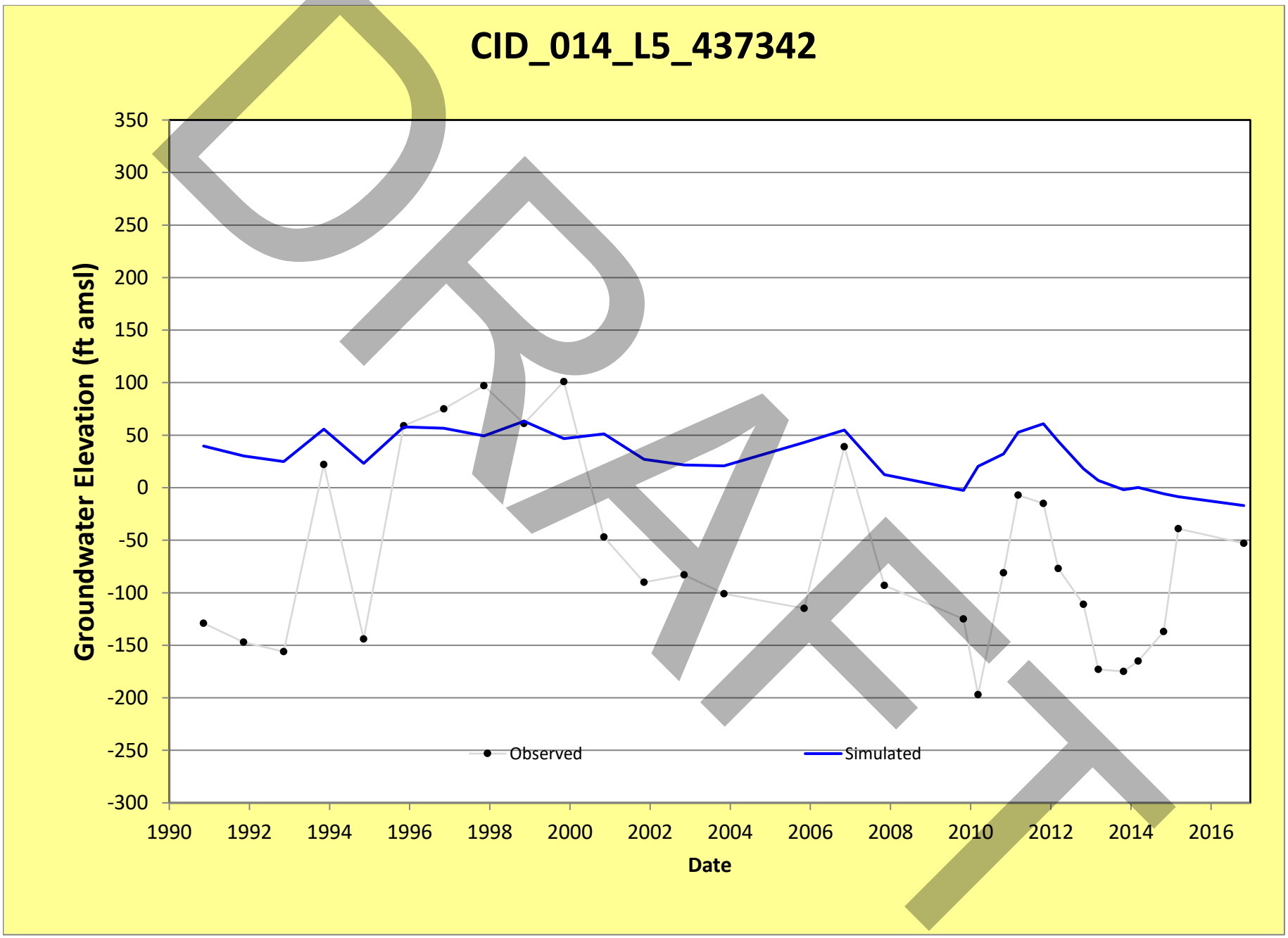
Date
Observed
Simulated
DRAFT


CID_014_L5_437342
Groundwater Elevation (ft amsl)
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300
250
200
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100
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0
-50
-100
-150
-200
-250
-300
1990
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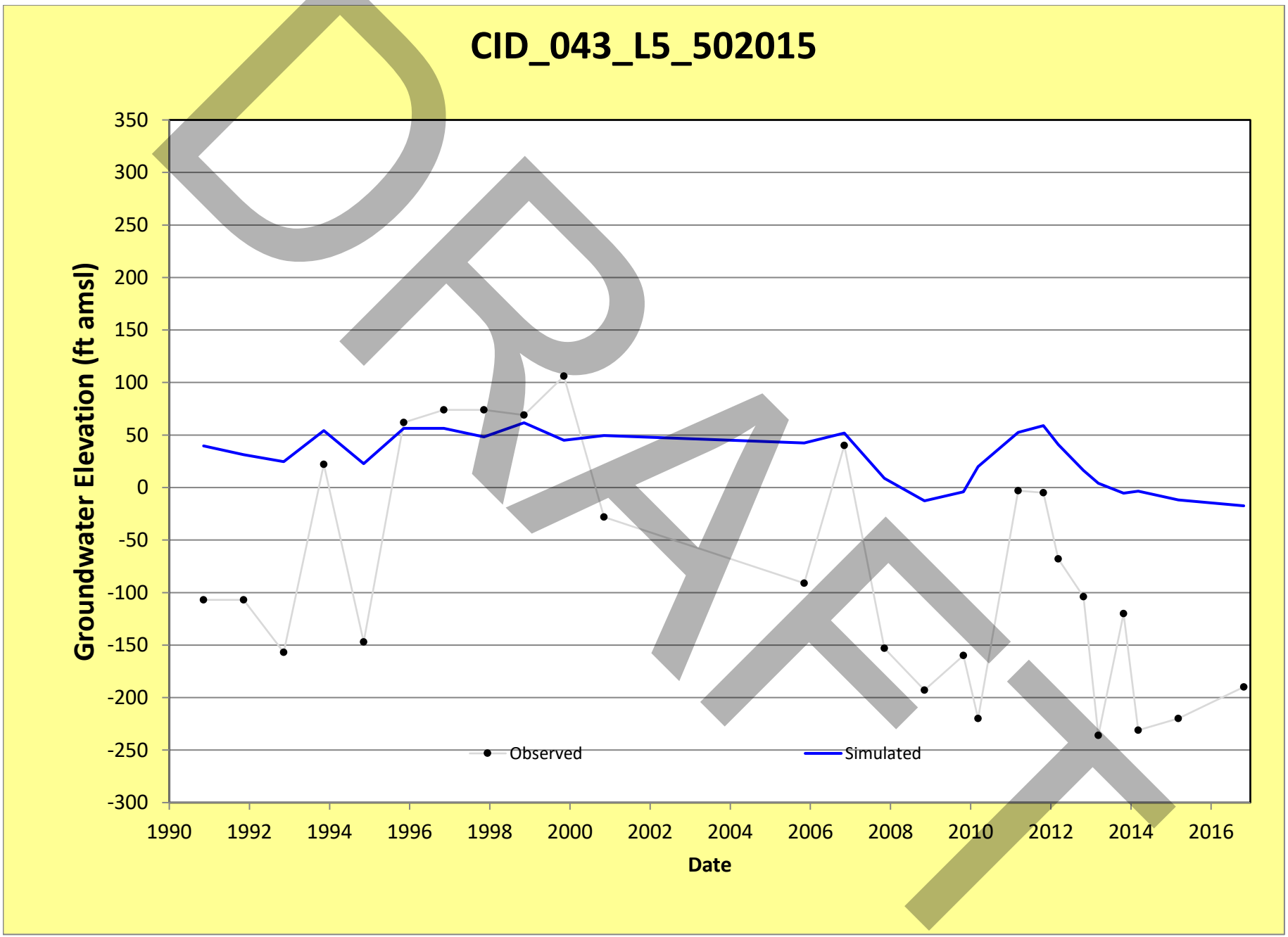
Date
Observed
Simulated
DRAFT


CID_043_L5_502015
Groundwater Elevation (ft amsl)
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200
150
100
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-50
-100
-150
-200
-250
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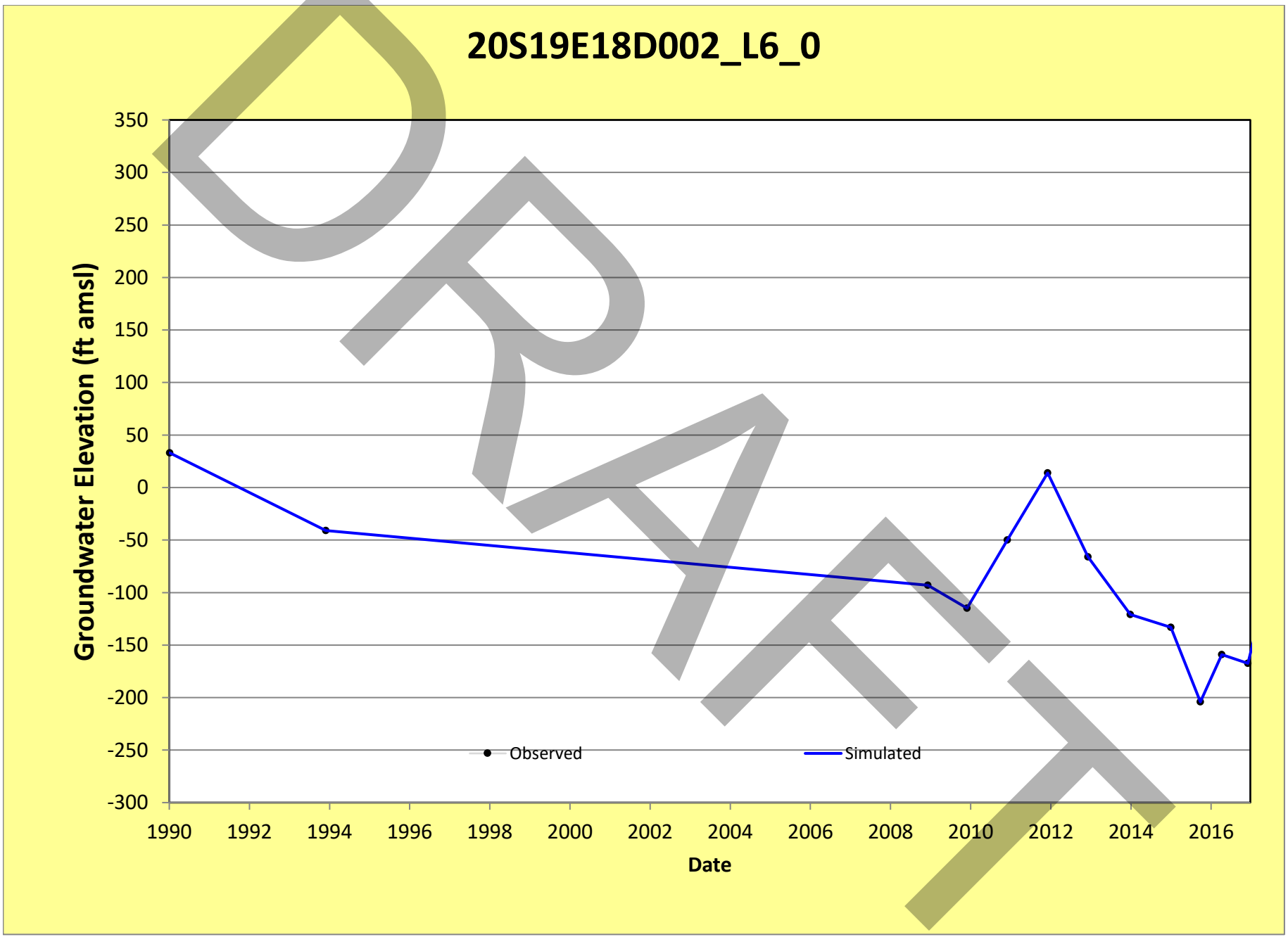
Date
Observed
Simulated
DRAFT


20S19E18D002_L6_0
Groundwater Elevation (ft amsl)
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200
150
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0
-50
-100
-150
-200
-250
-300
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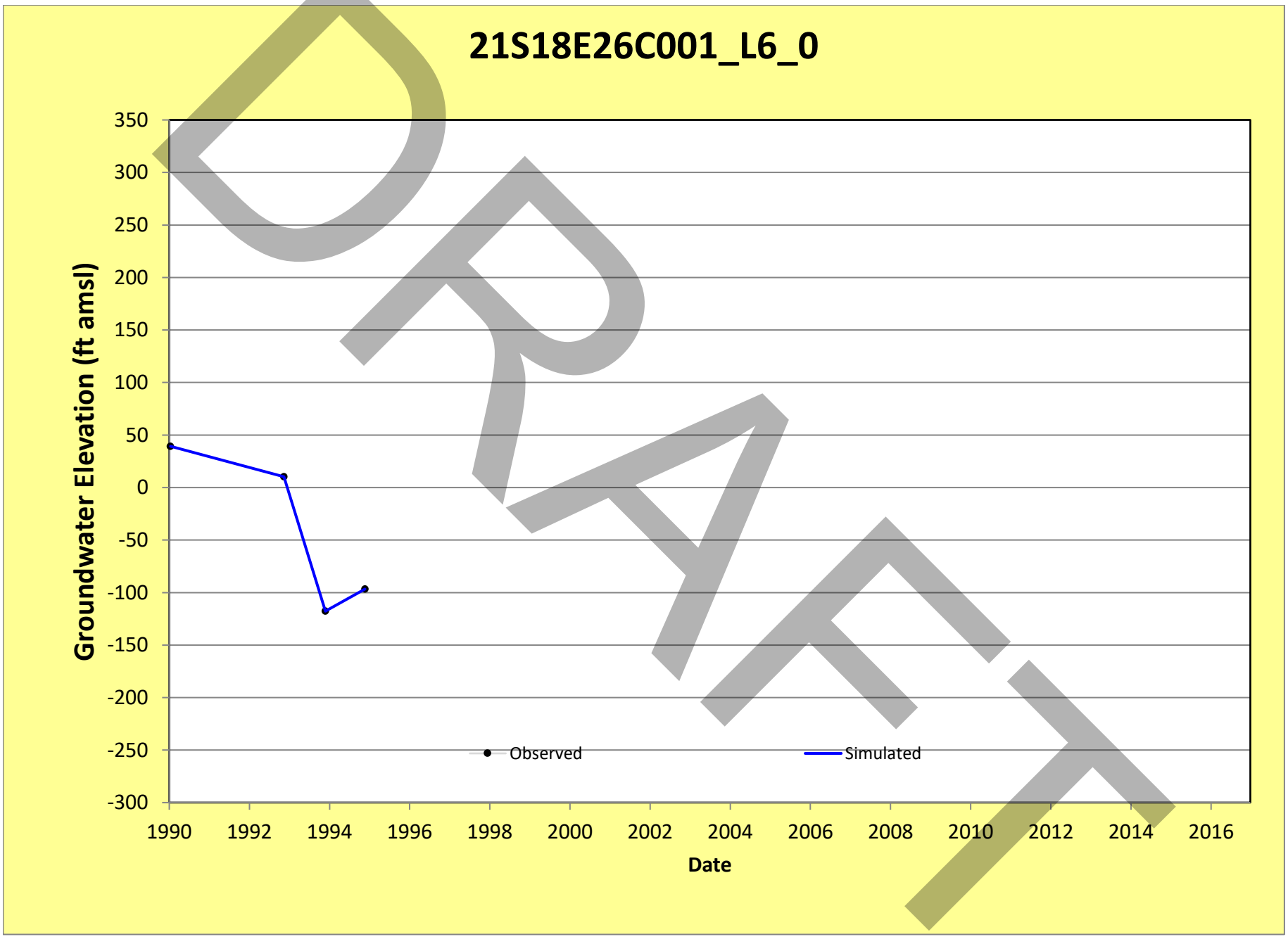
Date
Observed
Simulated
DRAFT


21S18E26C001_L6_0
Groundwater Elevation (ft amsl)
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300
250
200
150
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0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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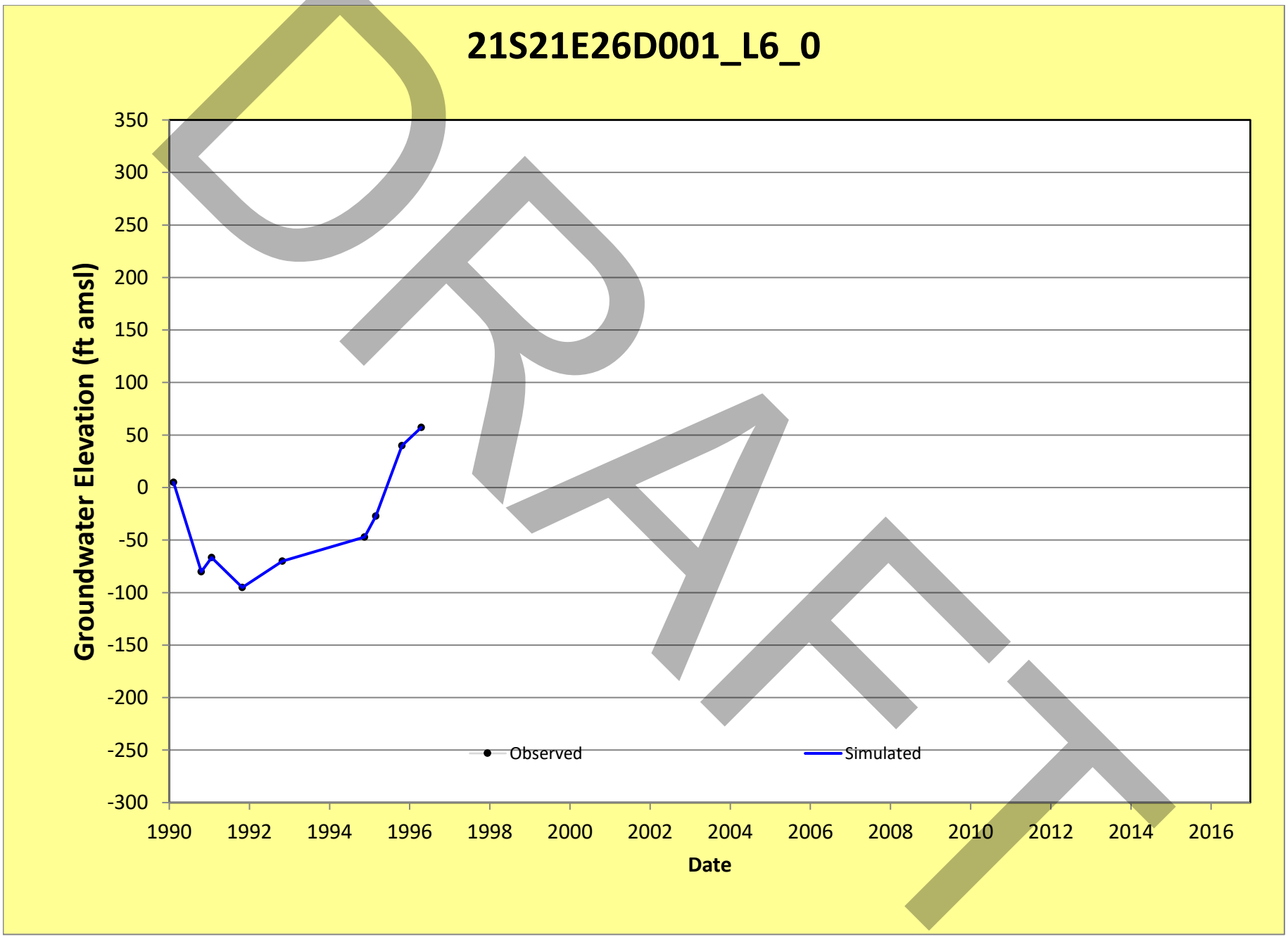
21S21E26D001_L6_0
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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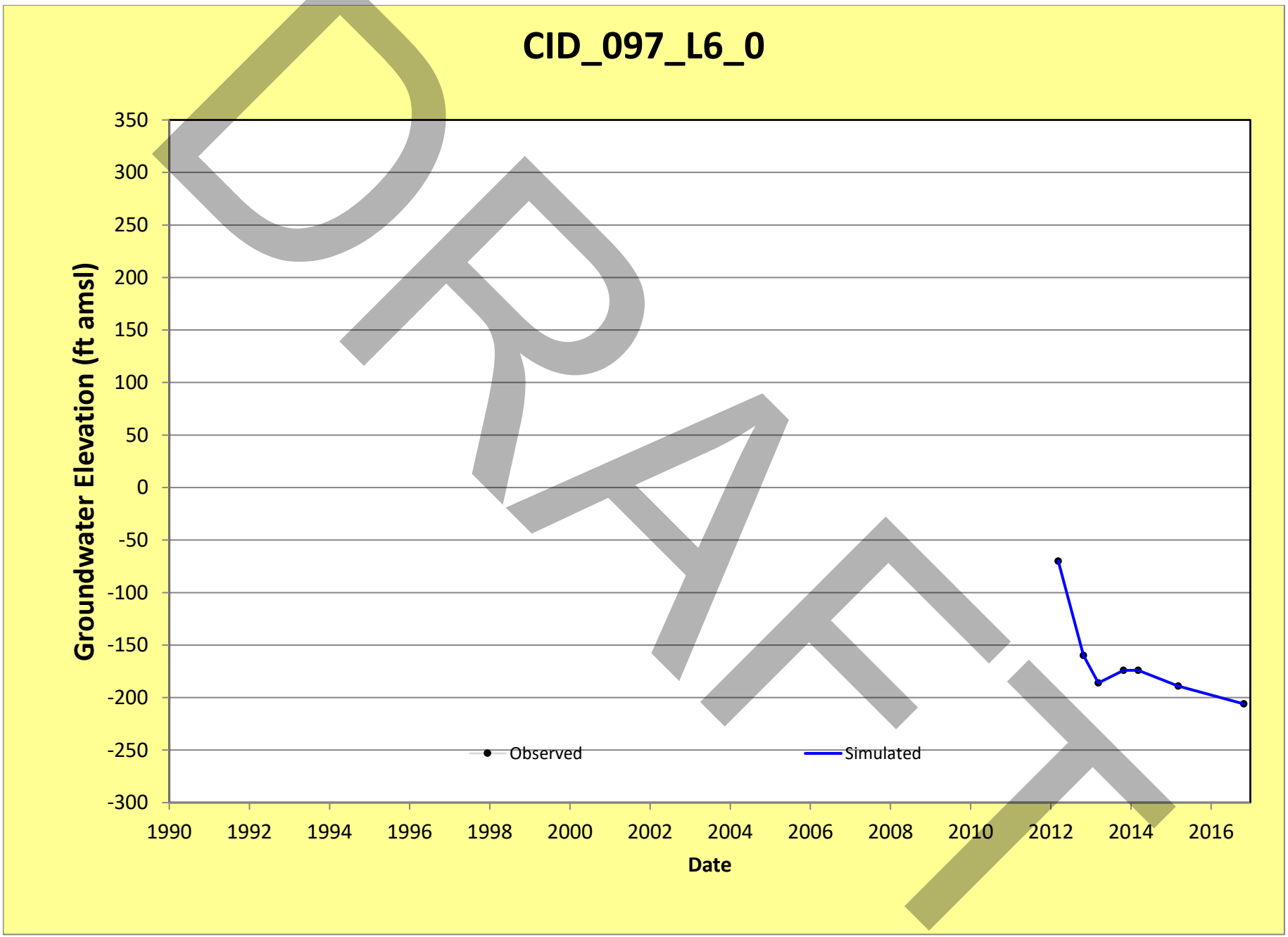
Date
Observed
Simulated
DRAFT


CID_097_L6_0
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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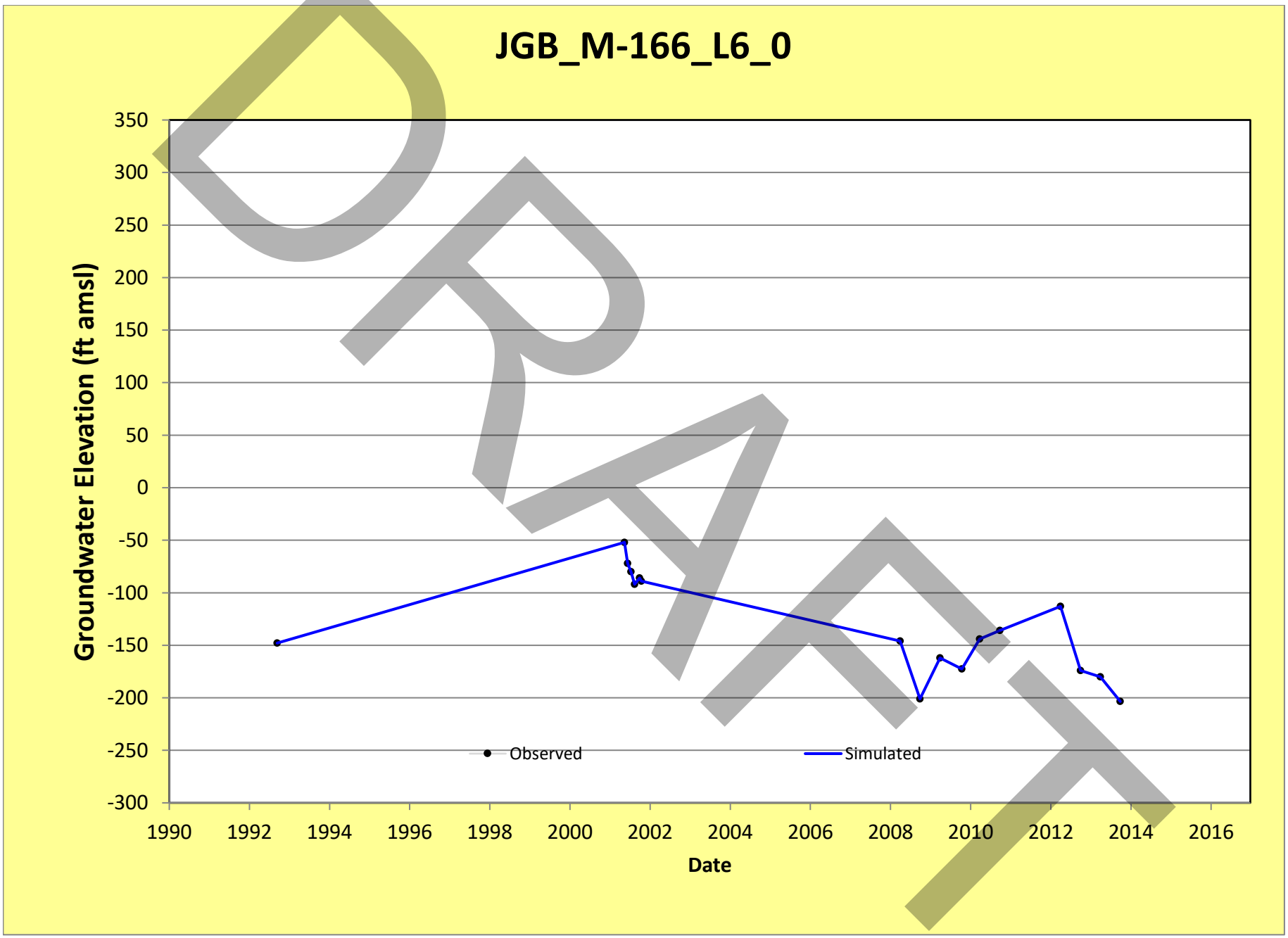
Date
Observed
Simulated
DRAFT


JGB_M-166_L6_0
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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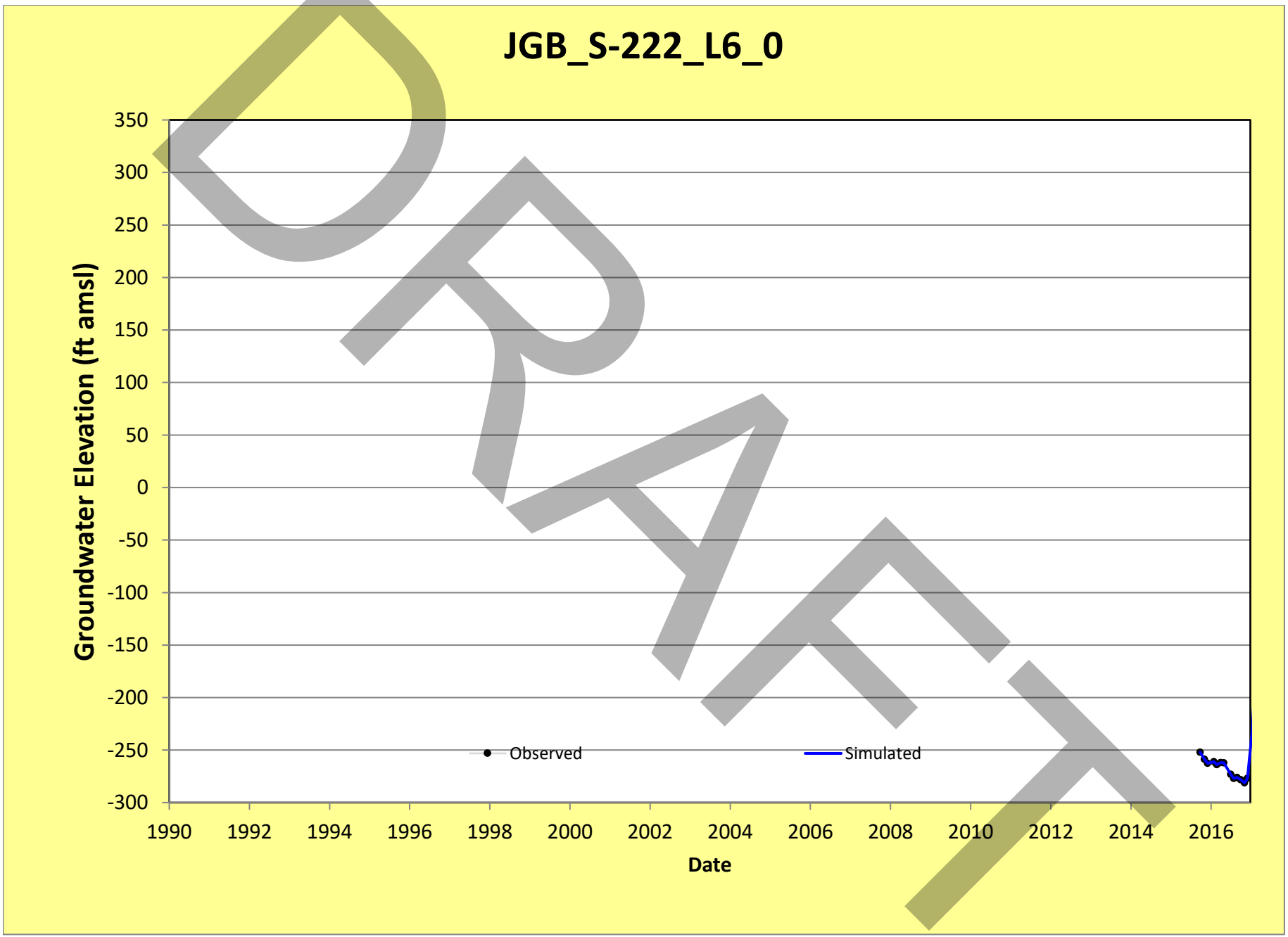
Date
Observed
Simulated
DRAFT


JGB_S-222_L6_0
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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Date
Observed
Simulated

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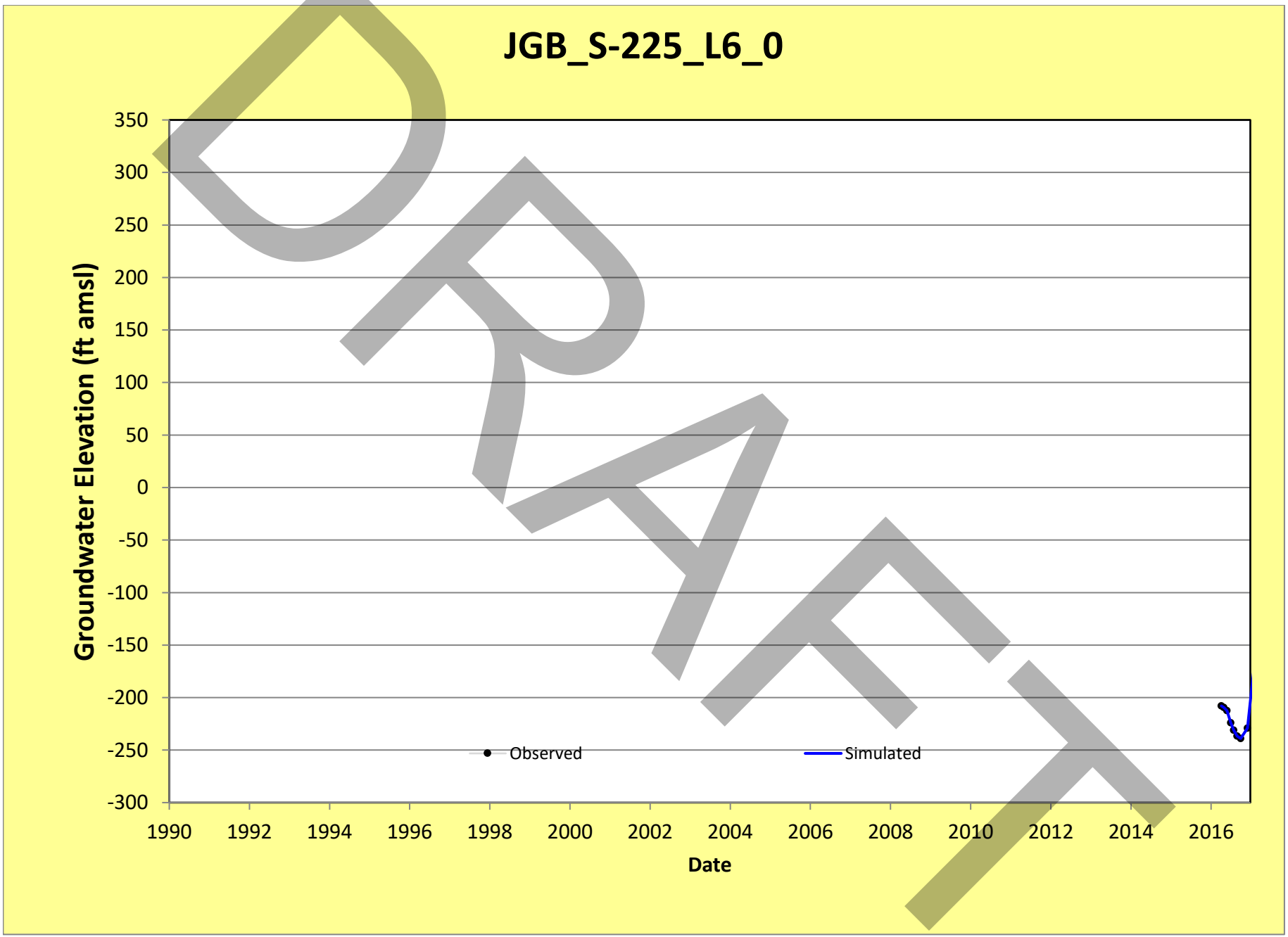
JGB_S-225_L6_0
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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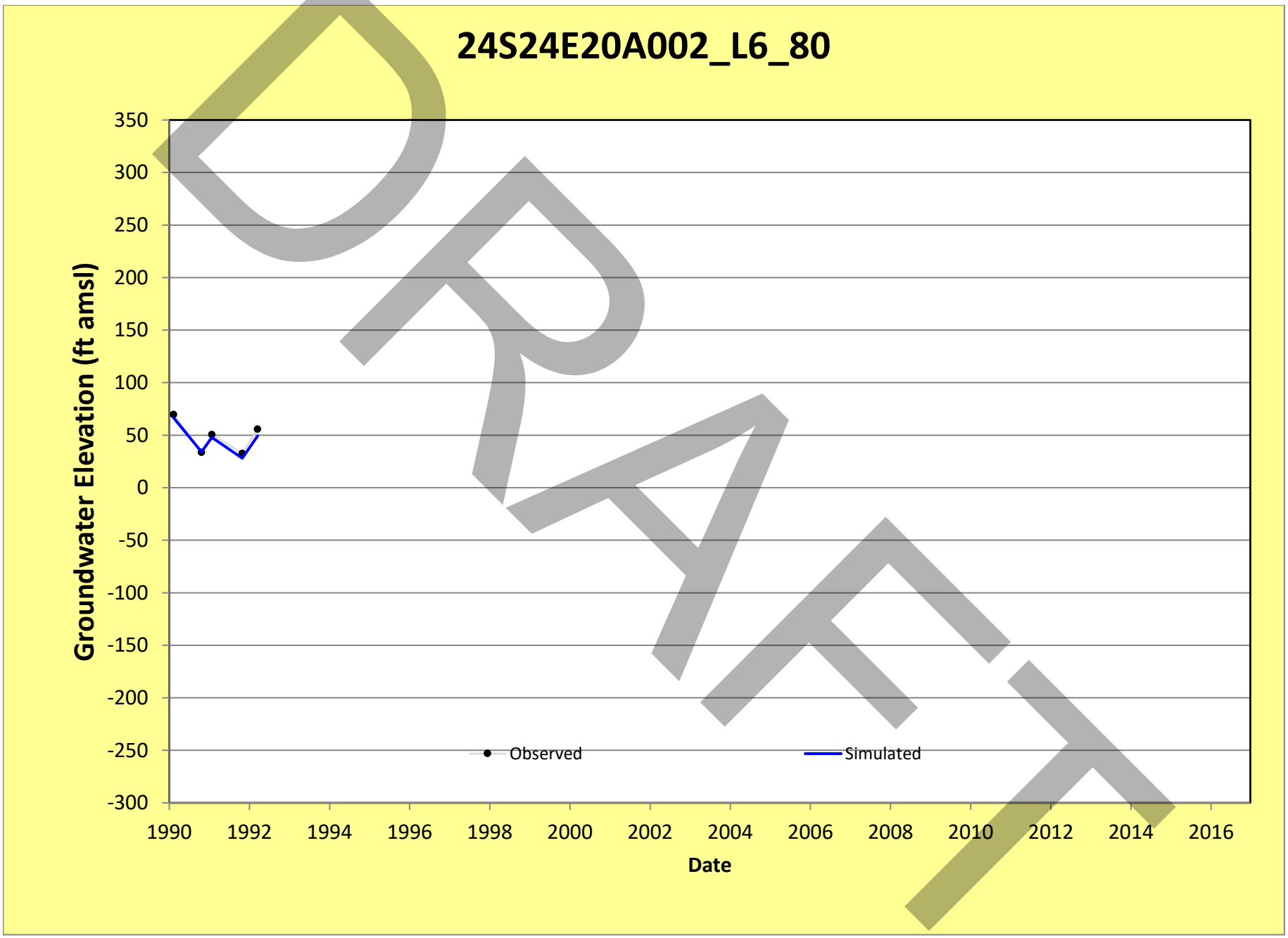
Date
Observed
Simulated
DRAFT


24S24E20A002_L6_80
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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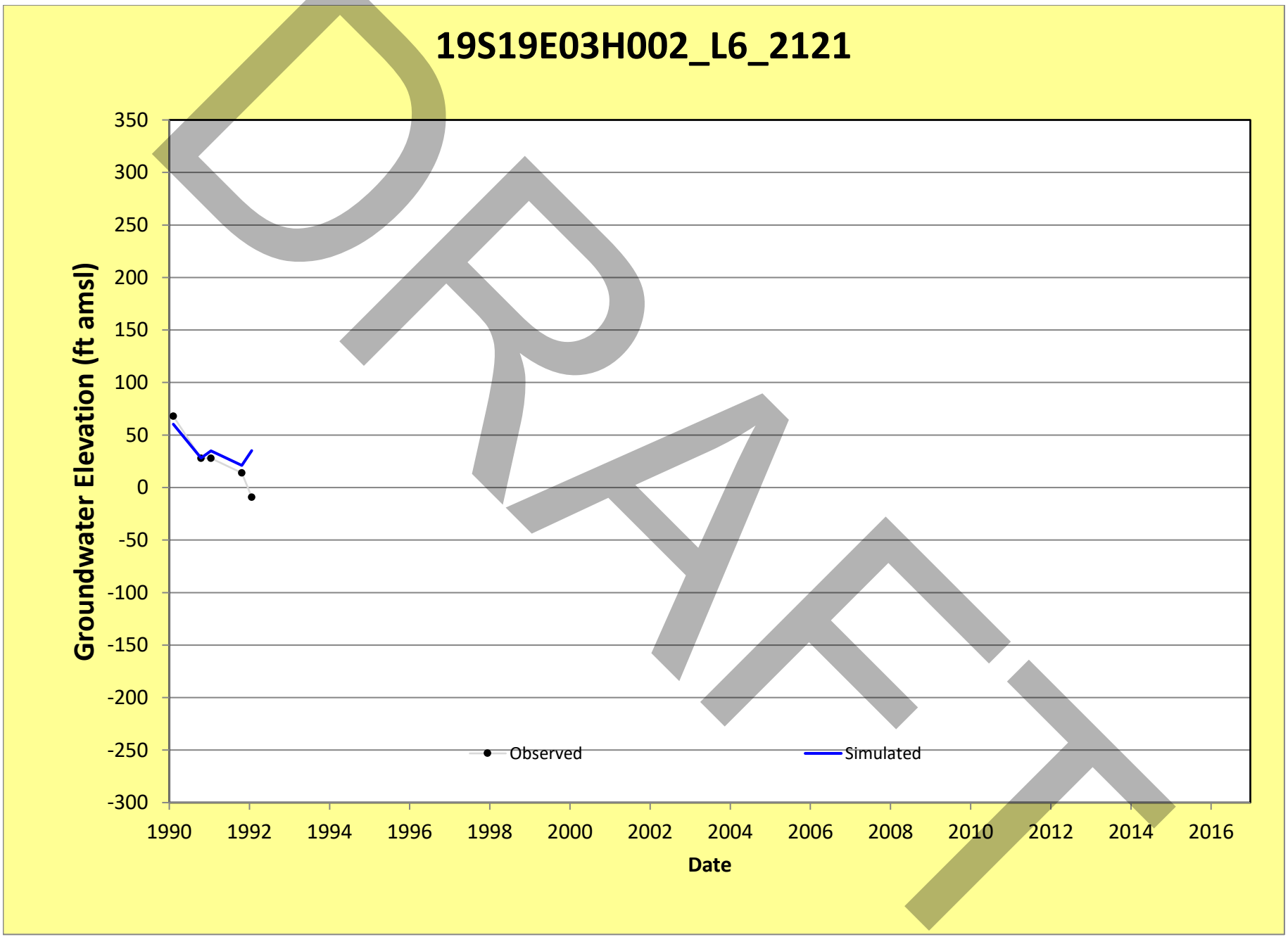
Date
Observed
Simulated
DRAFT


19S19E03H002_L6_2121
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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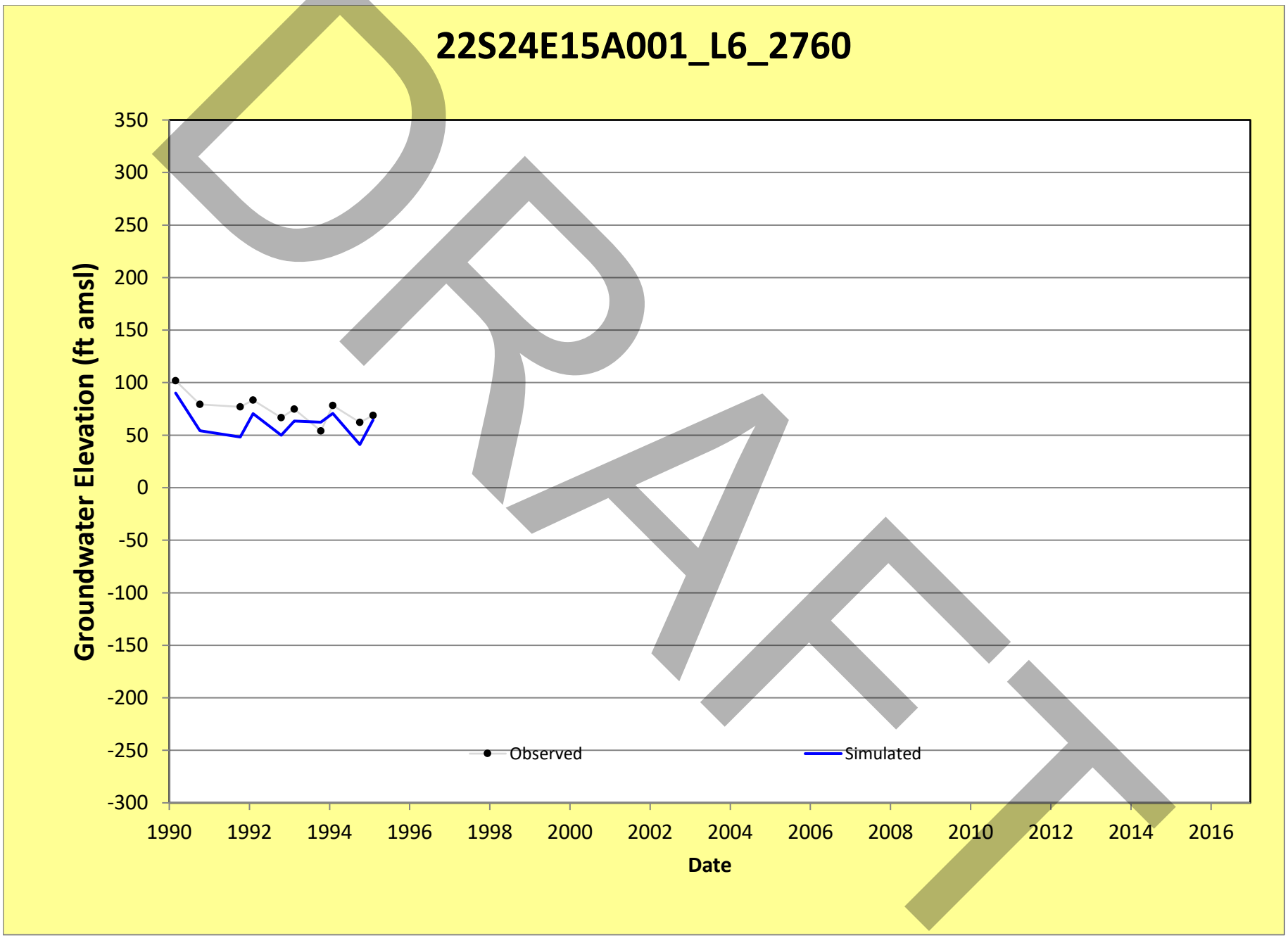
2016
Date
Observed
Simulated
DRAFT


22S24E15A001_L6_2760
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
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-50
-100
-150
-200
-250
-300
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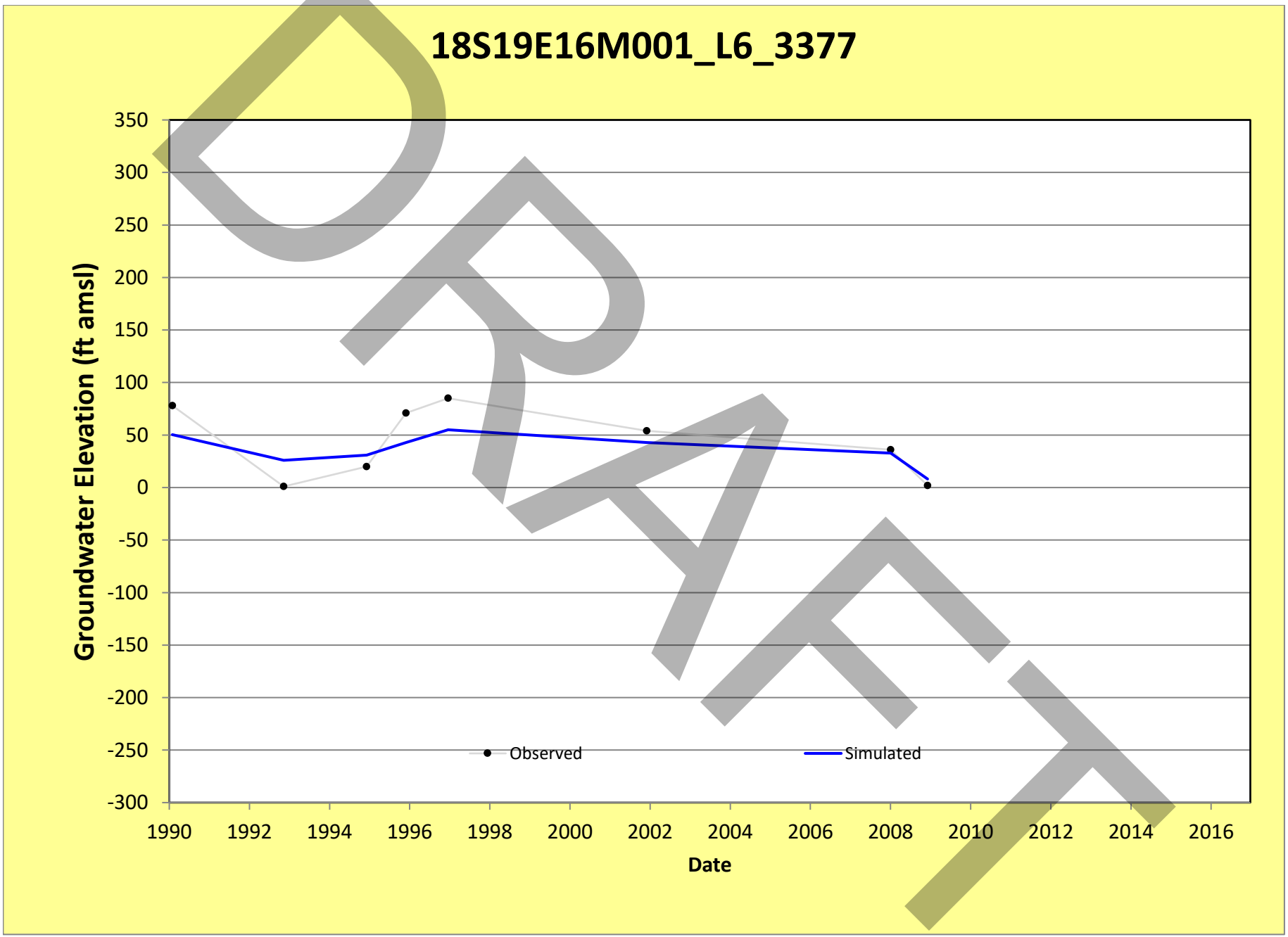
2016
Date
Observed
Simulated
DRAFT


18S19E16M001_L6_3377
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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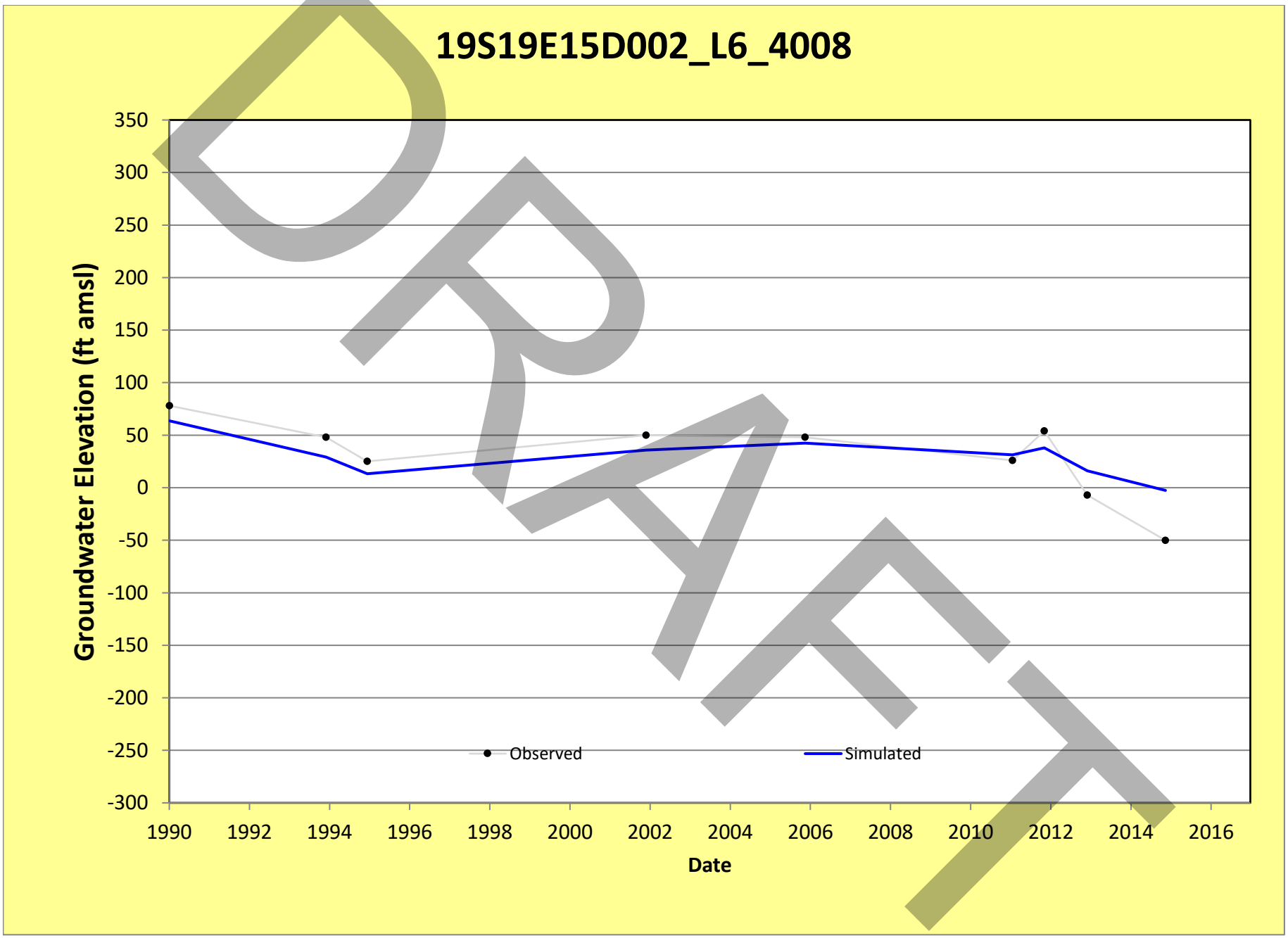
Date
Observed
Simulated
DRAFT


19S19E15D002_L6_4008
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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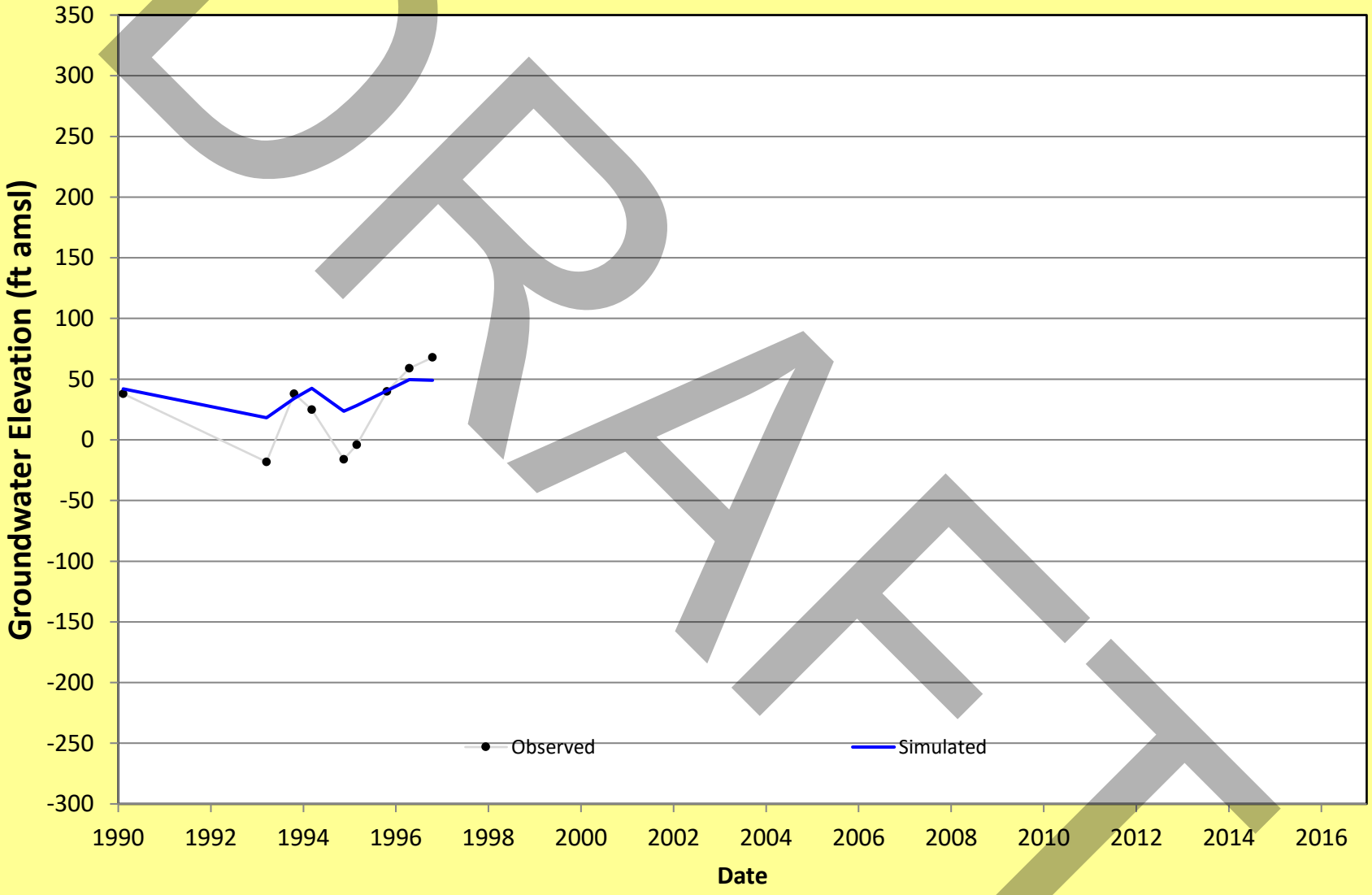
Date
Observed
Simulated
DRAFT

21S21E21D001_L6_4733



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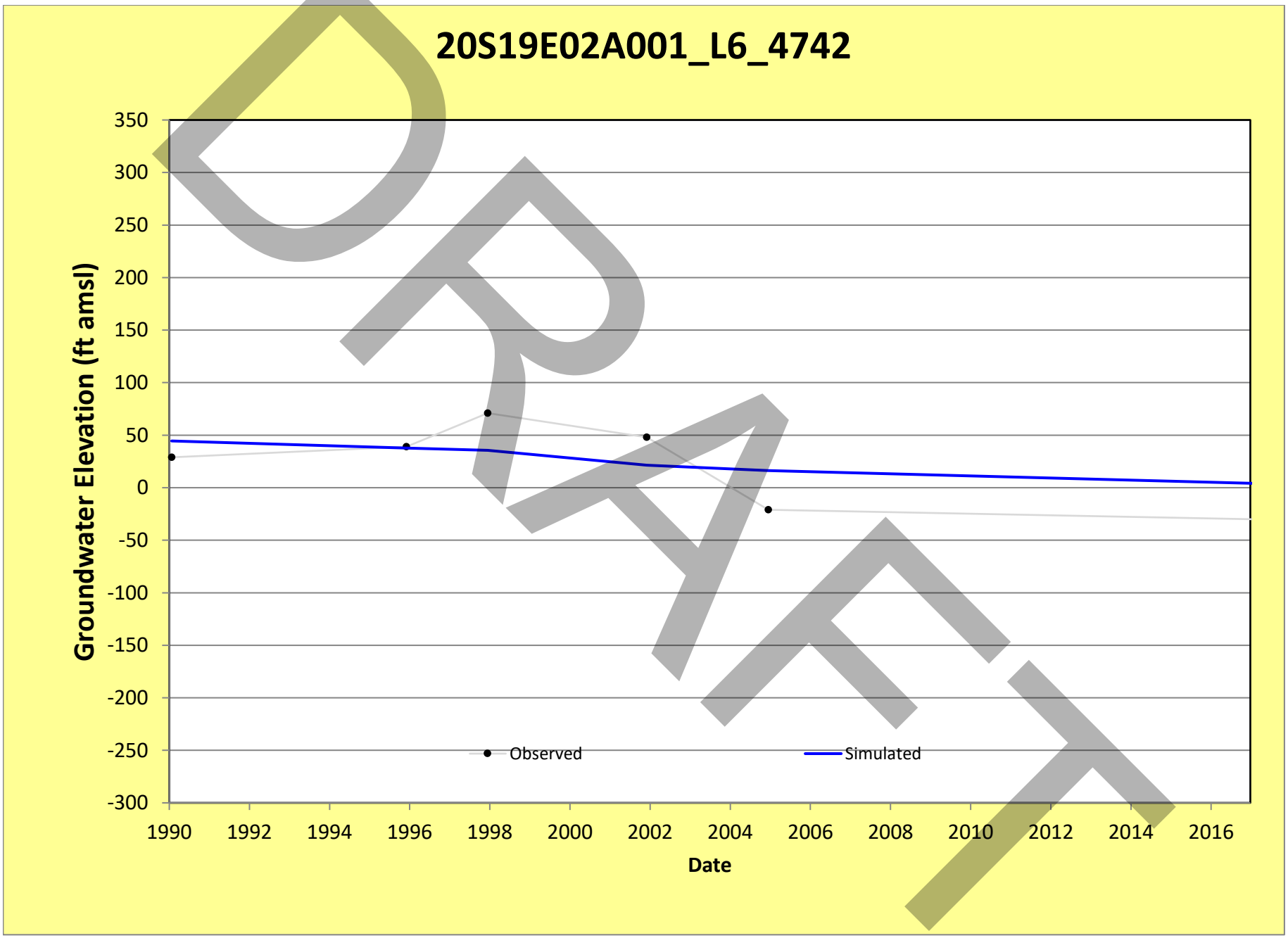
20S19E02A001_L6_4742
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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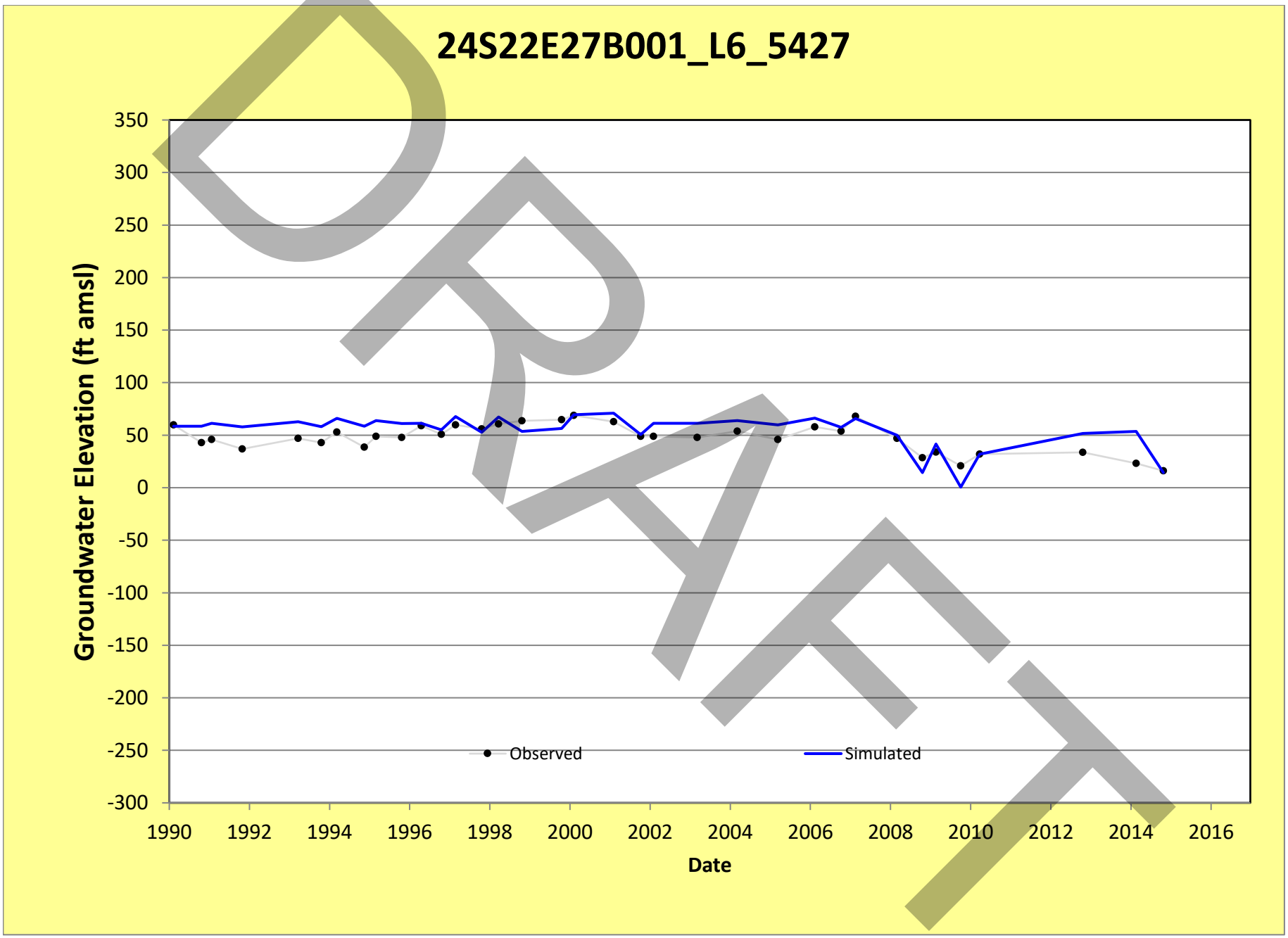
2012
2014
2016
Date
Observed
Simulated
DRAFT


24S22E27B001_L6_5427
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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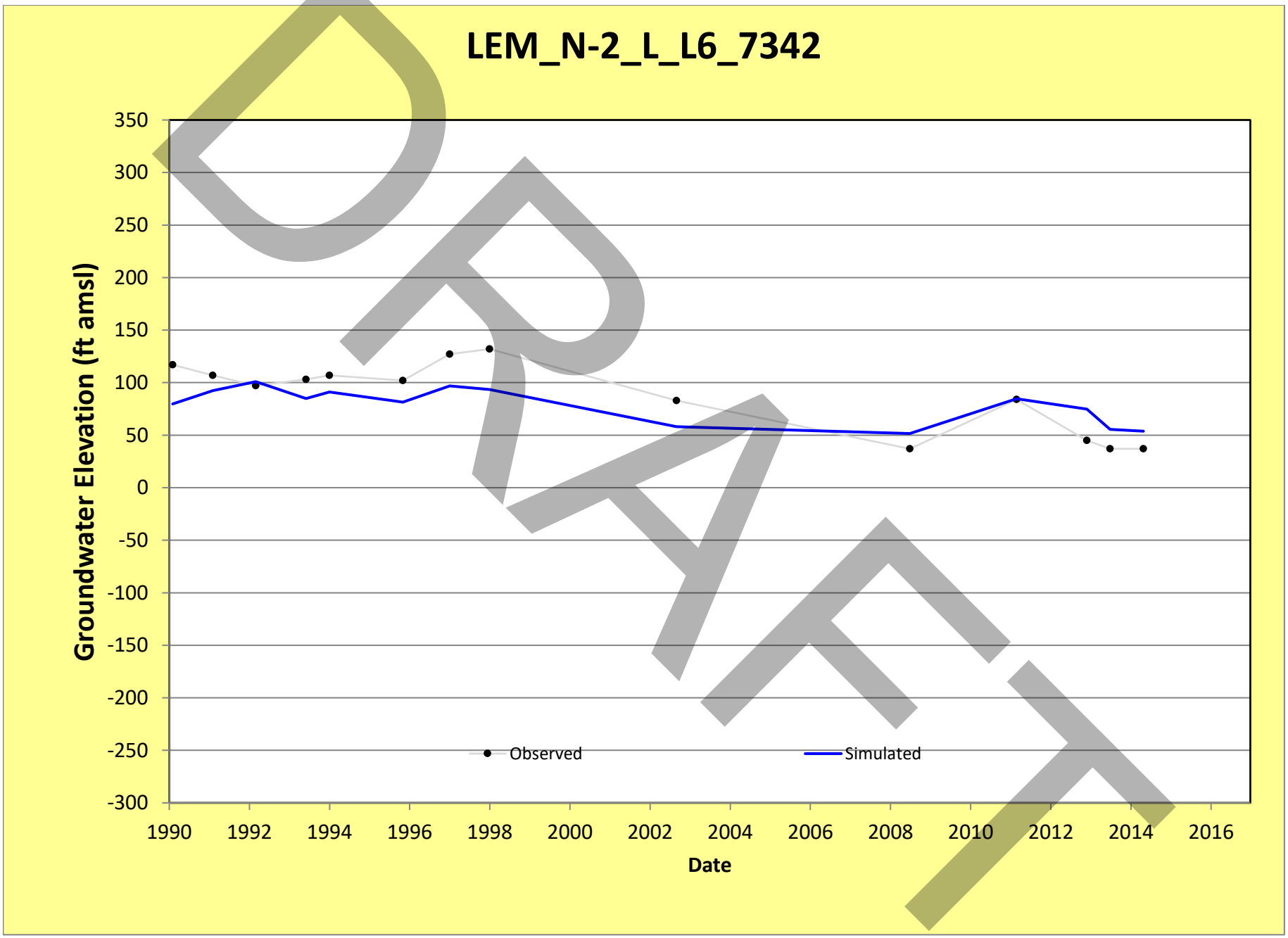
Date
Observed
Simulated
DRAFT


LEM_N-2_L_L6_7342
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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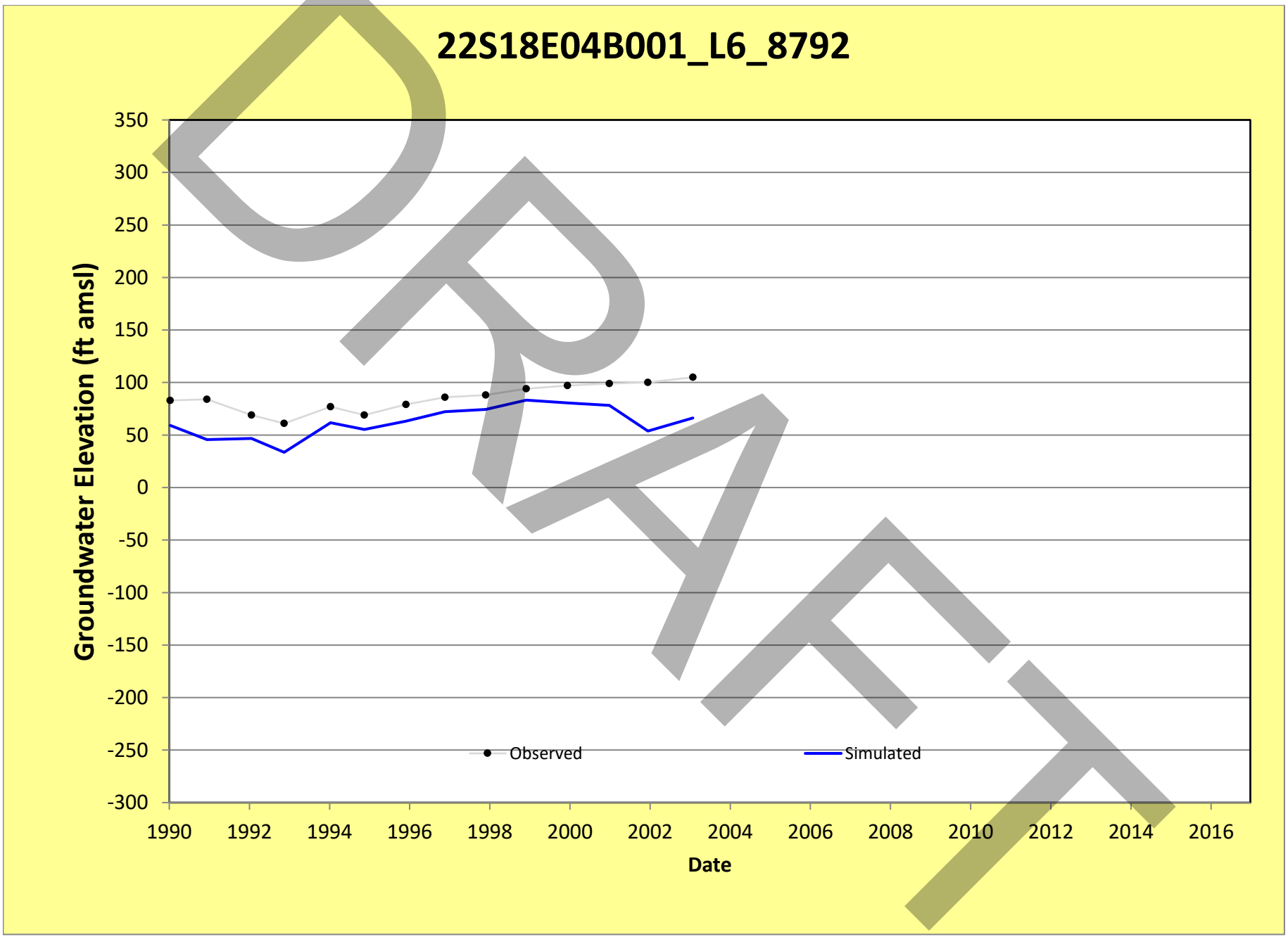
Date
Observed
Simulated
DRAFT


22S18E04B001_L6_8792
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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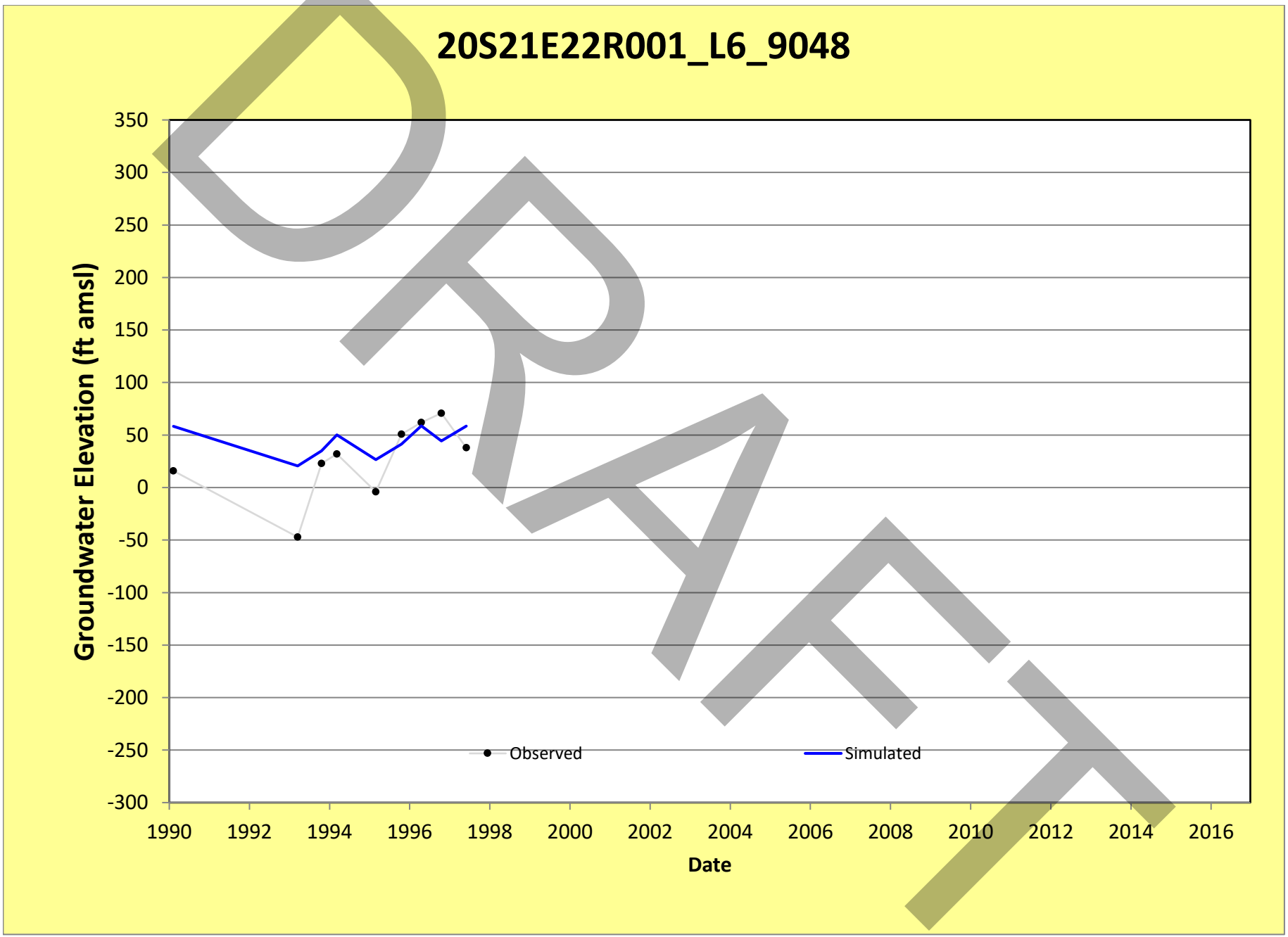
Date
Observed
Simulated
DRAFT


20S21E22R001_L6_9048
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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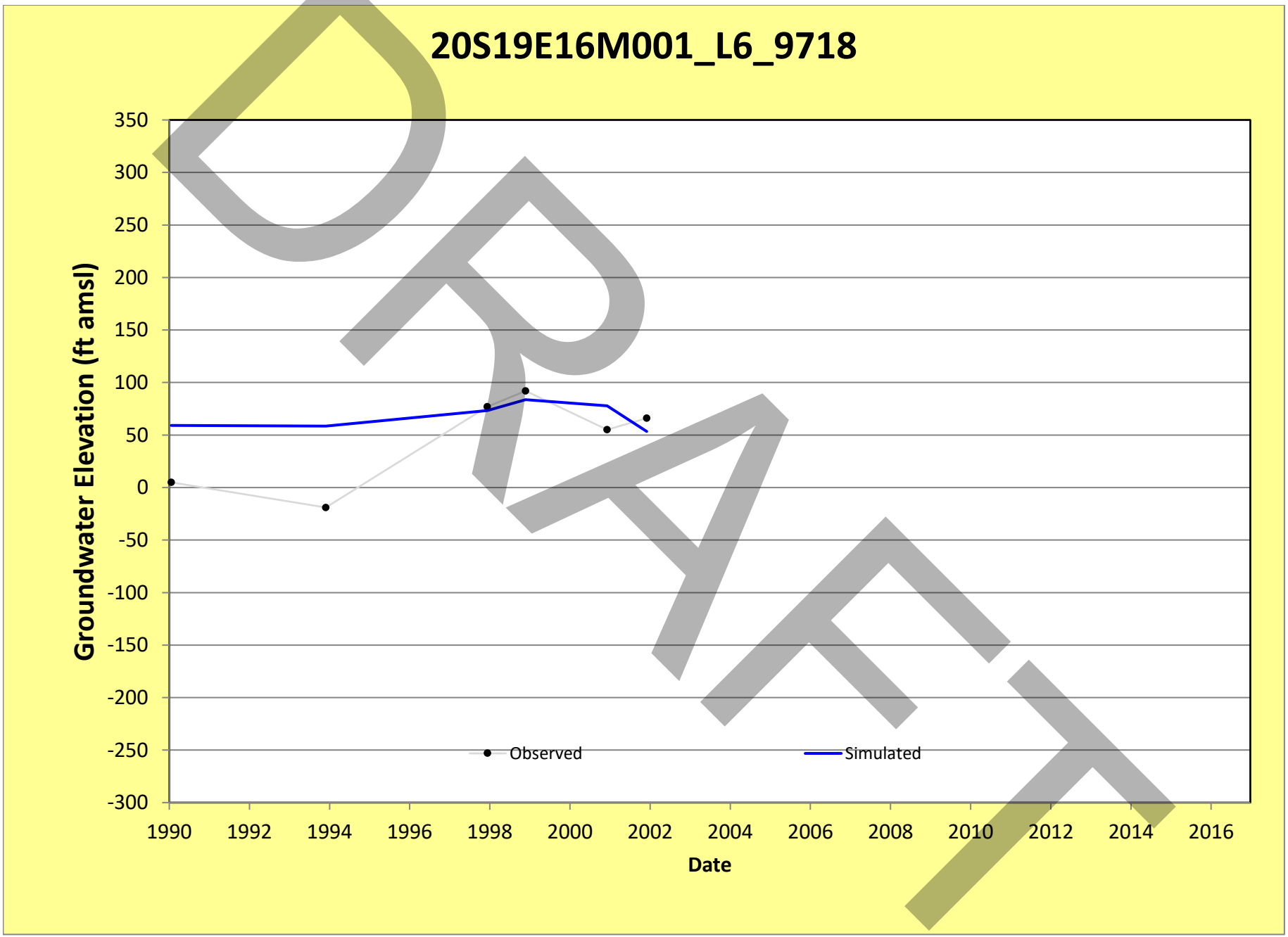
Date
Observed
Simulated
DRAFT


20S19E16M001_L6_9718
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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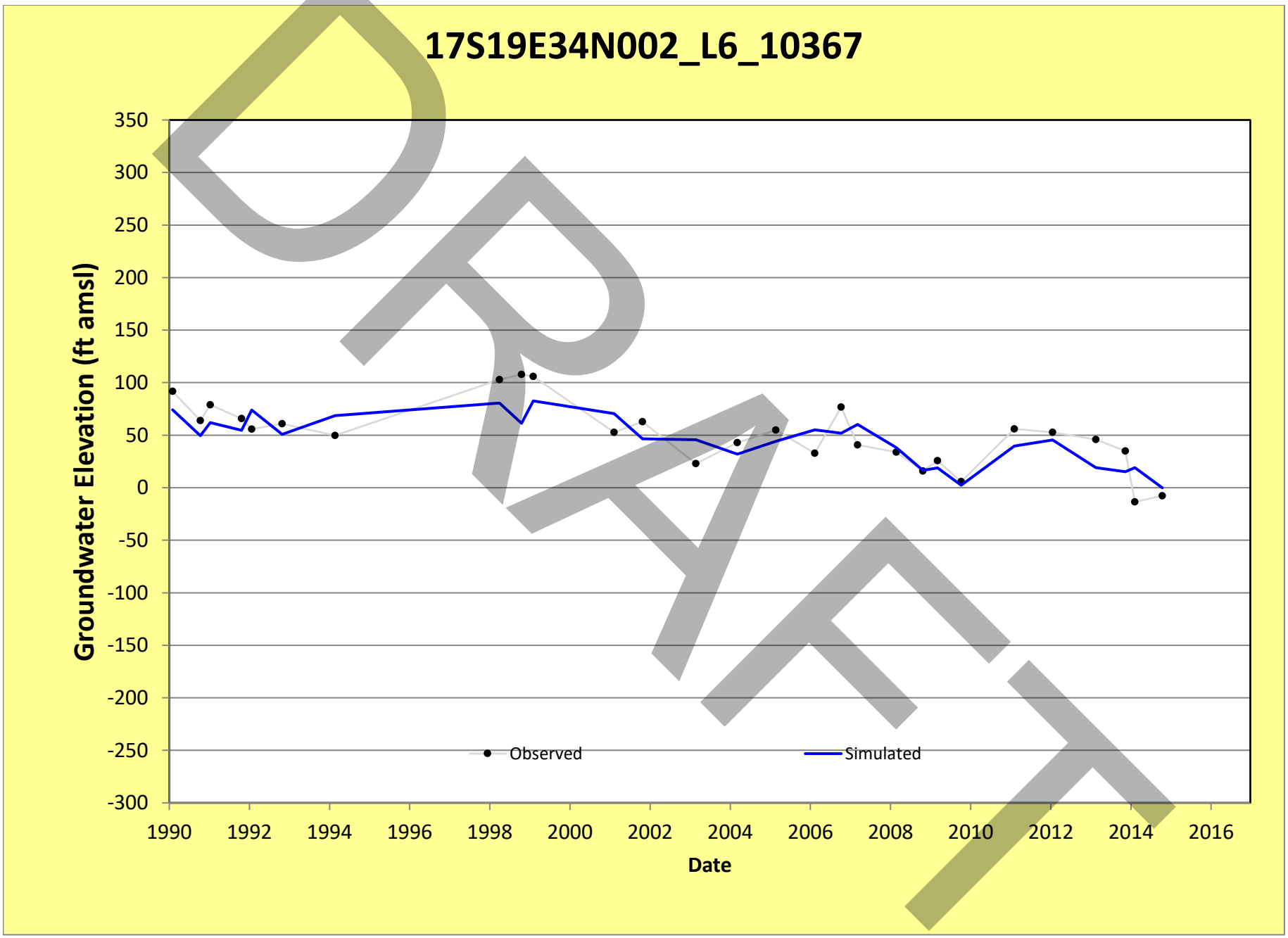
Date
Observed
Simulated
DRAFT


17S19E34N002_L6_10367
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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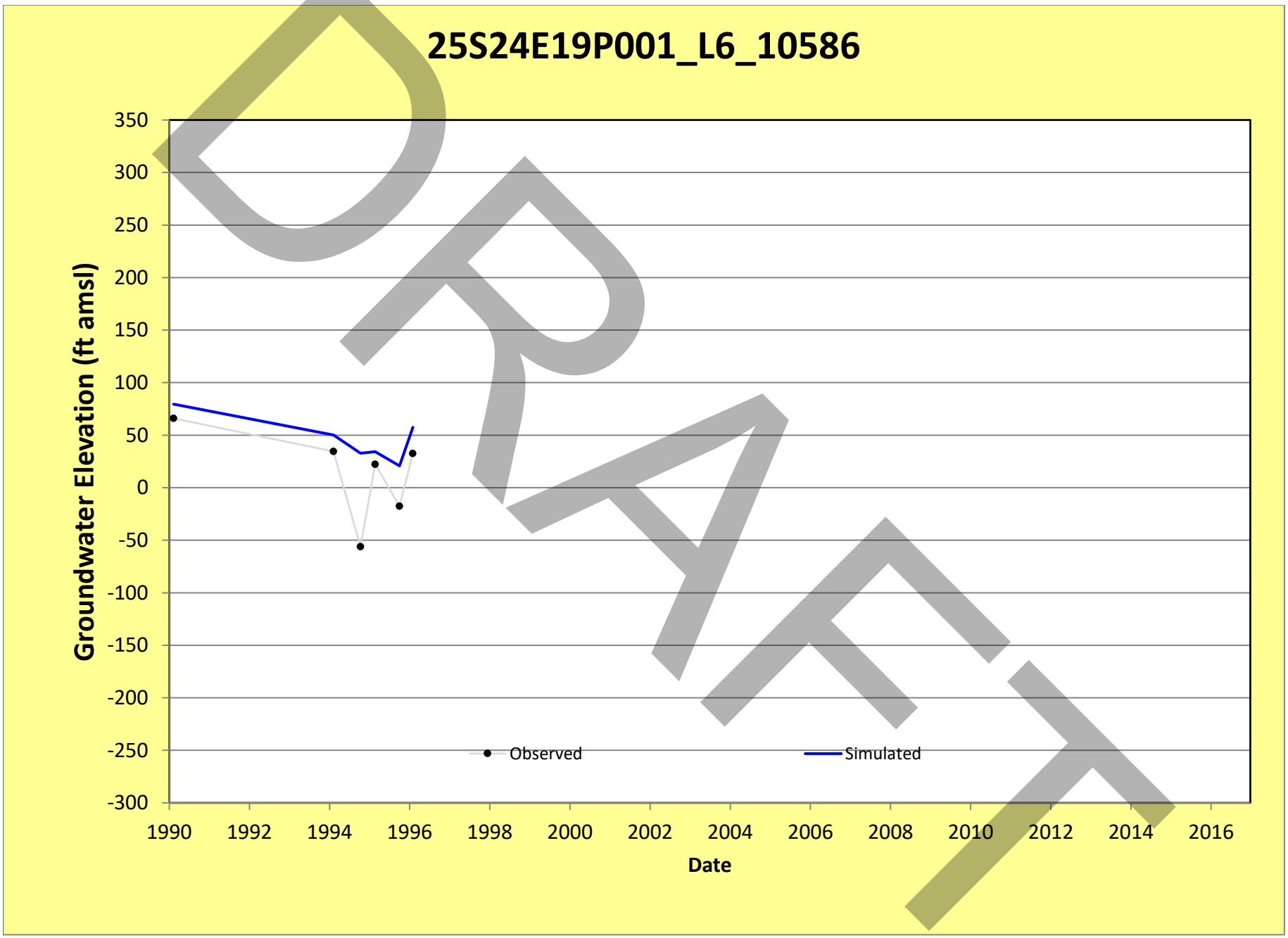
Date
Observed
Simulated
DRAFT


25S24E19P001_L6_10586
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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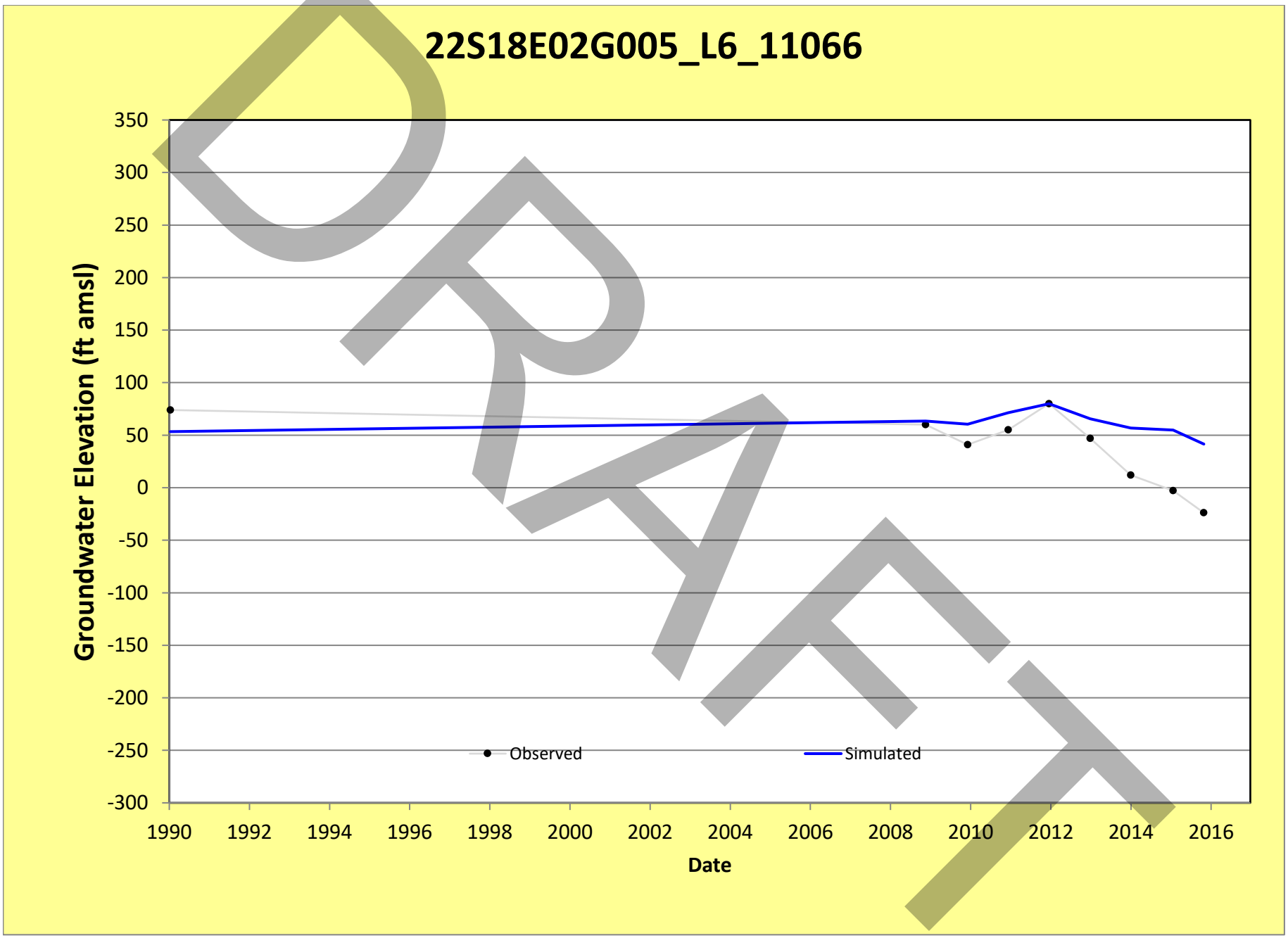
2016
Date
Observed
Simulated
DRAFT


22S18E02G005_L6_11066
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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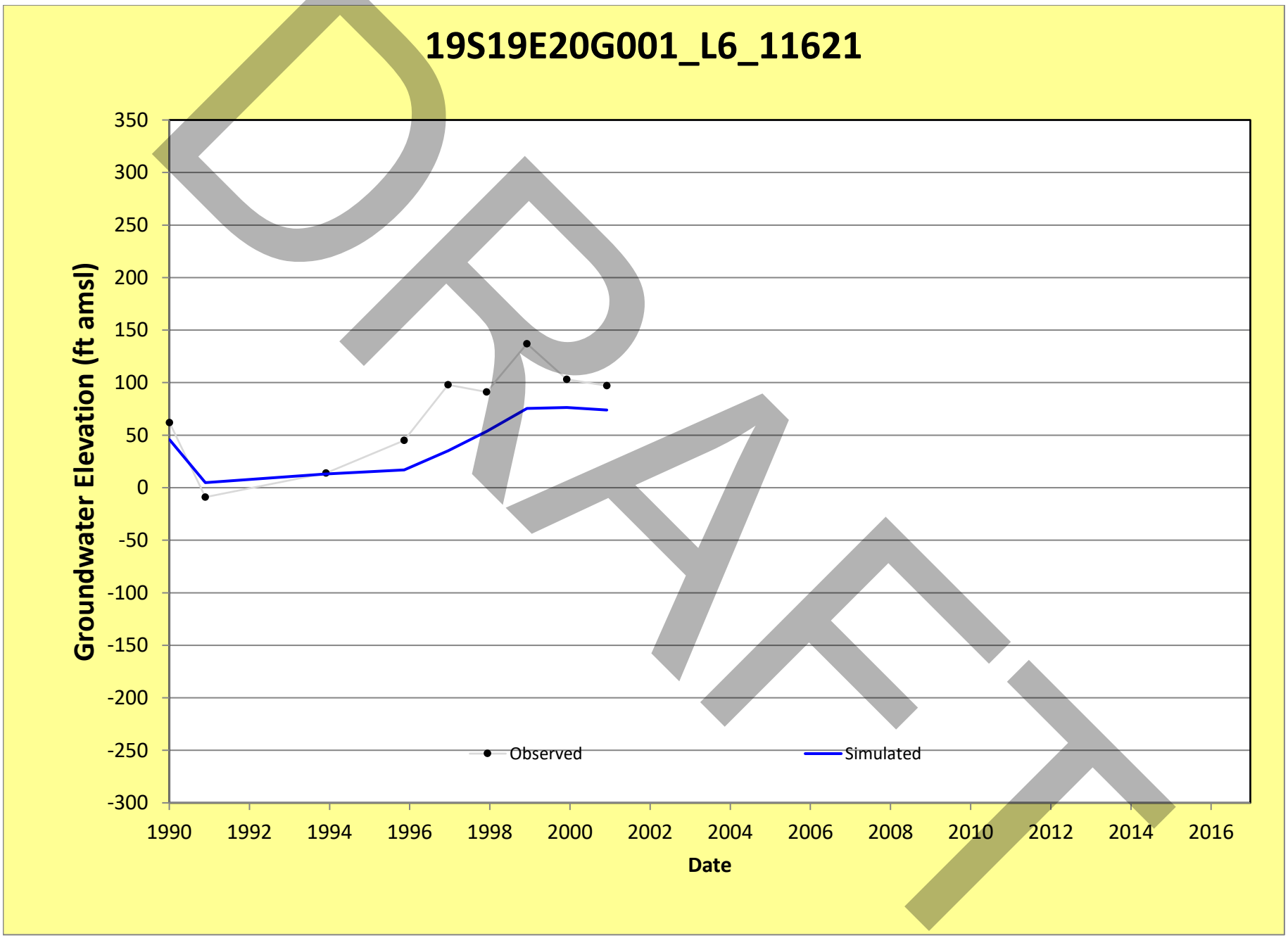
2016
Date
Observed
Simulated
DRAFT


19S19E20G001_L6_11621
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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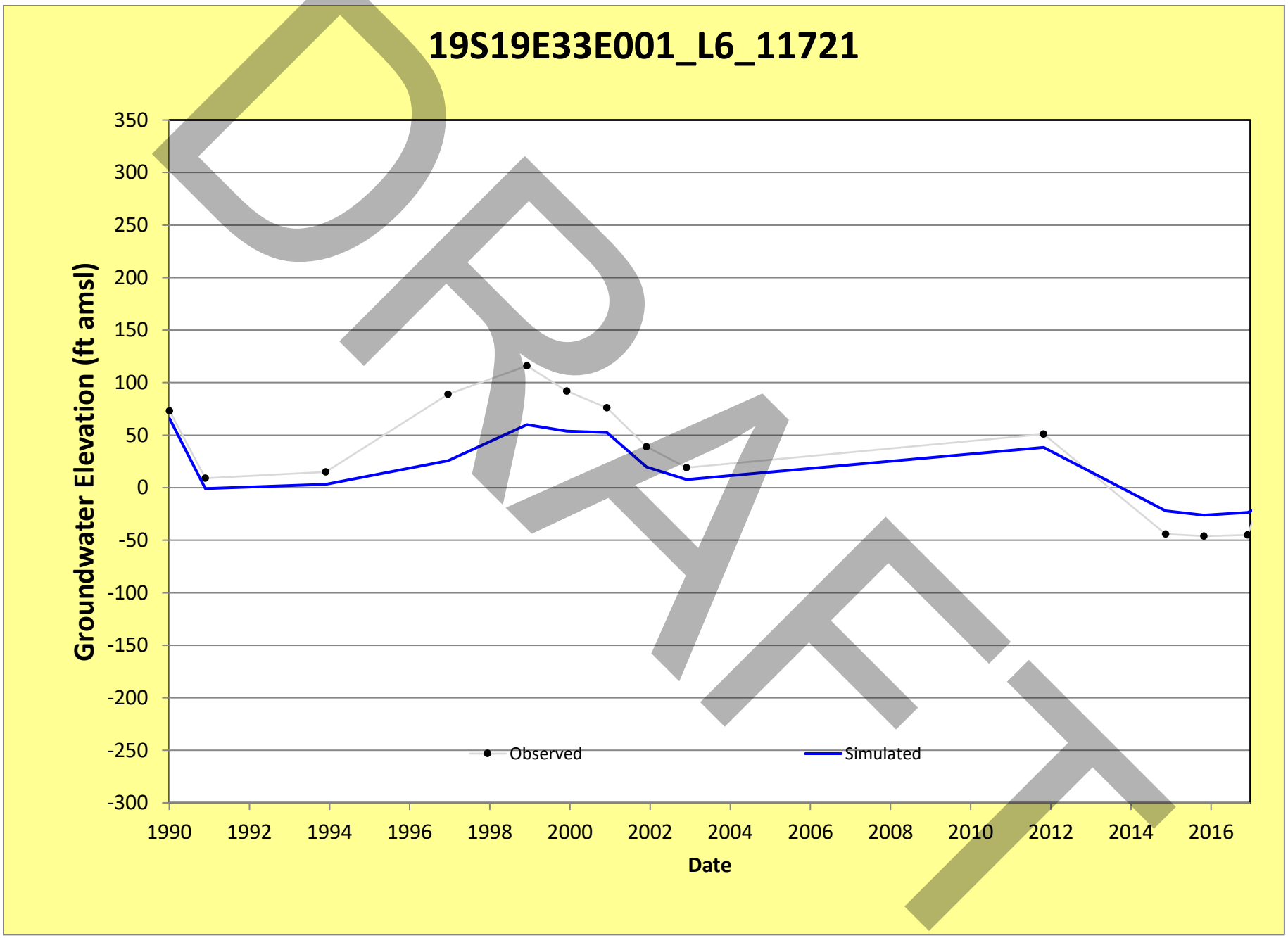
2016
Date
Observed
Simulated
DRAFT


19S19E33E001_L6_11721
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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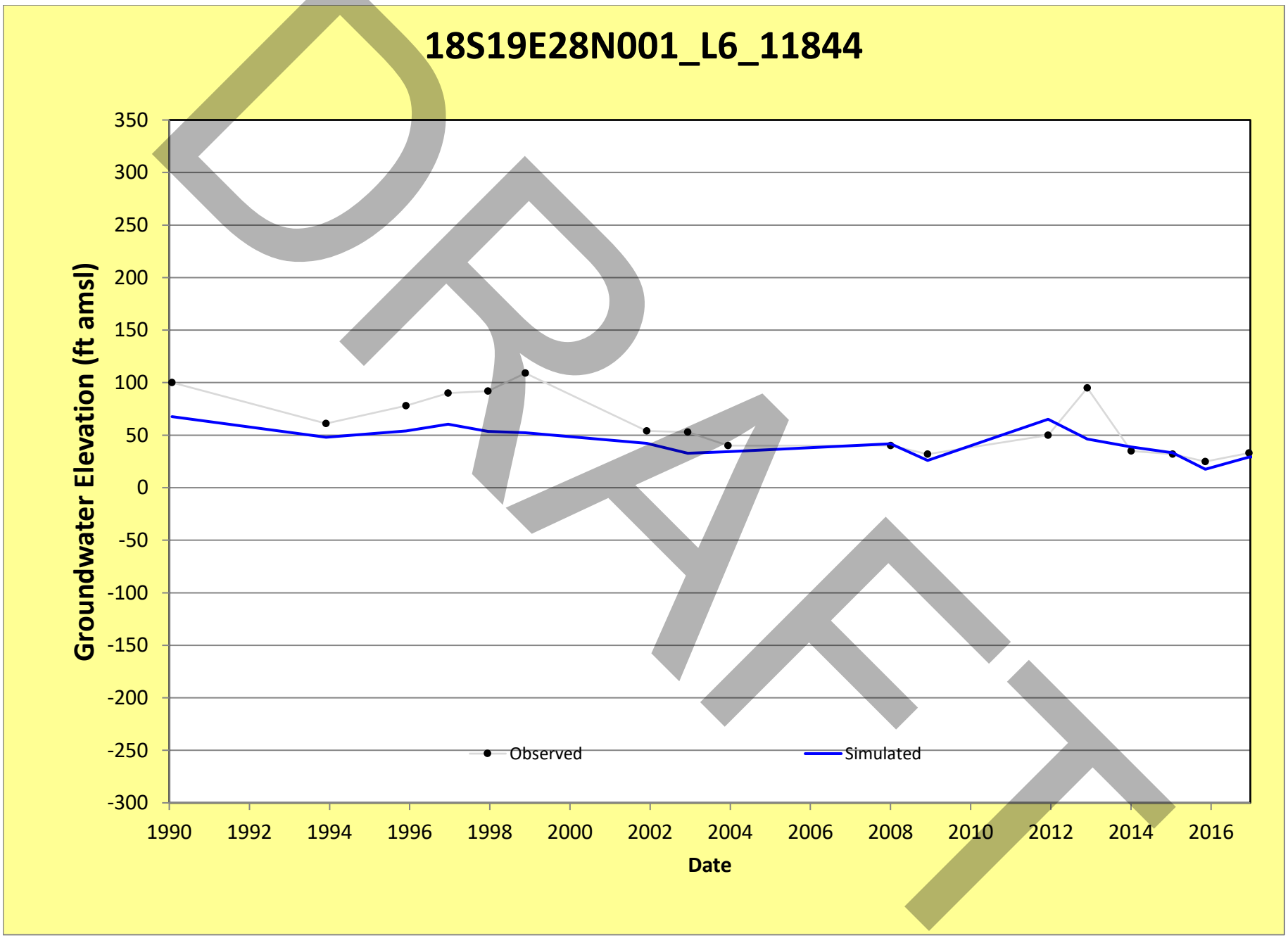
Date
Observed
Simulated
DRAFT


18S19E28N001_L6_11844
Groundwater Elevation (ft amsl)
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300
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200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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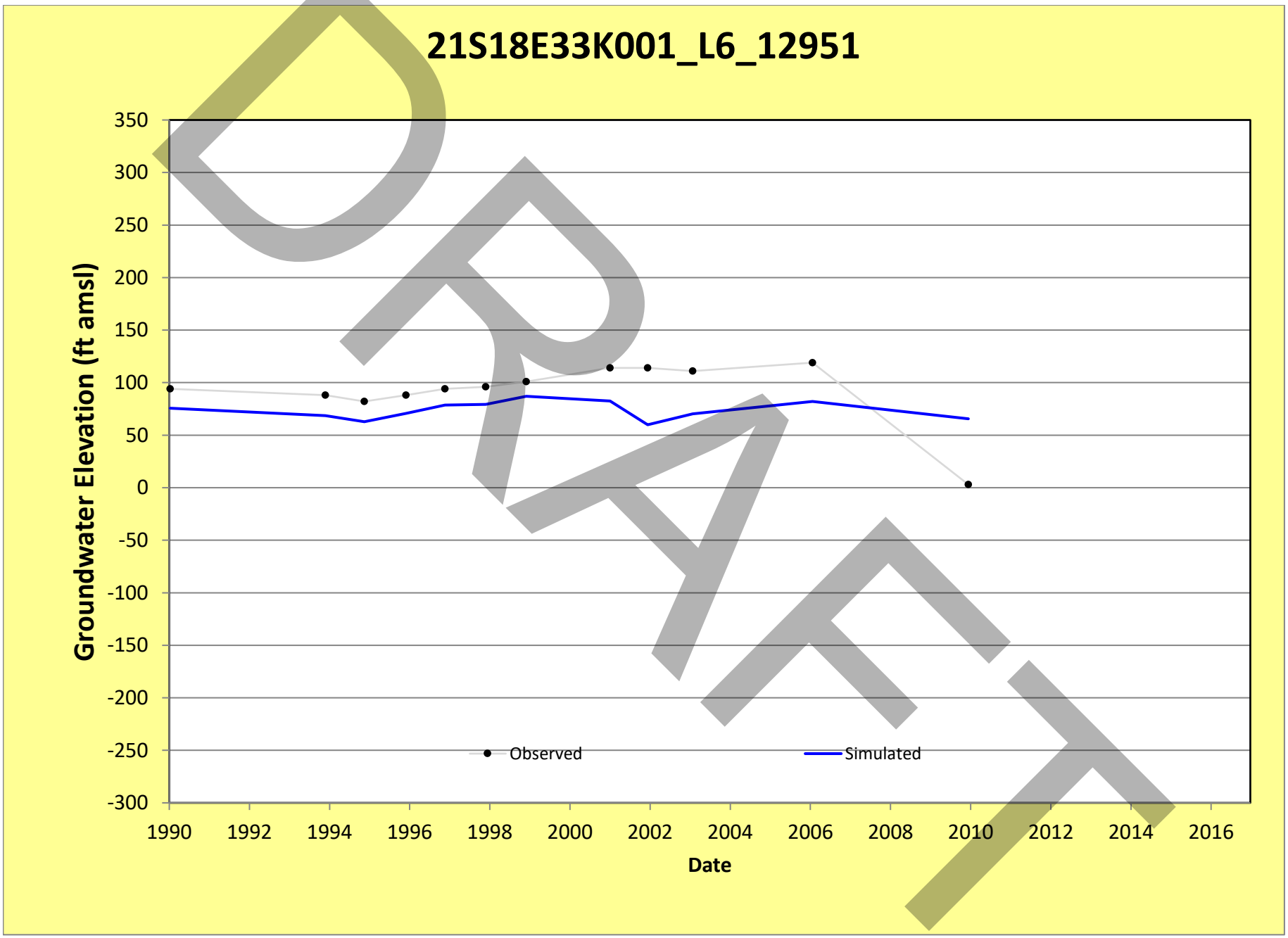
2016
Date
Observed
Simulated
DRAFT


21S18E33K001_L6_12951
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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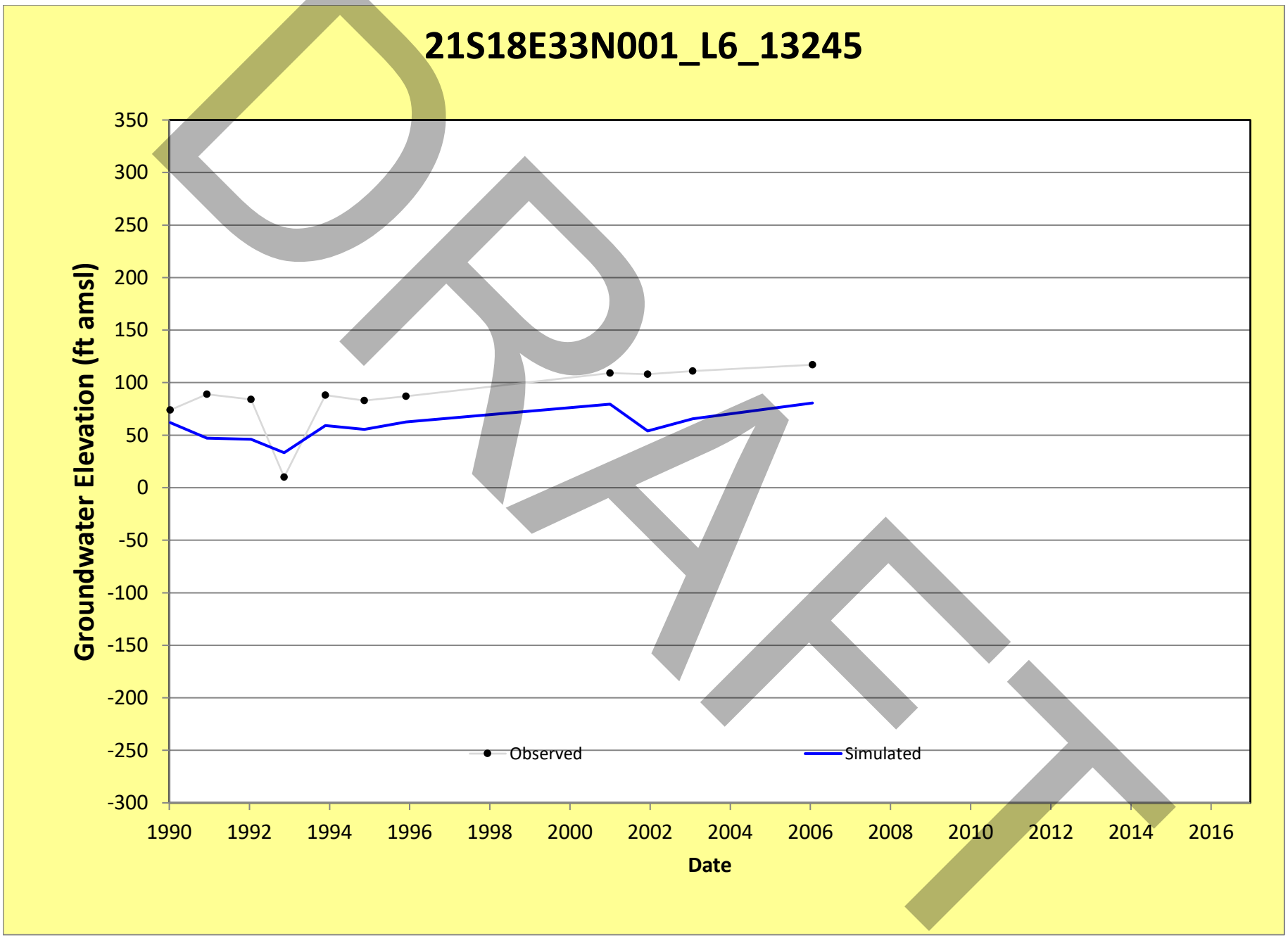
Date
Observed
Simulated
DRAFT


21S18E33N001_L6_13245
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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Date
Observed
Simulated
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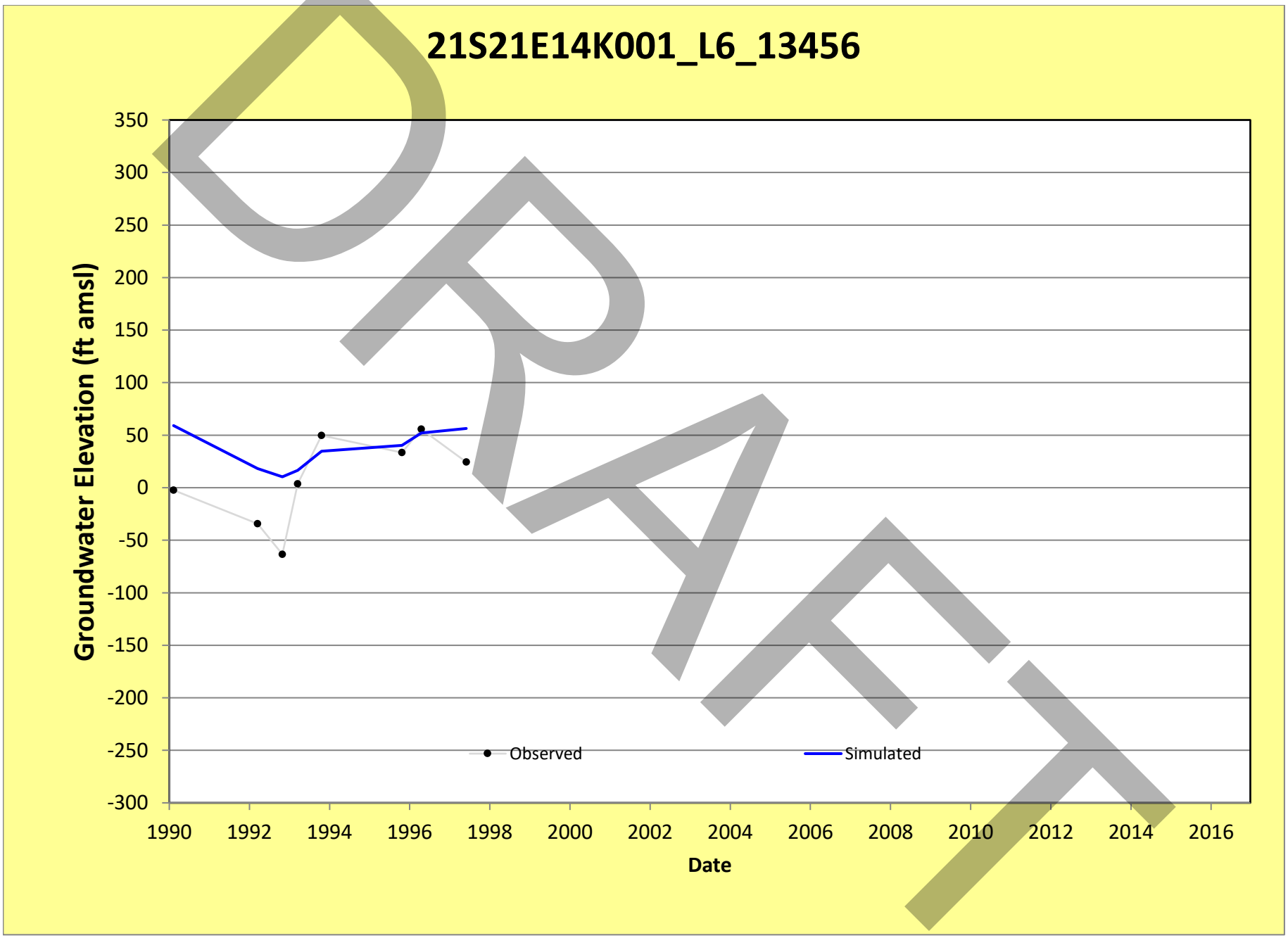
21S21E14K001_L6_13456
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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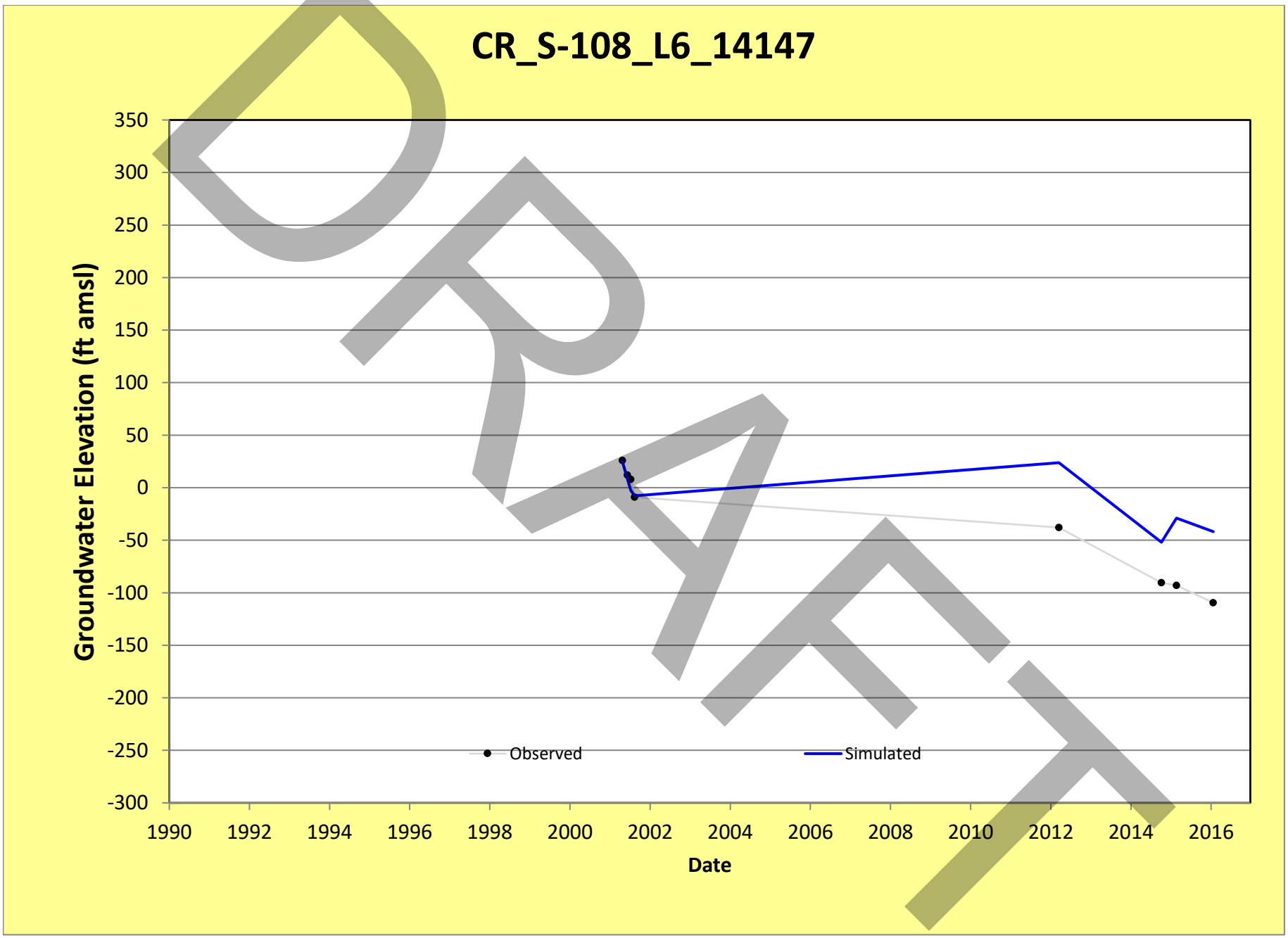
Date
Observed
Simulated
DRAFT


CR_S-108_L6_14147
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
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Date
Observed
Simulated

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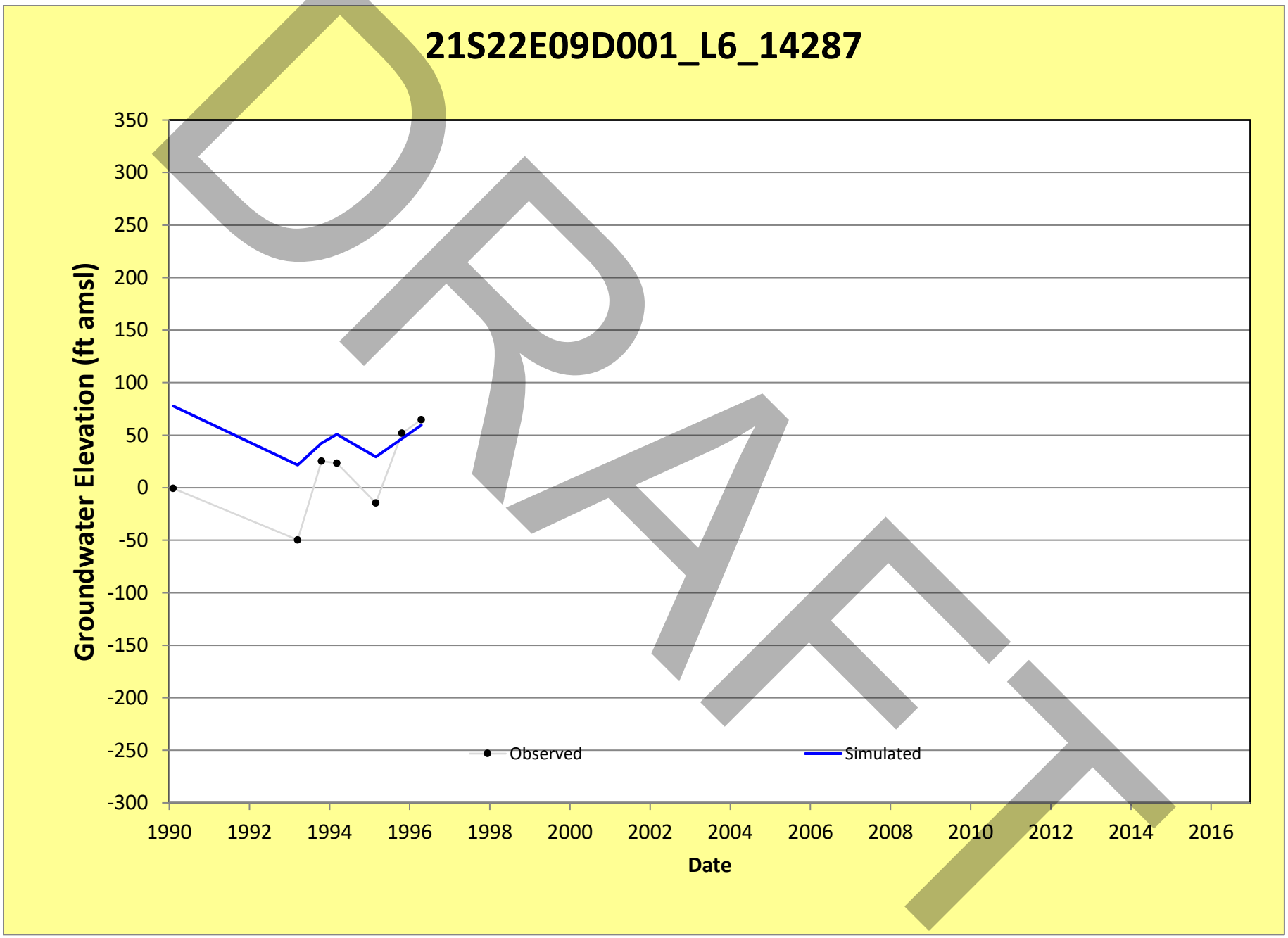
21S22E09D001_L6_14287
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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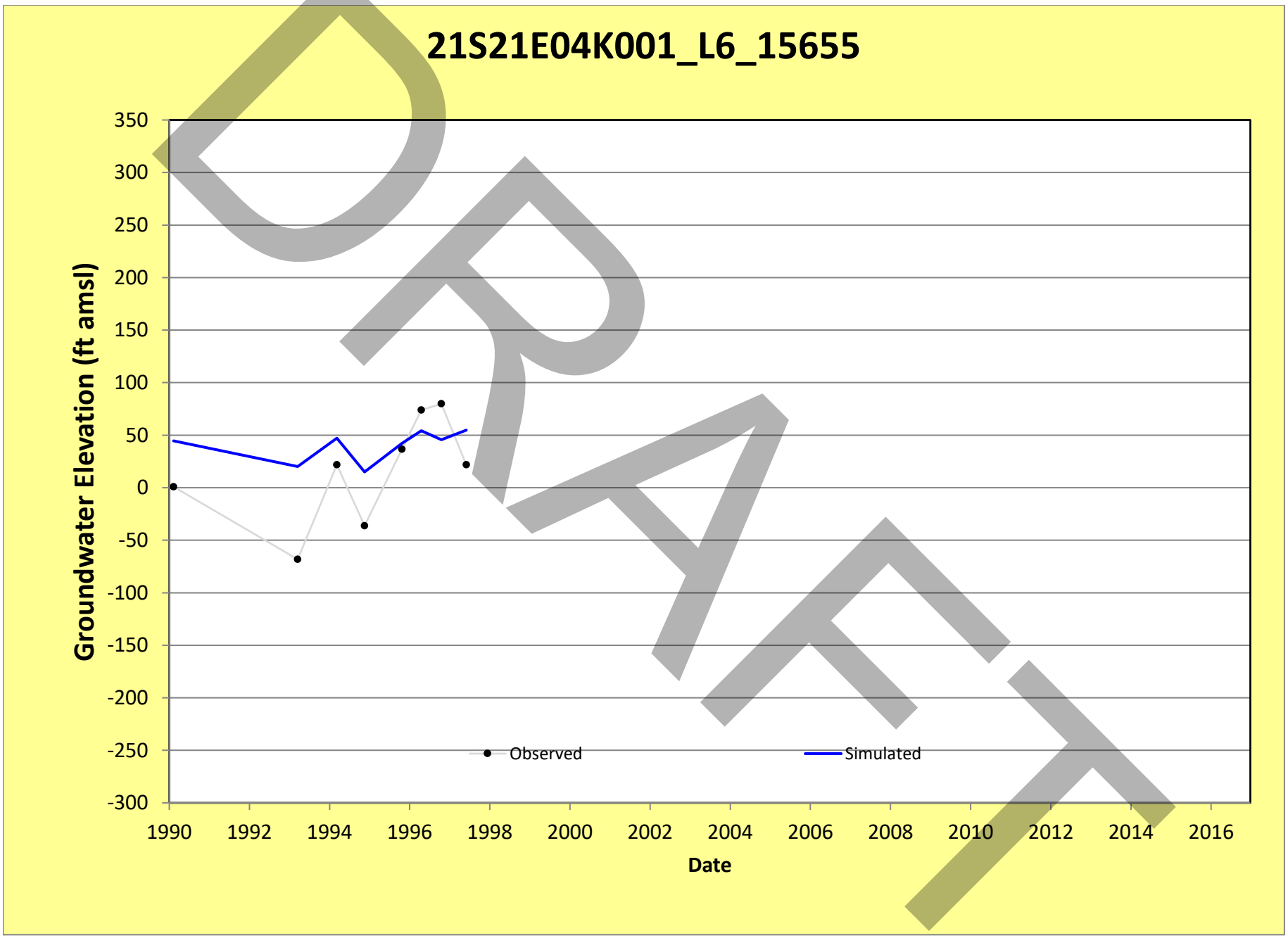
Date
Observed
Simulated
DRAFT


21S21E04K001_L6_15655
Groundwater Elevation (ft amsl)
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200
150
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0
-50
-100
-150
-200
-250
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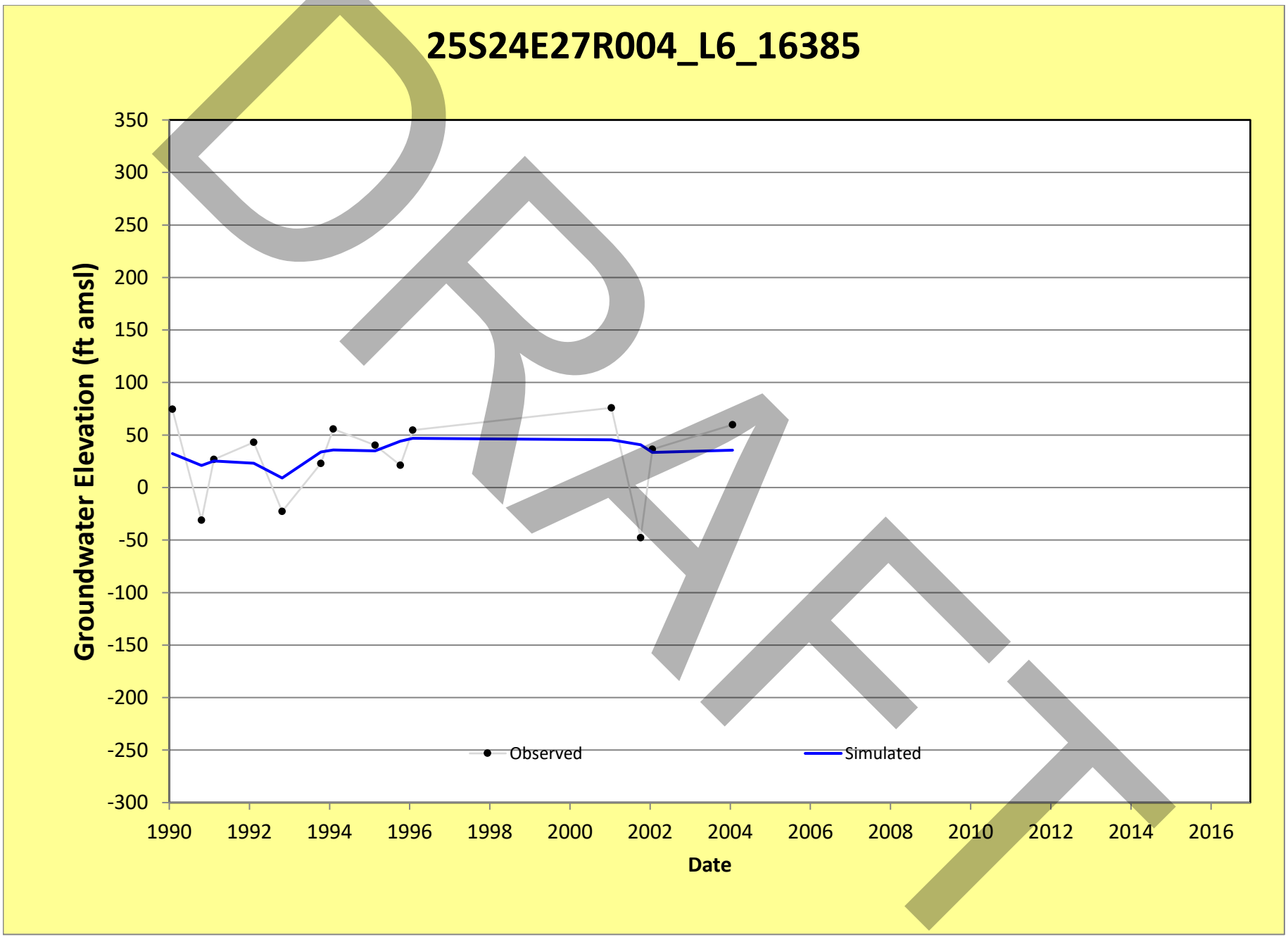
Date
Observed
Simulated
DRAFT


25S24E27R004_L6_16385
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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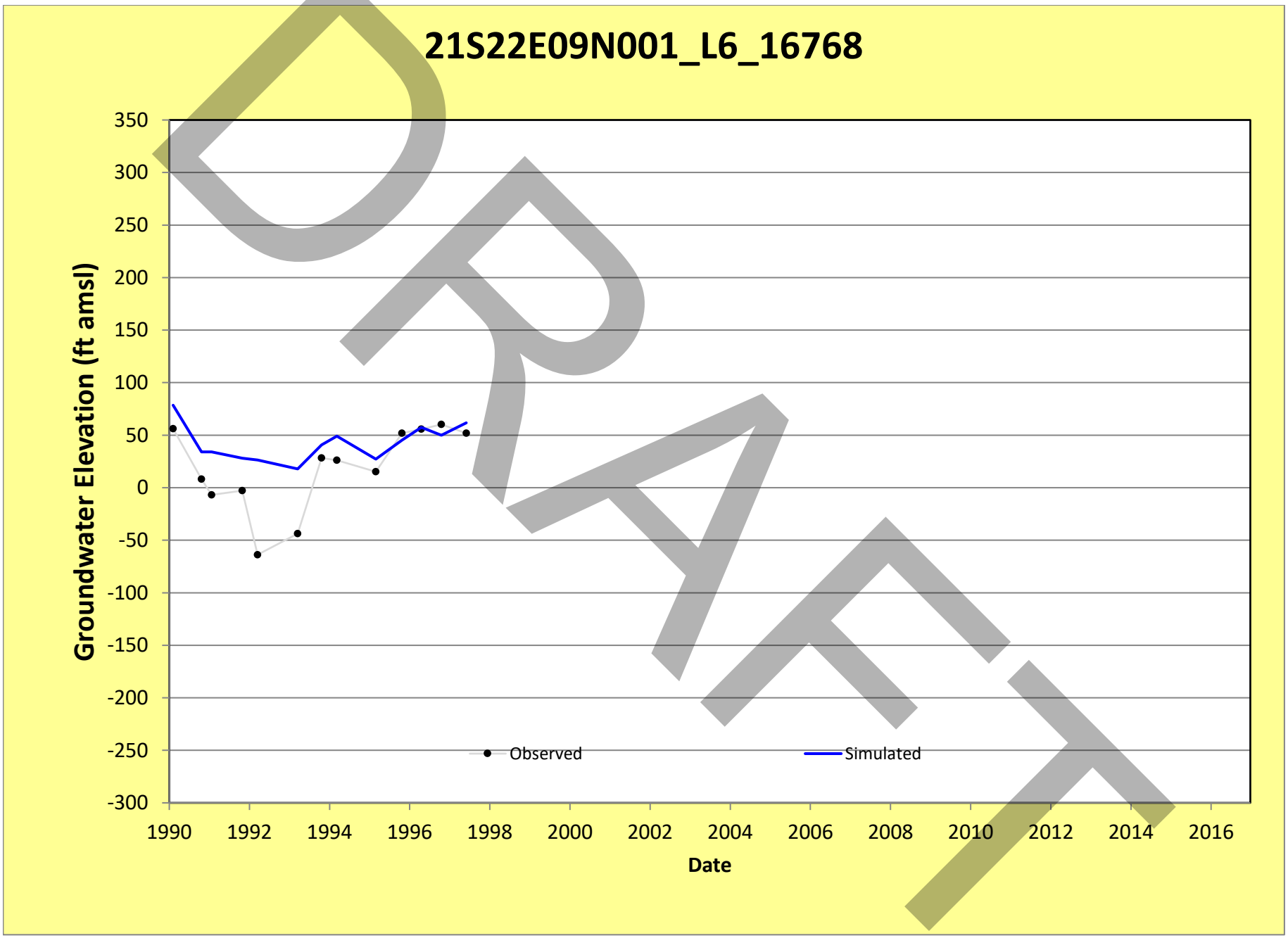
Date
Observed
Simulated
DRAFT


21S22E09N001_L6_16768
Groundwater Elevation (ft amsl)
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300
250
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100
50
0
-50
-100
-150
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-250
-300
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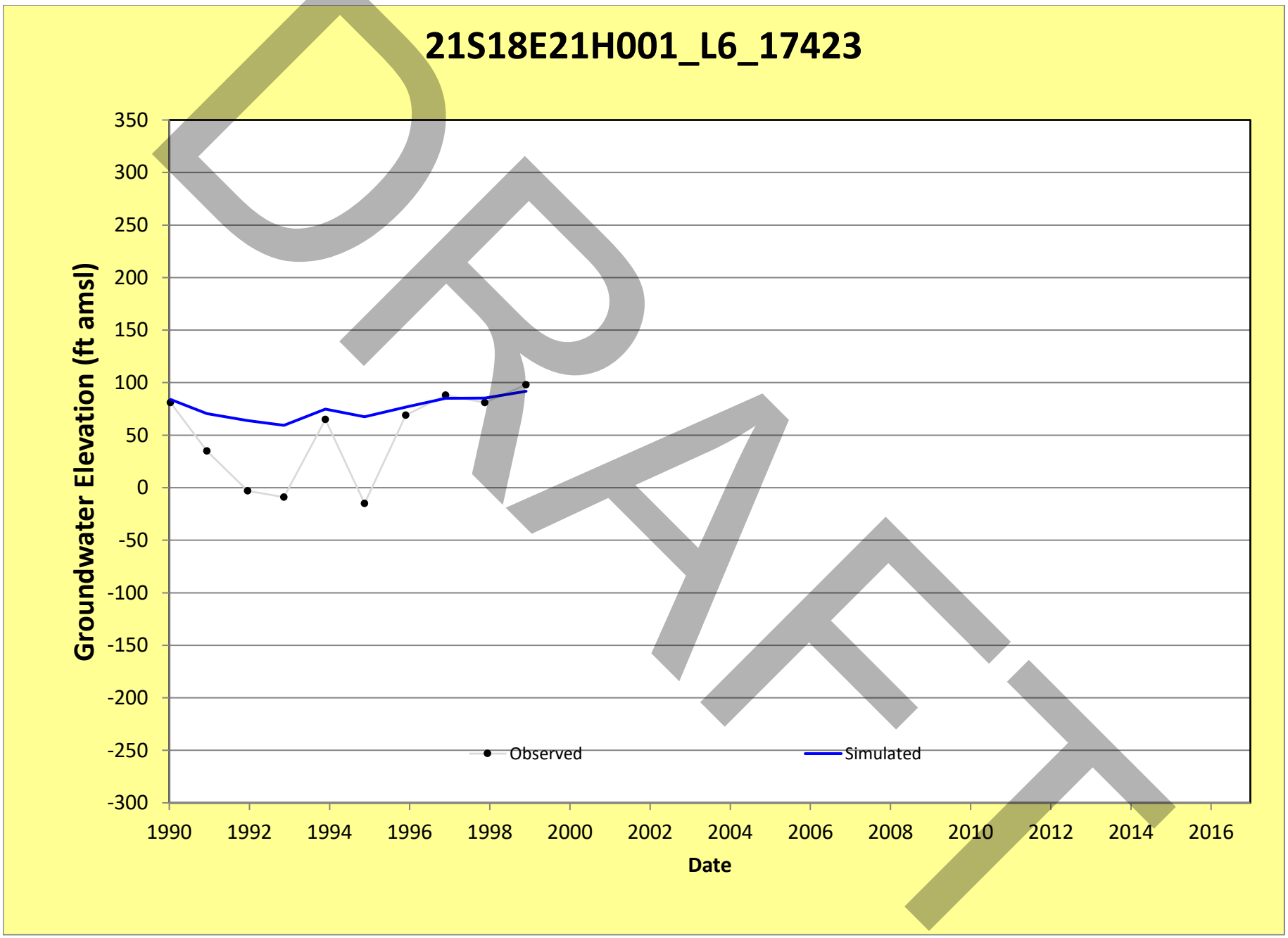
Date
Observed
Simulated
DRAFT


21S18E21H001_L6_17423
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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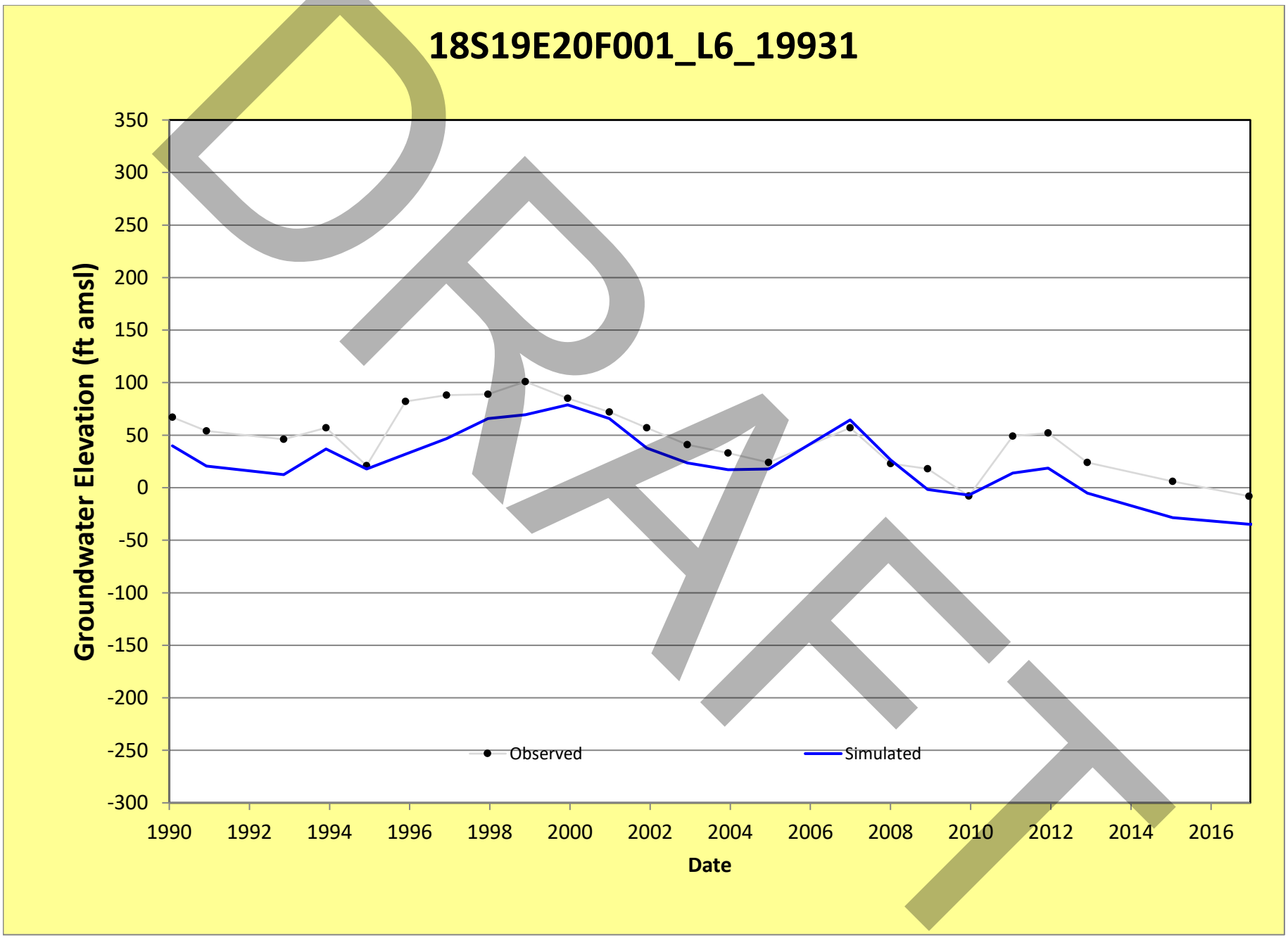
Date
Observed
Simulated
DRAFT


18S19E20F001_L6_19931
Groundwater Elevation (ft amsl)
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100
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0
-50
-100
-150
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-250
-300
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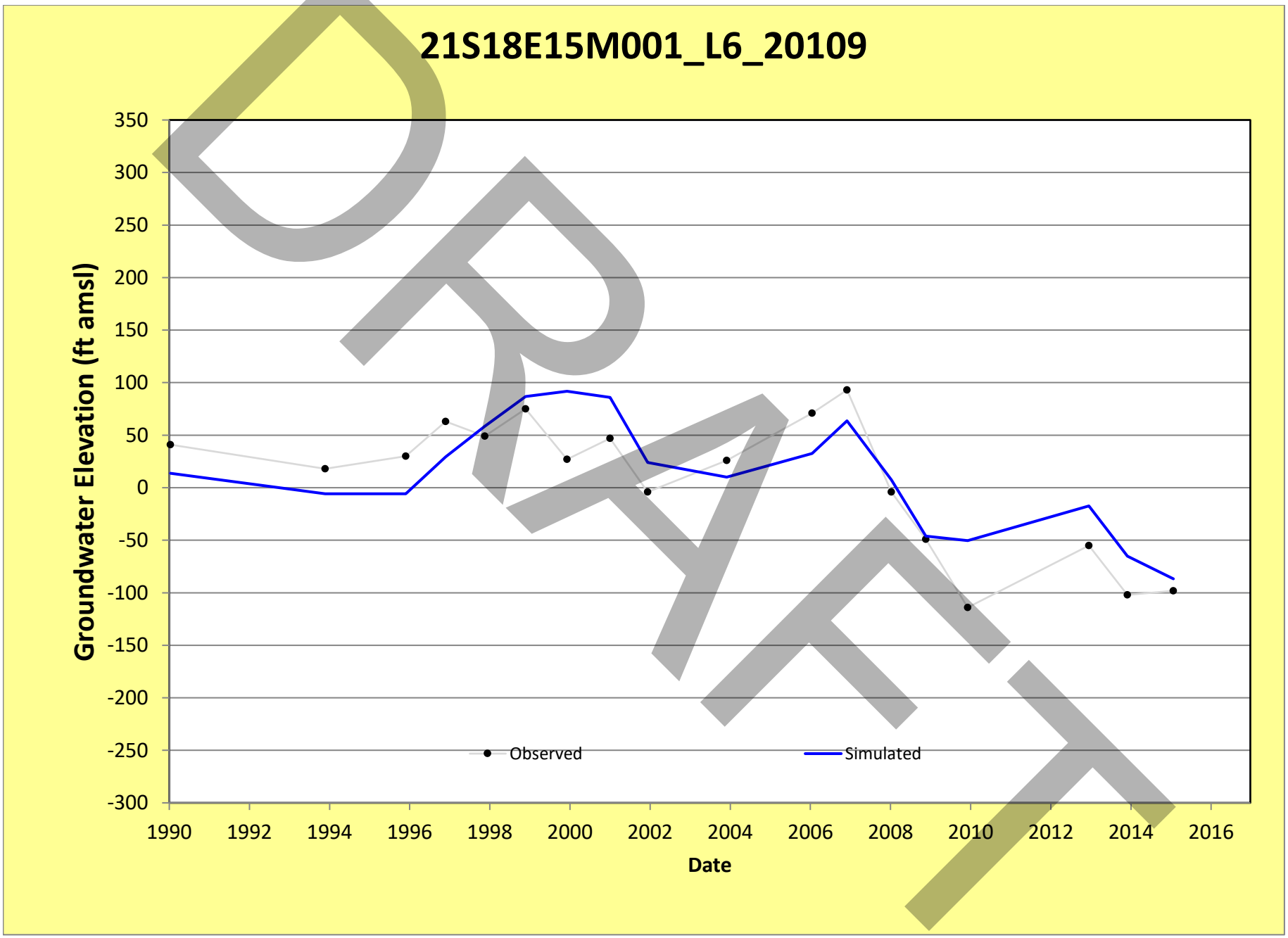
Date
Observed
Simulated
DRAFT


21S18E15M001_L6_20109
Groundwater Elevation (ft amsl)
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300
250
200
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100
50
0
-50
-100
-150
-200
-250
-300
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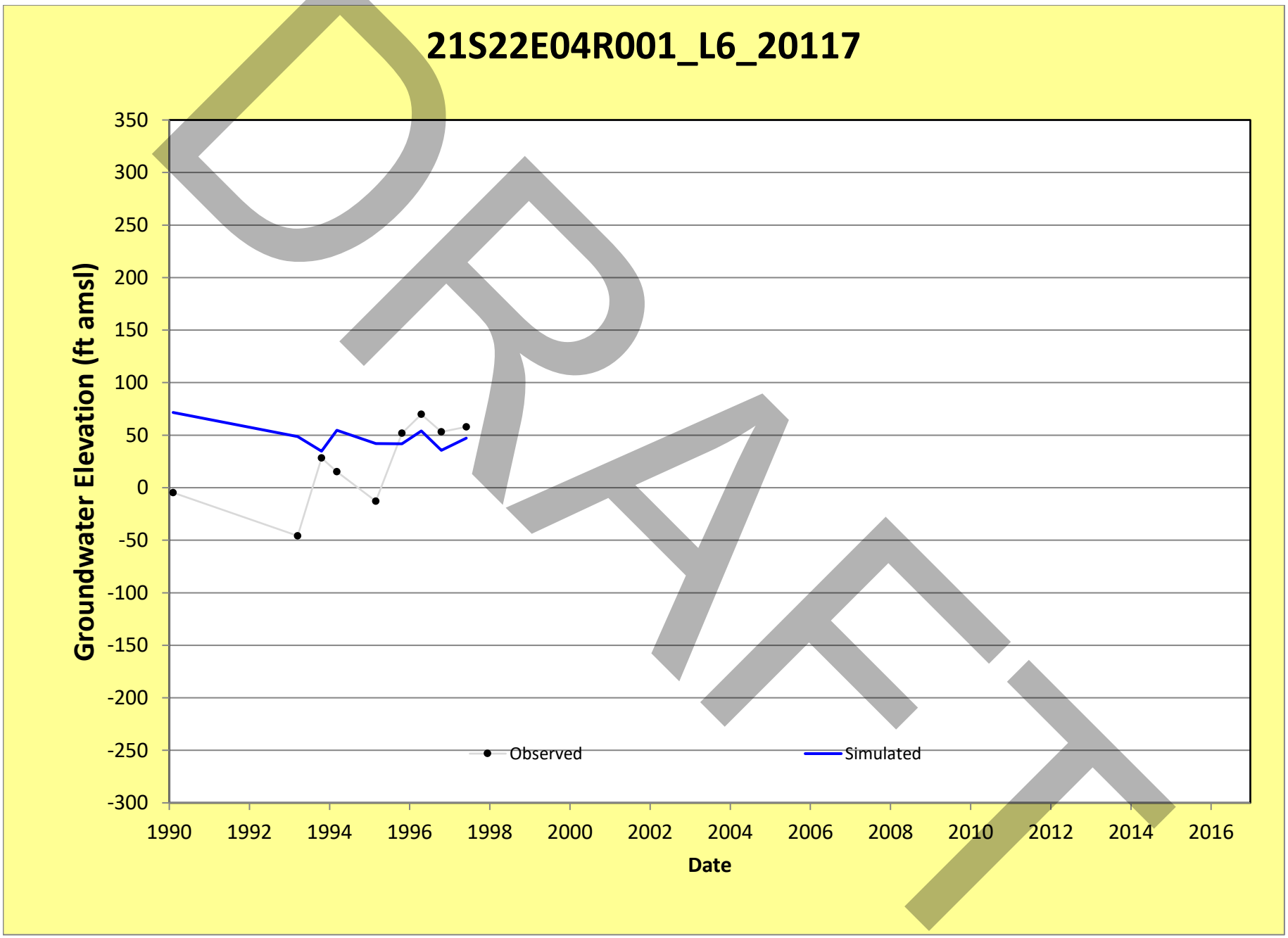
Date
Observed
Simulated
DRAFT


21S22E04R001_L6_20117
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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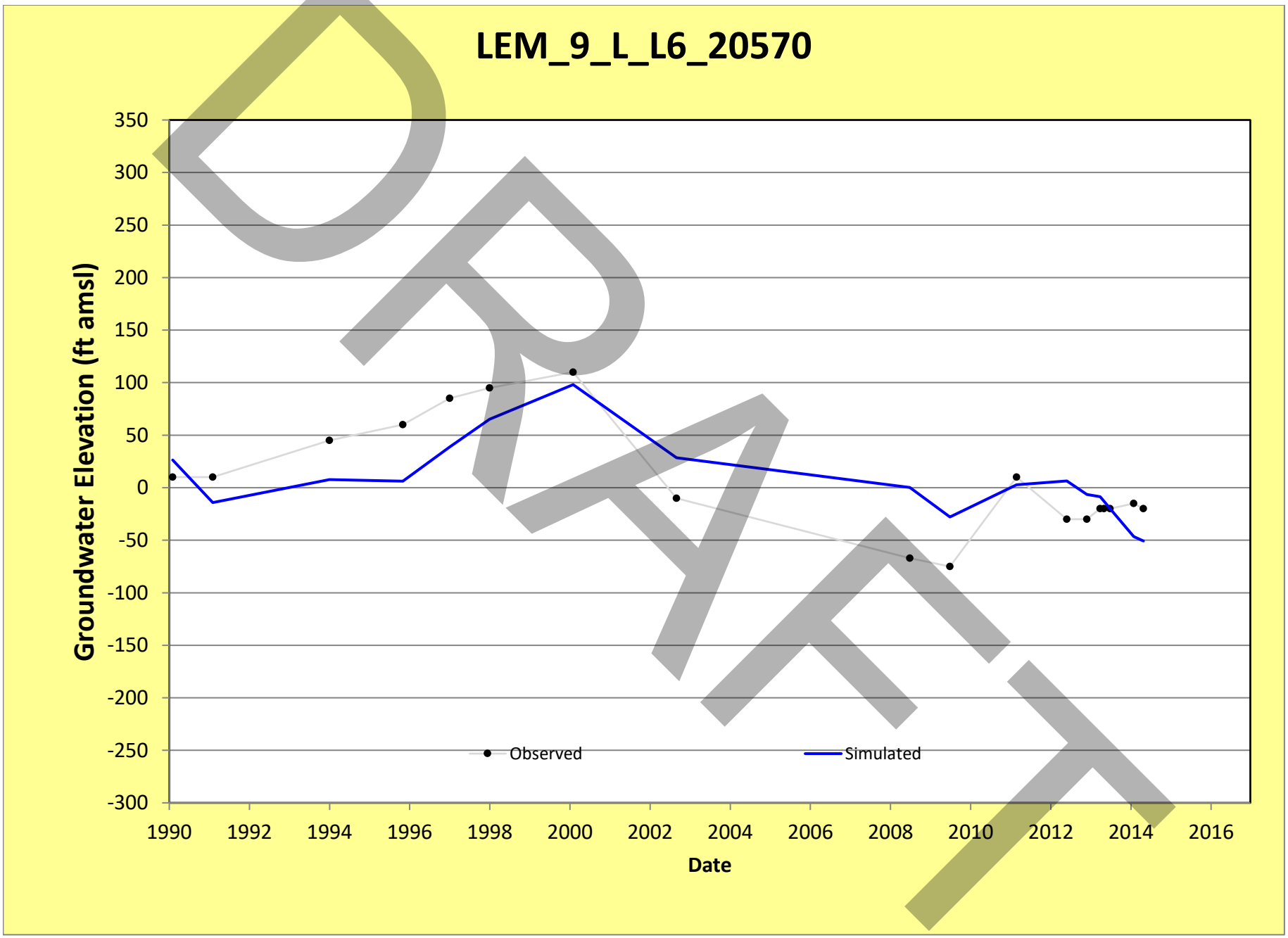
Date
Observed
Simulated
DRAFT


LEM_9_L_L6_20570
Groundwater Elevation (ft amsl)
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100
50
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-50
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-150
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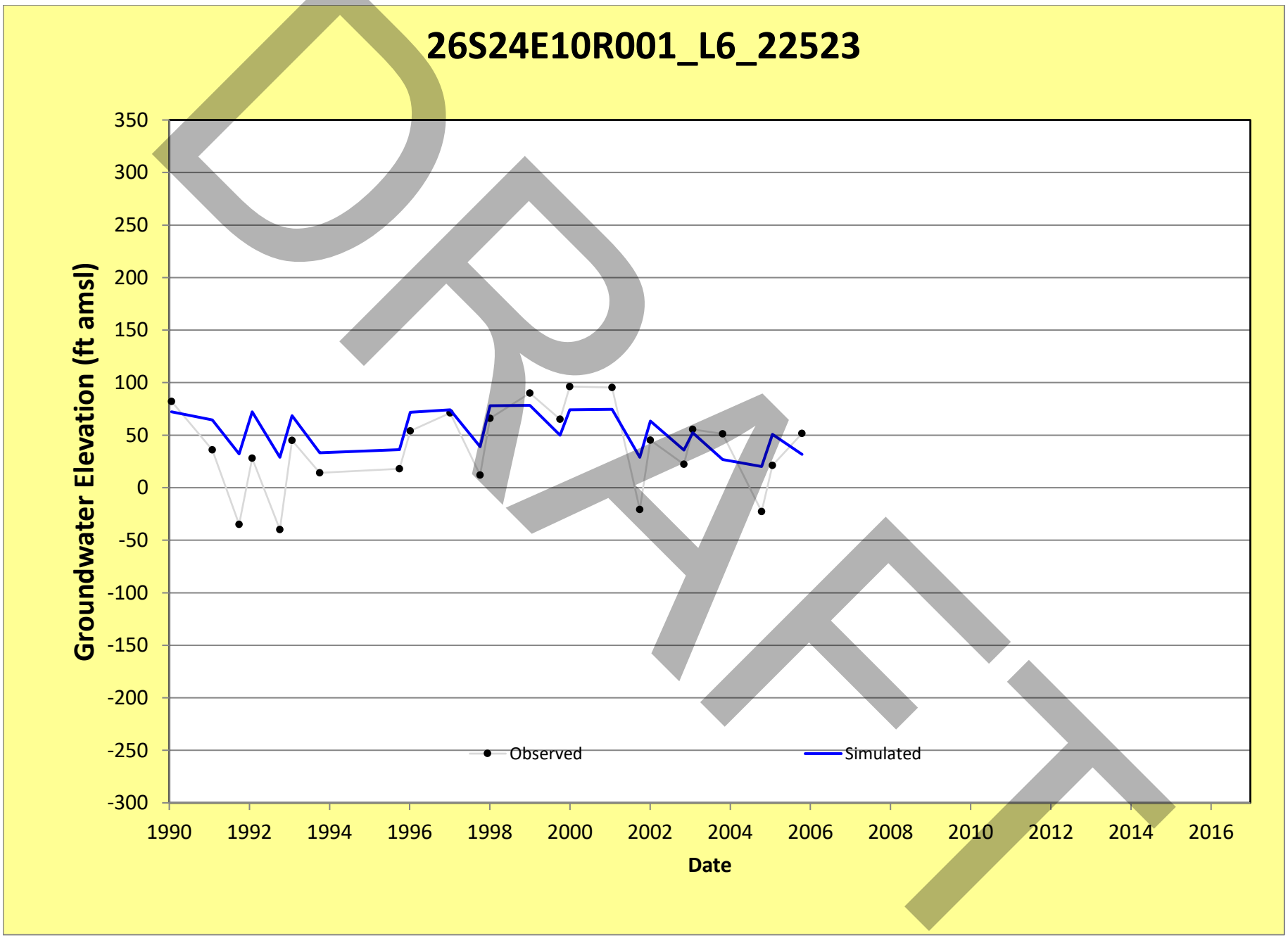
Date
Observed
Simulated
DRAFT


26S24E10R001_L6_22523
Groundwater Elevation (ft amsl)
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300
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100
50
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-50
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-150
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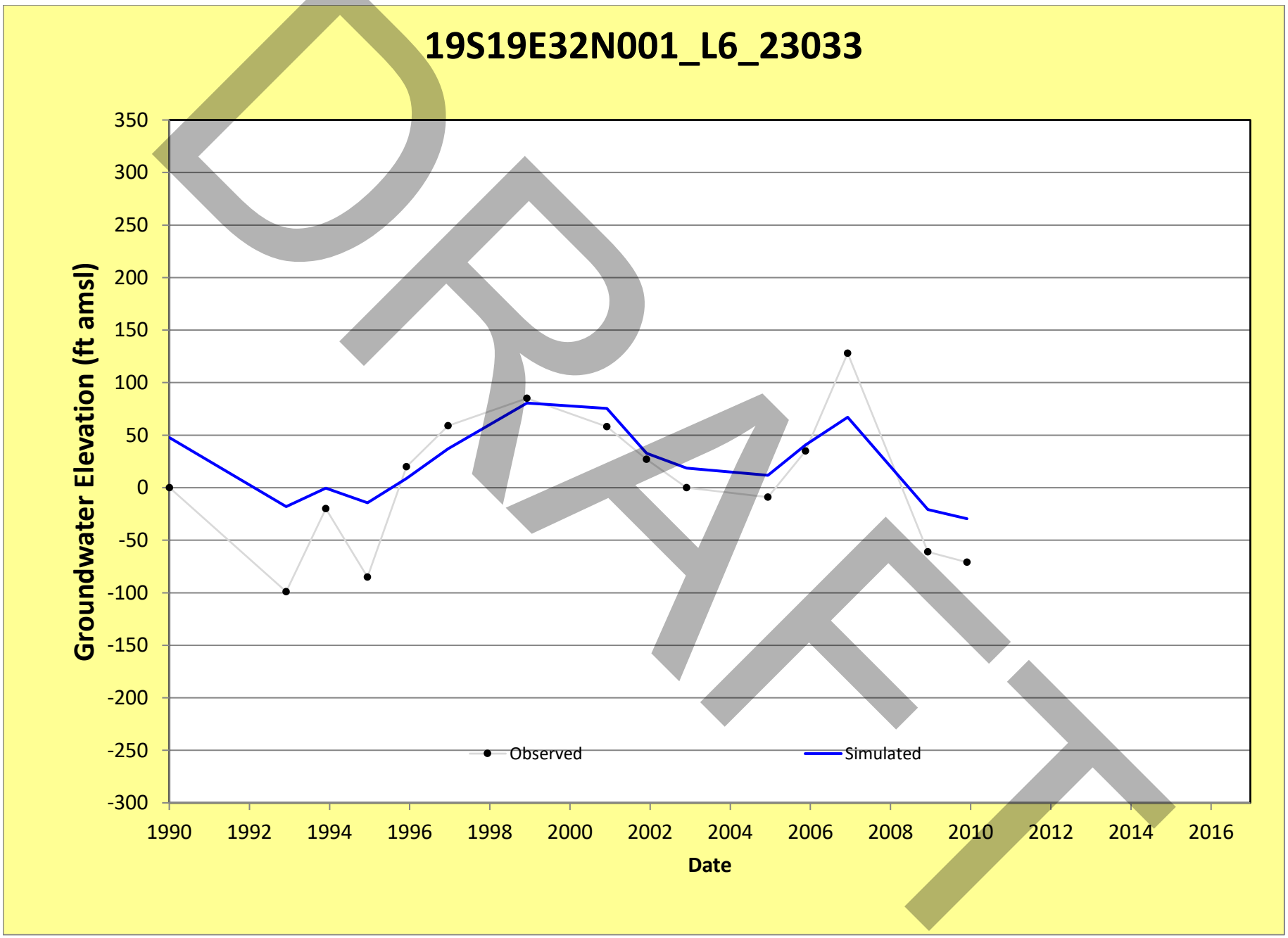
Observed
Simulated
DRAFT


19S19E32N001_L6_23033
Groundwater Elevation (ft amsl)
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-50
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-150
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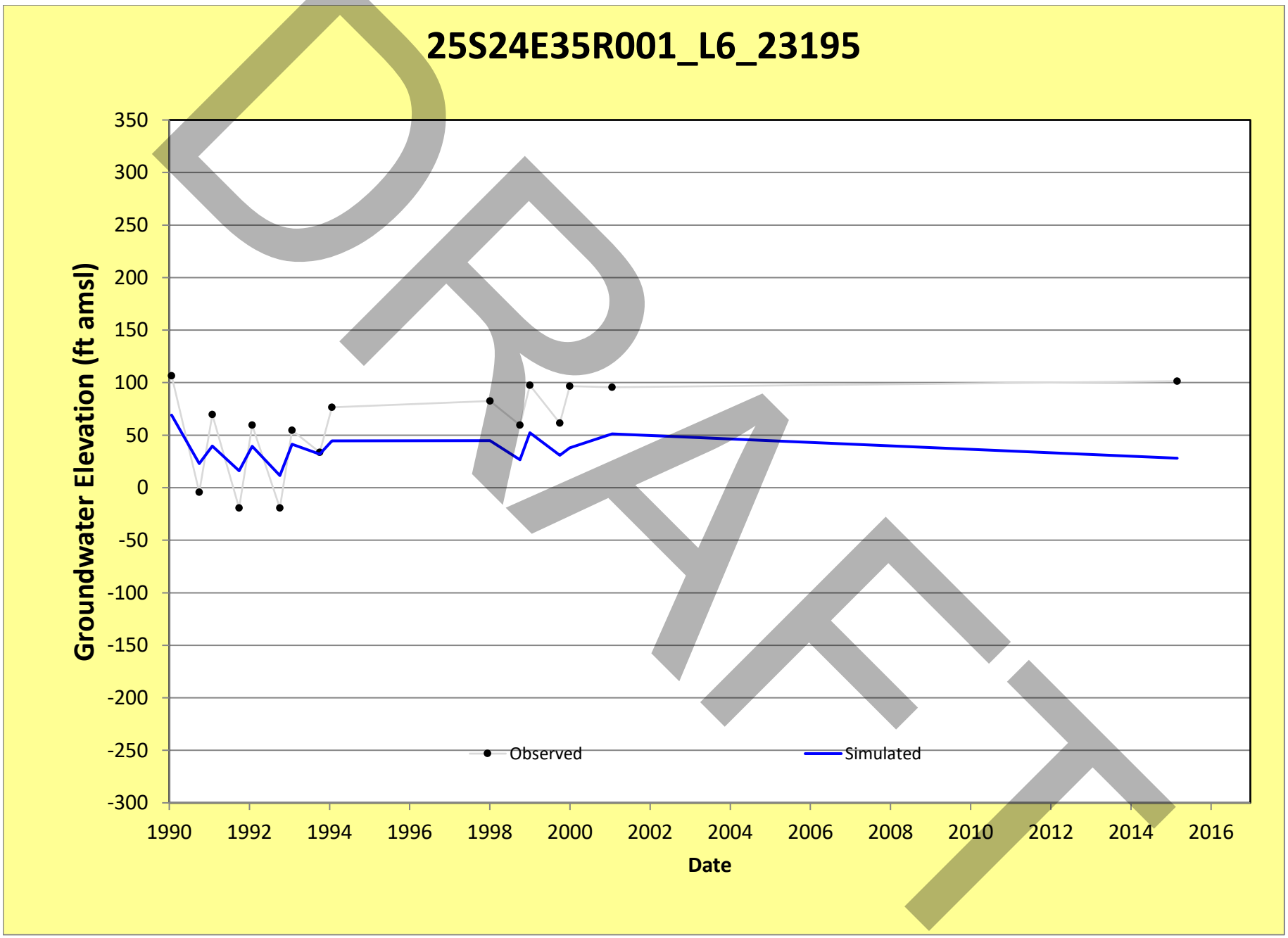
Date
Observed
Simulated
DRAFT


25S24E35R001_L6_23195
Groundwater Elevation (ft amsl)
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300
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100
50
0
-50
-100
-150
-200
-250
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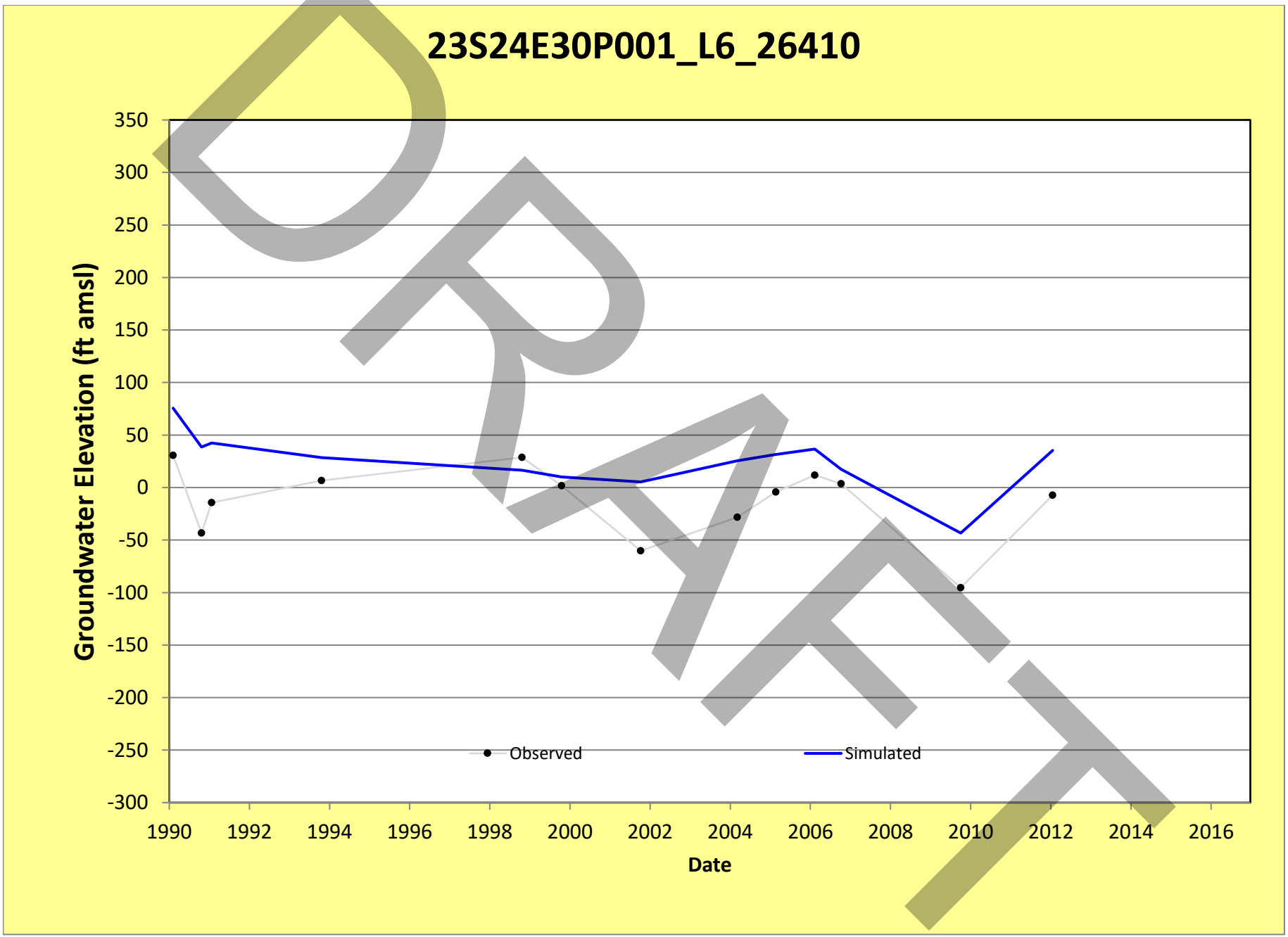
Date
Observed
Simulated
DRAFT


23S24E30P001_L6_26410
Groundwater Elevation (ft amsl)
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100
50
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-50
-100
-150
-200
-250
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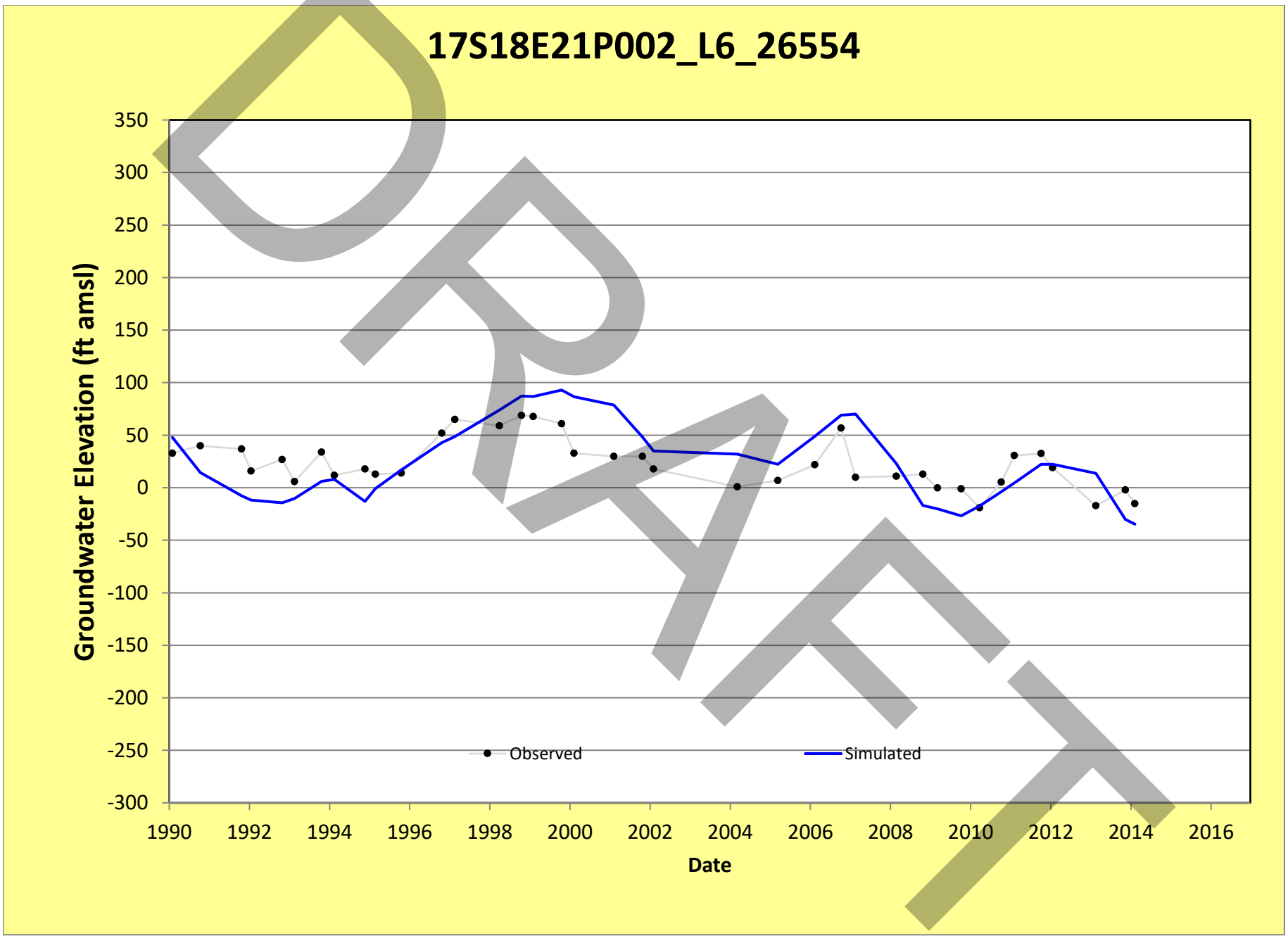
Date
Observed
Simulated
DRAFT


17S18E21P002_L6_26554
Groundwater Elevation (ft amsl)
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-50
-100
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-200
-250
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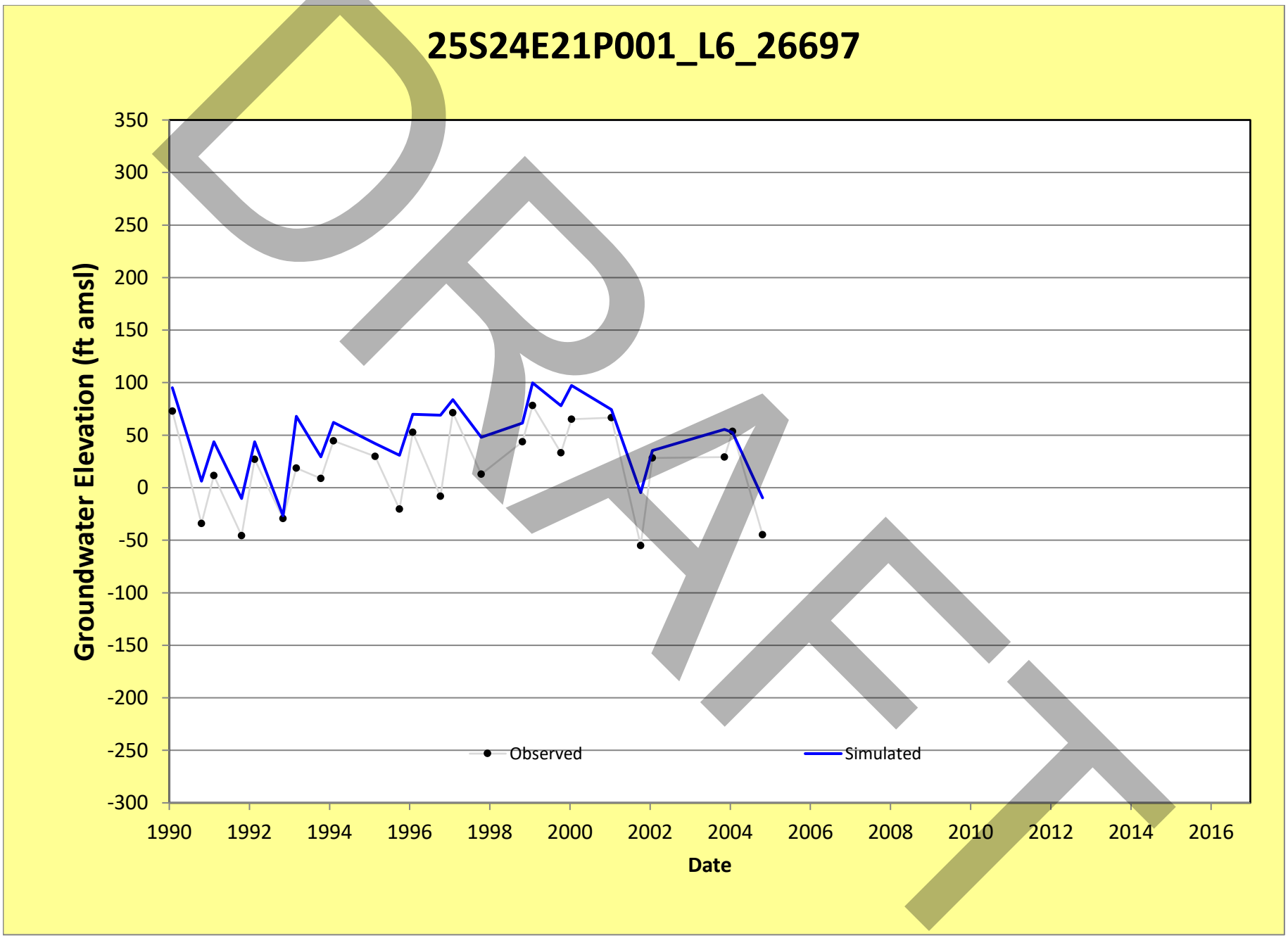
Date
Observed
Simulated
DRAFT


25S24E21P001_L6_26697
Groundwater Elevation (ft amsl)
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-100
-150
-200
-250
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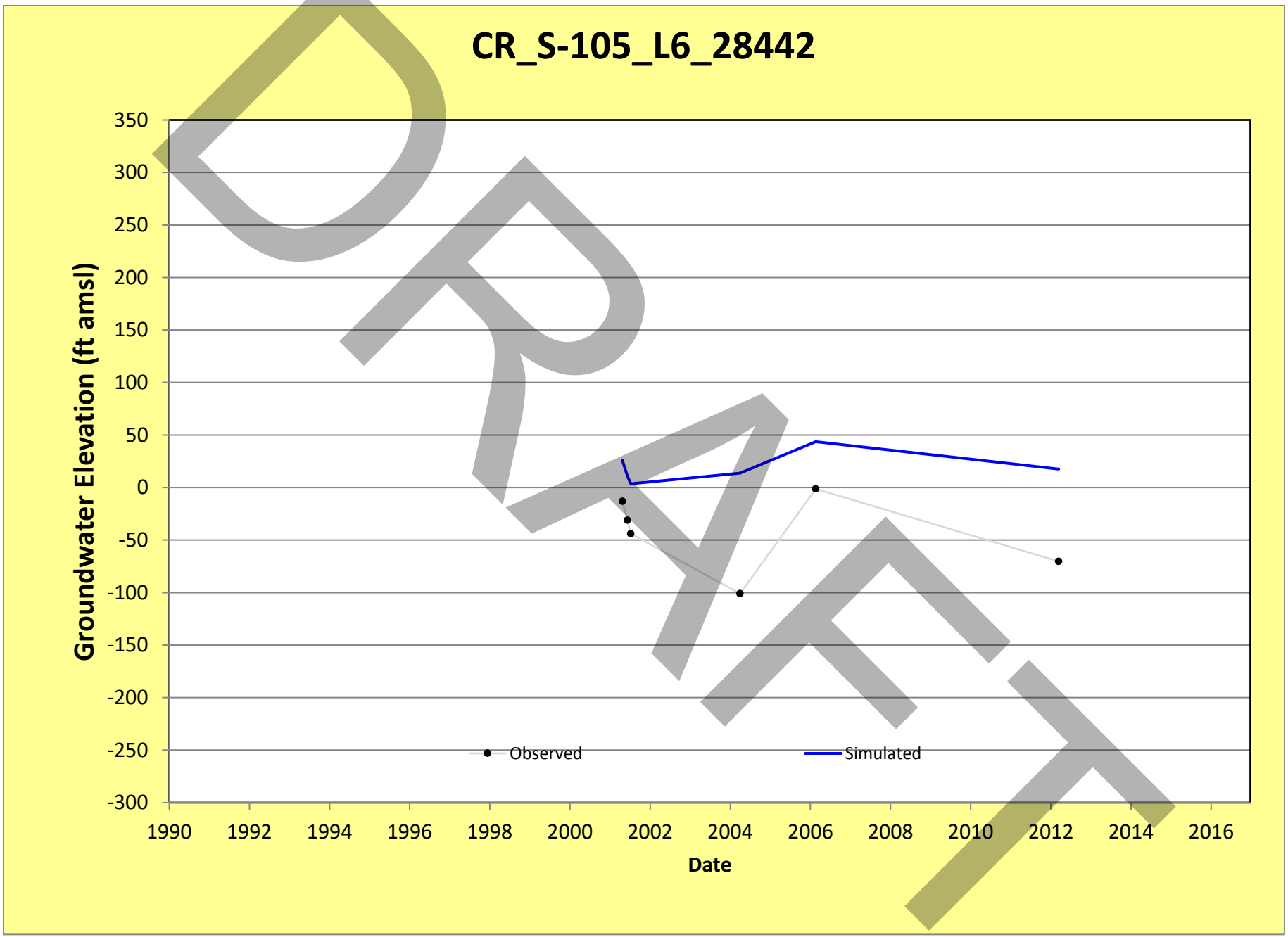
Date
Observed
Simulated
DRAFT


CR_S-105_L6_28442
Groundwater Elevation (ft amsl)
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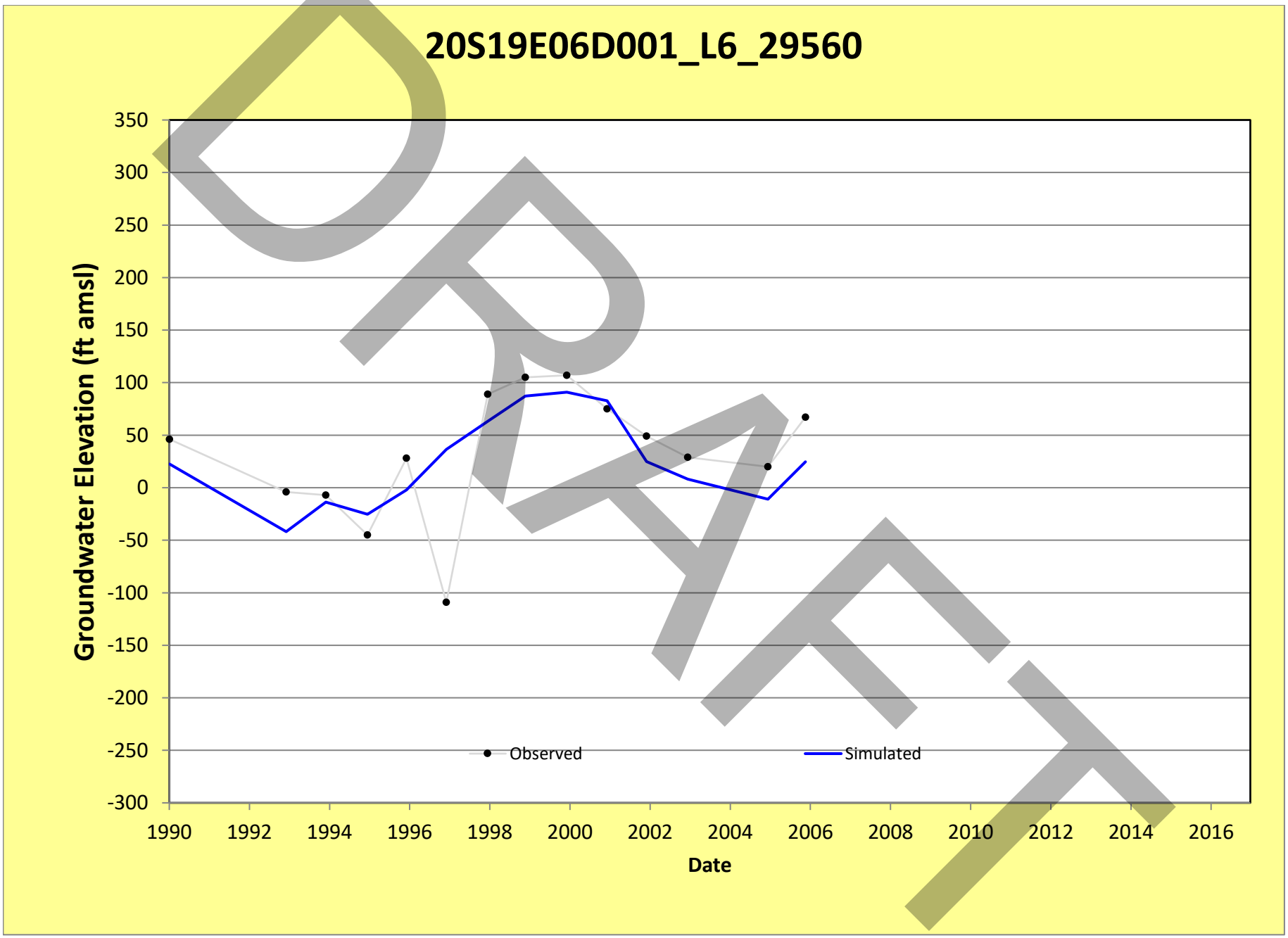
Observed
Simulated
DRAFT


20S19E06D001_L6_29560
Groundwater Elevation (ft amsl)
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-200
-250
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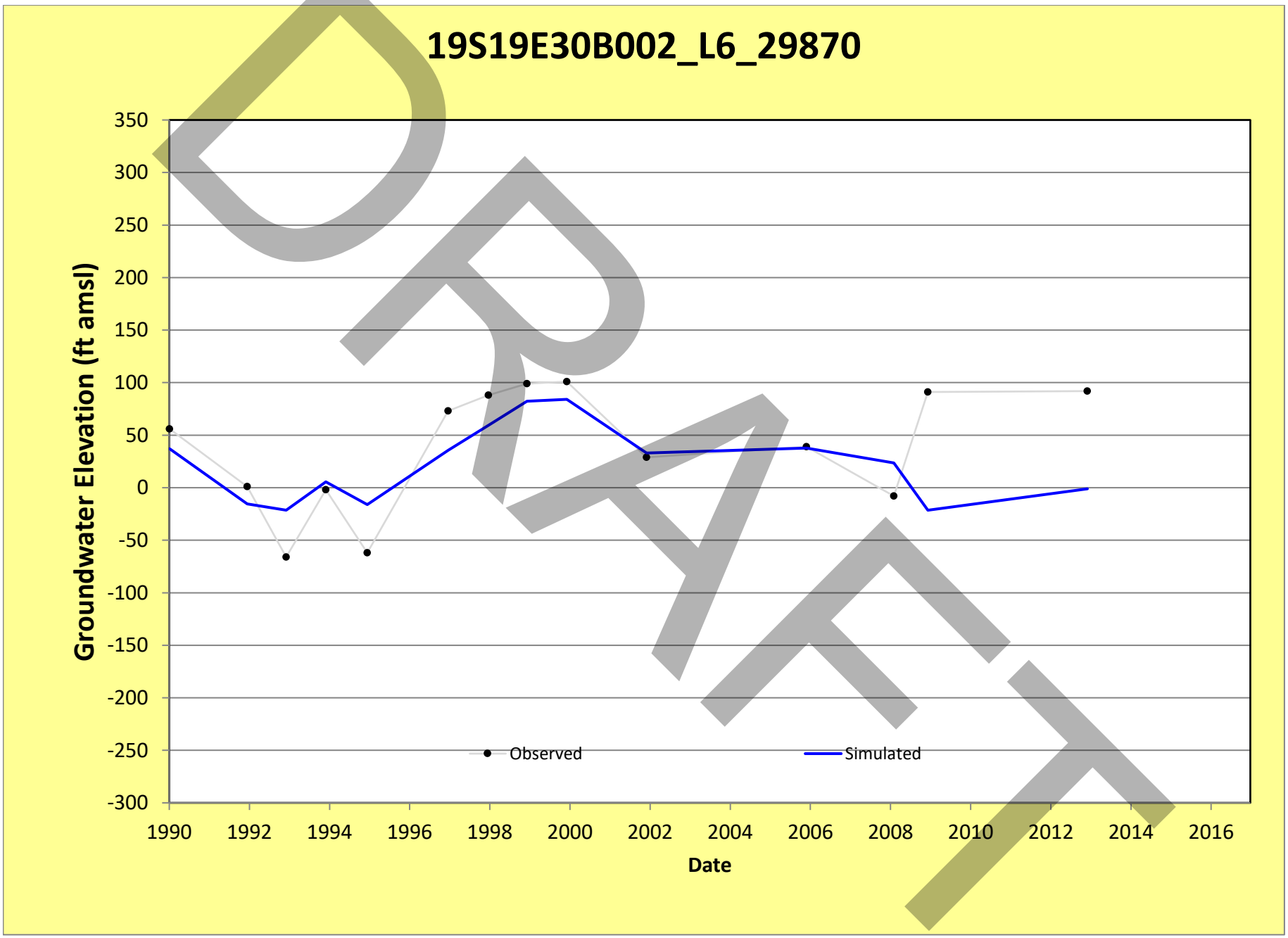
Date
Observed
Simulated
DRAFT


19S19E30B002_L6_29870
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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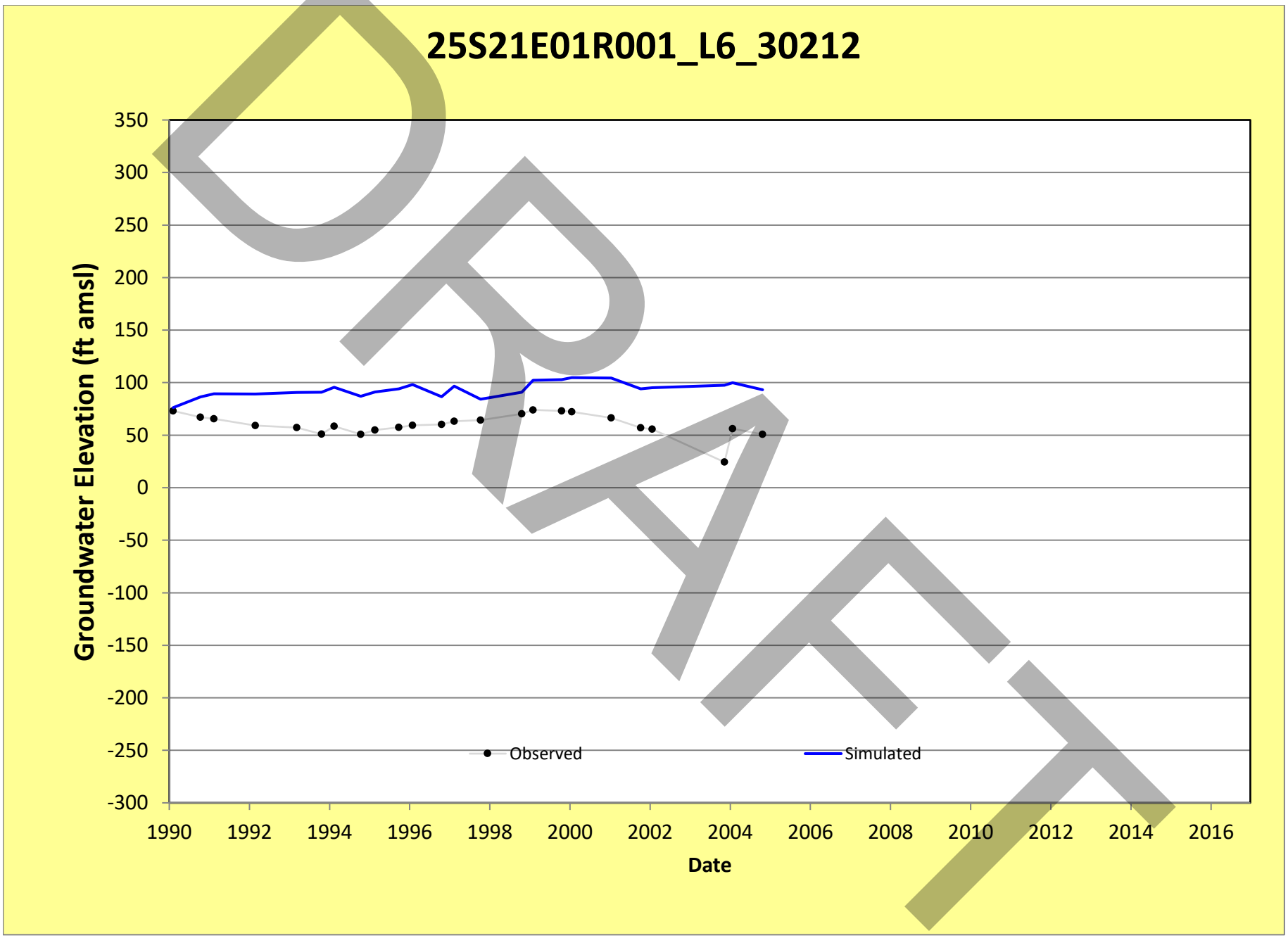
Date
Observed
Simulated
DRAFT


25S21E01R001_L6_30212
Groundwater Elevation (ft amsl)
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0
-50
-100
-150
-200
-250
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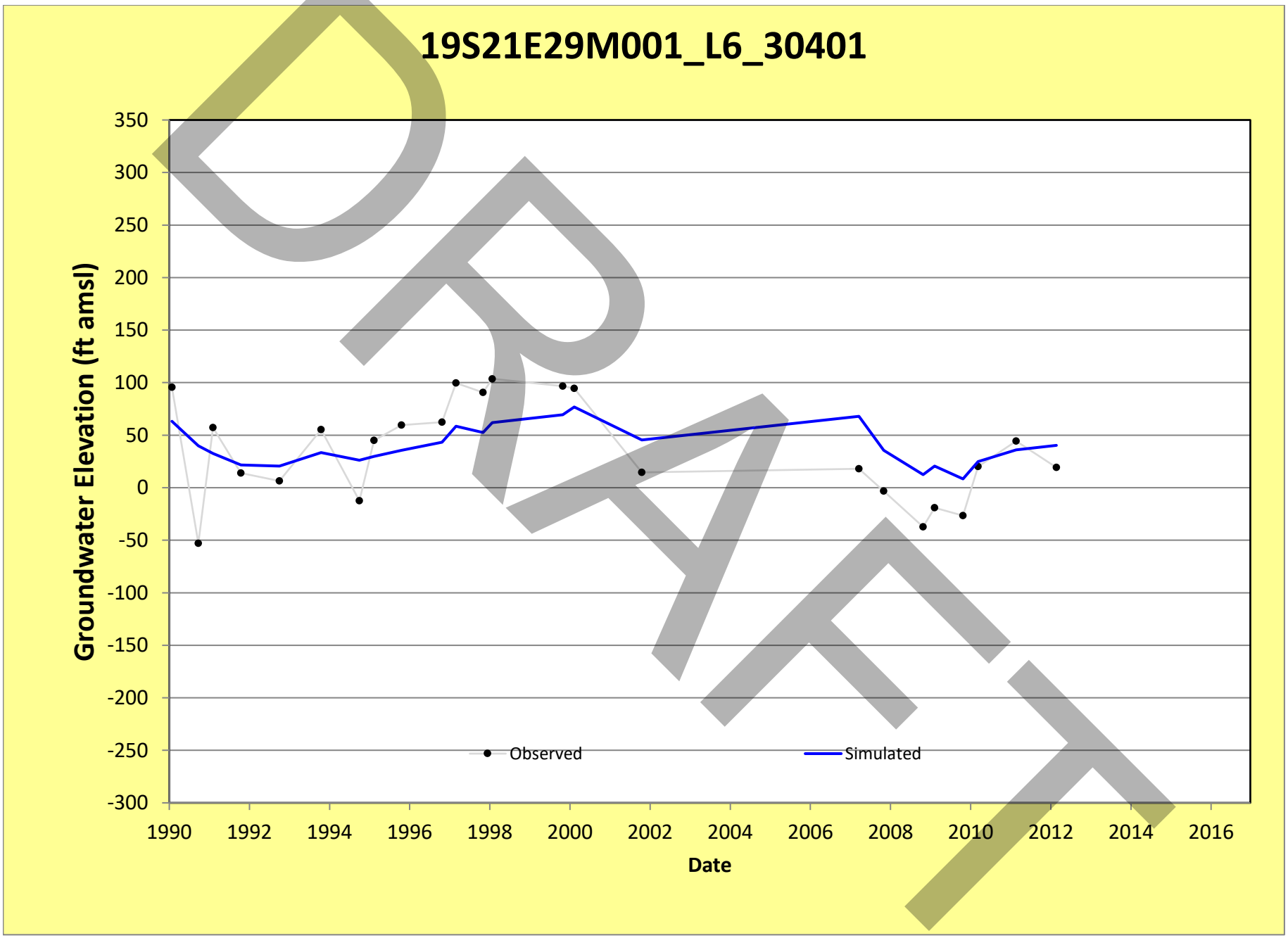
Date
Observed
Simulated
DRAFT


19S21E29M001_L6_30401
Groundwater Elevation (ft amsl)
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200
150
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0
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-100
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-200
-250
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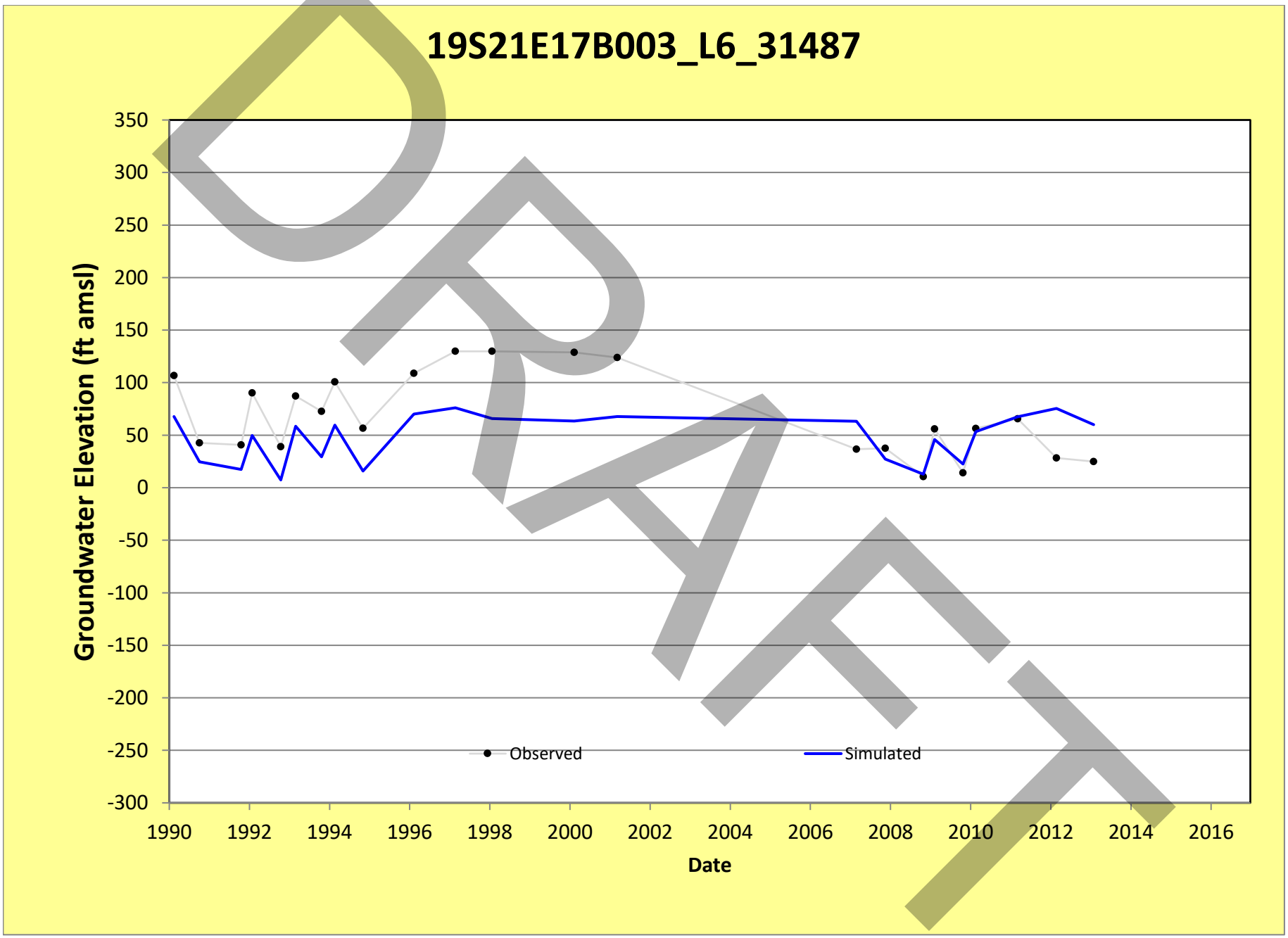
Date
Observed
Simulated
DRAFT


19S21E17B003_L6_31487
Groundwater Elevation (ft amsl)
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150
100
50
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-50
-100
-150
-200
-250
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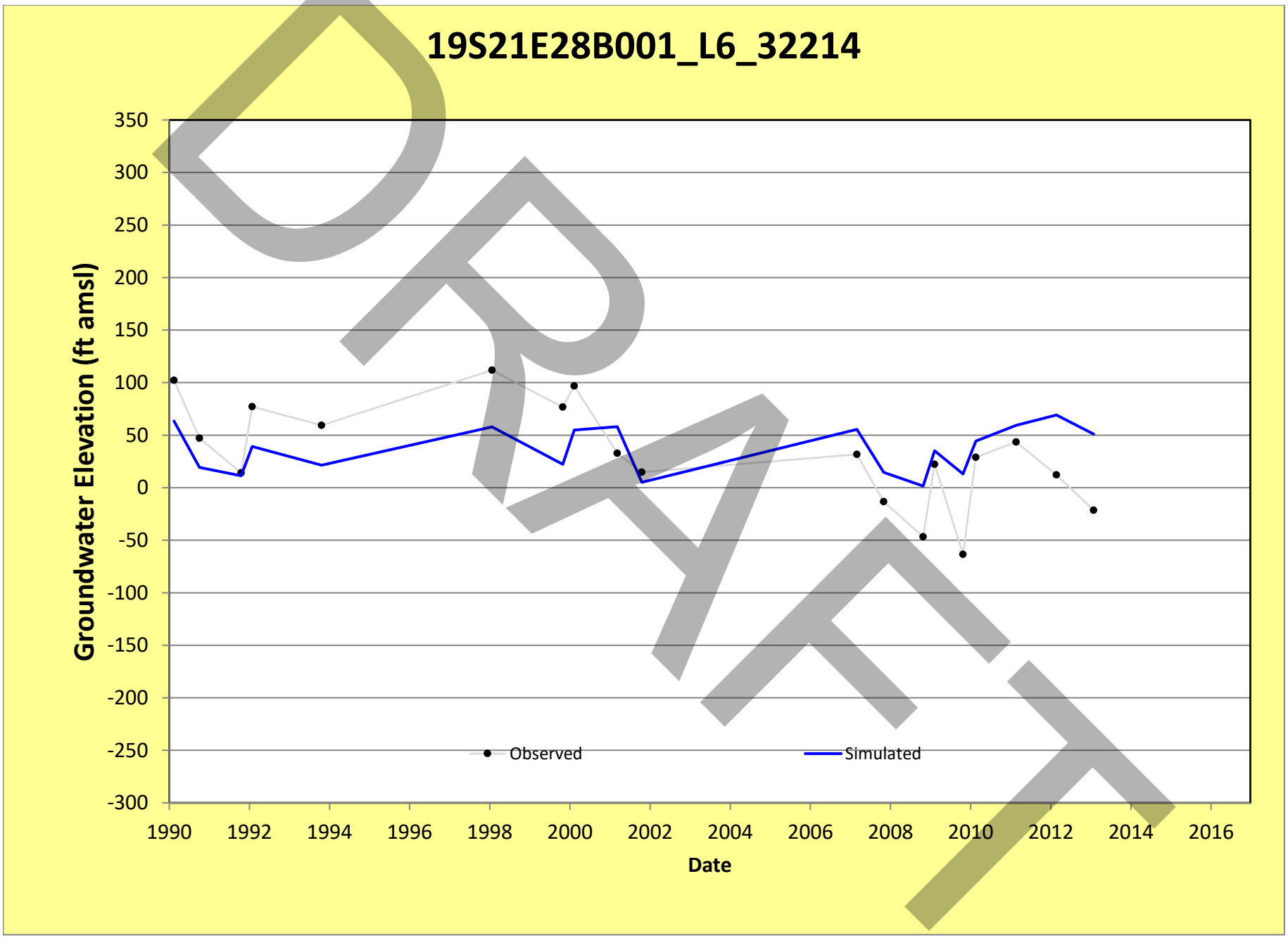
Date
Observed
Simulated
DRAFT


19S21E28B001_L6_32214
Groundwater Elevation (ft amsl)
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-50
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-200
-250
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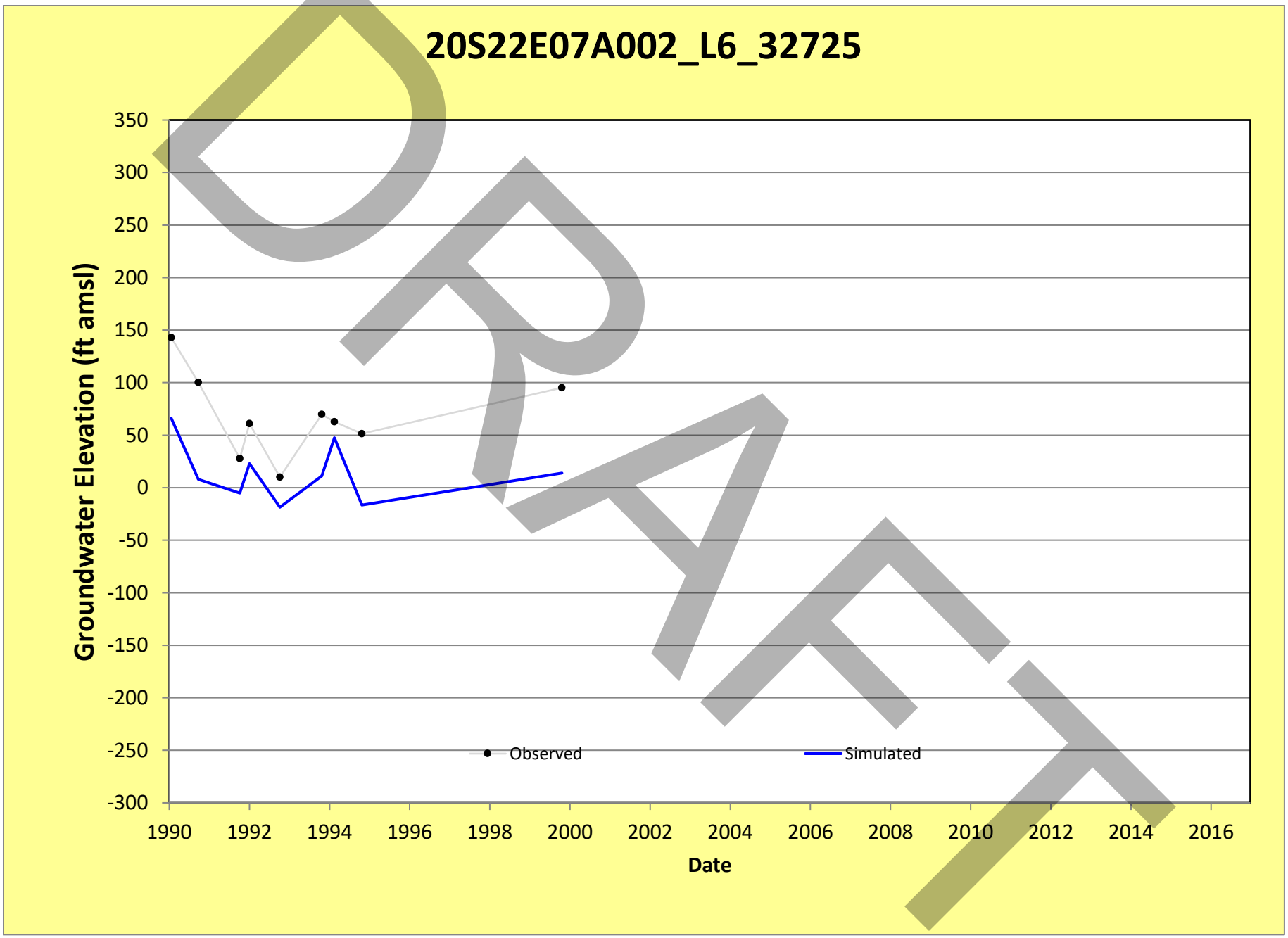
Date
Observed
Simulated
DRAFT


20S22E07A002_L6_32725
Groundwater Elevation (ft amsl)
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200
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50
0
-50
-100
-150
-200
-250
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1990
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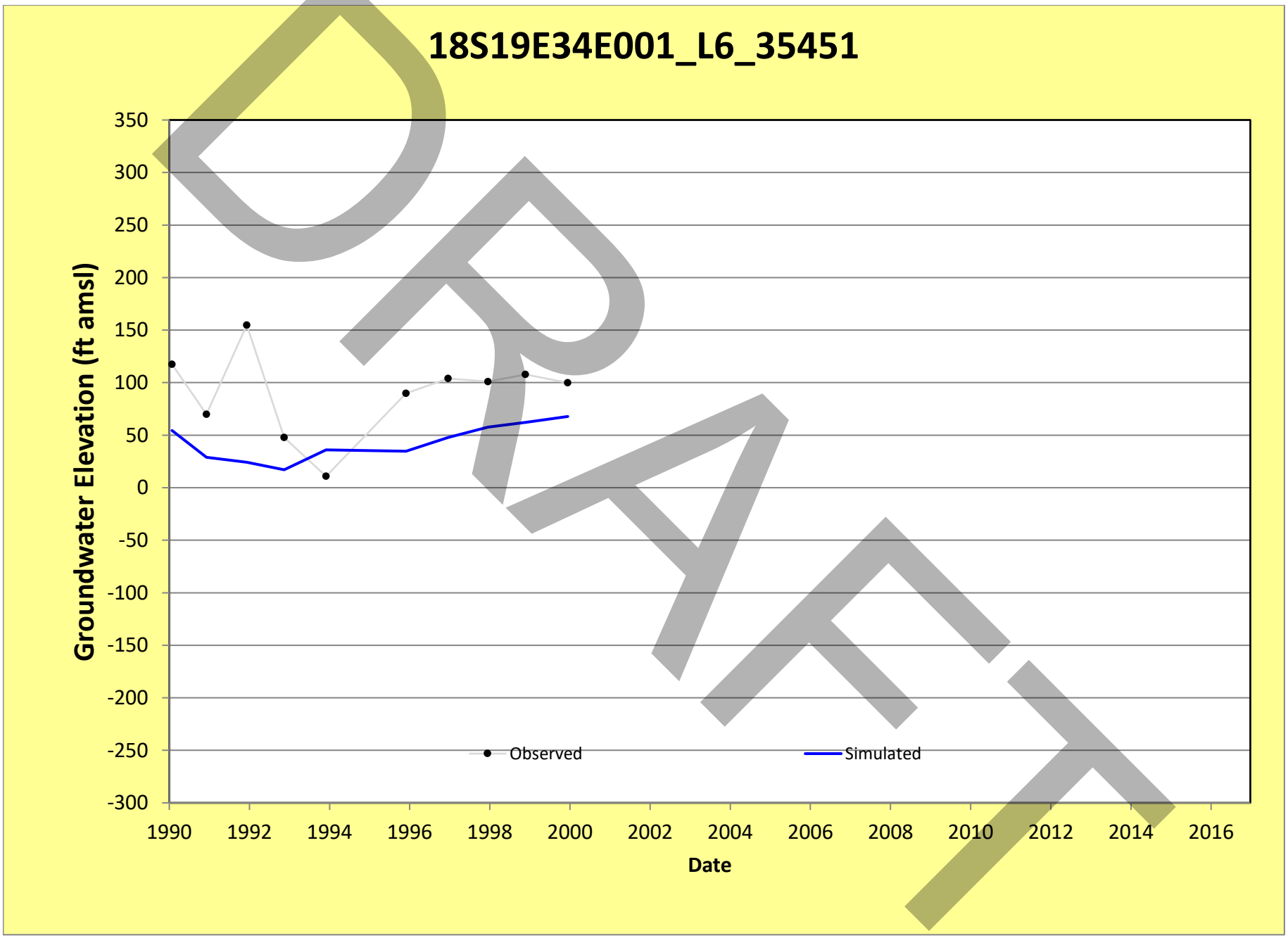
Date
Observed
Simulated
DRAFT


18S19E34E001_L6_35451
Groundwater Elevation (ft amsl)
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-100
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-200
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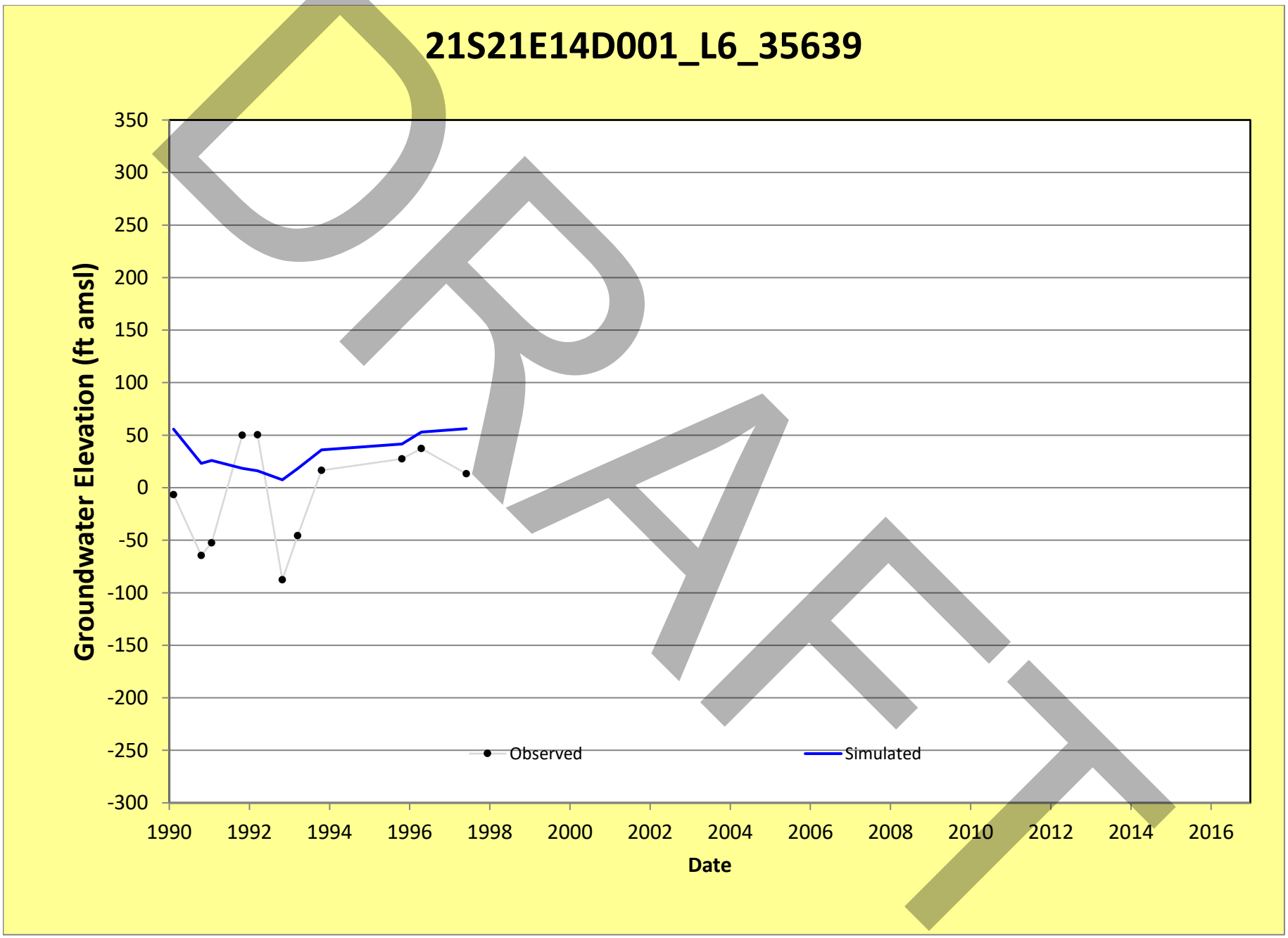
Date
Observed
Simulated

DRAFT


21S21E14D001_L6_35639
Groundwater Elevation (ft amsl)
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200
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-50
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-200
-250
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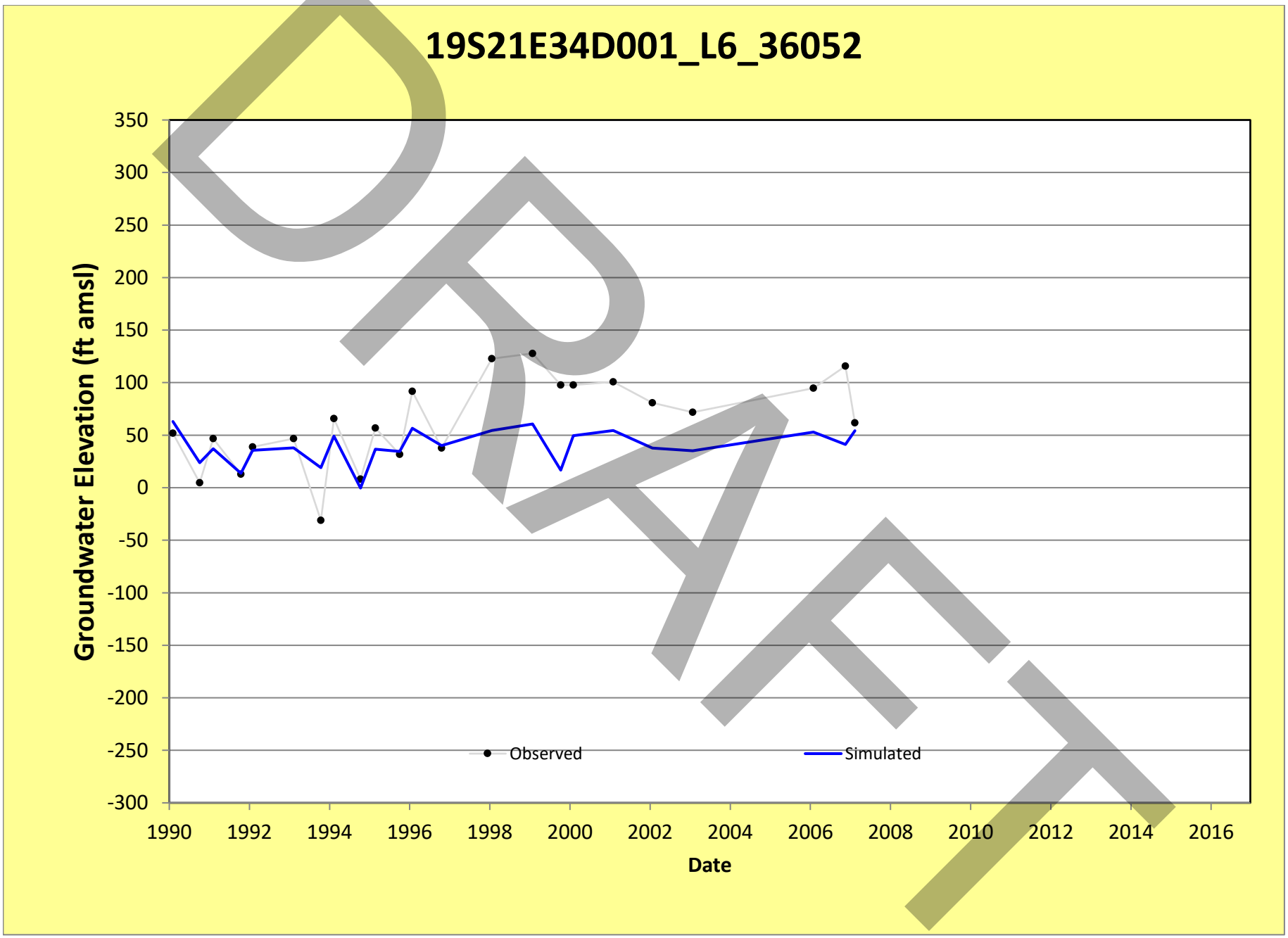
Date
Observed
Simulated
DRAFT


19S21E34D001_L6_36052
Groundwater Elevation (ft amsl)
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-100
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-200
-250
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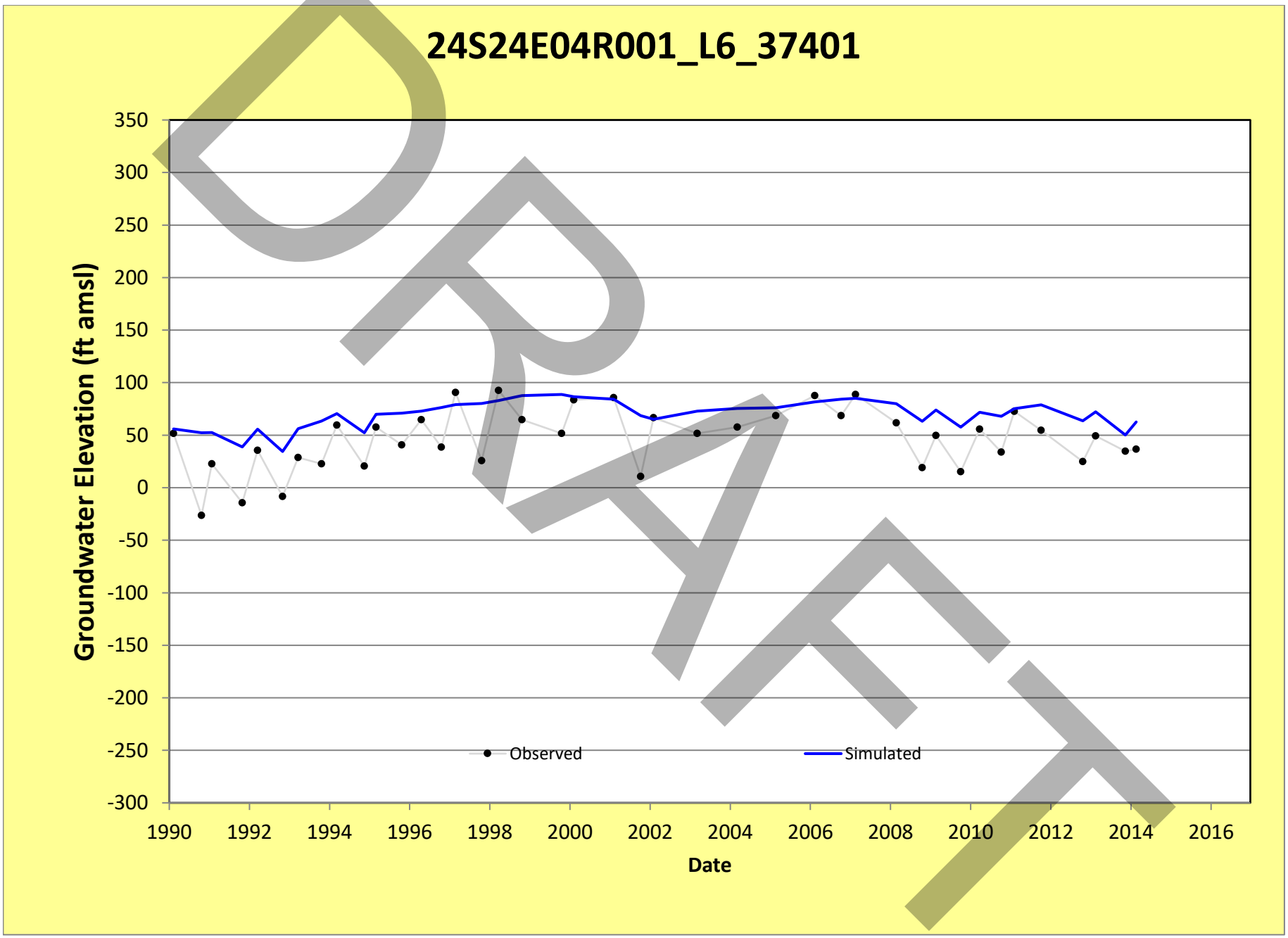
Date
Observed
Simulated
DRAFT


24S24E04R001_L6_37401
Groundwater Elevation (ft amsl)
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200
150
100
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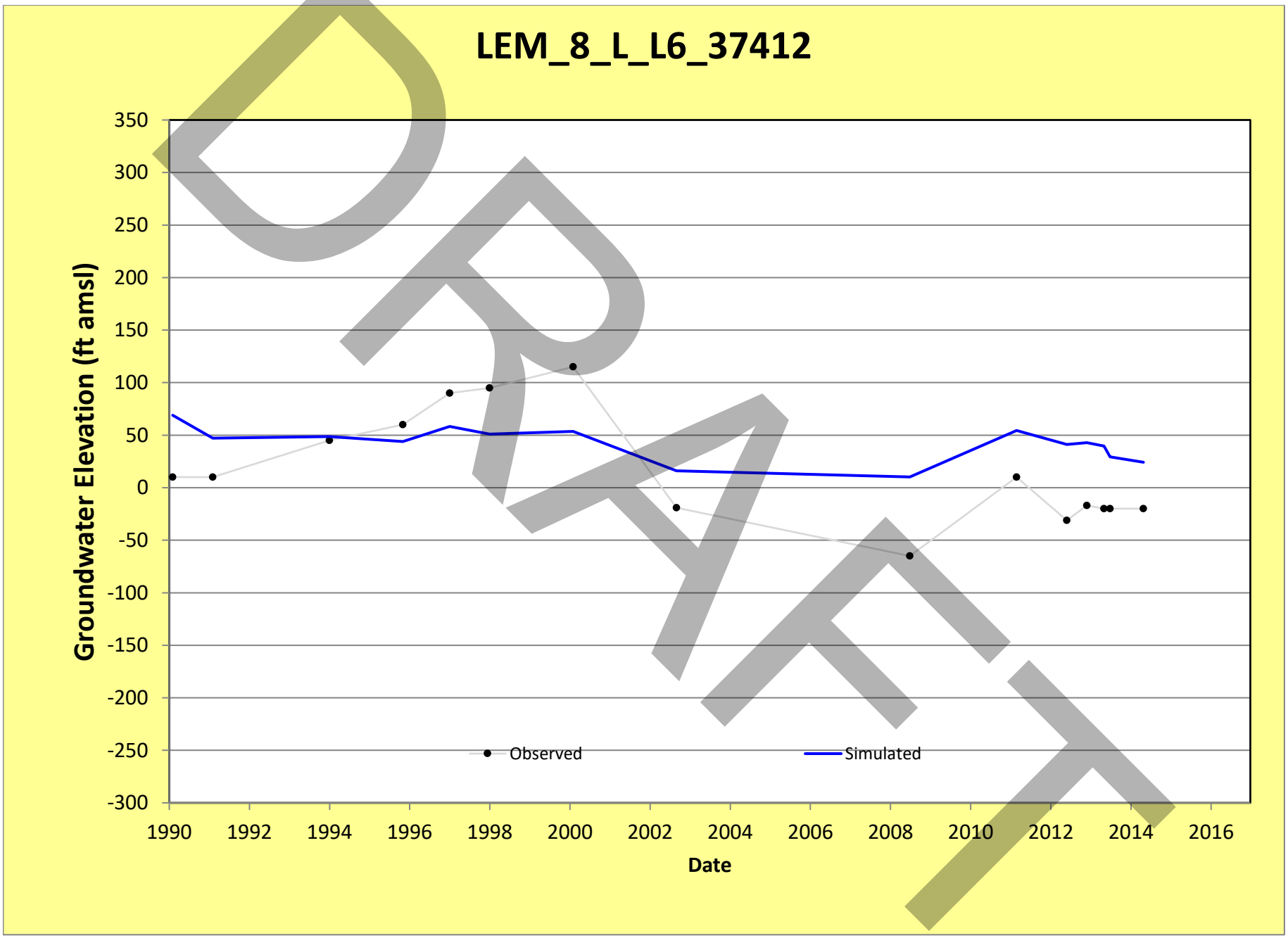
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Groundwater Elevation (ft amsl)
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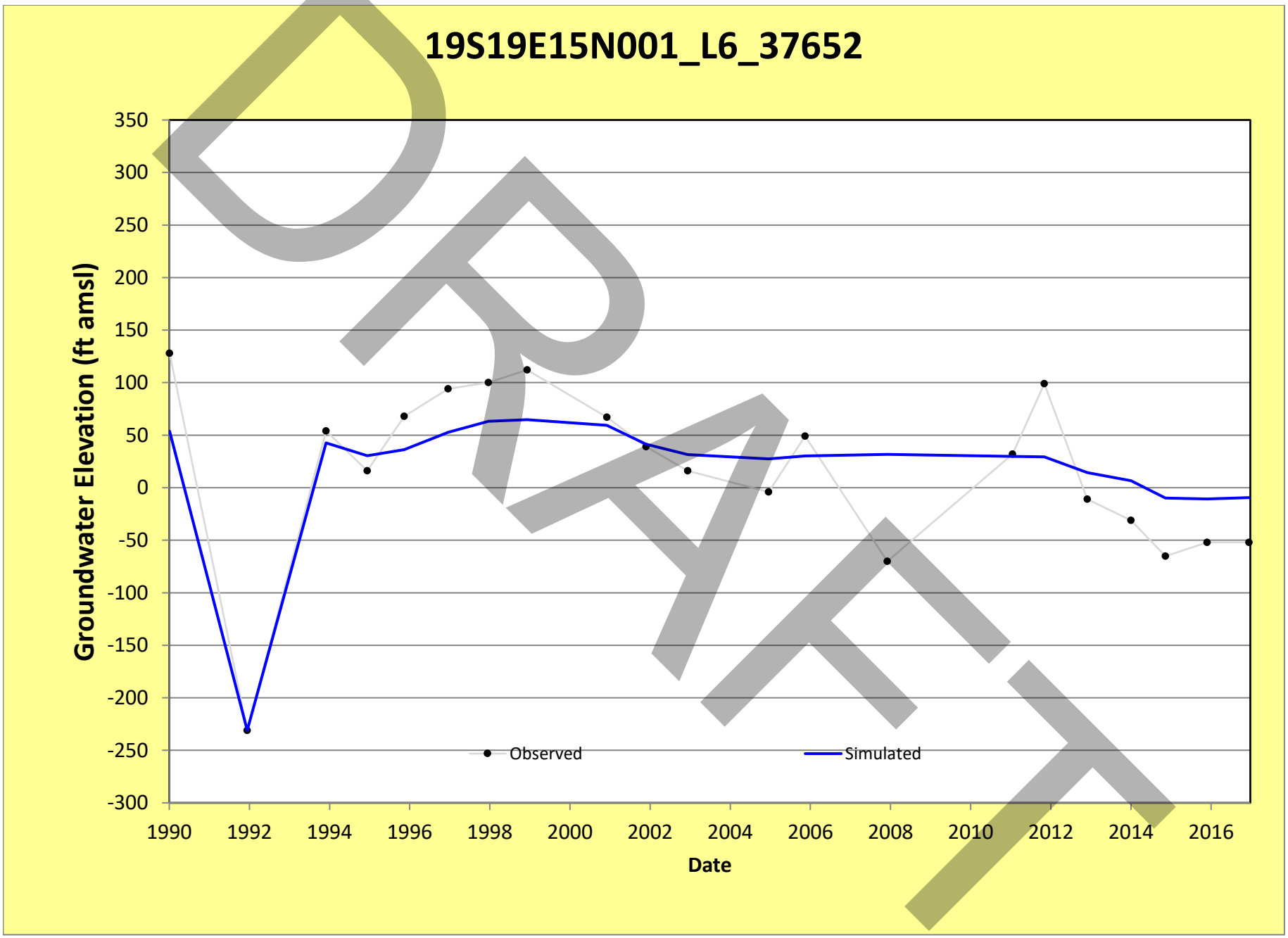
19S19E15N001_L6_37652
Groundwater Elevation (ft amsl)
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-150
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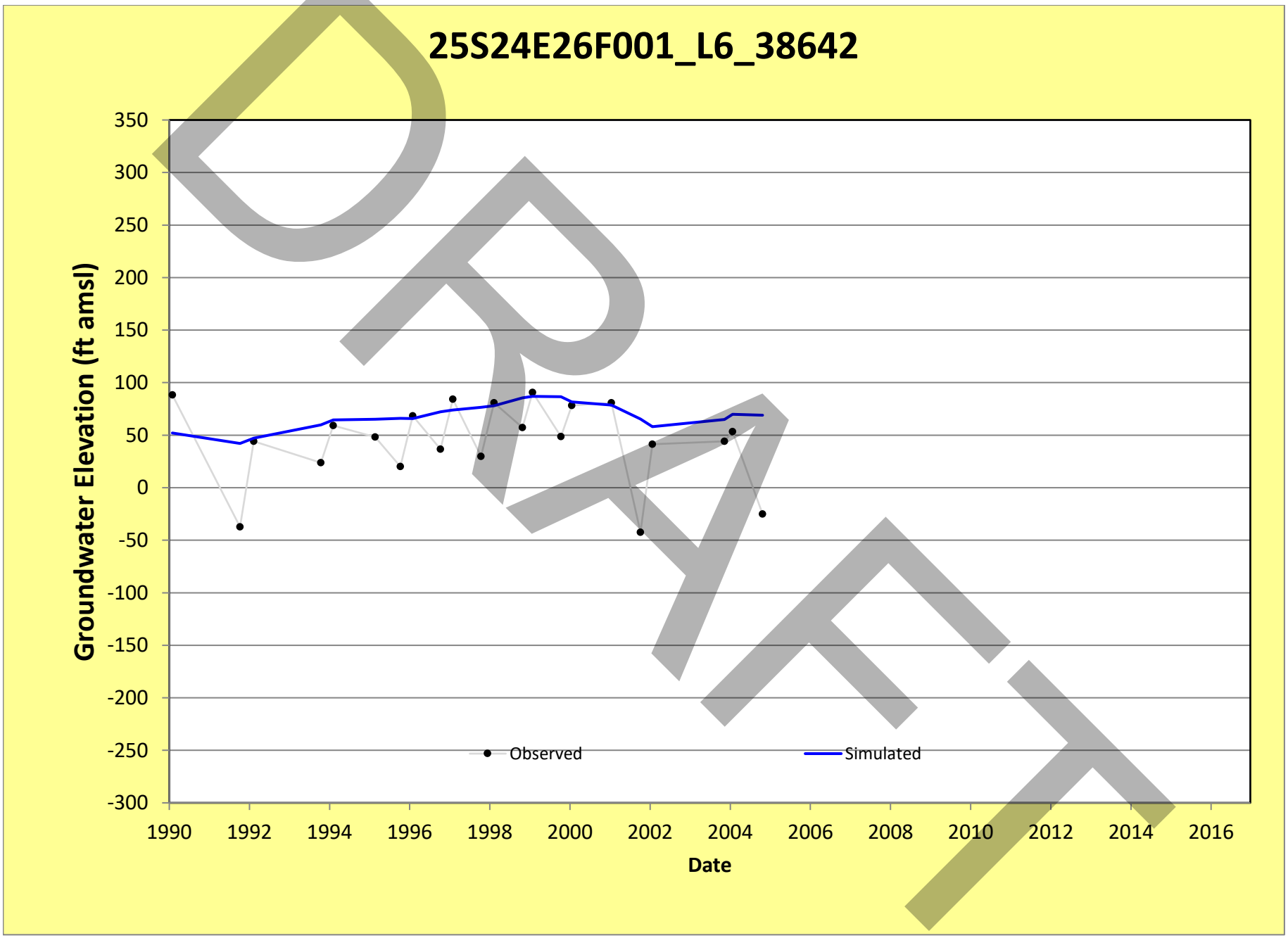
25S24E26F001_L6_38642
Groundwater Elevation (ft amsl)
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0
-50
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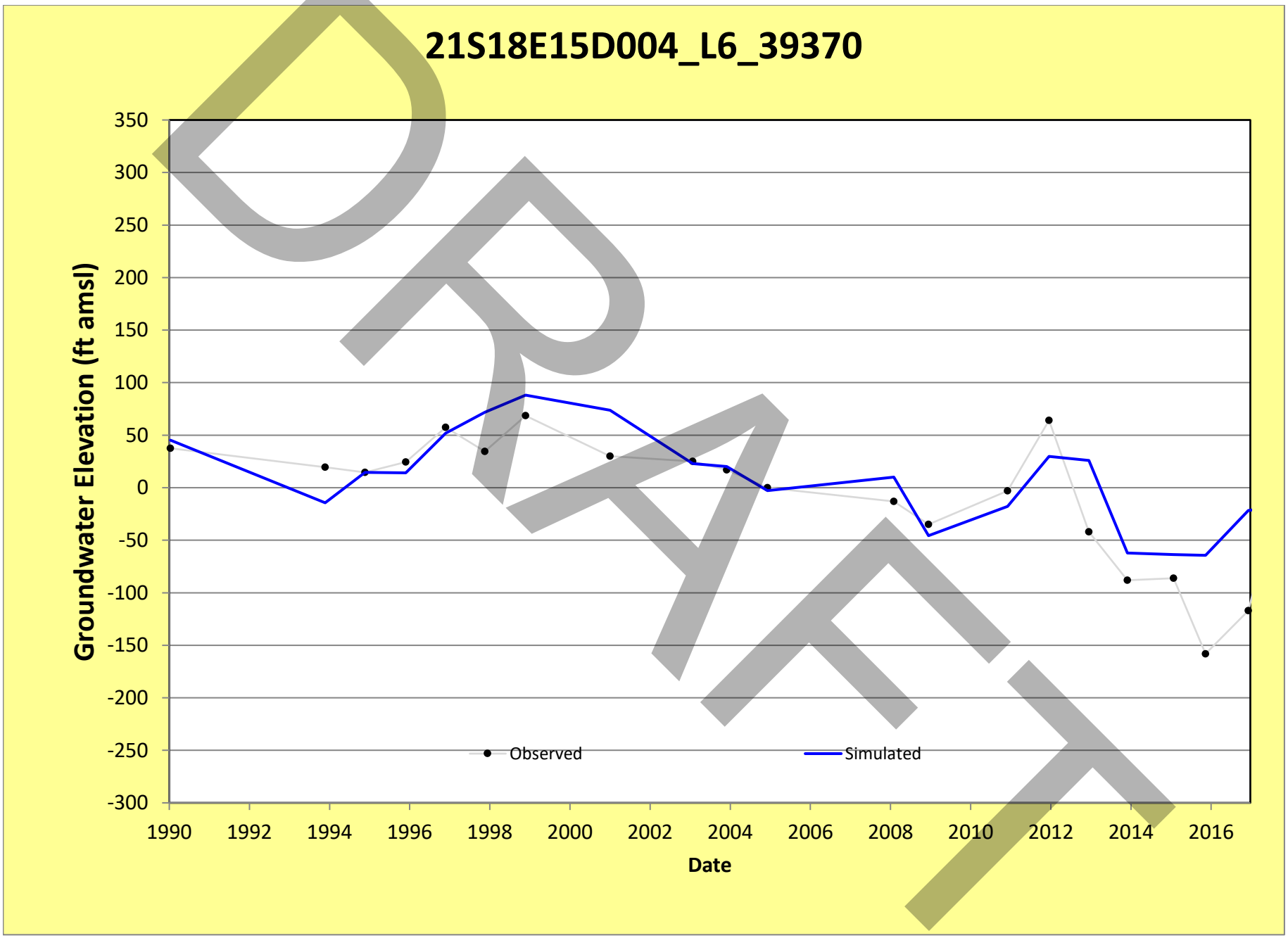
21S18E15D004_L6_39370
Groundwater Elevation (ft amsl)
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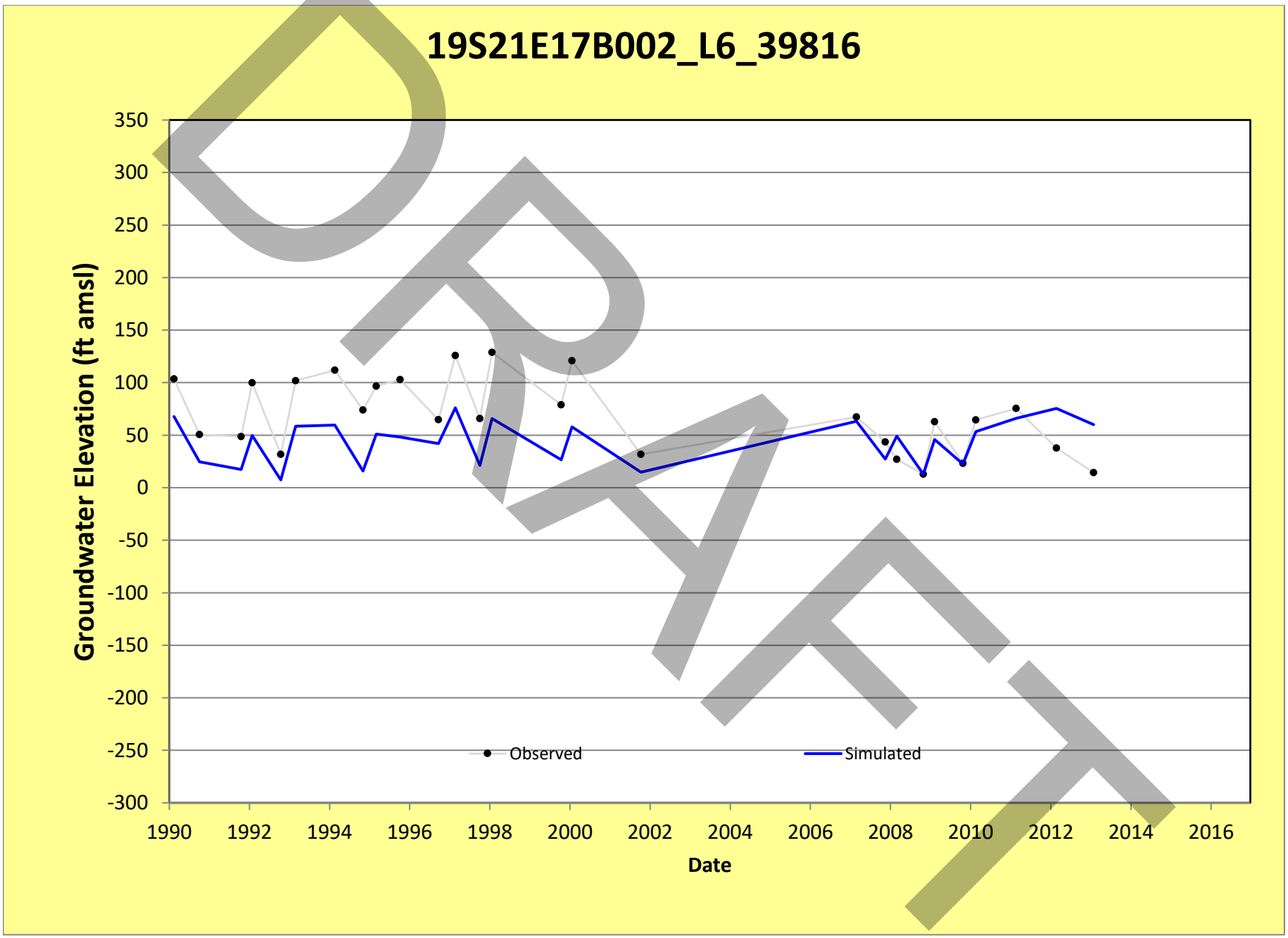
19S21E17B002_L6_39816
Groundwater Elevation (ft amsl)
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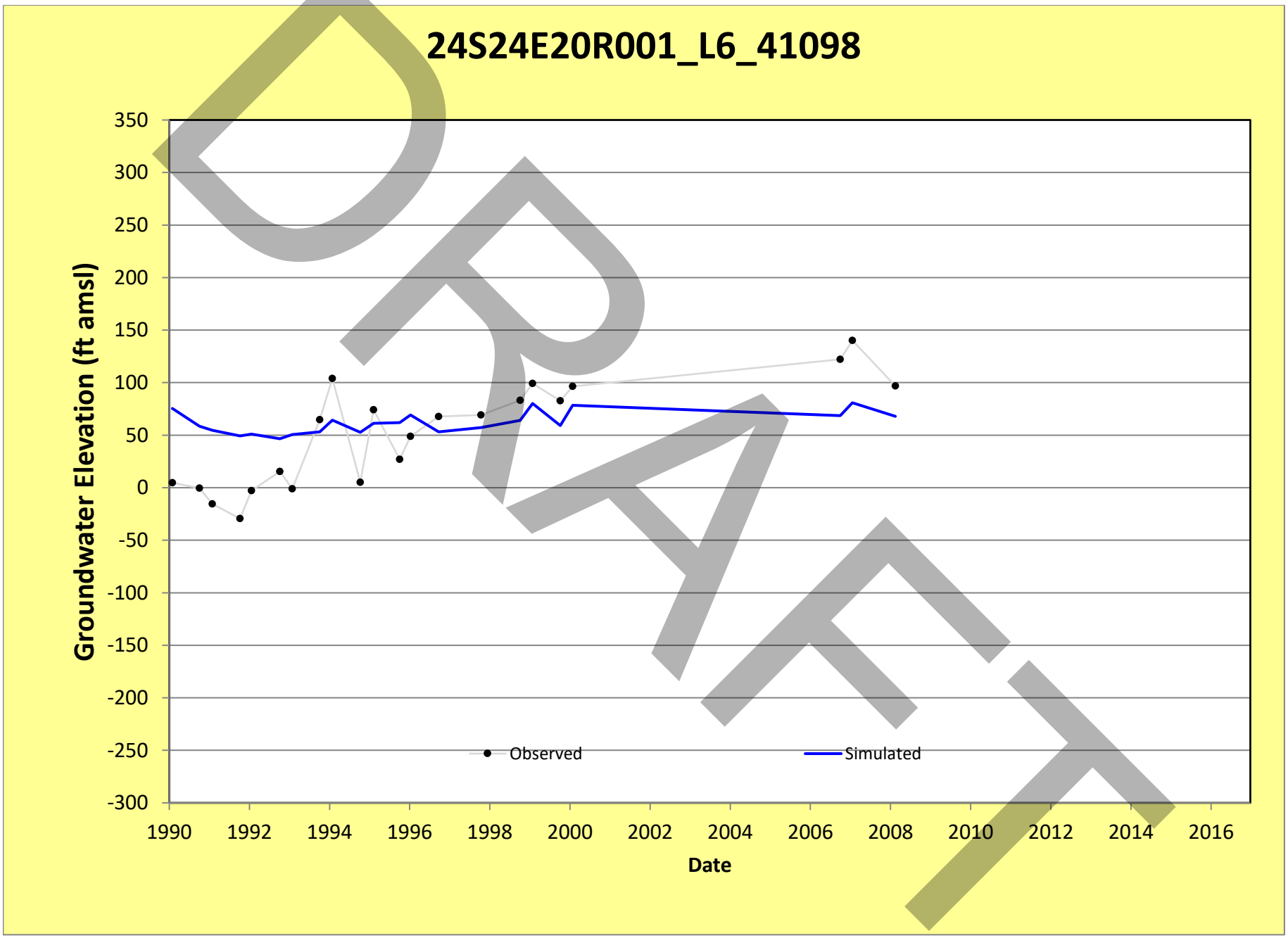
24S24E20R001_L6_41098
Groundwater Elevation (ft amsl)
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-150
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Observed
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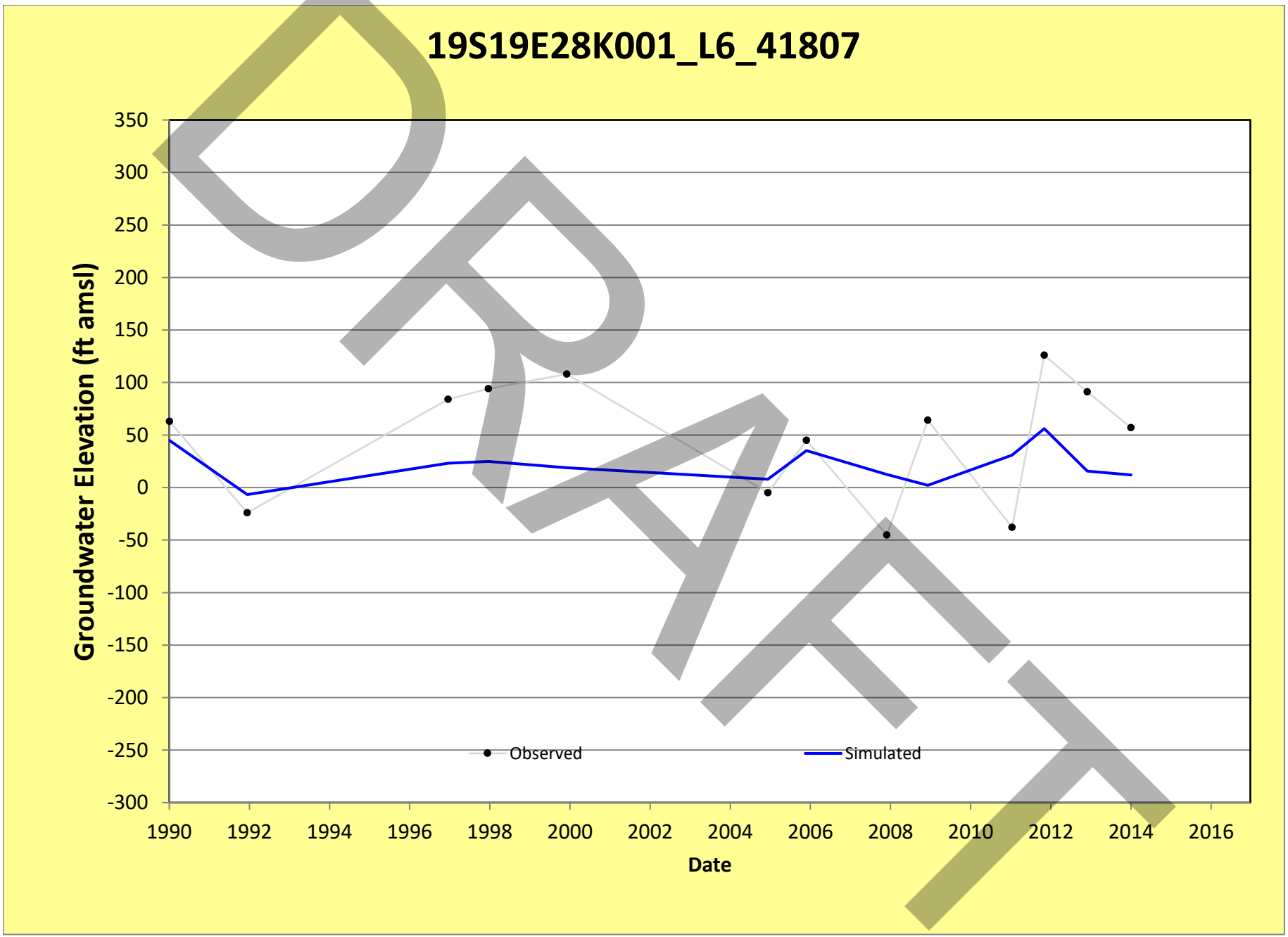
19S19E28K001_L6_41807
Groundwater Elevation (ft amsl)
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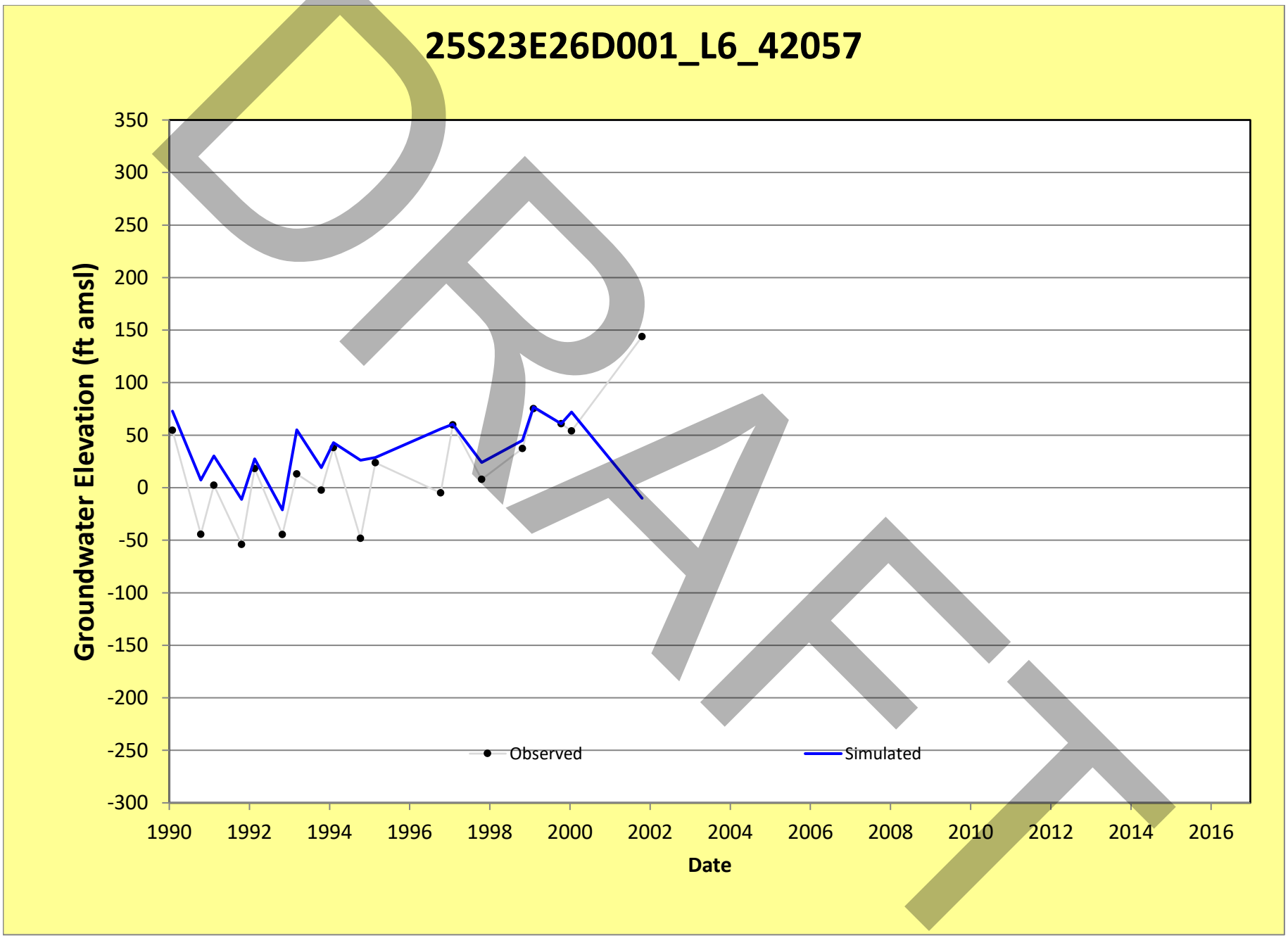
25S23E26D001_L6_42057
Groundwater Elevation (ft amsl)
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-100
-150
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Observed
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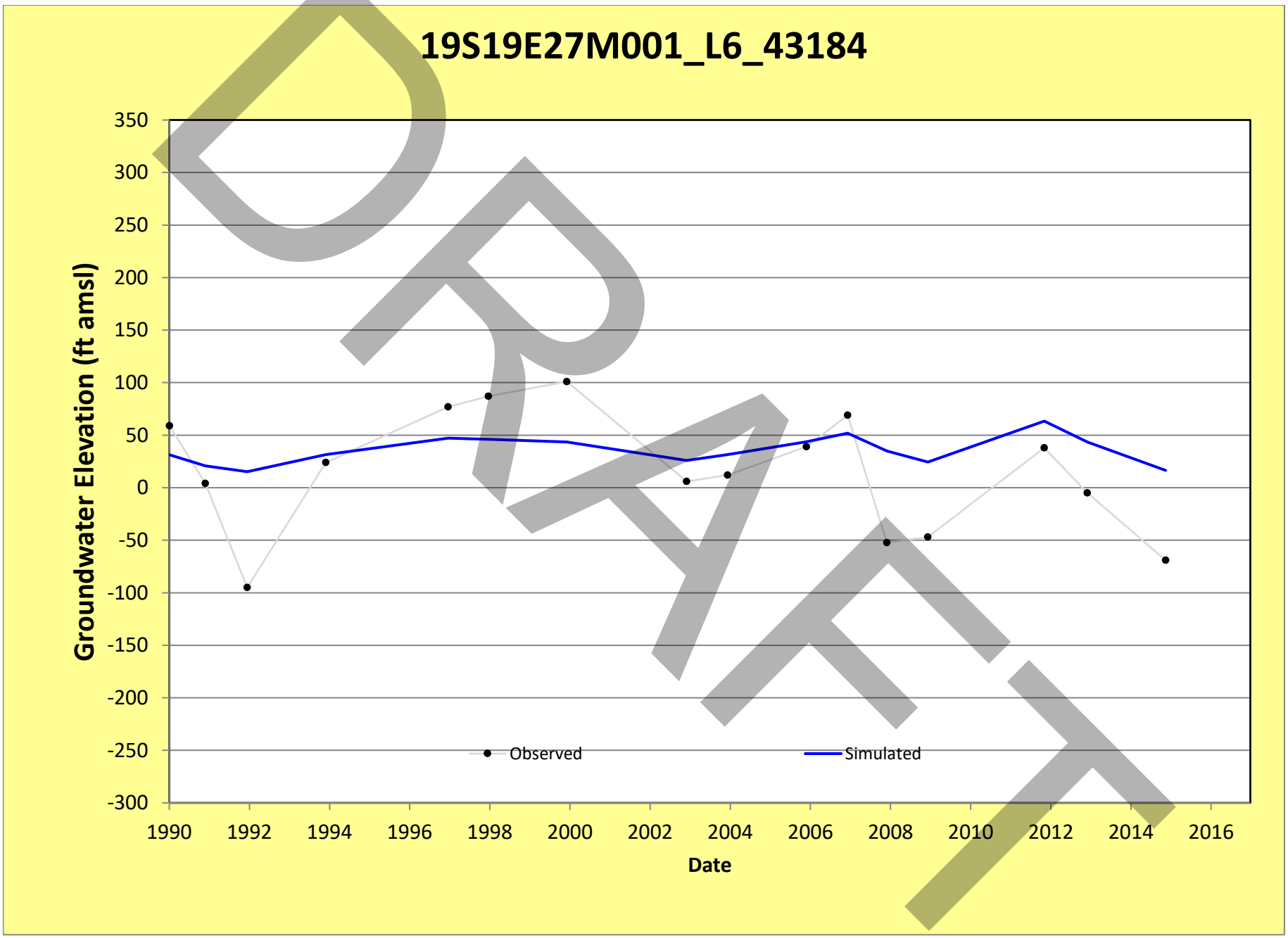
19S19E27M001_L6_43184
Groundwater Elevation (ft amsl)
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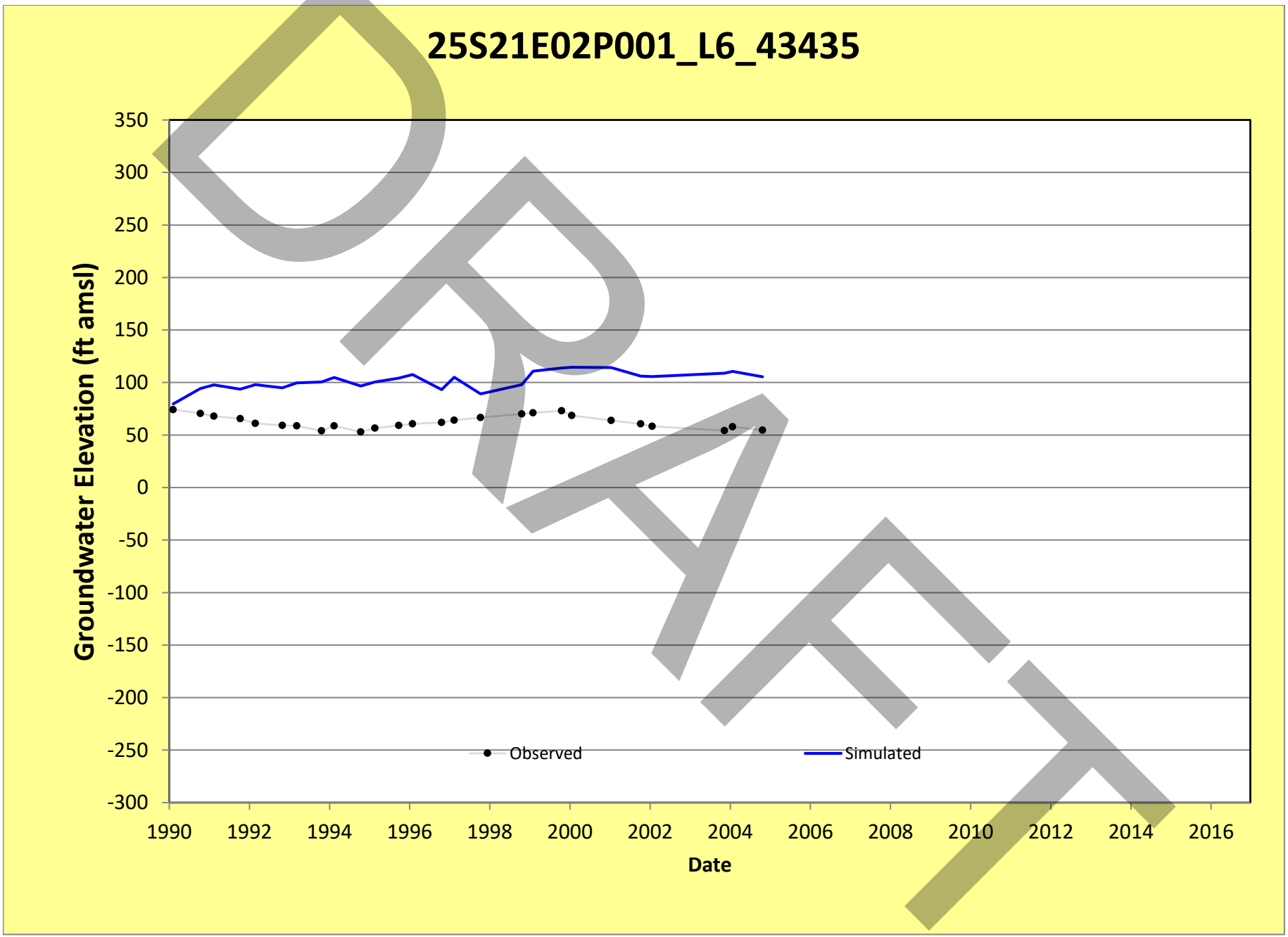
25S21E02P001_L6_43435
Groundwater Elevation (ft amsl)
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-50
-100
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Observed
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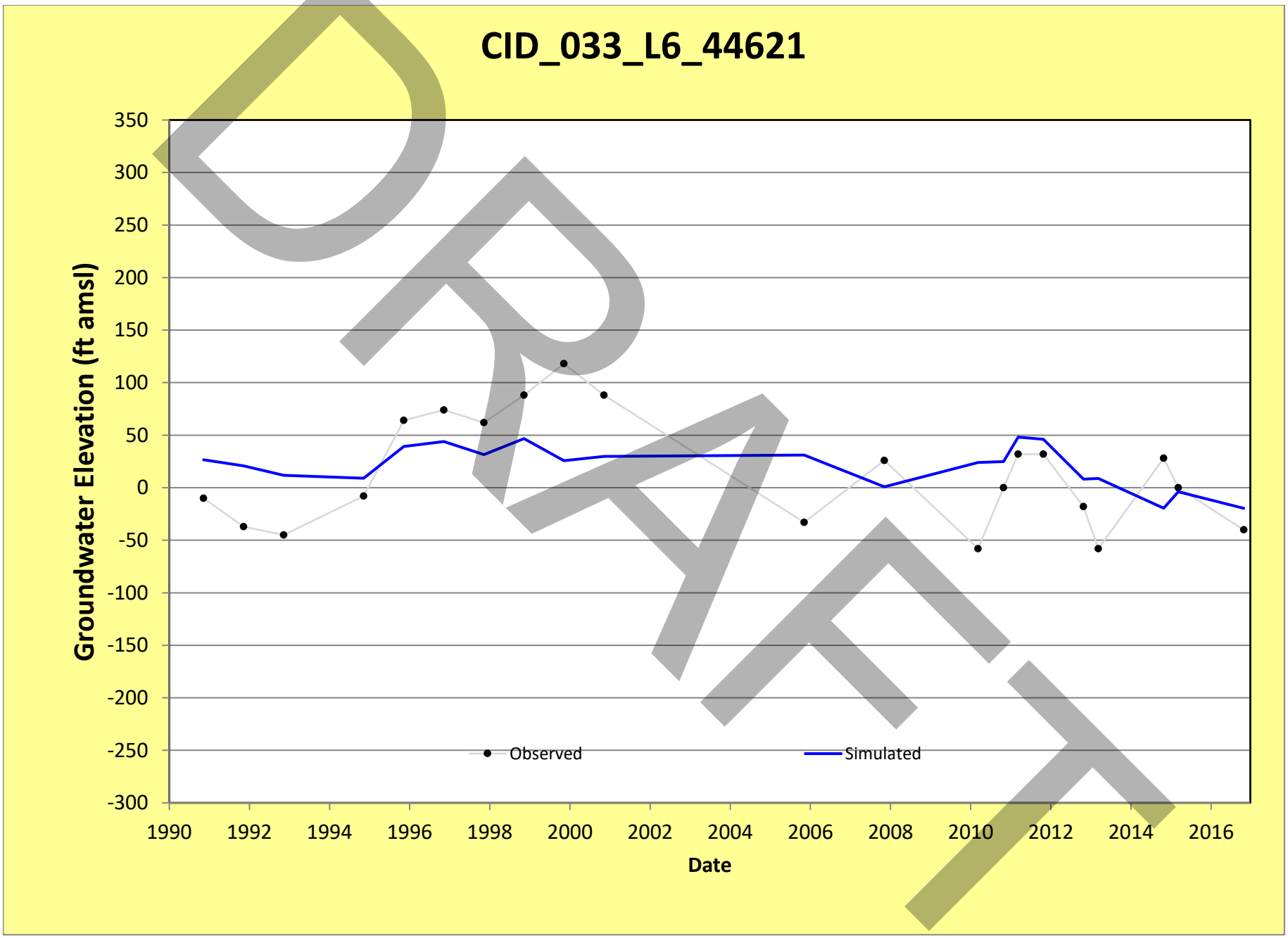
CID_033_L6_44621
Groundwater Elevation (ft amsl)
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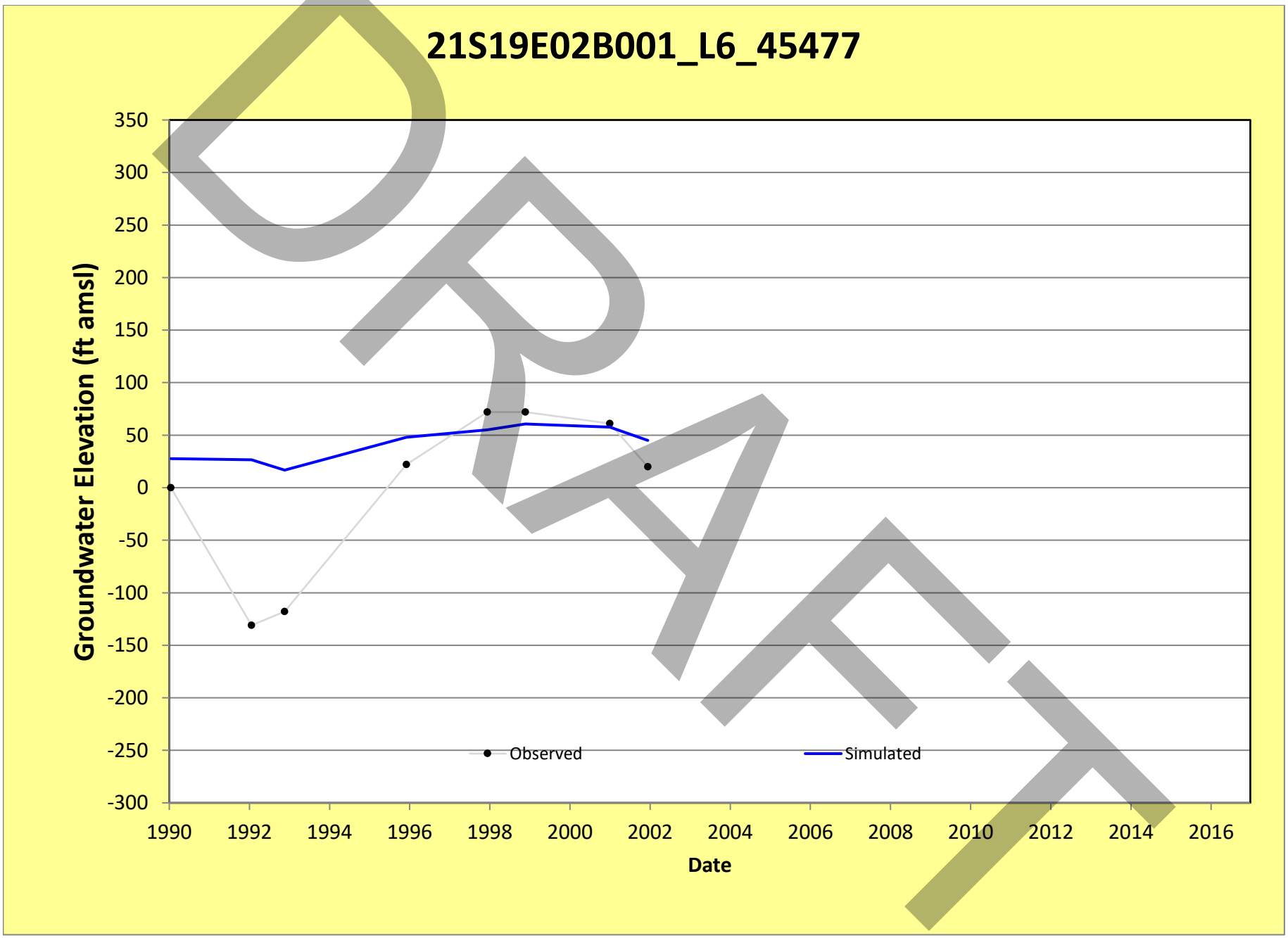
21S19E02B001_L6_45477
Groundwater Elevation (ft amsl)
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Simulated
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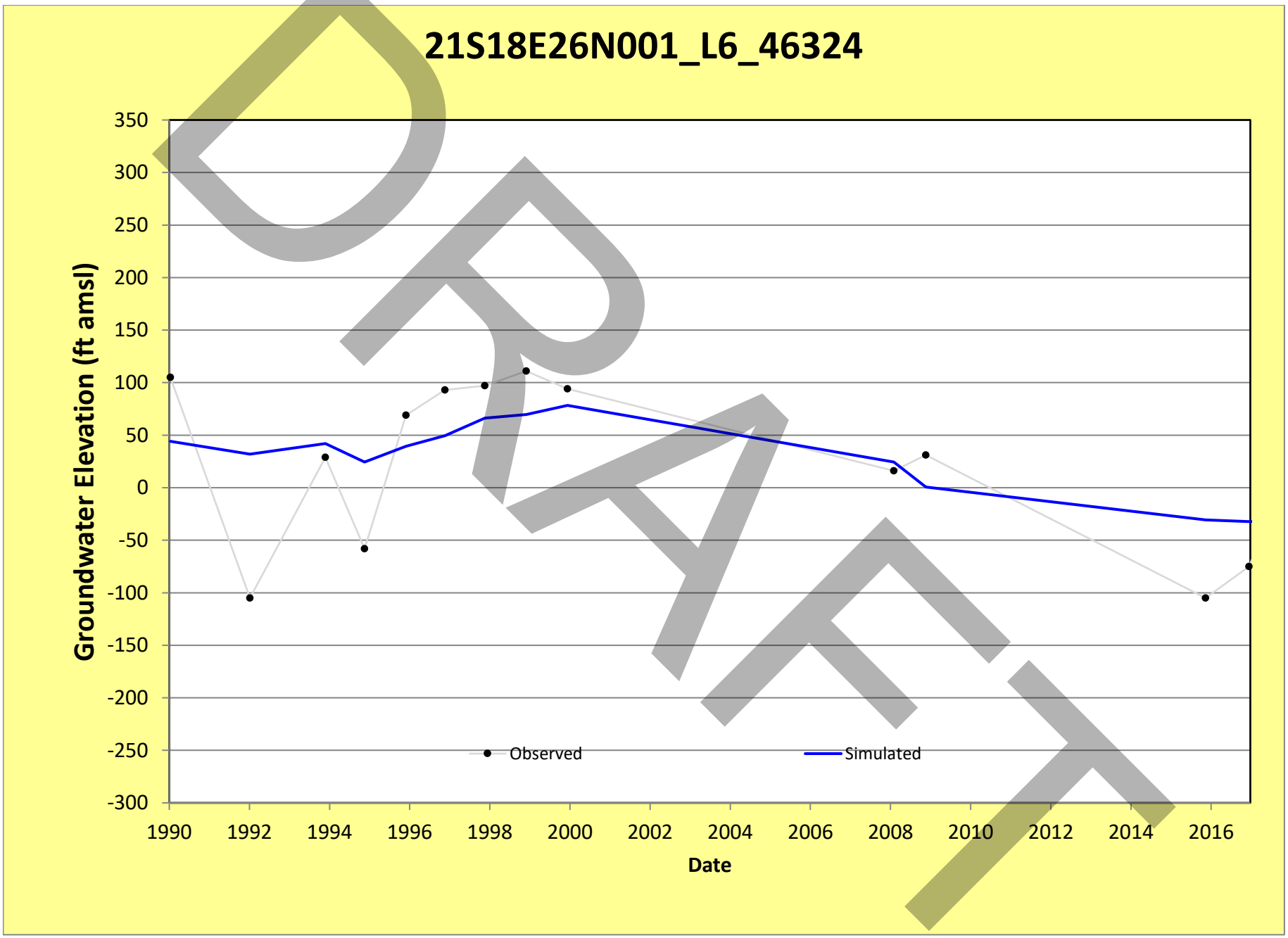
21S18E26N001_L6_46324
Groundwater Elevation (ft amsl)
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Observed
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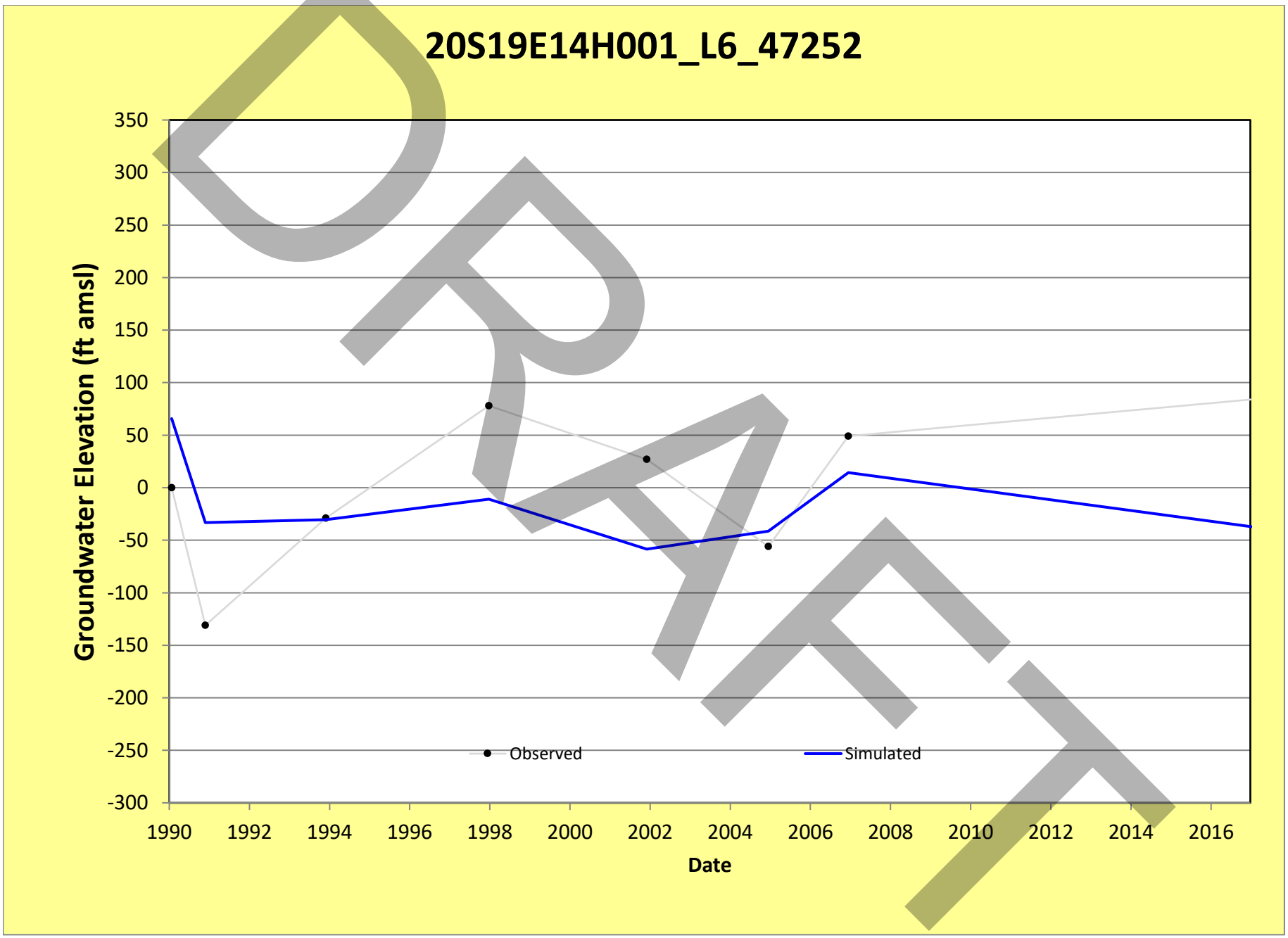
20S19E14H001_L6_47252
Groundwater Elevation (ft amsl)
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Observed
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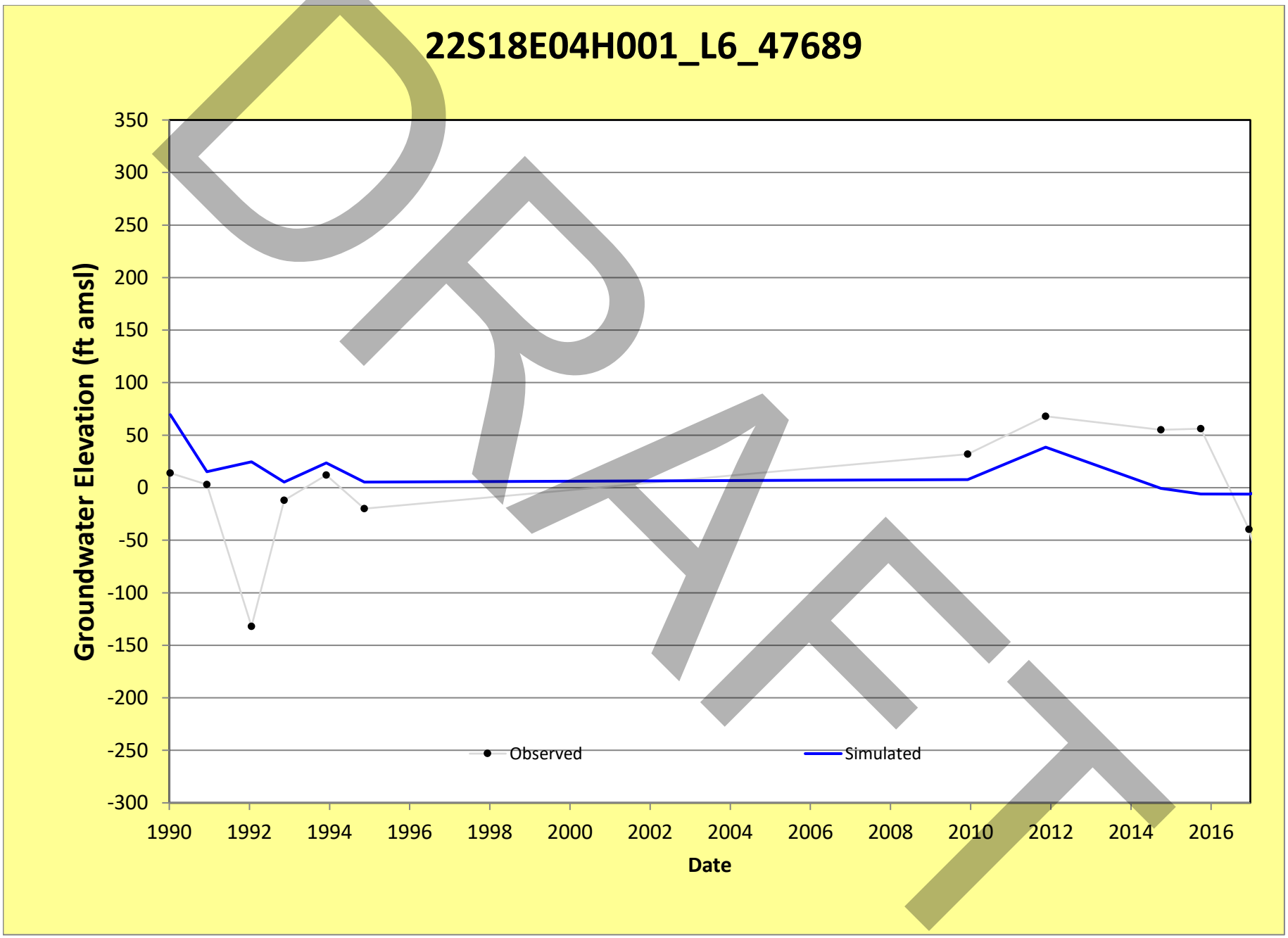
22S18E04H001_L6_47689
Groundwater Elevation (ft amsl)
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Observed
Simulated
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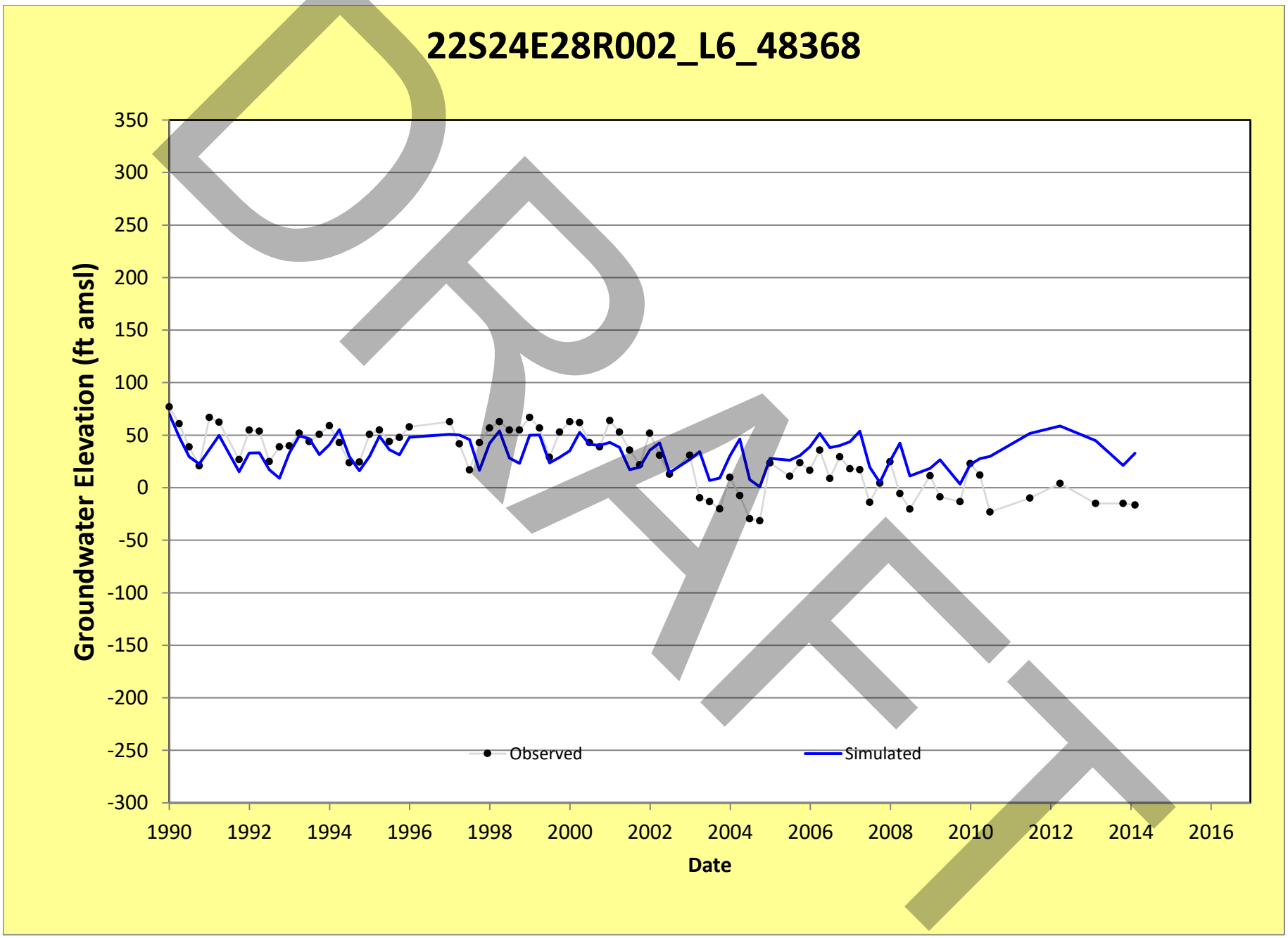
22S24E28R002_L6_48368
Groundwater Elevation (ft amsl)
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Observed
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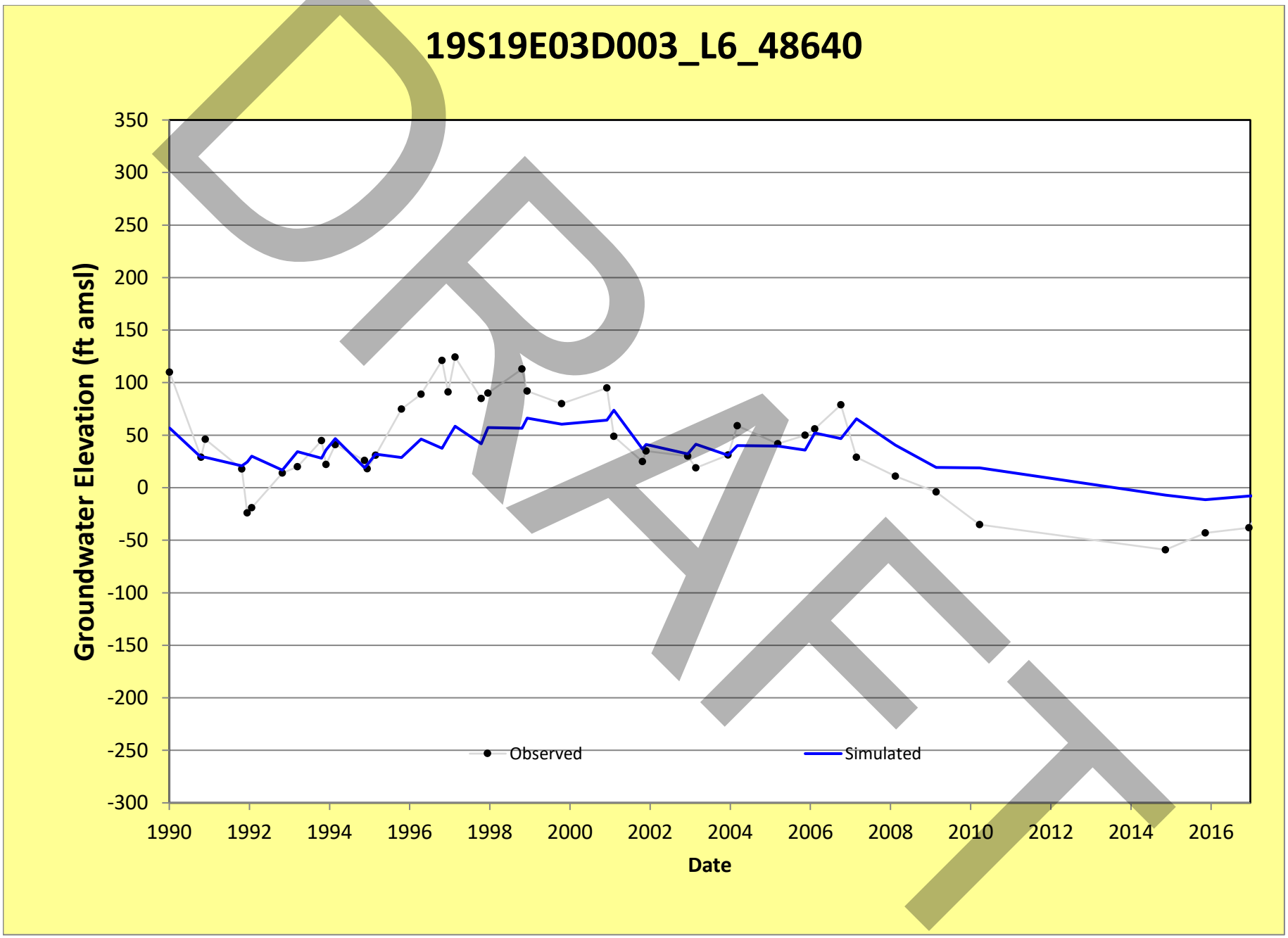
19S19E03D003_L6_48640
Groundwater Elevation (ft amsl)
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Observed
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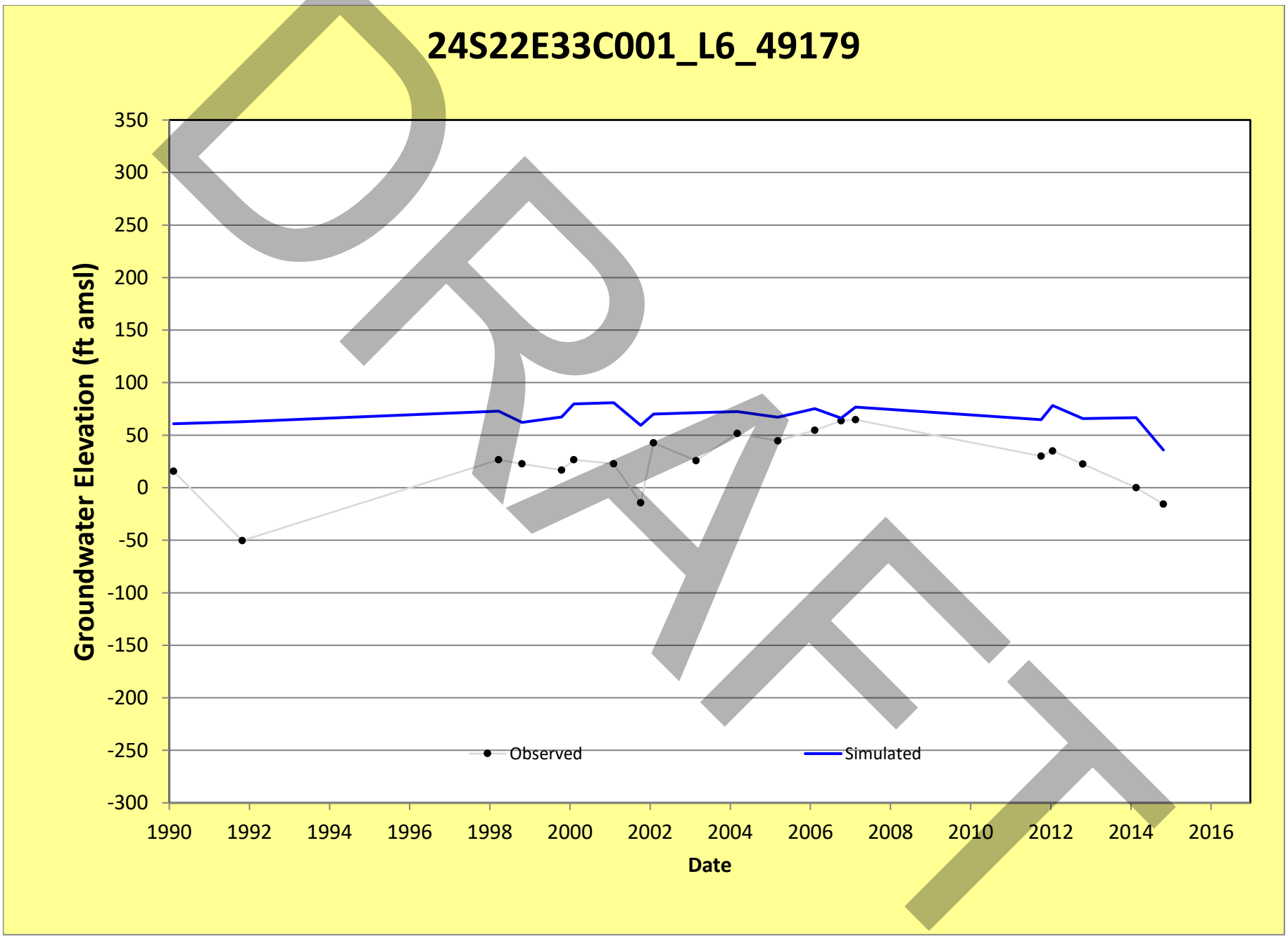
24S22E33C001_L6_49179
Groundwater Elevation (ft amsl)
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Observed
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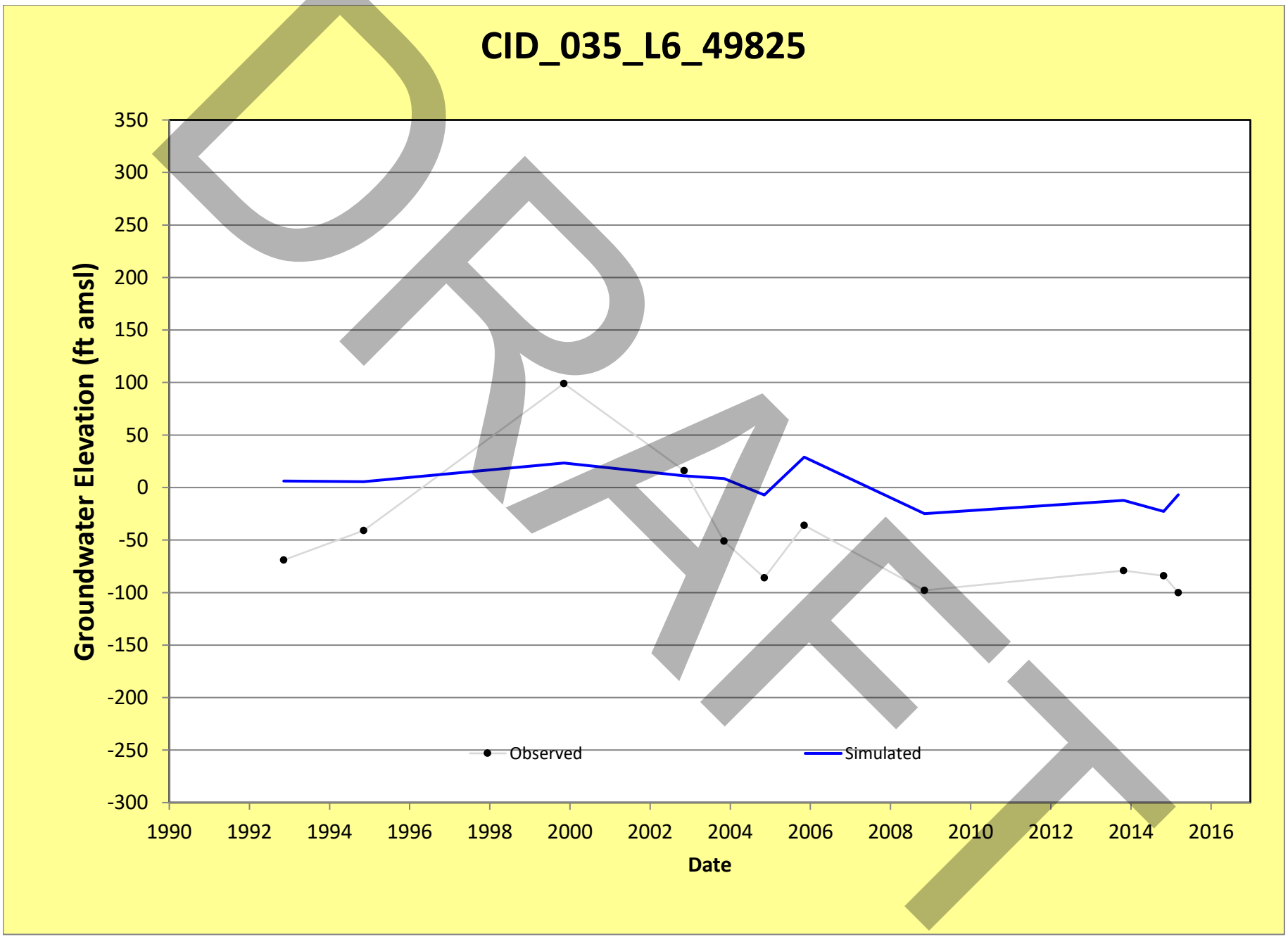
CID_035_L6_49825
Groundwater Elevation (ft amsl)
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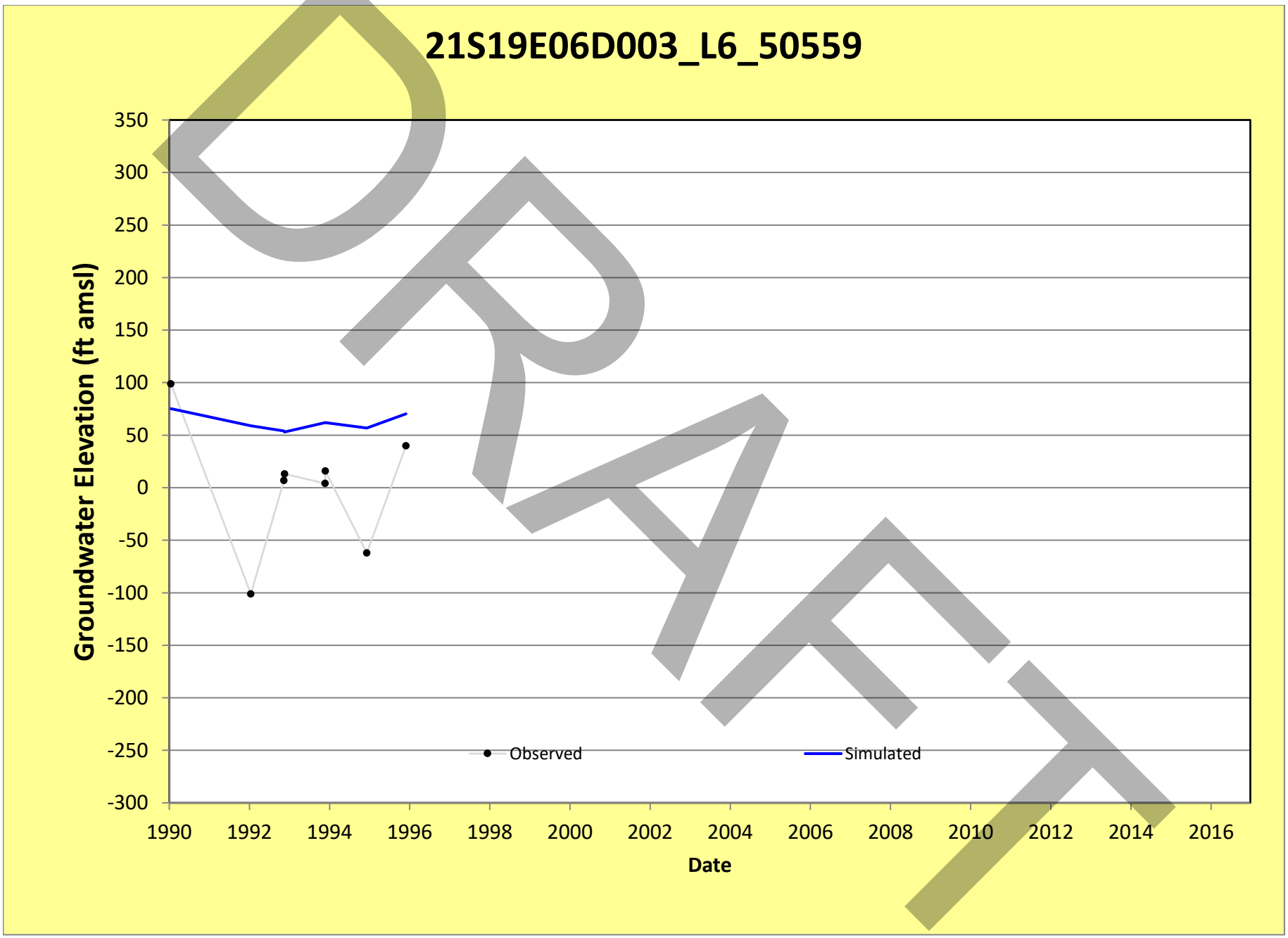
21S19E06D003_L6_50559
Groundwater Elevation (ft amsl)
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Observed
Simulated
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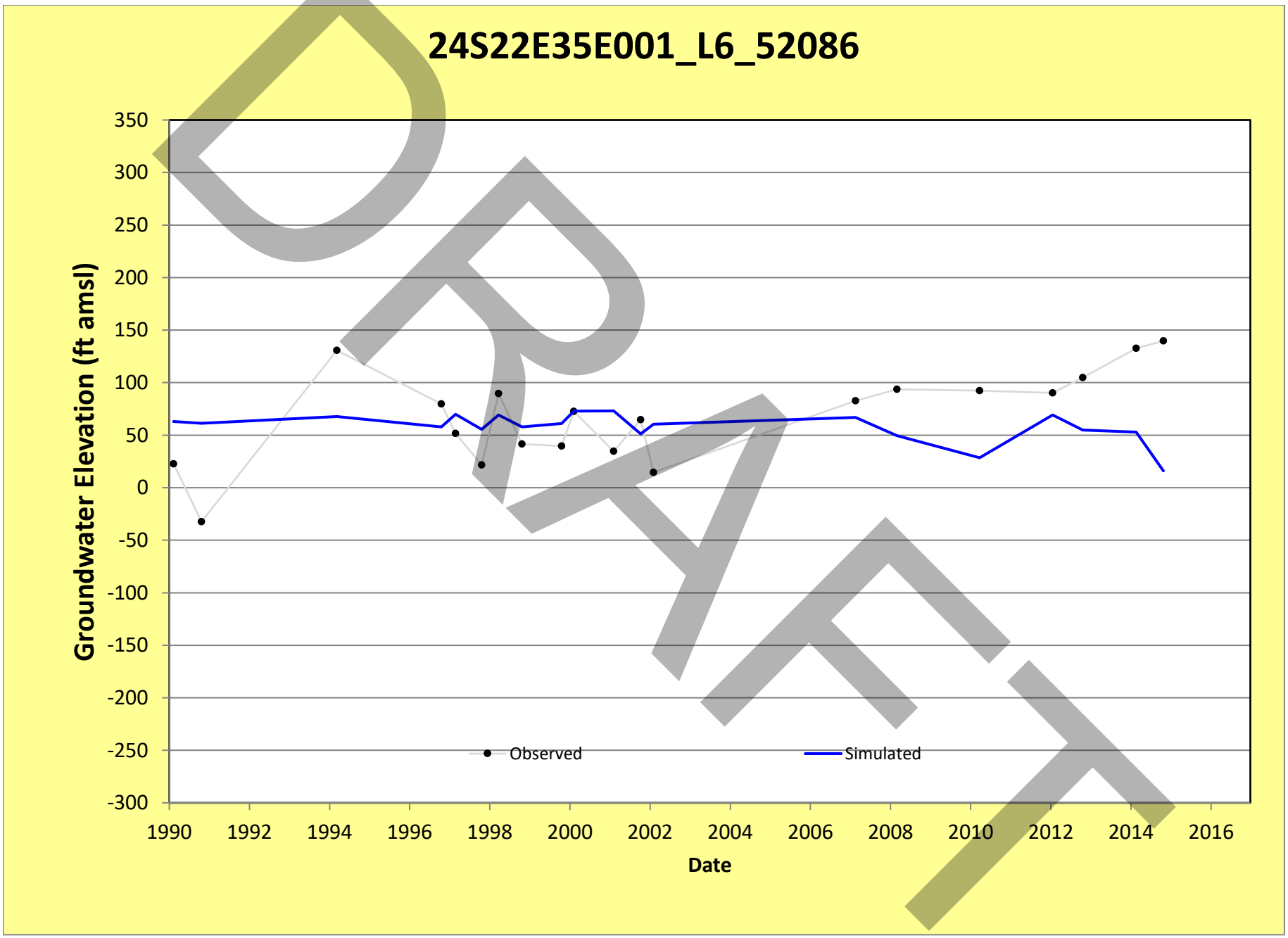
24S22E35E001_L6_52086
Groundwater Elevation (ft amsl)
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Observed
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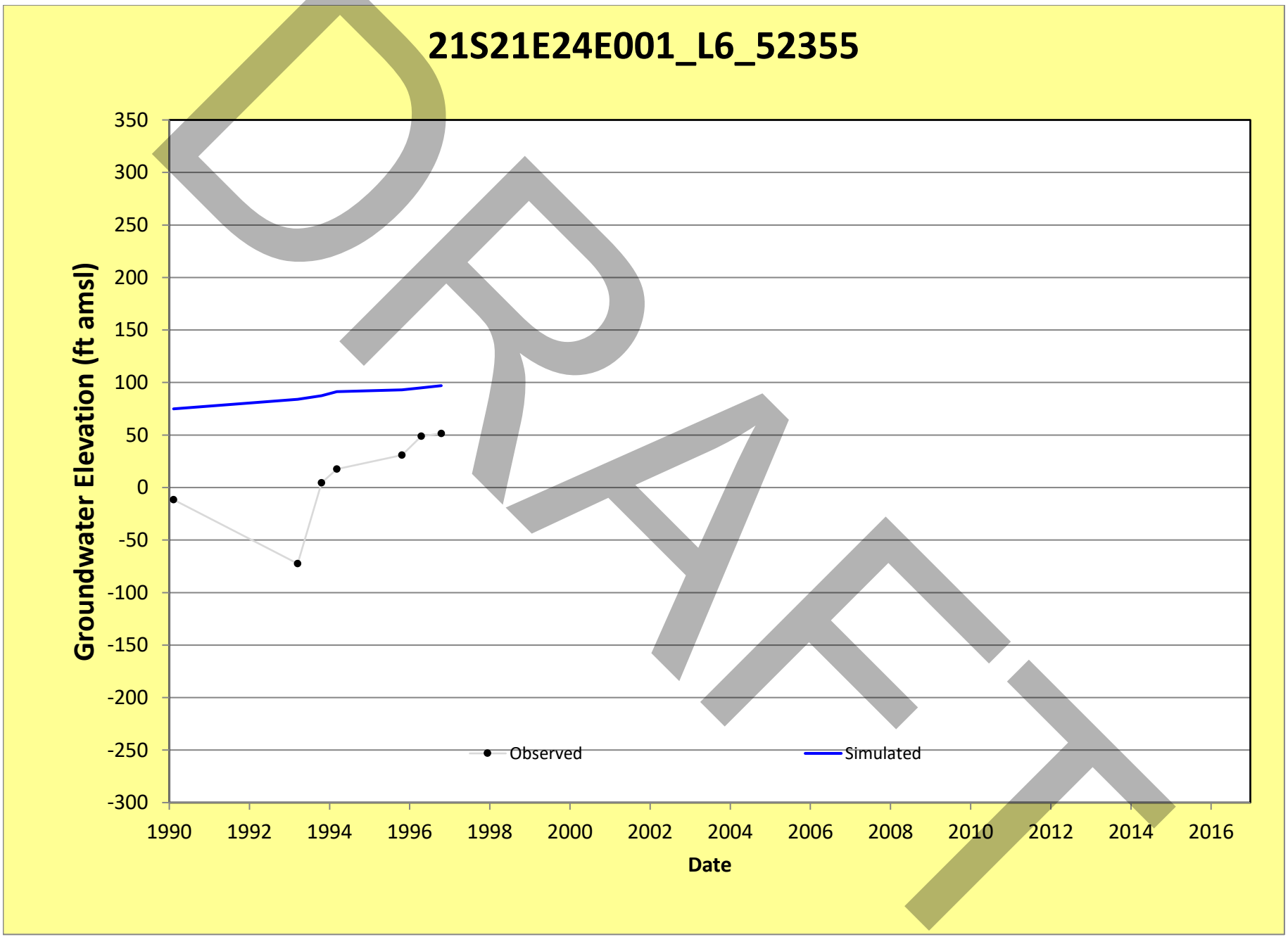
DRAFT


21S21E24E001_L6_52355
Groundwater Elevation (ft amsl)
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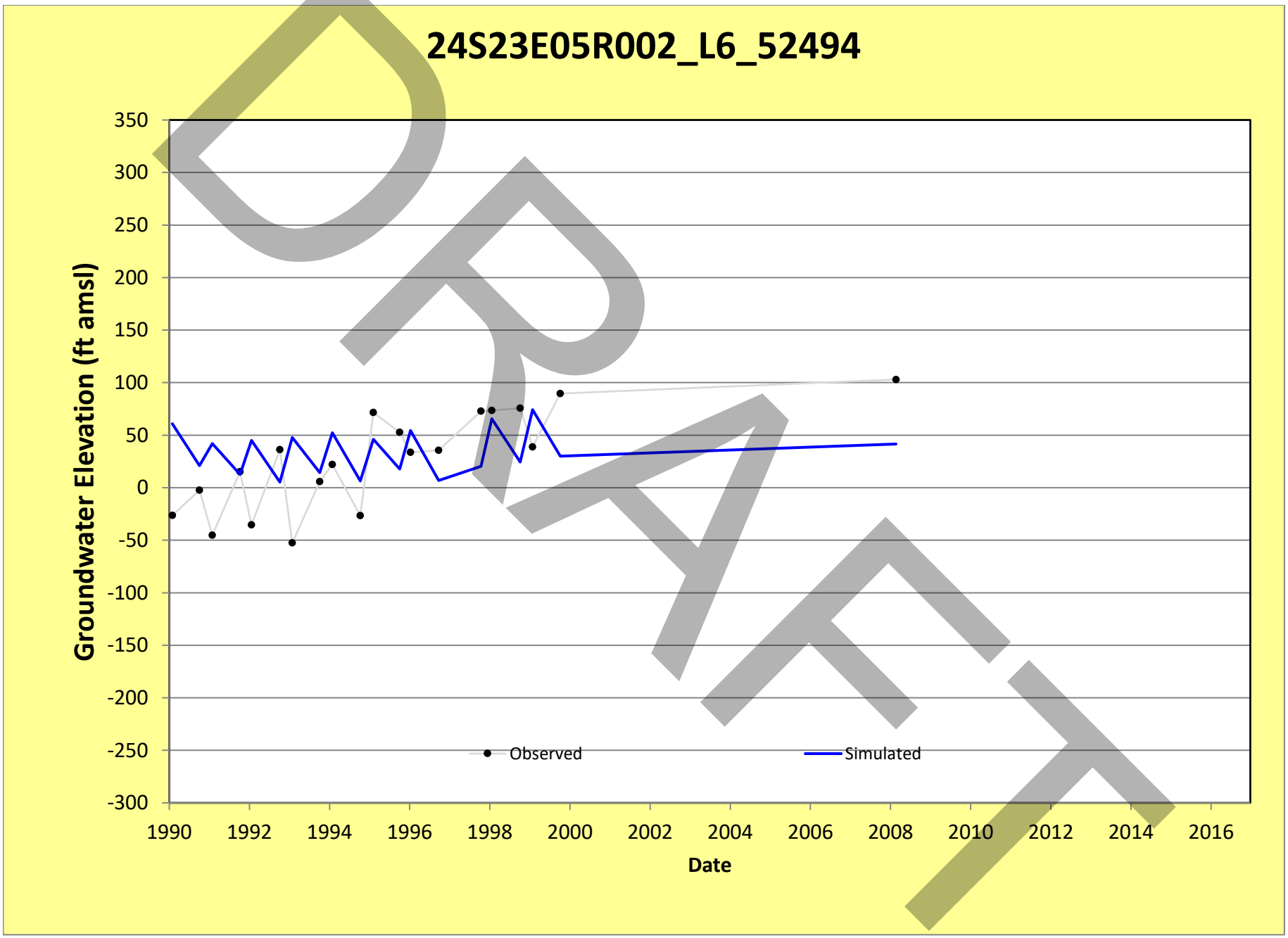
Date
Observed
Simulated
DRAFT


24S23E05R002_L6_52494
Groundwater Elevation (ft amsl)
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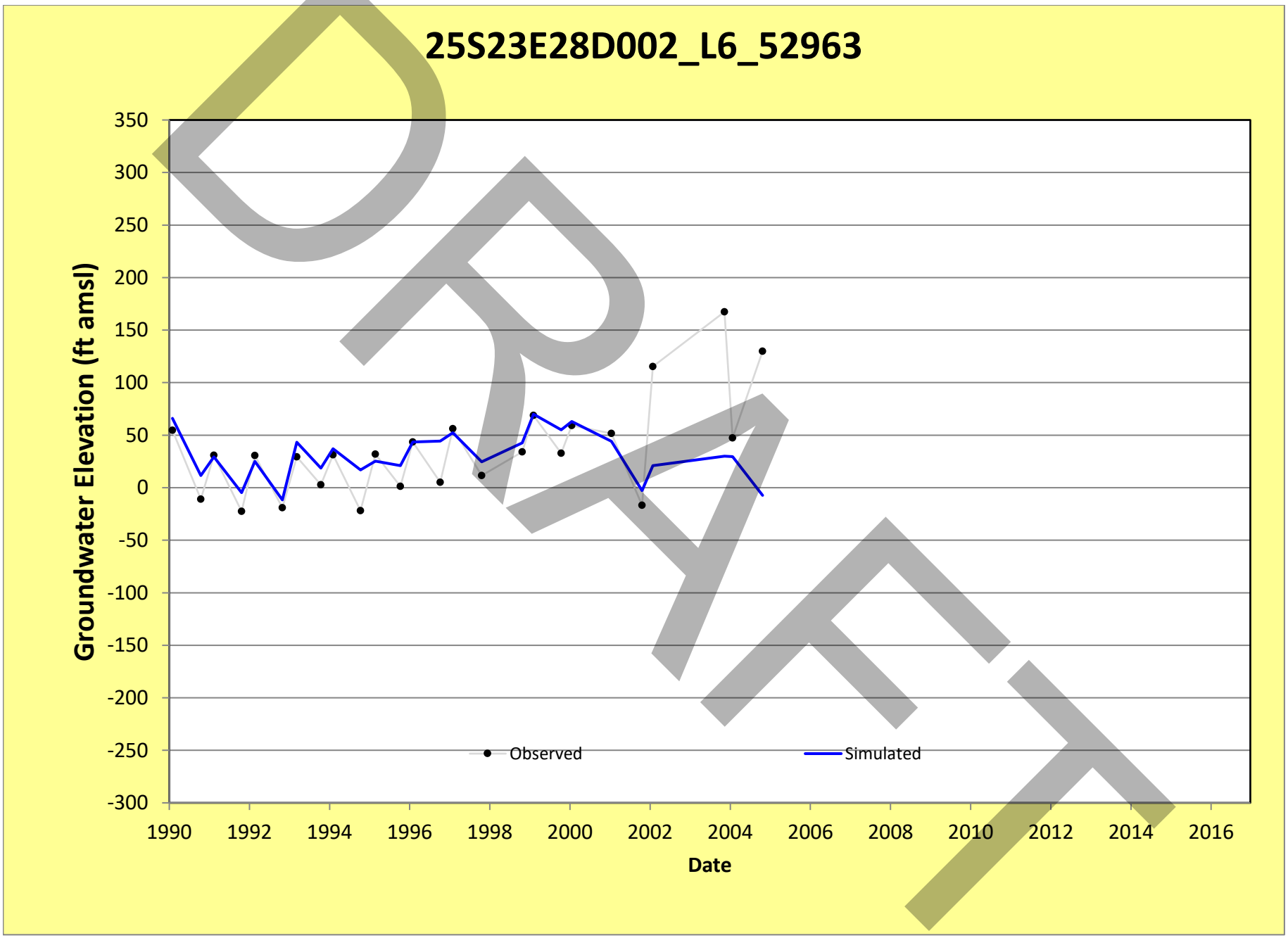
Date
Observed
Simulated
DRAFT


25S23E28D002_L6_52963
Groundwater Elevation (ft amsl)
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Observed
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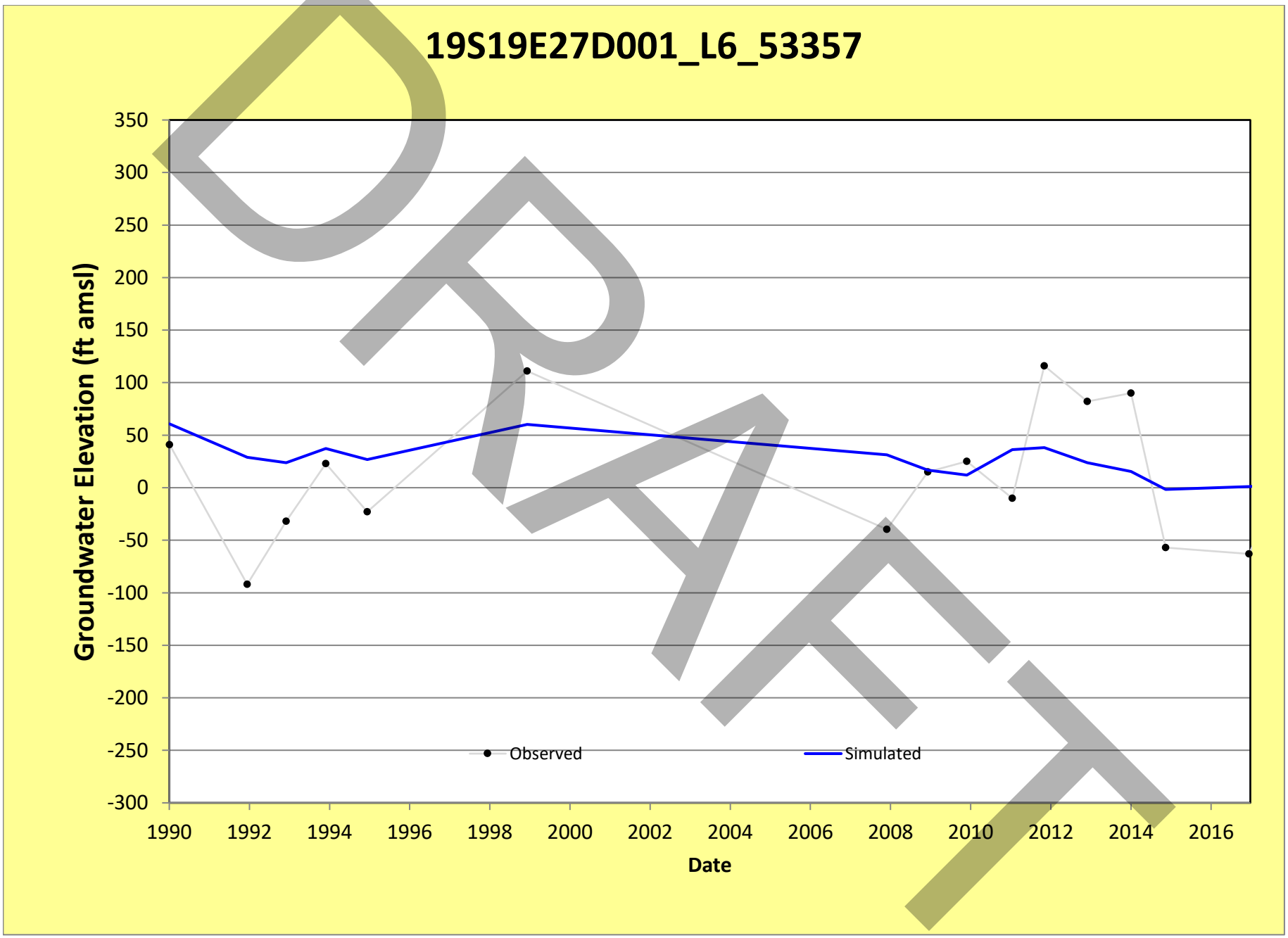
DRAFT


19S19E27D001_L6_53357
Groundwater Elevation (ft amsl)
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Observed
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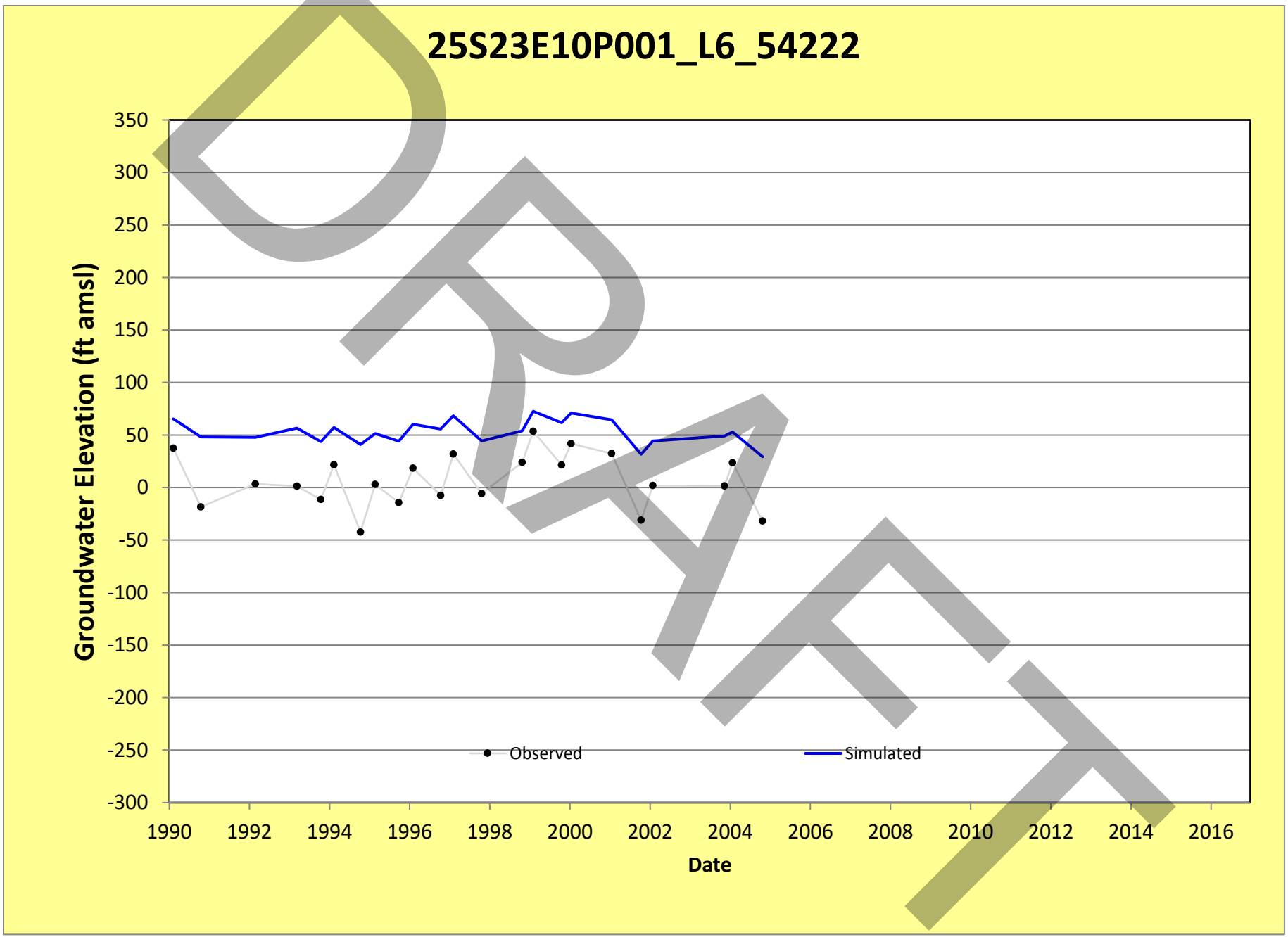
DRAFT


25S23E10P001_L6_54222
Groundwater Elevation (ft amsl)
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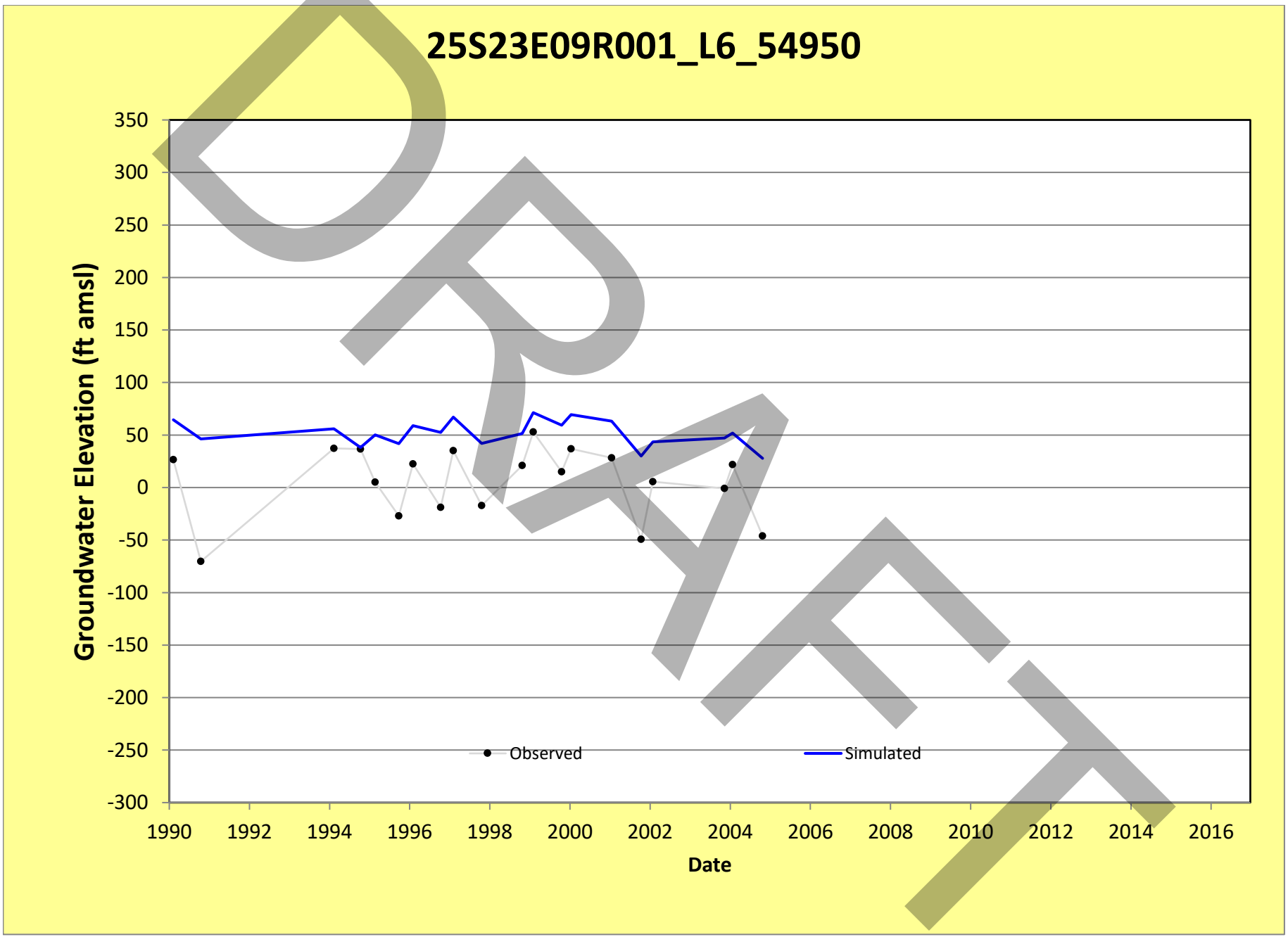
Date
Observed
Simulated
DRAFT


25S23E09R001_L6_54950
Groundwater Elevation (ft amsl)
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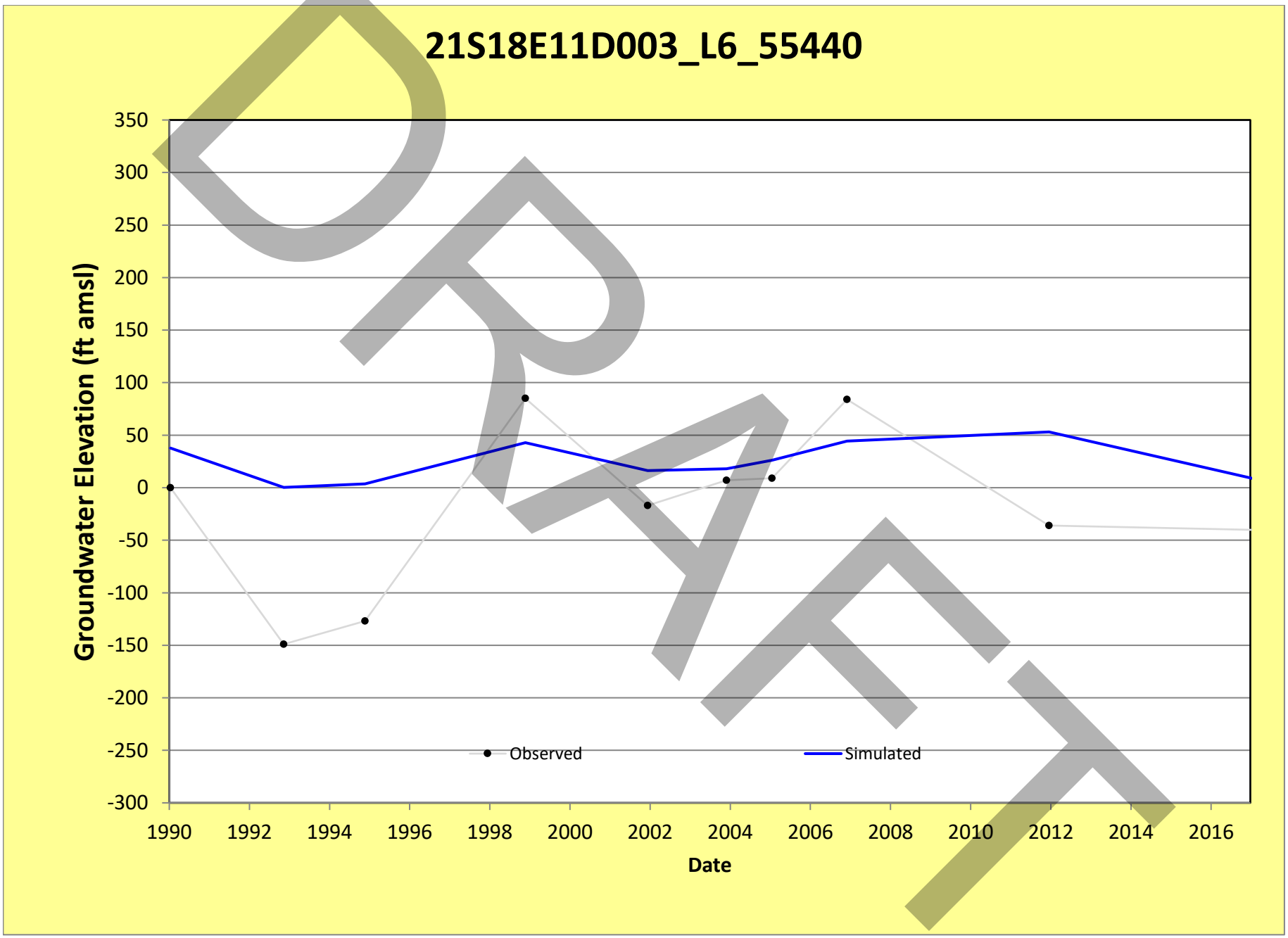
21S18E11D003_L6_55440
Groundwater Elevation (ft amsl)
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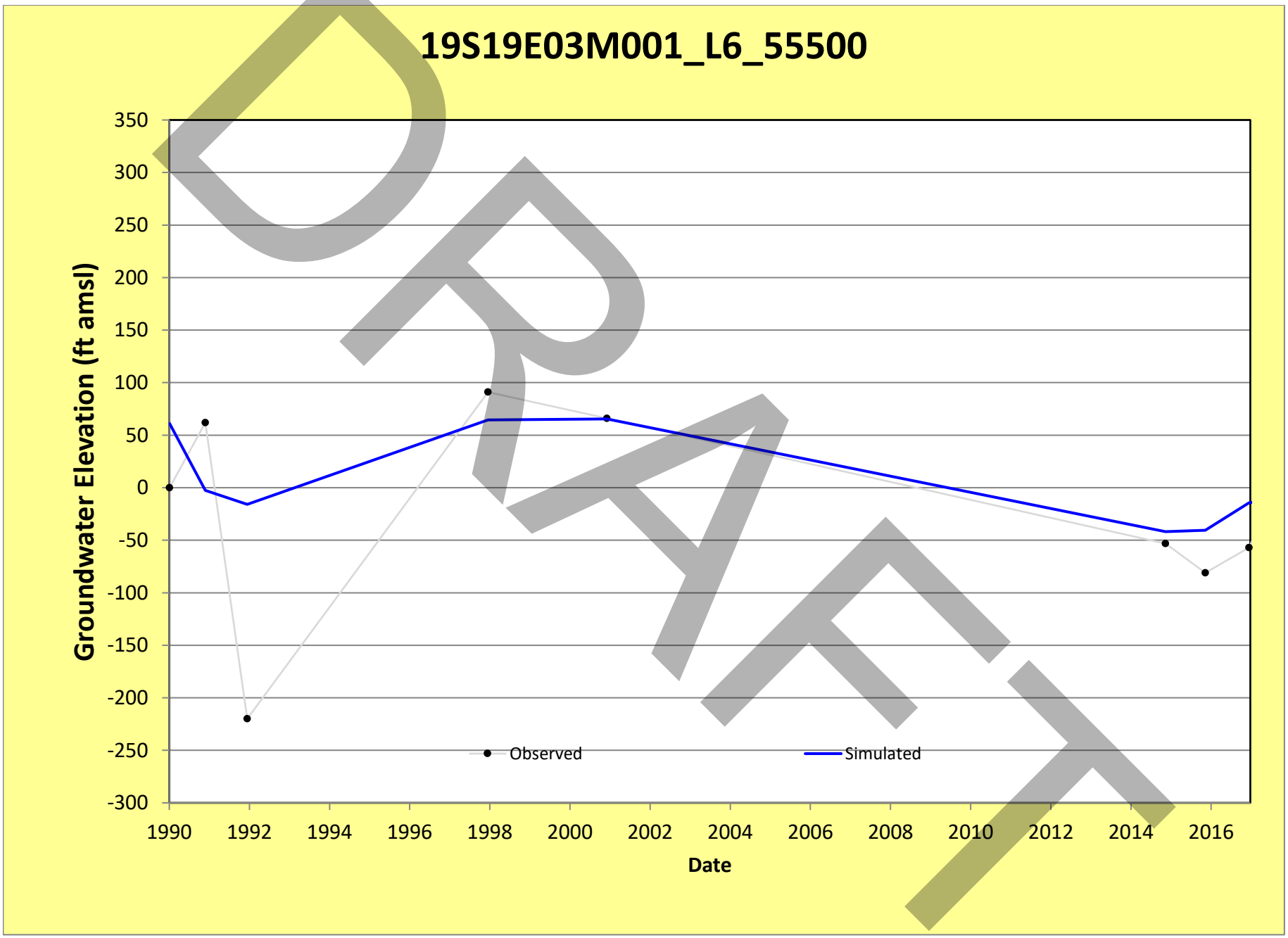
19S19E03M001_L6_55500
Groundwater Elevation (ft amsl)
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Observed
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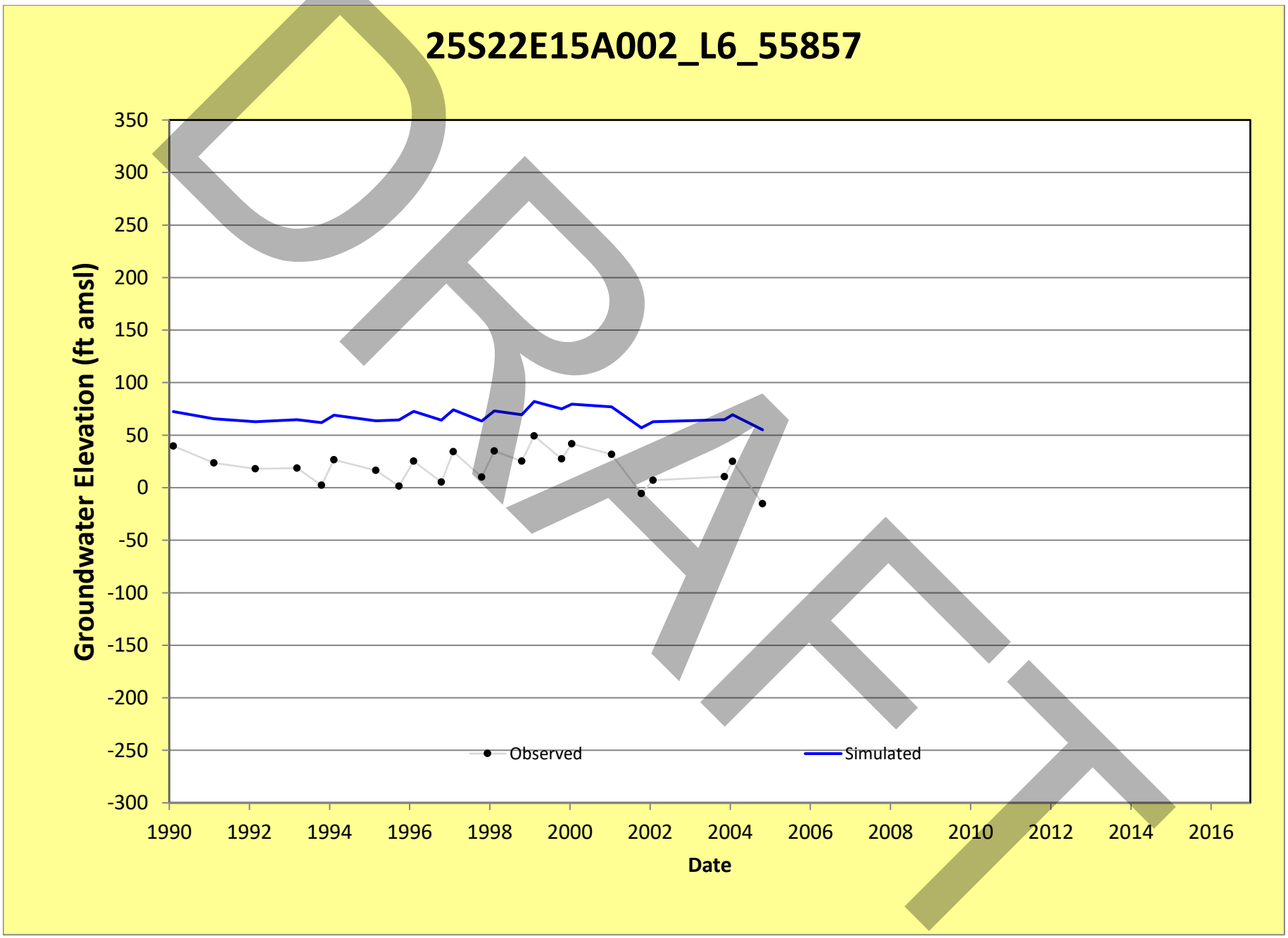
25S22E15A002_L6_55857
Groundwater Elevation (ft amsl)
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300
250
200
150
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50
0
-50
-100
-150
-200
-250
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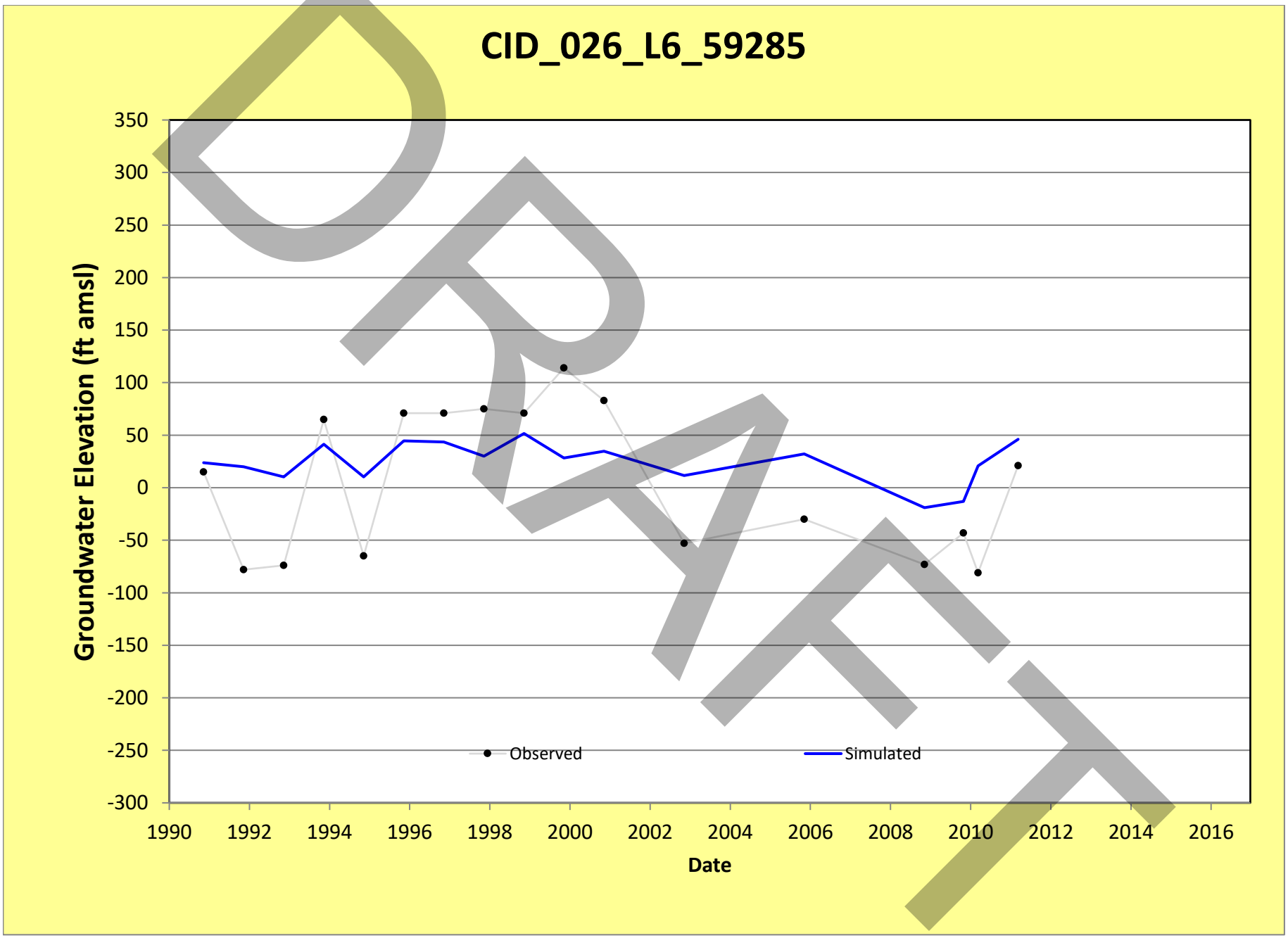
Date
Observed
Simulated
DRAFT


CID_026_L6_59285
Groundwater Elevation (ft amsl)
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250
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-50
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-200
-250
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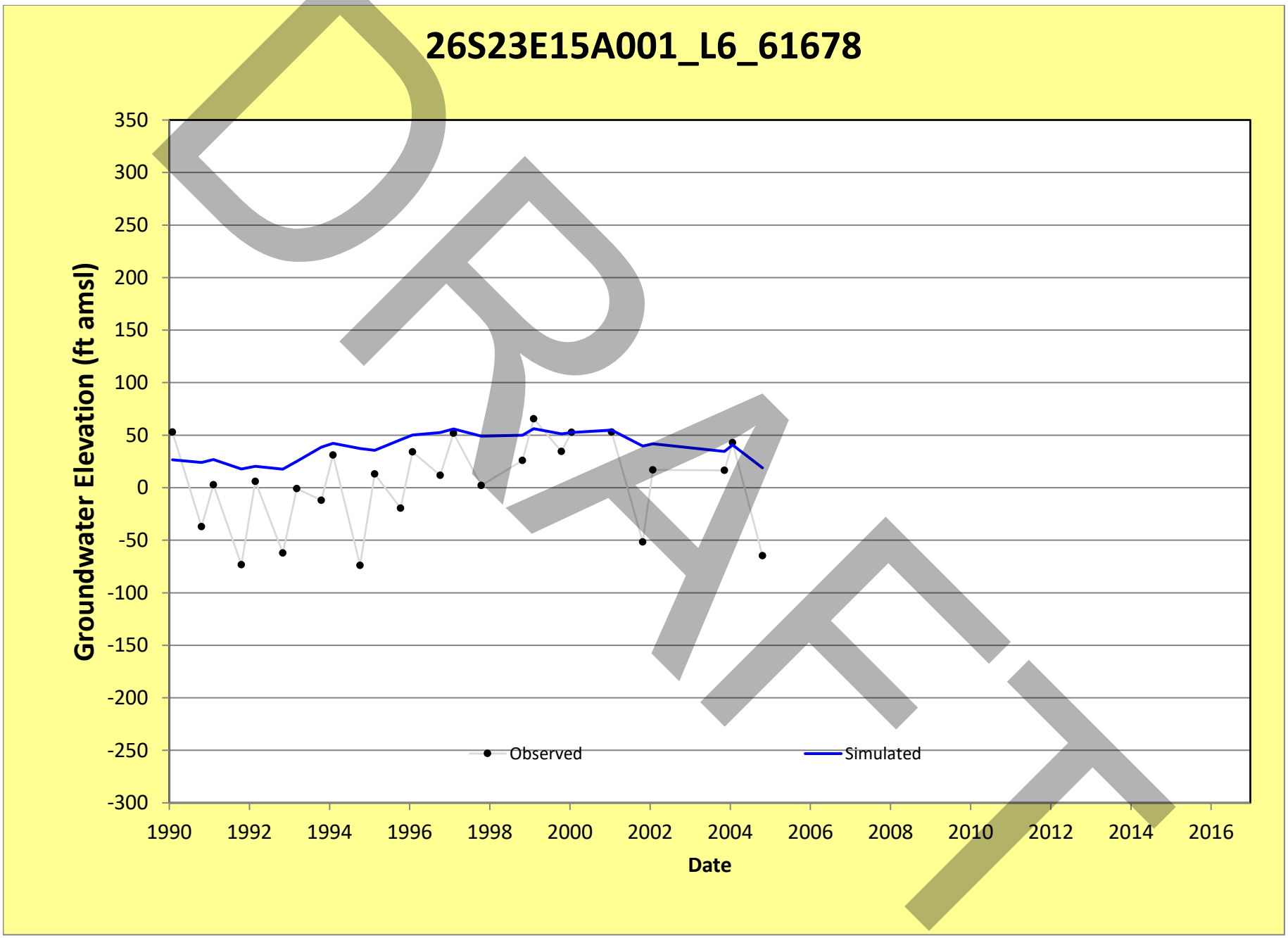
Observed
Simulated
DRAFT


26S23E15A001_L6_61678
Groundwater Elevation (ft amsl)
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300
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200
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-200
-250
-300
1990
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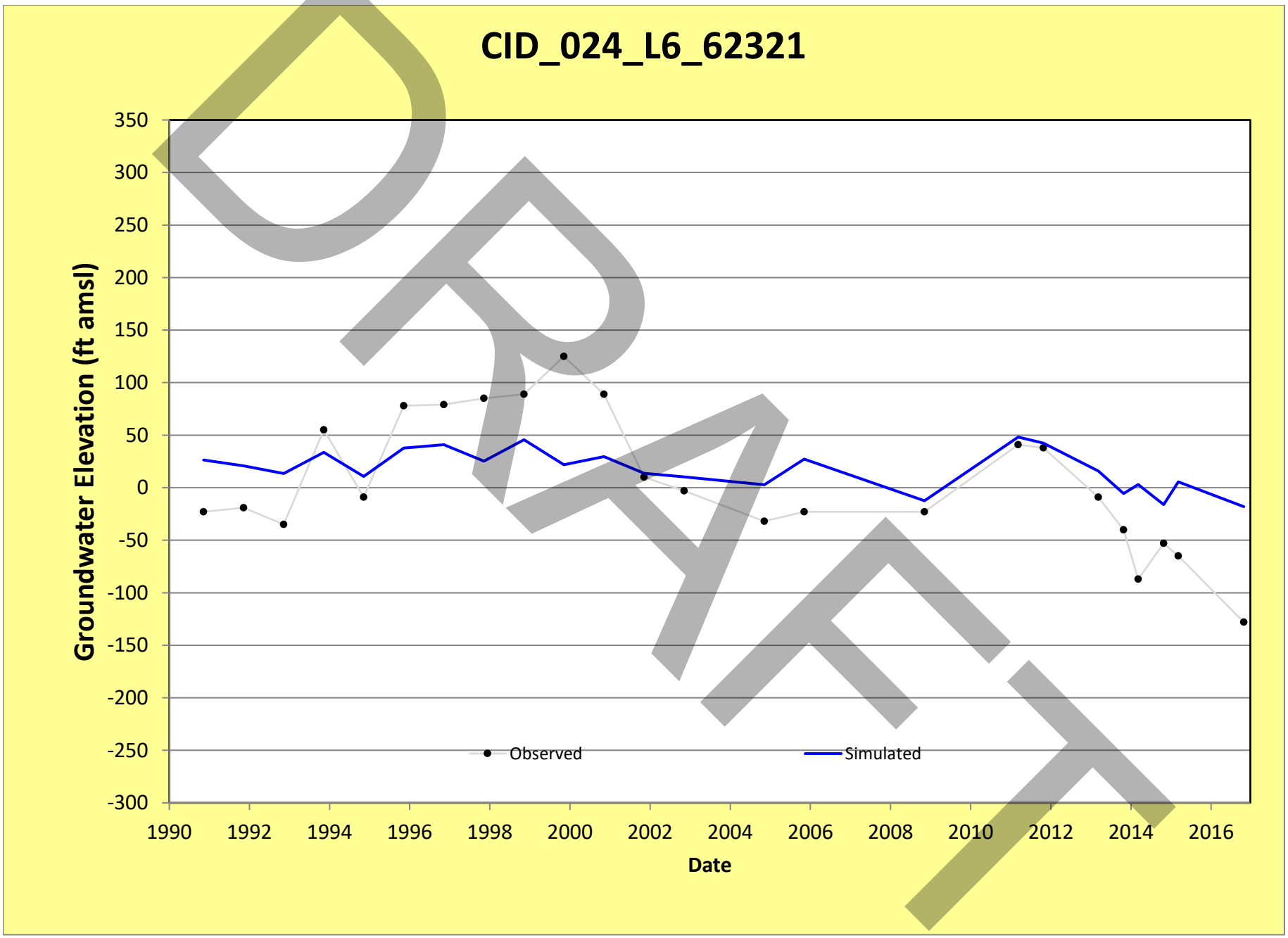
Date
Observed
Simulated
DRAFT


CID_024_L6_62321
Groundwater Elevation (ft amsl)
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250
200
150
100
50
0
-50
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-150
-200
-250
-300
1990
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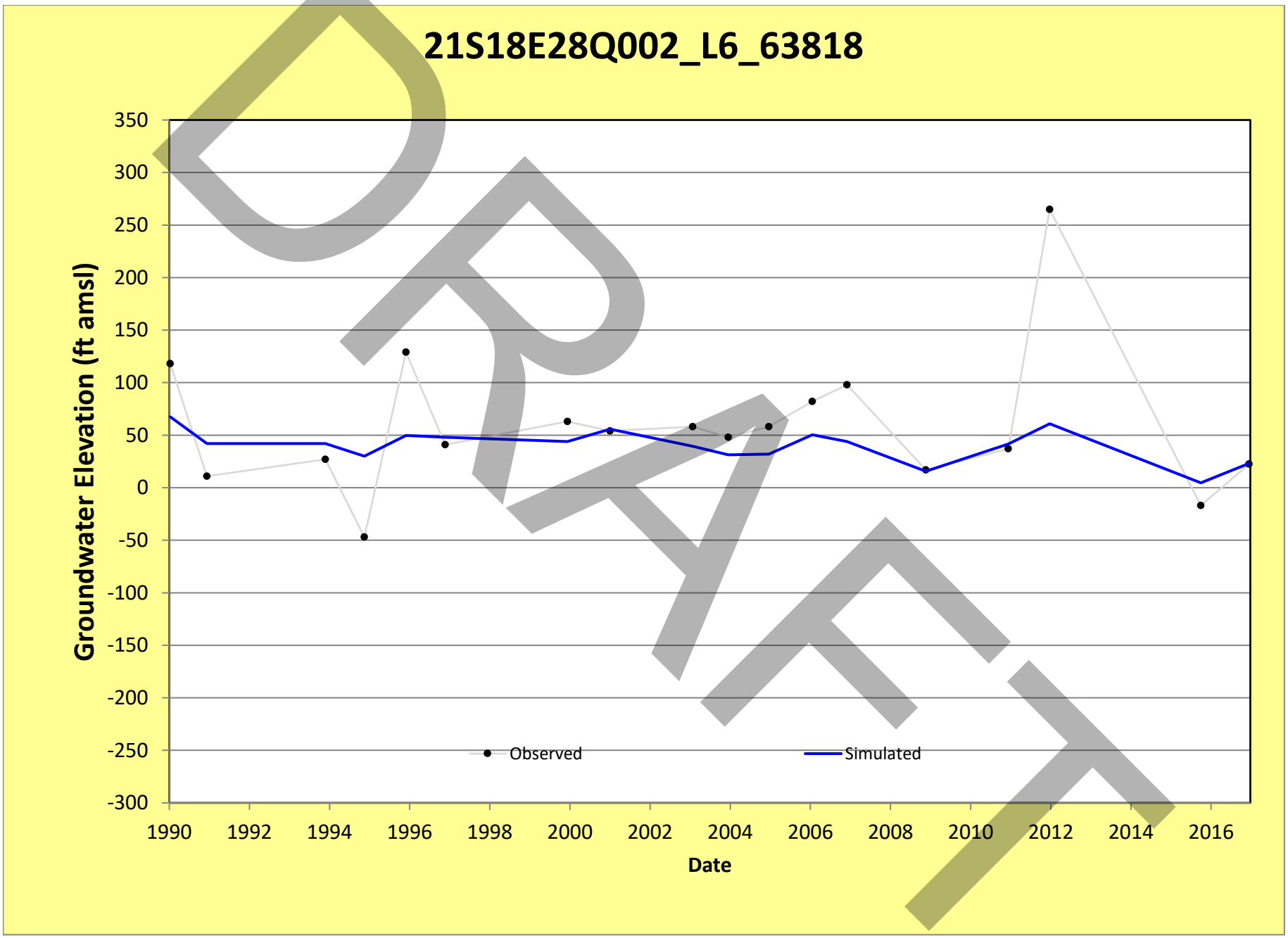
Date
Observed
Simulated
DRAFT


21S18E28Q002_L6_63818
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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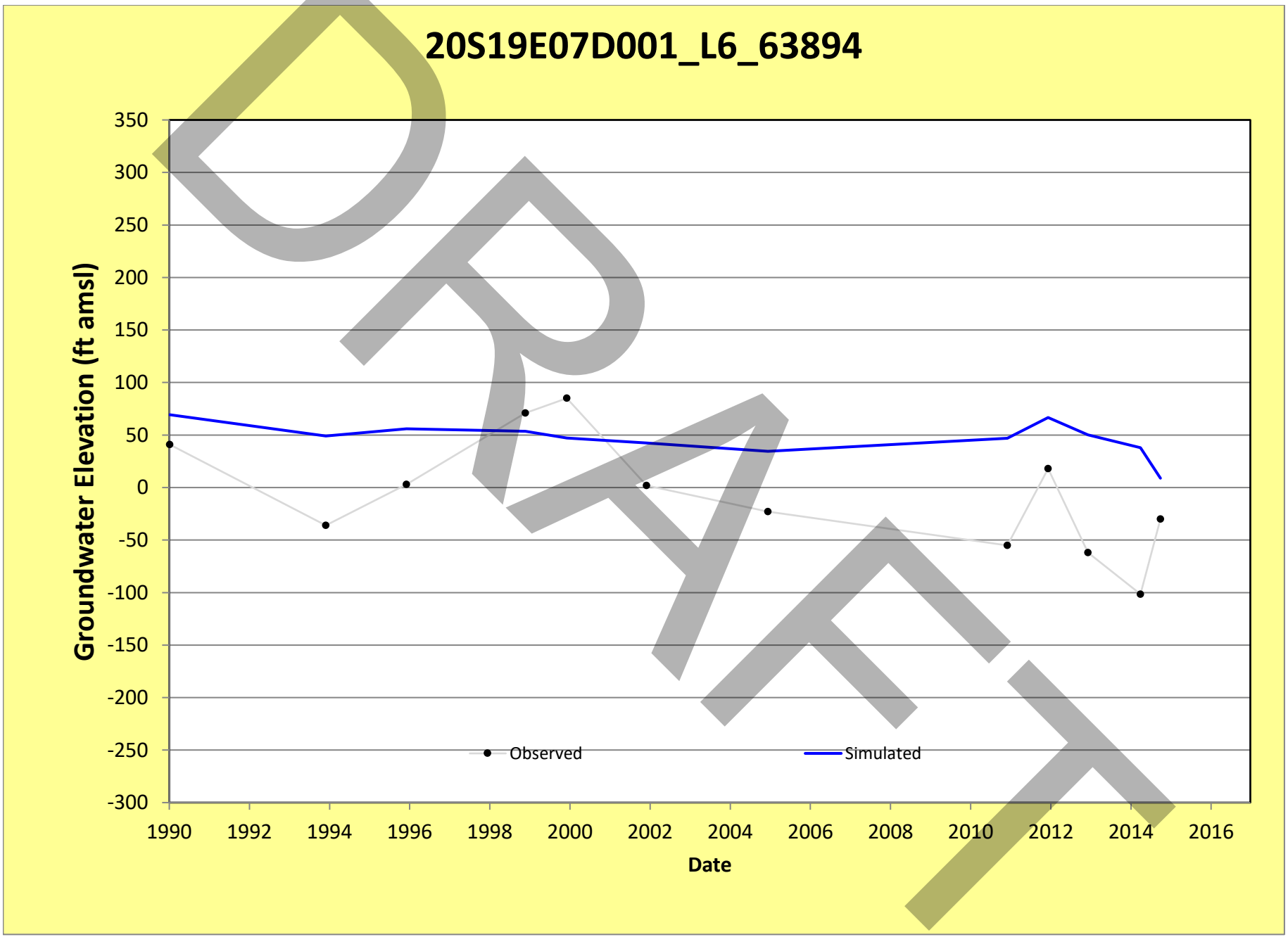
Date
Observed
Simulated
DRAFT


20S19E07D001_L6_63894
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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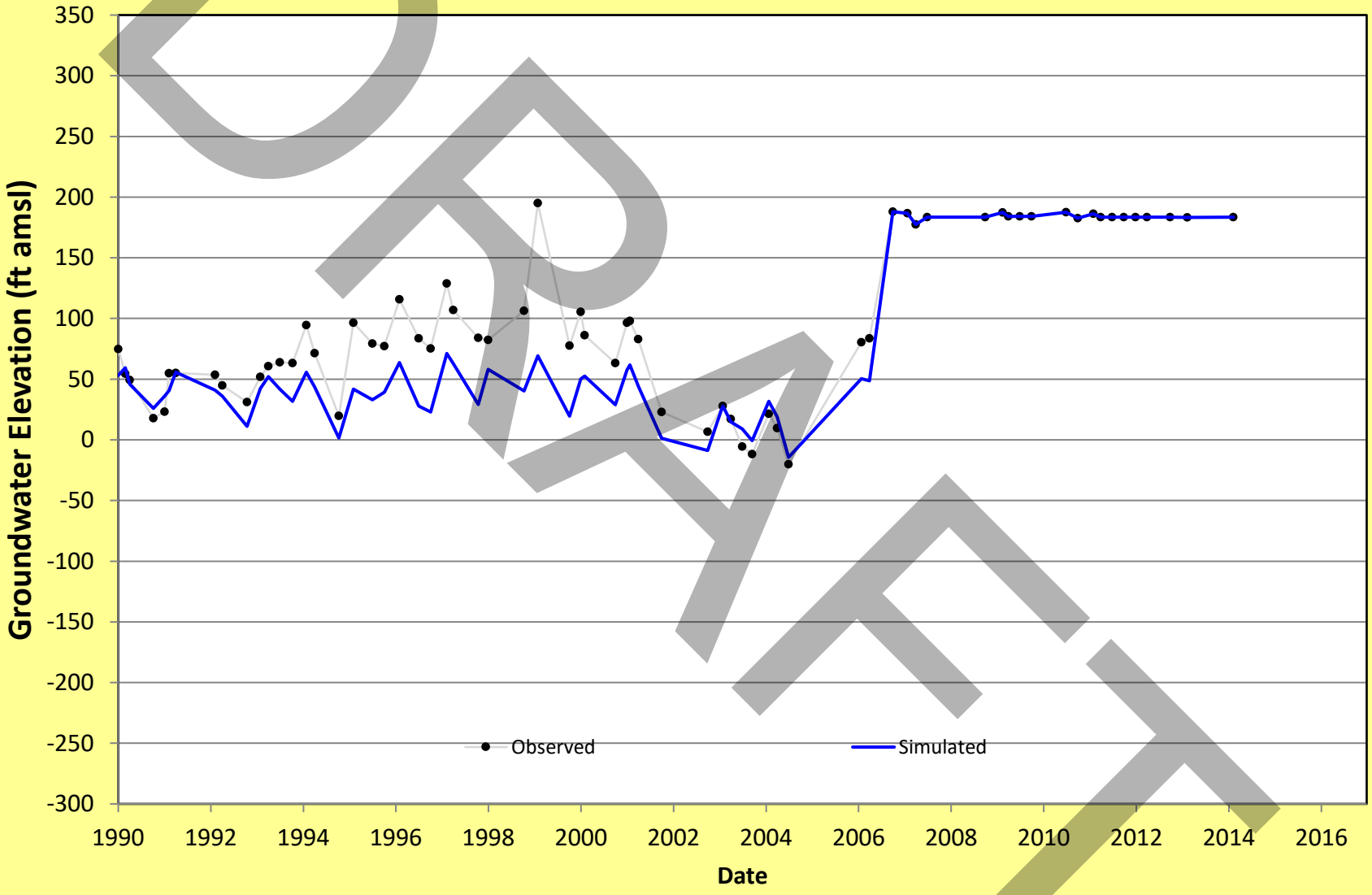
Date
Observed
Simulated
DRAFT

21S24E31D004_L6_66488



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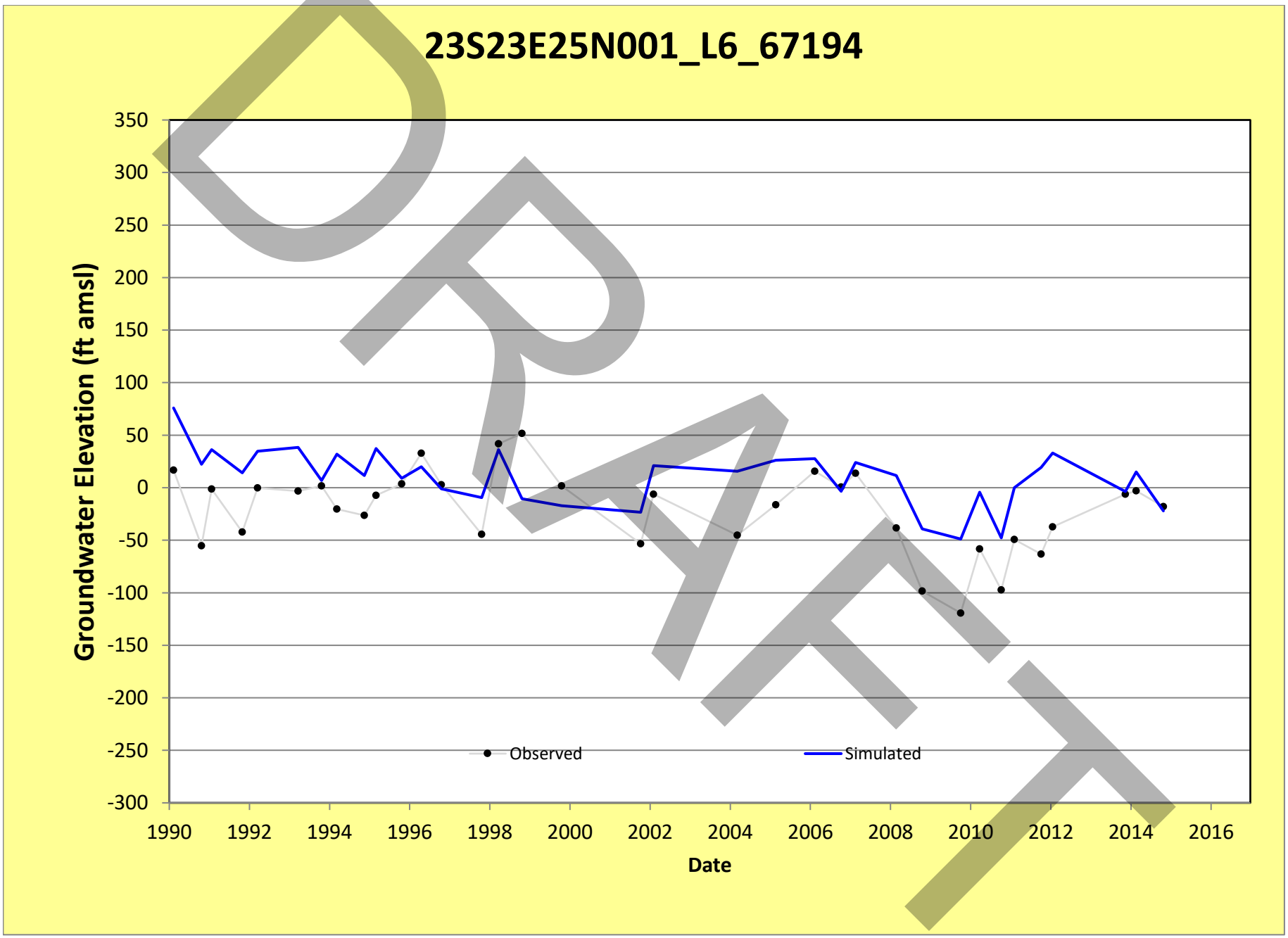
23S23E25N001_L6_67194
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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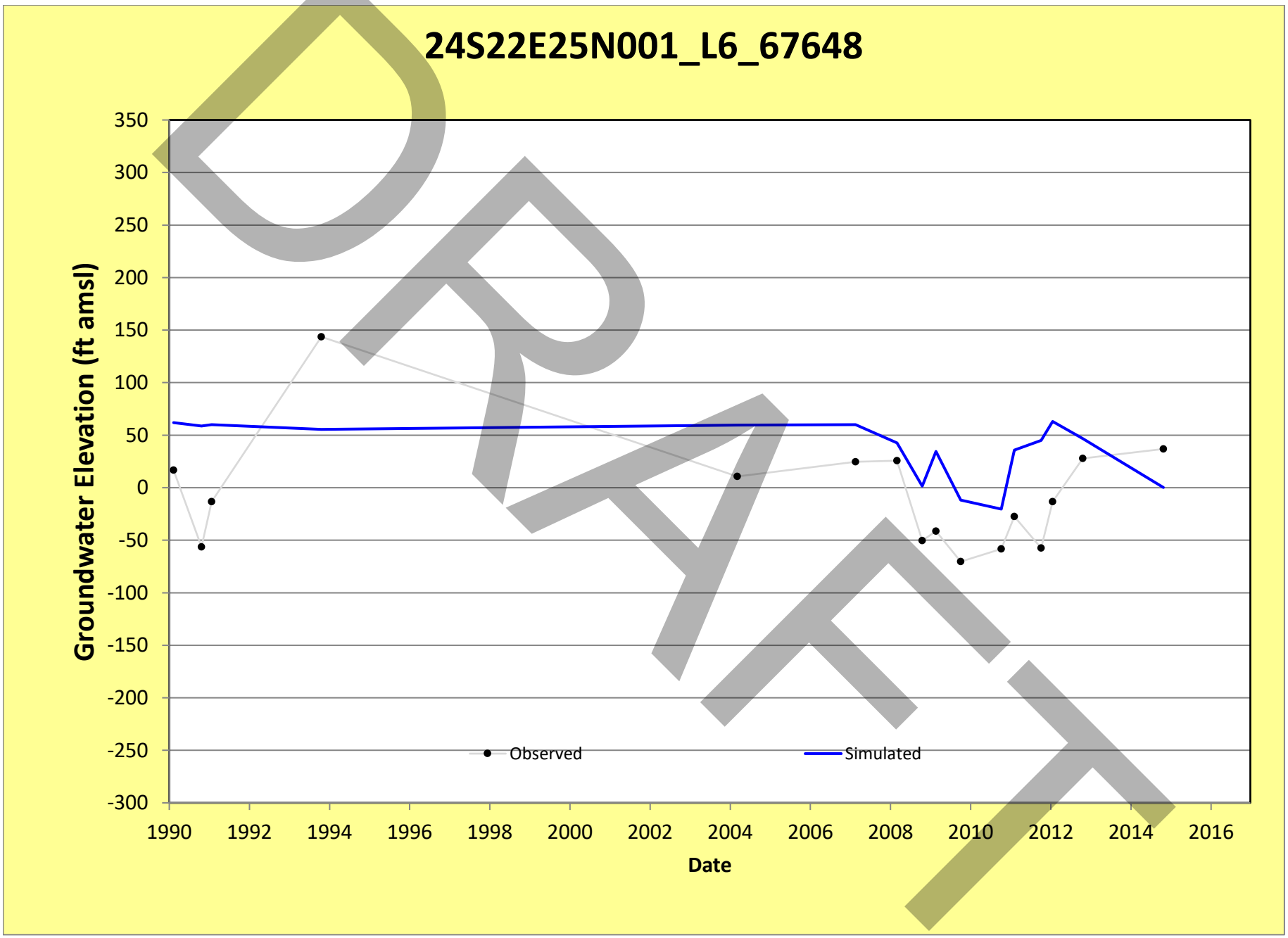
Date
Observed
Simulated
DRAFT


24S22E25N001_L6_67648
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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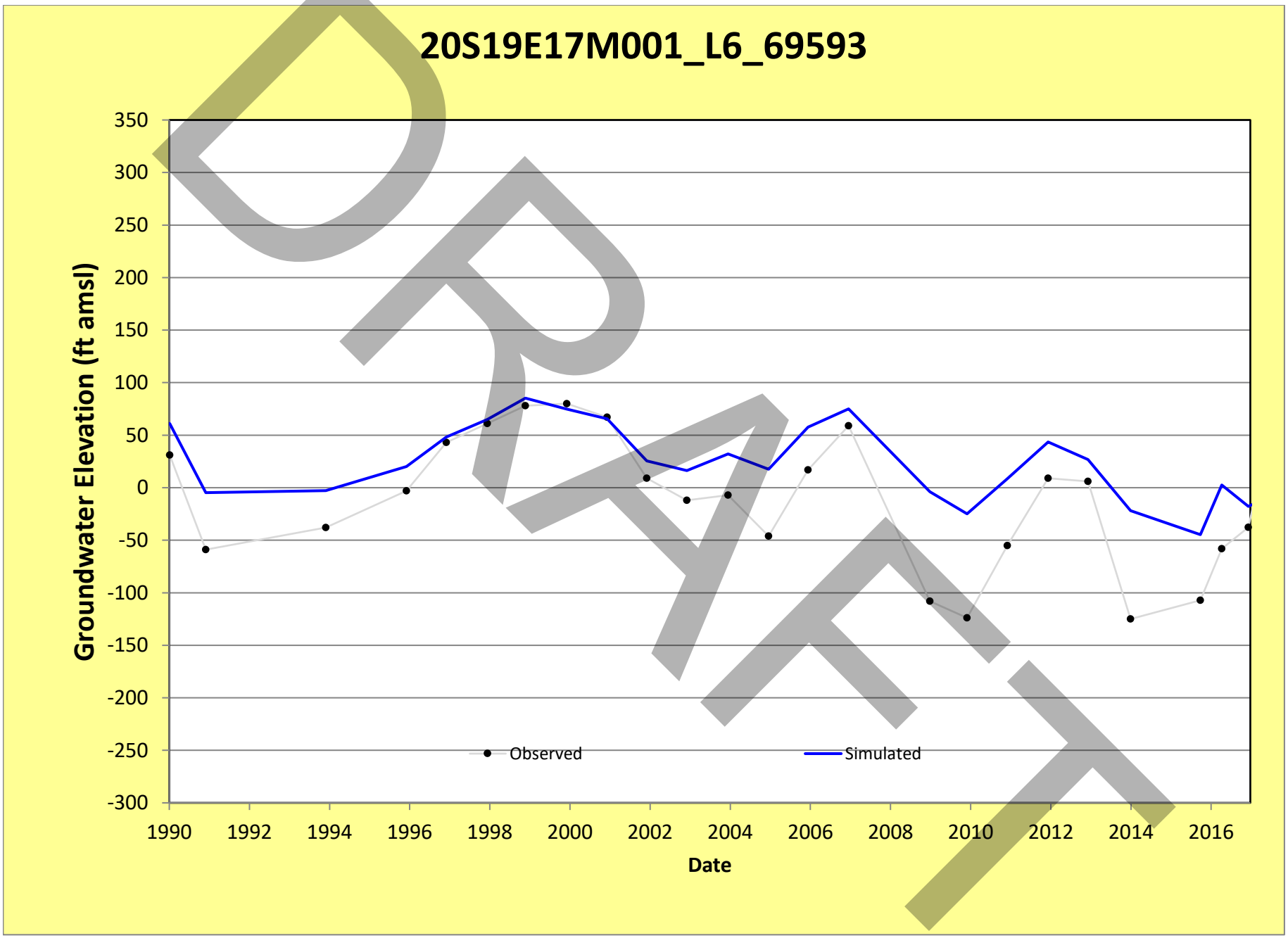
Date
Observed
Simulated
DRAFT


20S19E17M001_L6_69593
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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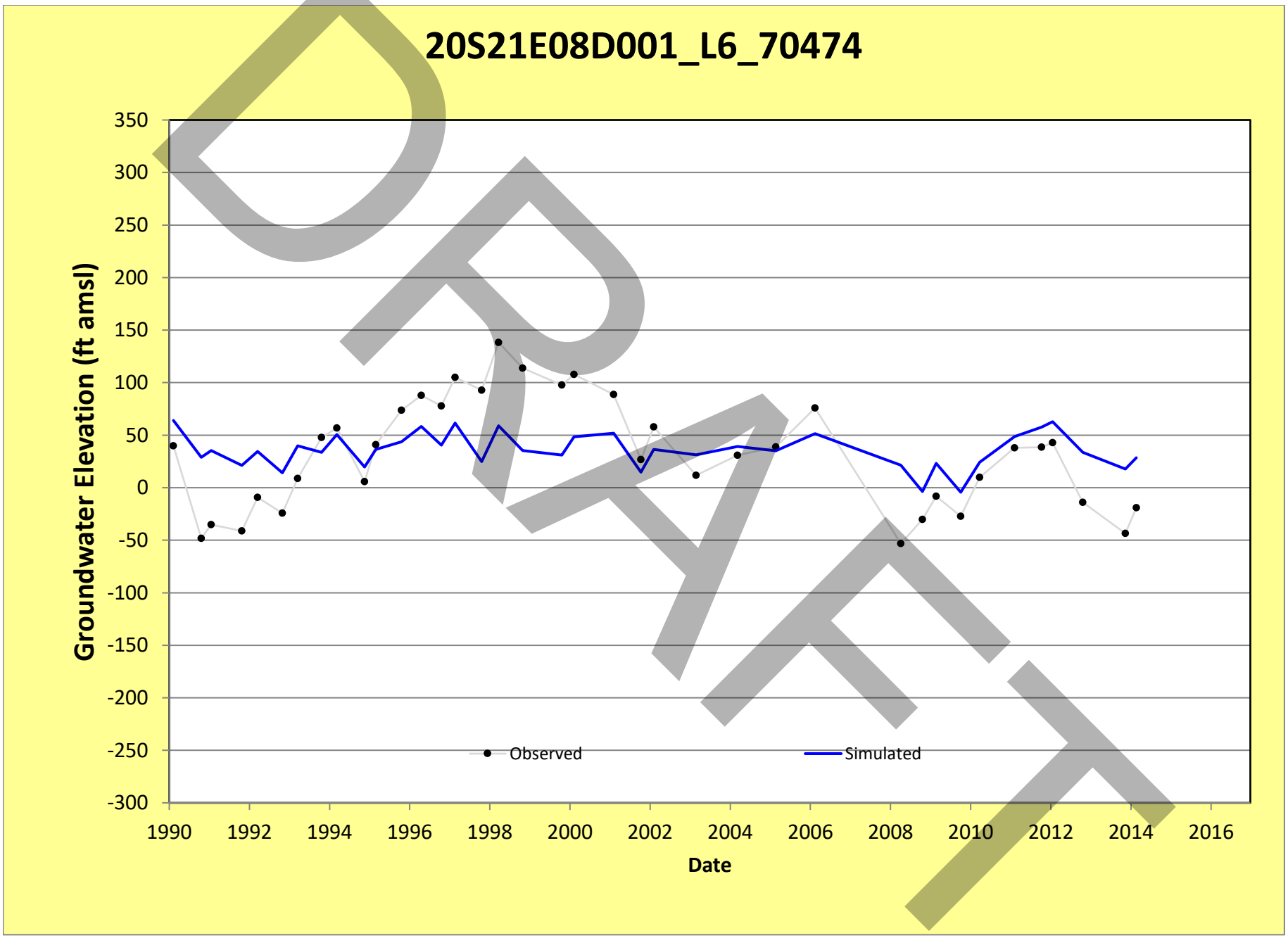
Date
Observed
Simulated
DRAFT


20S21E08D001_L6_70474
Groundwater Elevation (ft amsl)
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250
200
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100
50
0
-50
-100
-150
-200
-250
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Date
Observed
Simulated
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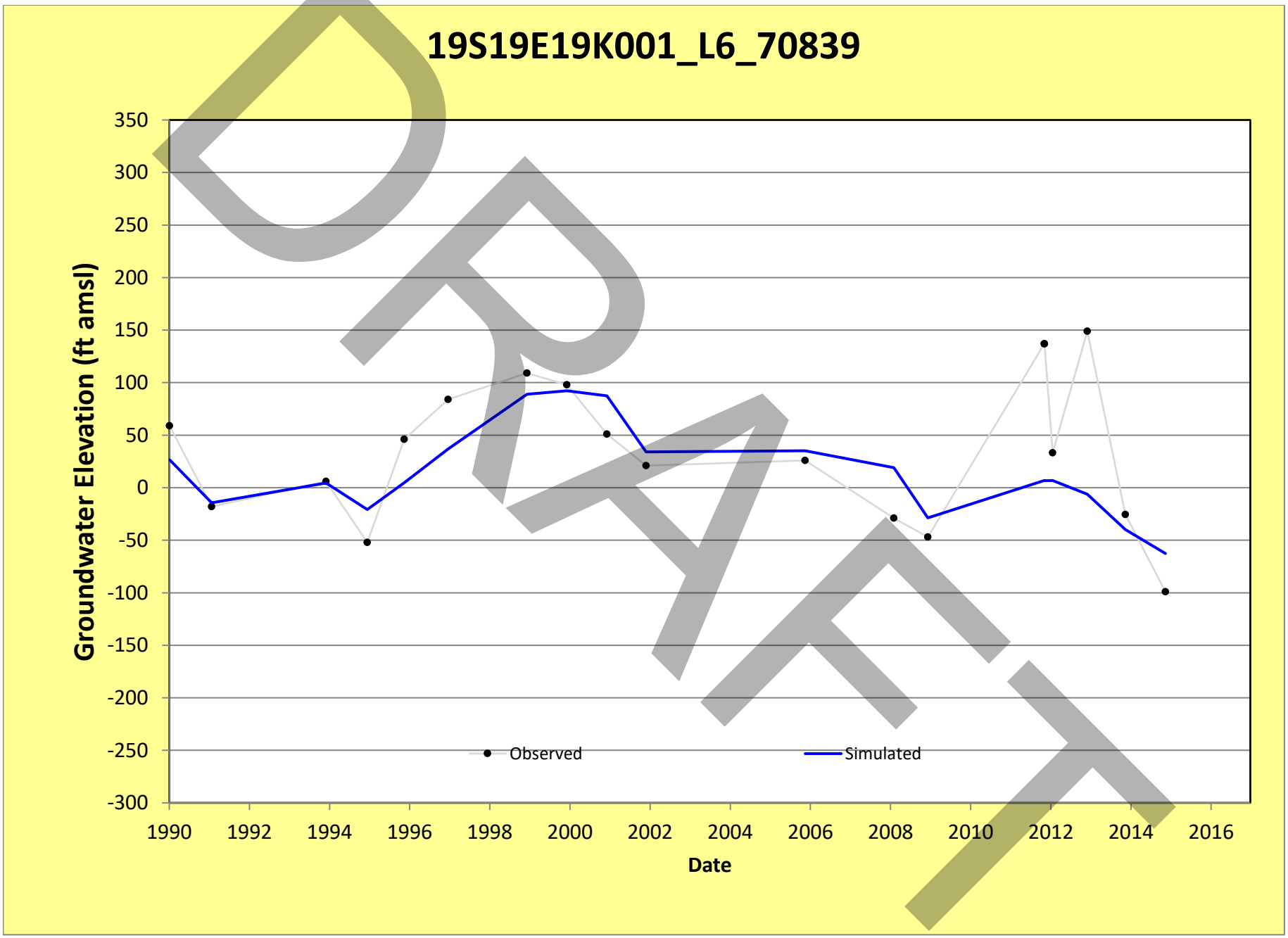
19S19E19K001_L6_70839
Groundwater Elevation (ft amsl)
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300
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100
50
0
-50
-100
-150
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-250
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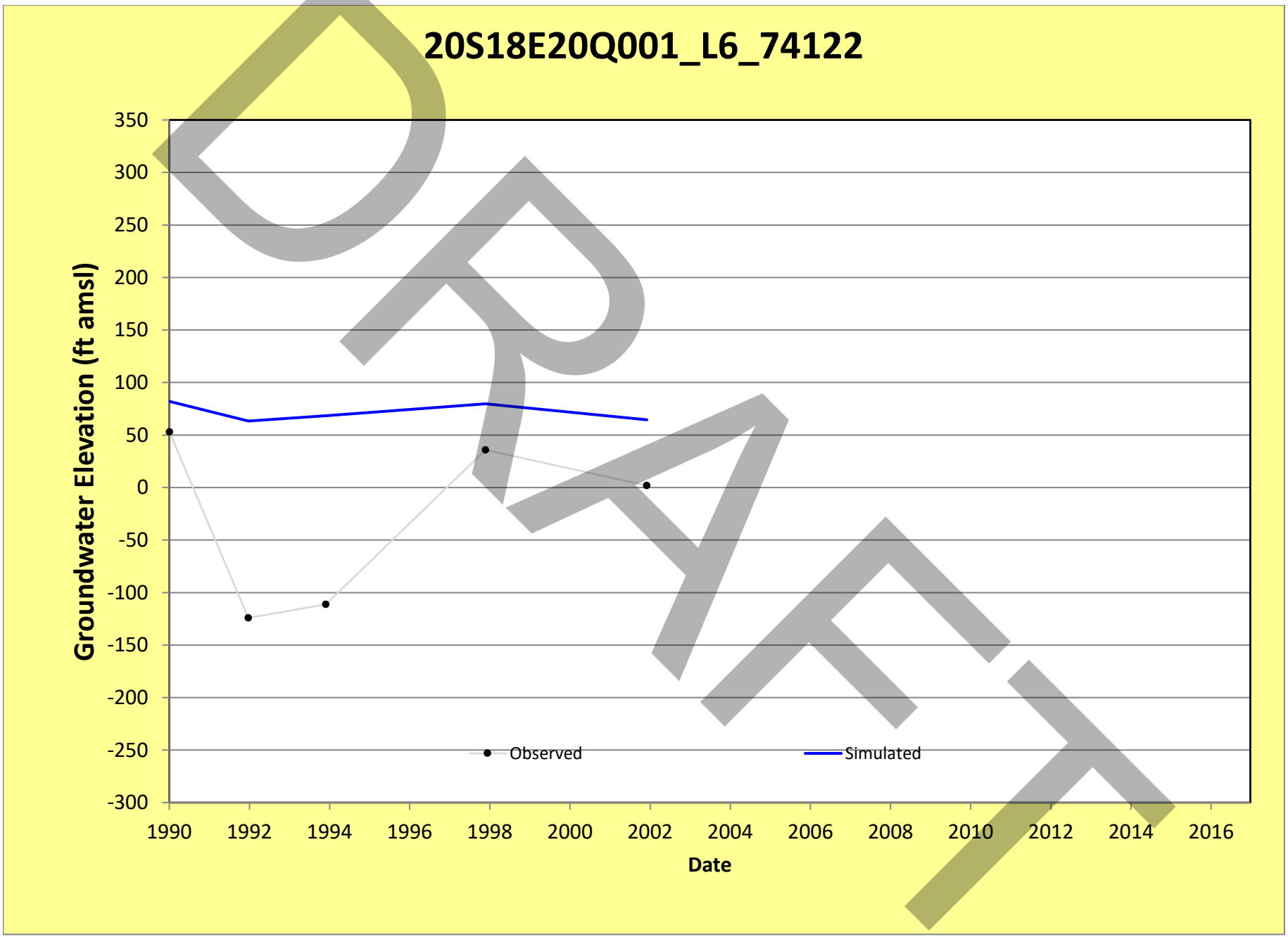
Date
Observed
Simulated
DRAFT


20S18E20Q001_L6_74122
Groundwater Elevation (ft amsl)
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100
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-50
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-150
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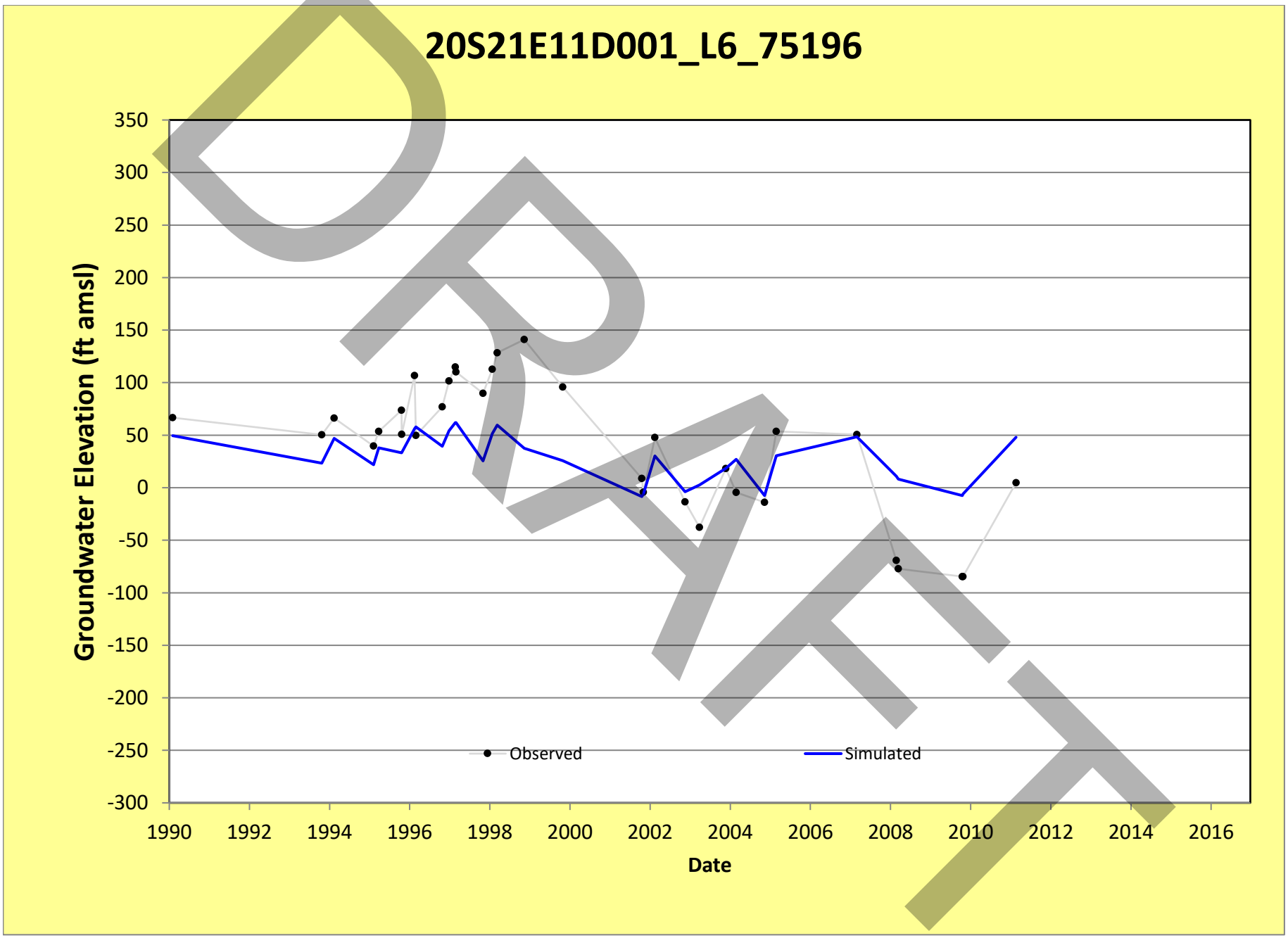
Date
Observed
Simulated
DRAFT


20S21E11D001_L6_75196
Groundwater Elevation (ft amsl)
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100
50
0
-50
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-150
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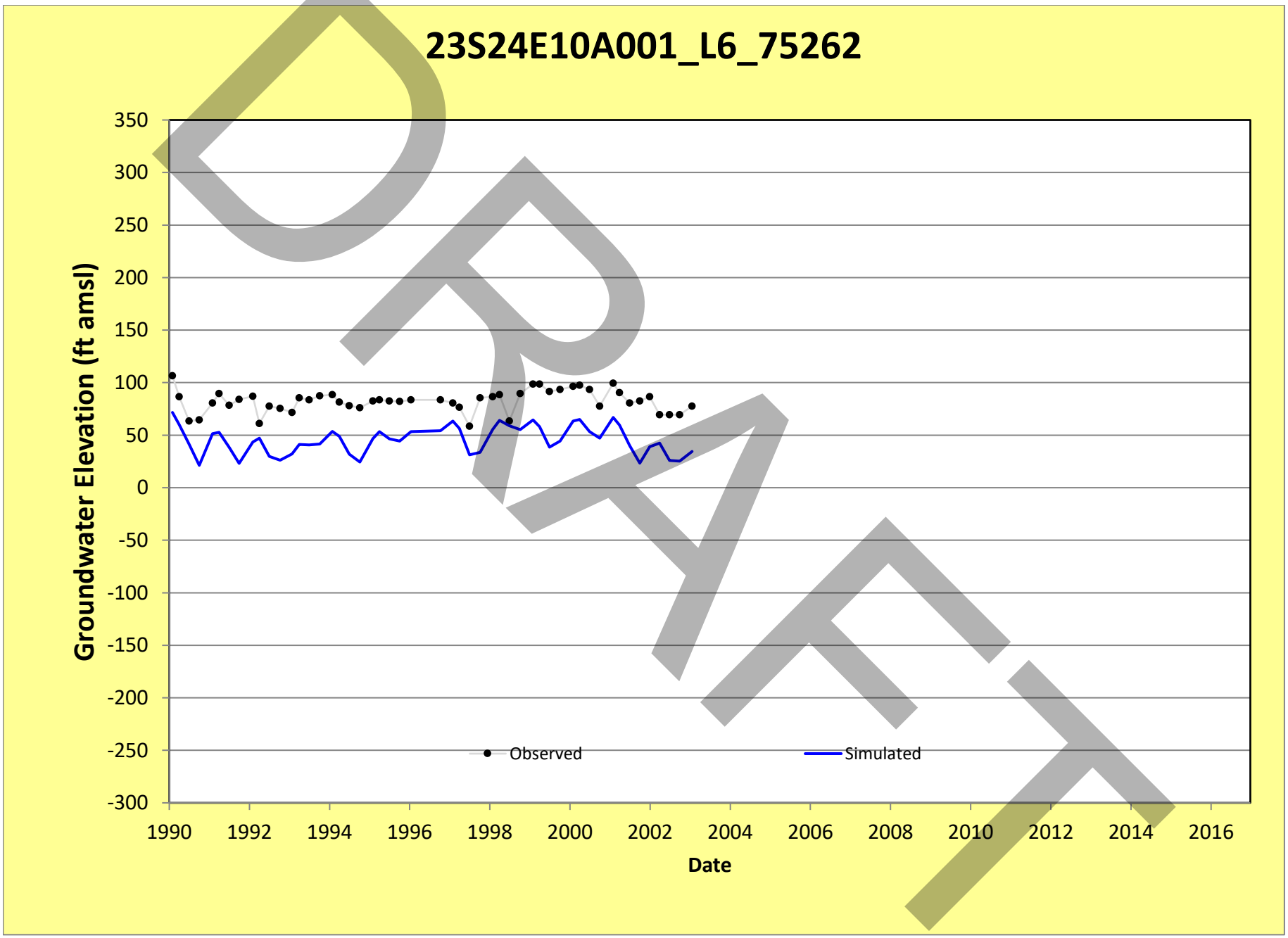
Date
Observed
Simulated
DRAFT


23S24E10A001_L6_75262
Groundwater Elevation (ft amsl)
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300
250
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100
50
0
-50
-100
-150
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-250
-300
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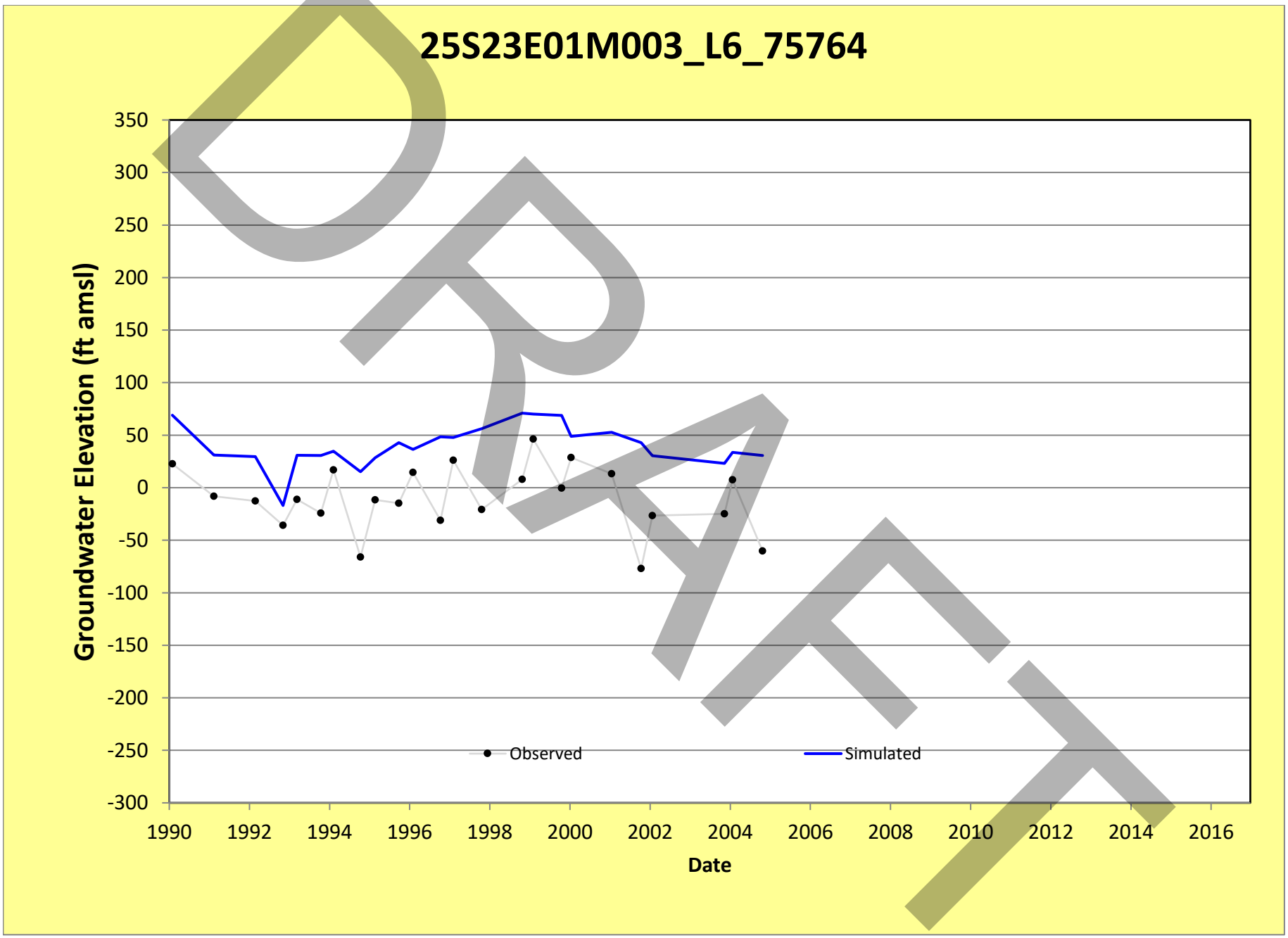
Date
Observed
Simulated
DRAFT


25S23E01M003_L6_75764
Groundwater Elevation (ft amsl)
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-50
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-150
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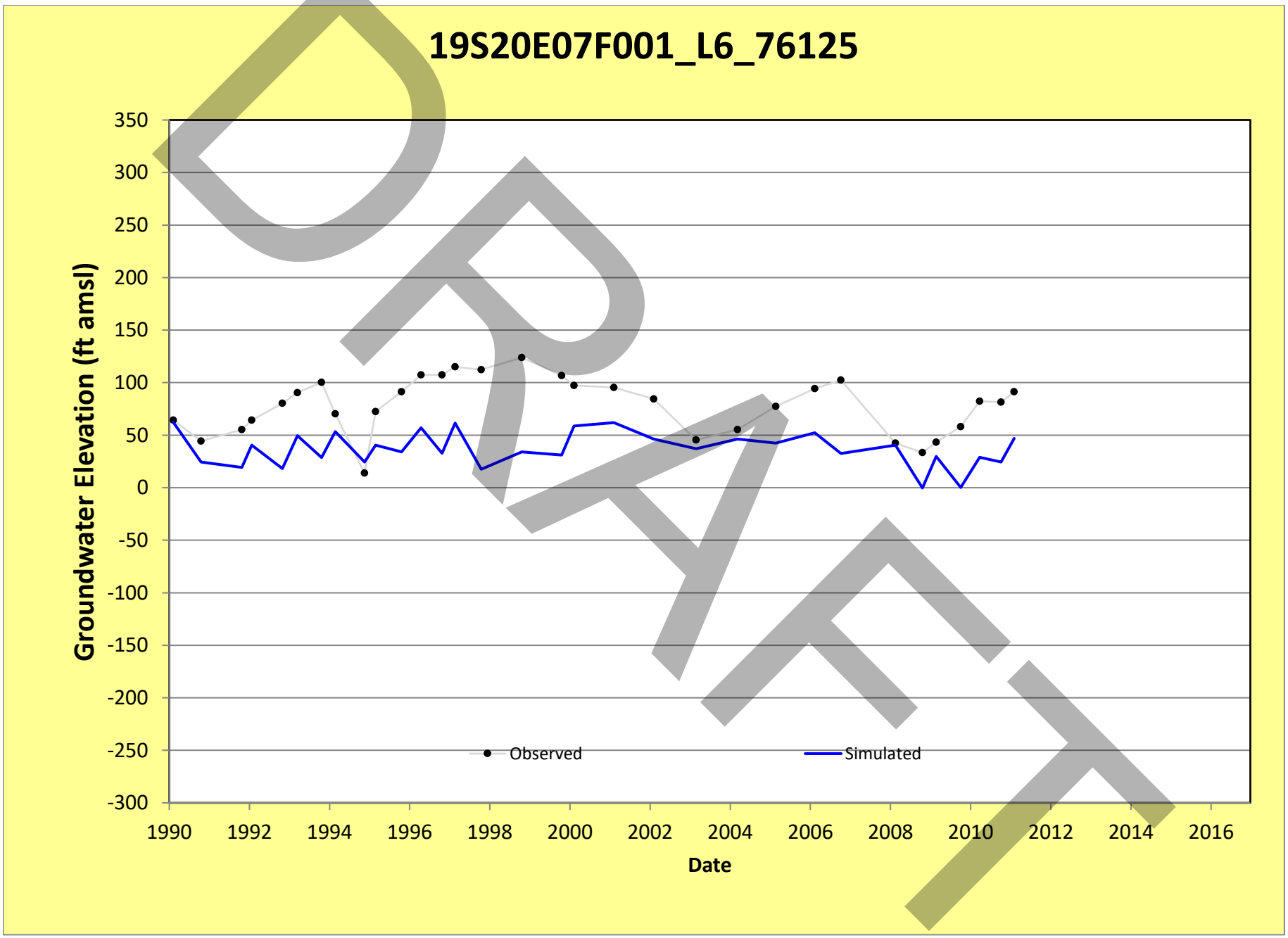
Observed
Simulated
DRAFT


19S20E07F001_L6_76125
Groundwater Elevation (ft amsl)
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100
50
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-50
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-150
-200
-250
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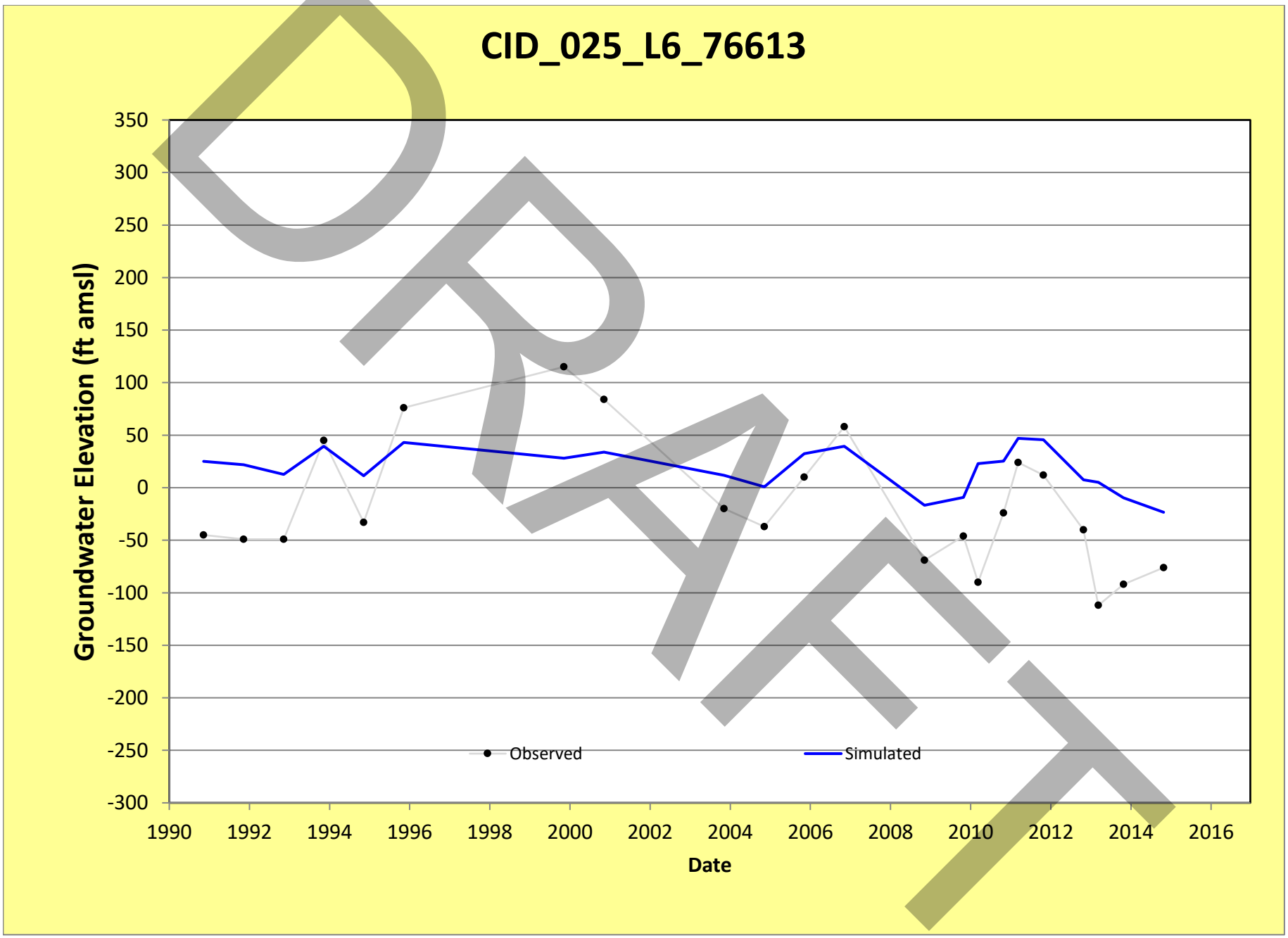
Date
Observed
Simulated
DRAFT


CID_025_L6_76613
Groundwater Elevation (ft amsl)
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100
50
0
-50
-100
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-250
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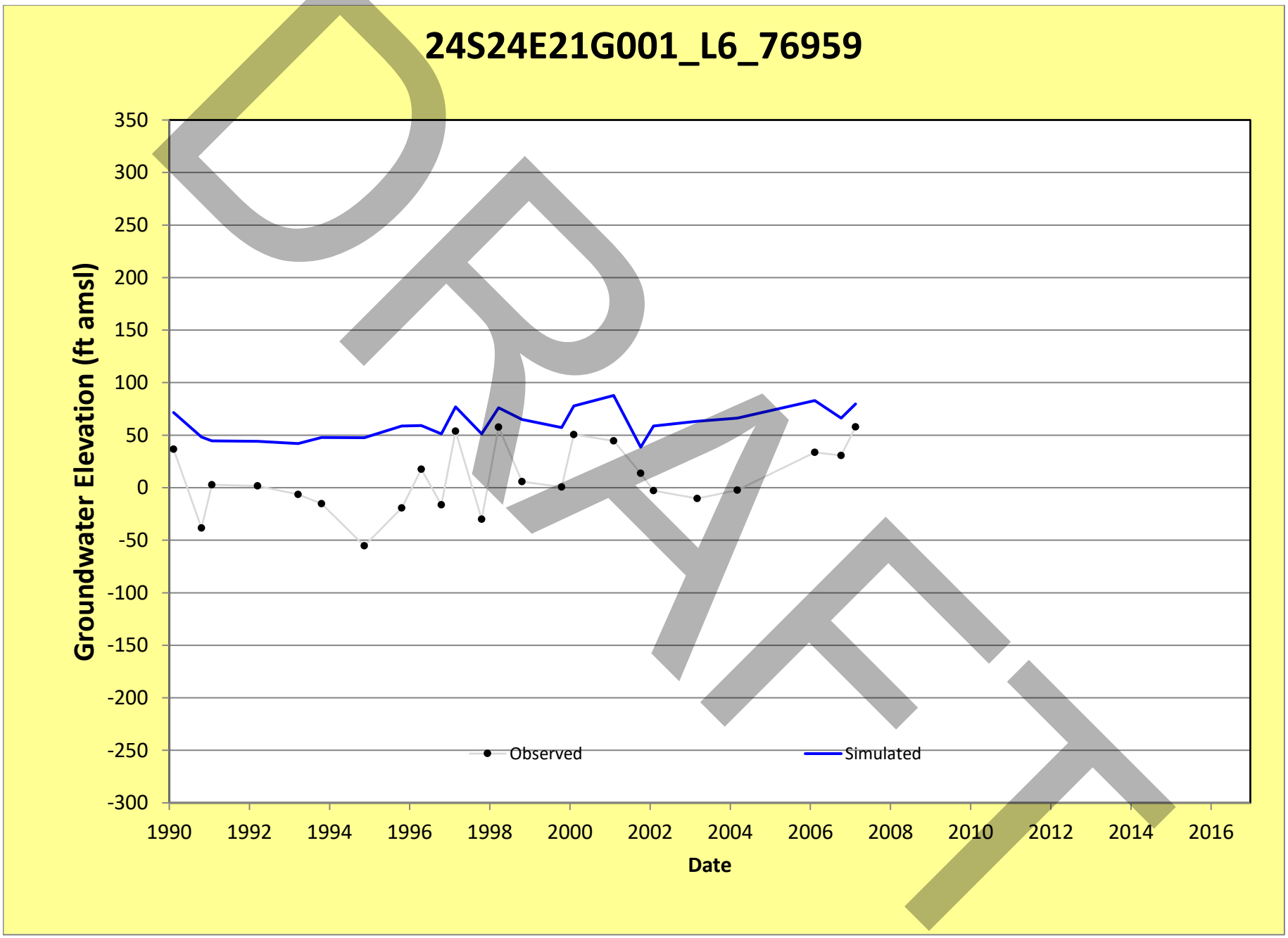
Date
Observed
Simulated
DRAFT


24S24E21G001_L6_76959
Groundwater Elevation (ft amsl)
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100
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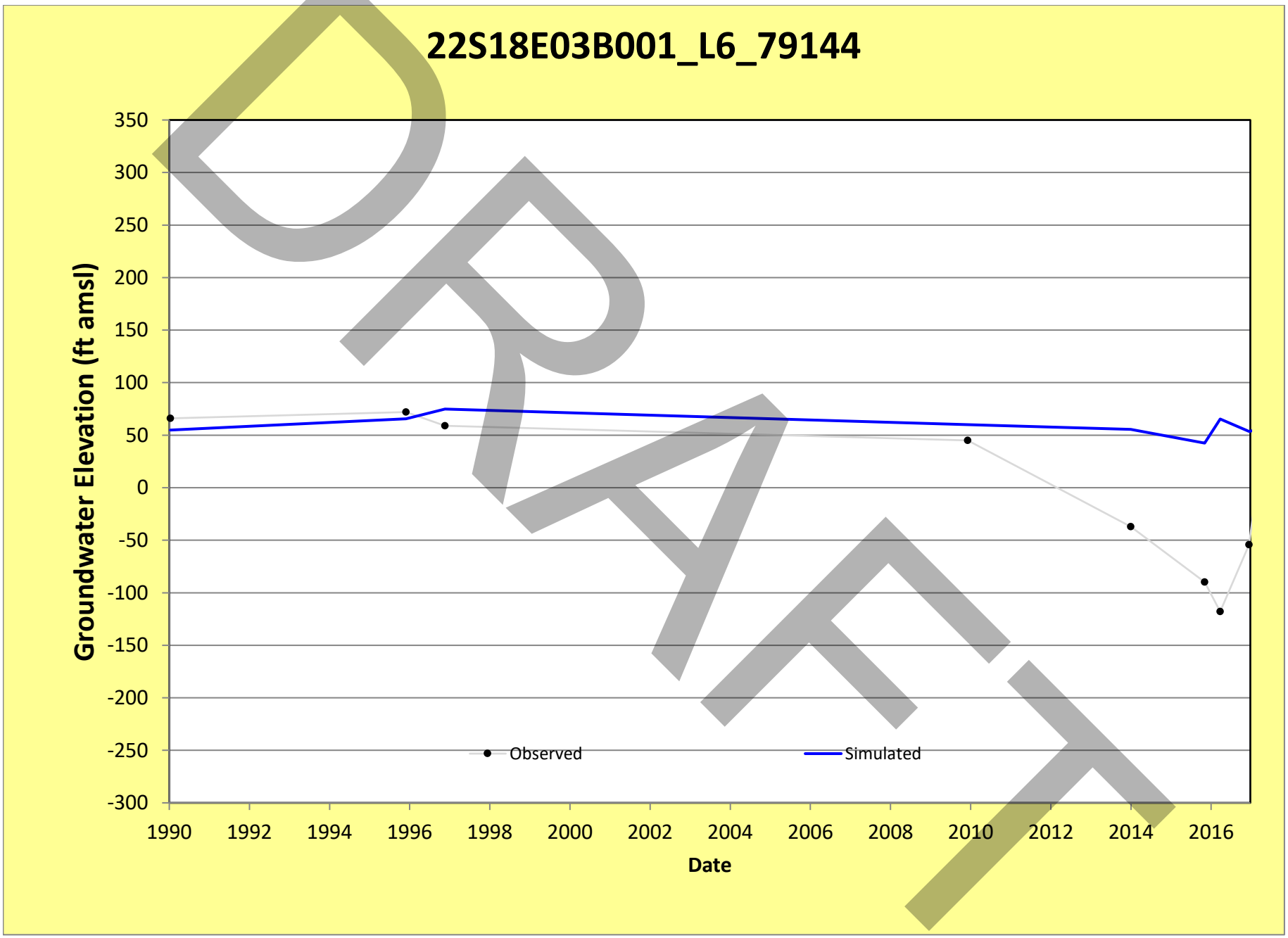
Date
Observed
Simulated
DRAFT


22S18E03B001_L6_79144
Groundwater Elevation (ft amsl)
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100
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-150
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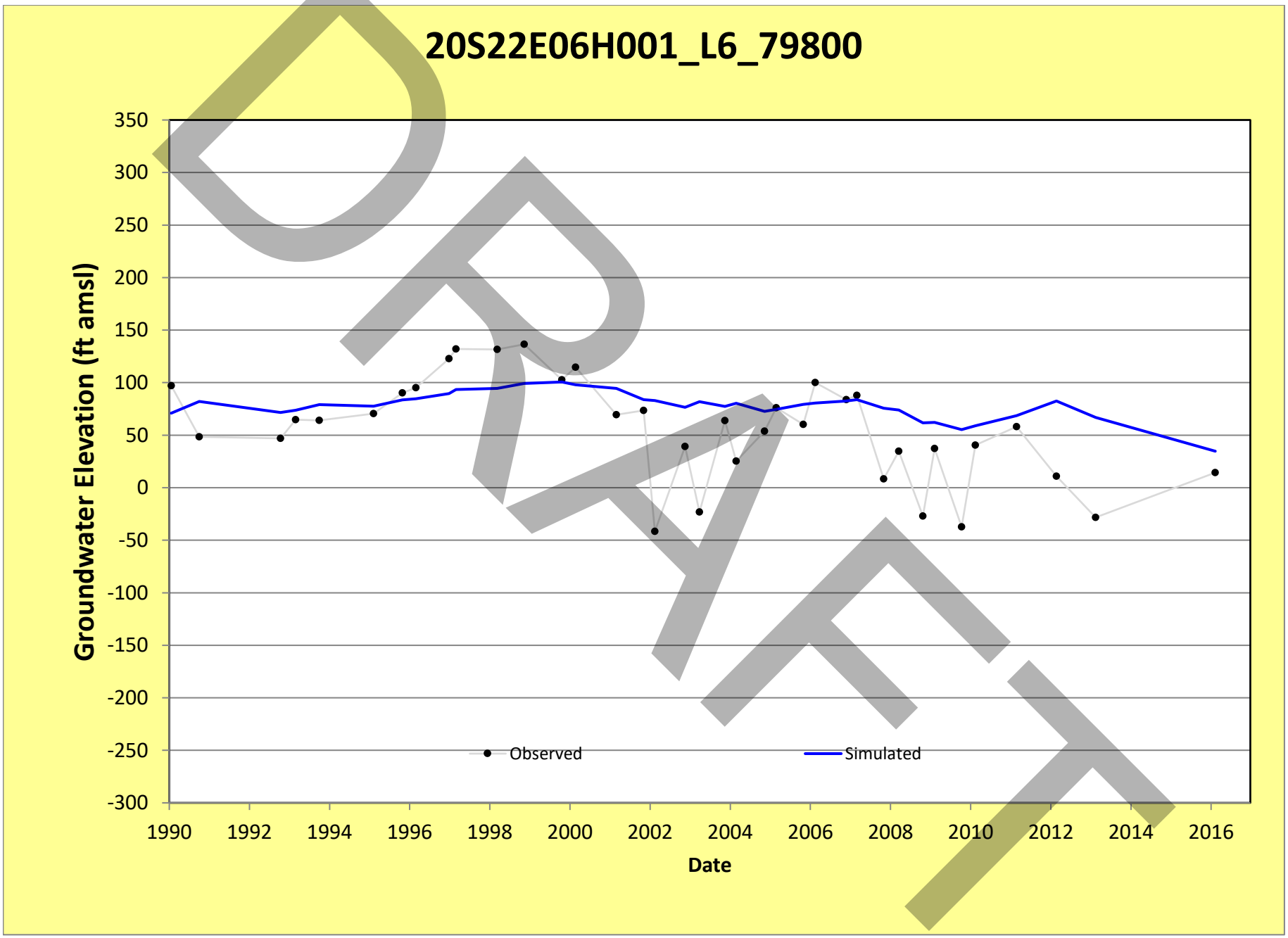
Date
Observed
Simulated
DRAFT


20S22E06H001_L6_79800
Groundwater Elevation (ft amsl)
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50
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-100
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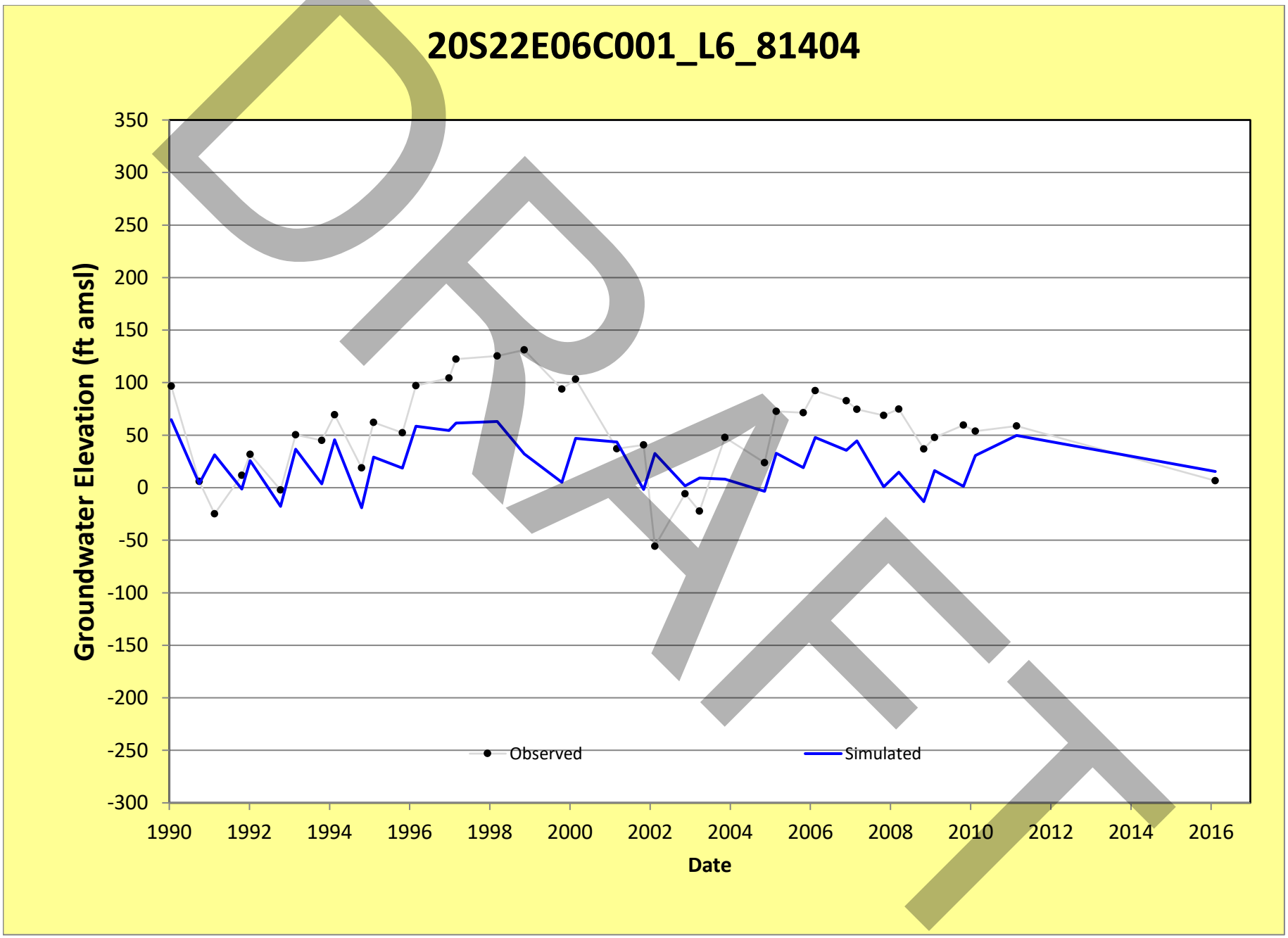
Date
Observed
Simulated
DRAFT


20S22E06C001_L6_81404
Groundwater Elevation (ft amsl)
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-50
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-200
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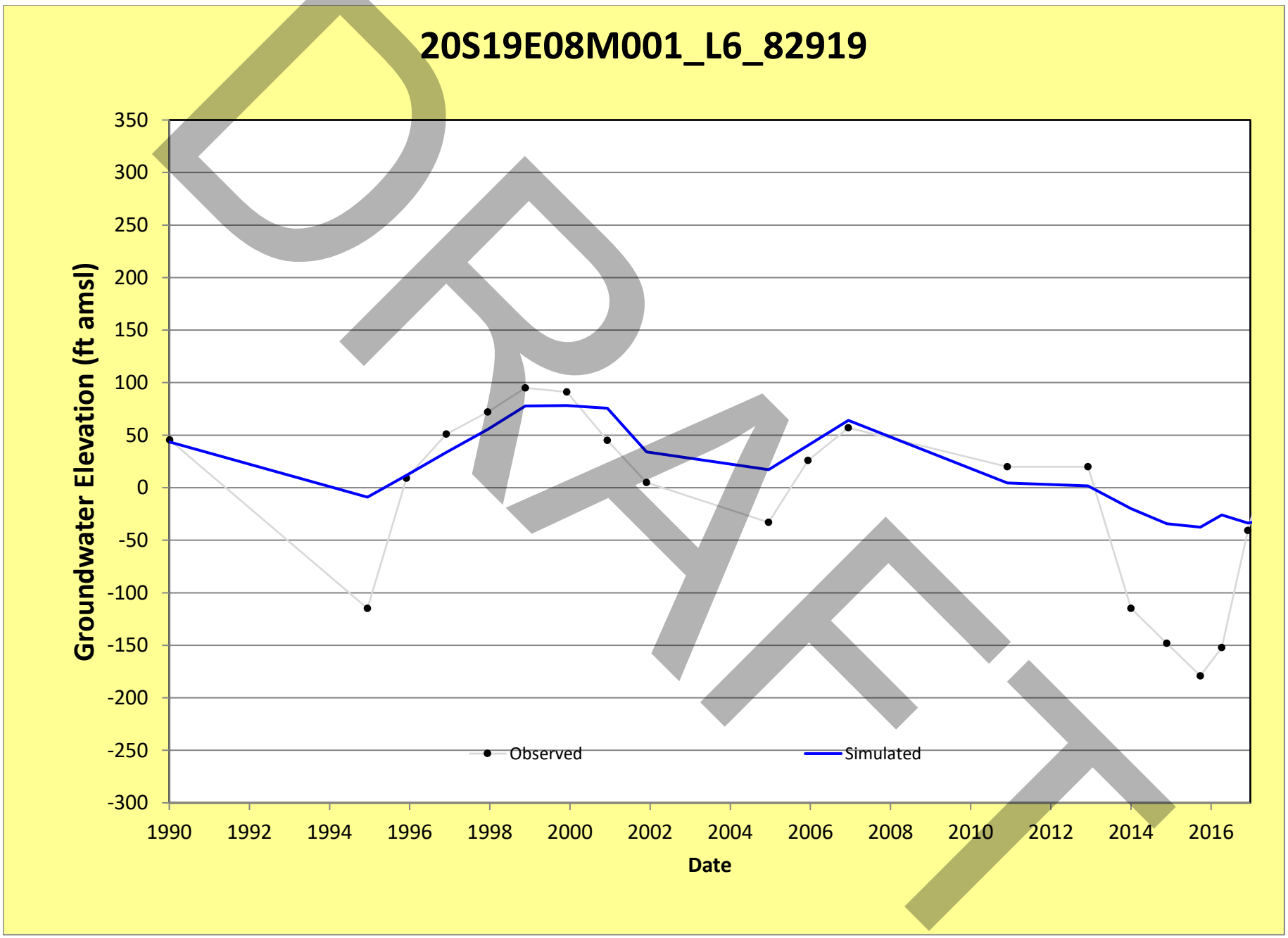
Observed
Simulated
DRAFT


20S19E08M001_L6_82919
Groundwater Elevation (ft amsl)
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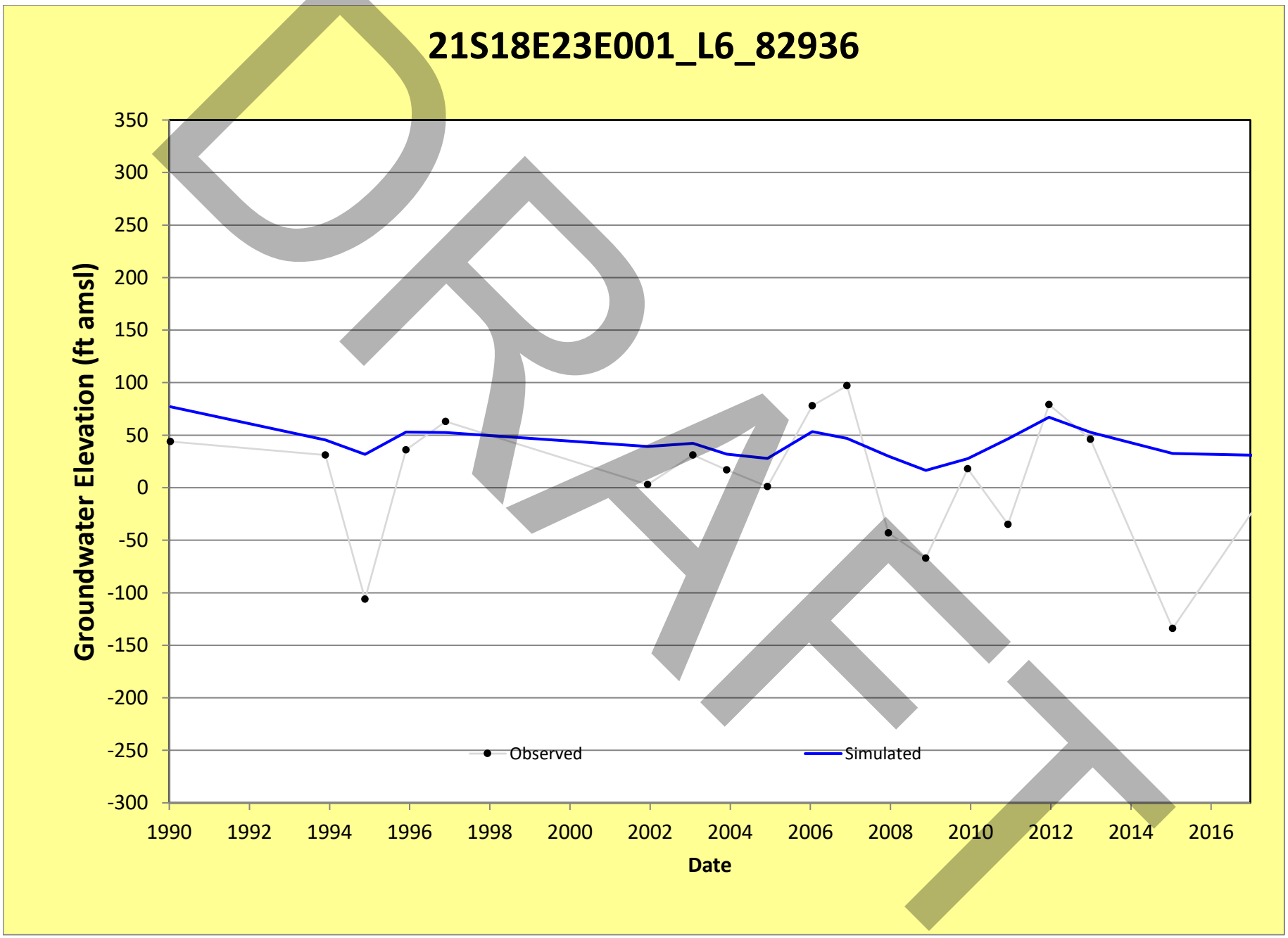
Date
Observed
Simulated
DRAFT


21S18E23E001_L6_82936
Groundwater Elevation (ft amsl)
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-150
-200
-250
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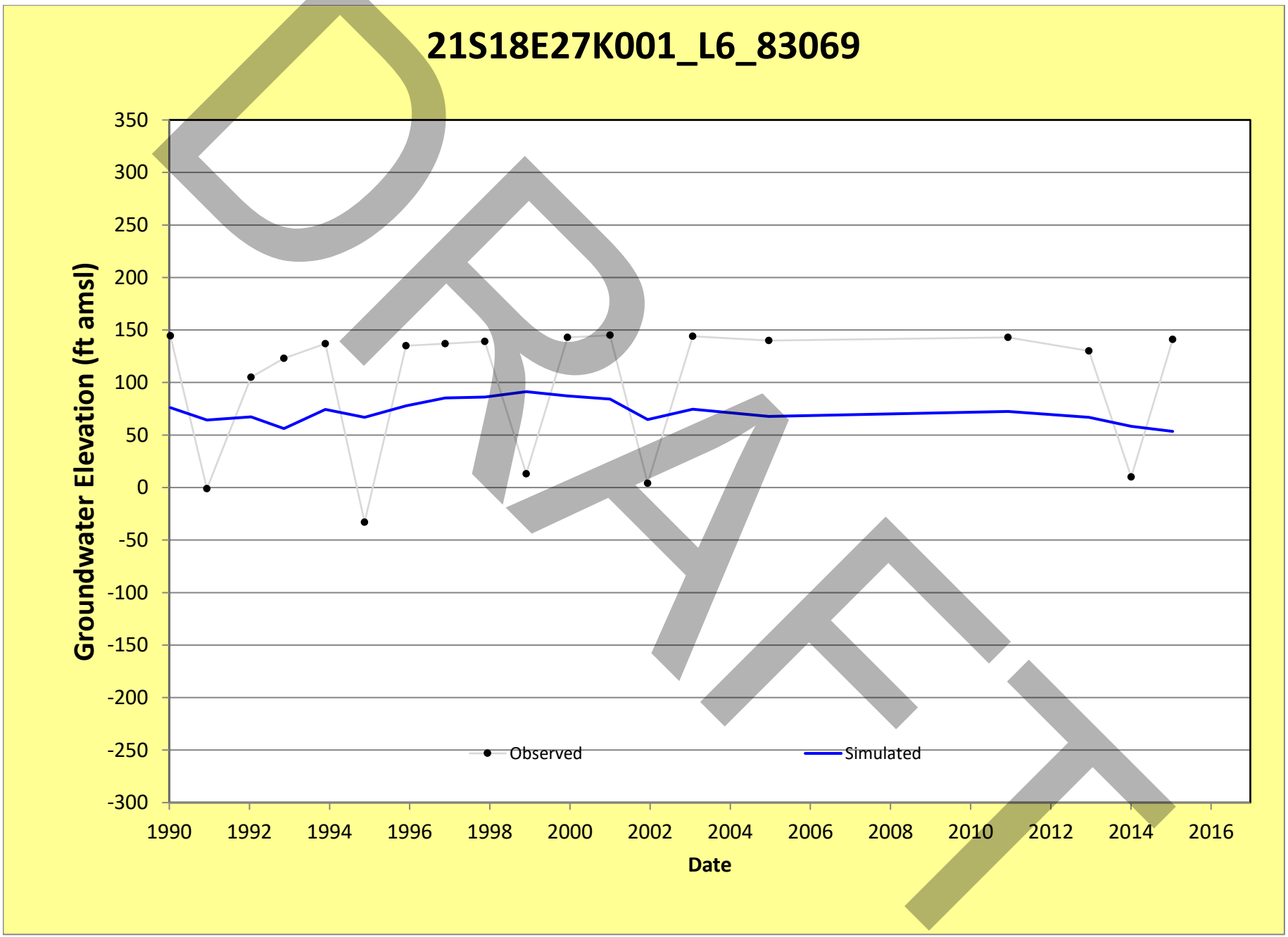
Date
Observed
Simulated
DRAFT


21S18E27K001_L6_83069
Groundwater Elevation (ft amsl)
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-200
-250
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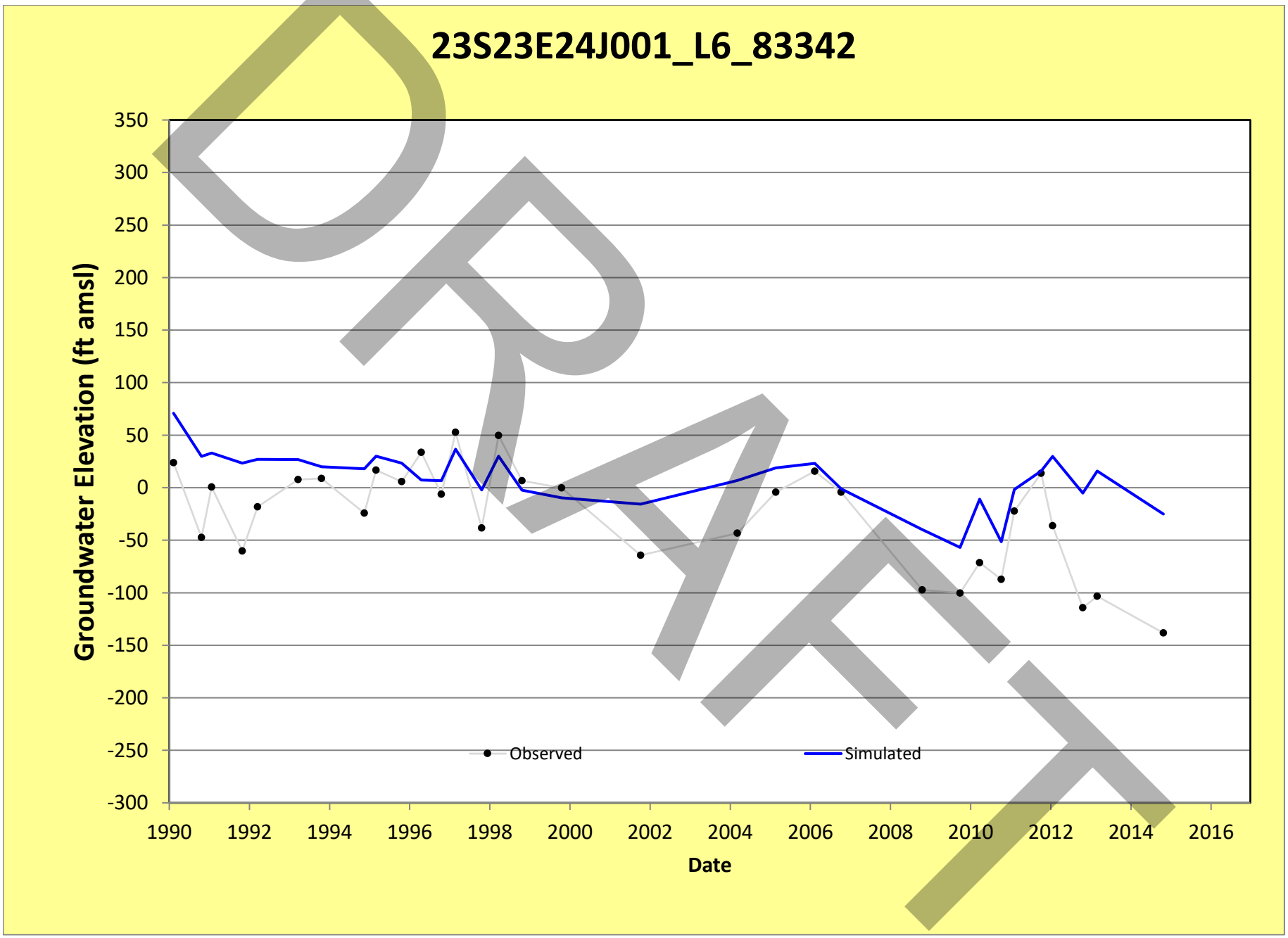
Date
Observed
Simulated
DRAFT


23S23E24J001_L6_83342
Groundwater Elevation (ft amsl)
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250
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100
50
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-50
-100
-150
-200
-250
-300
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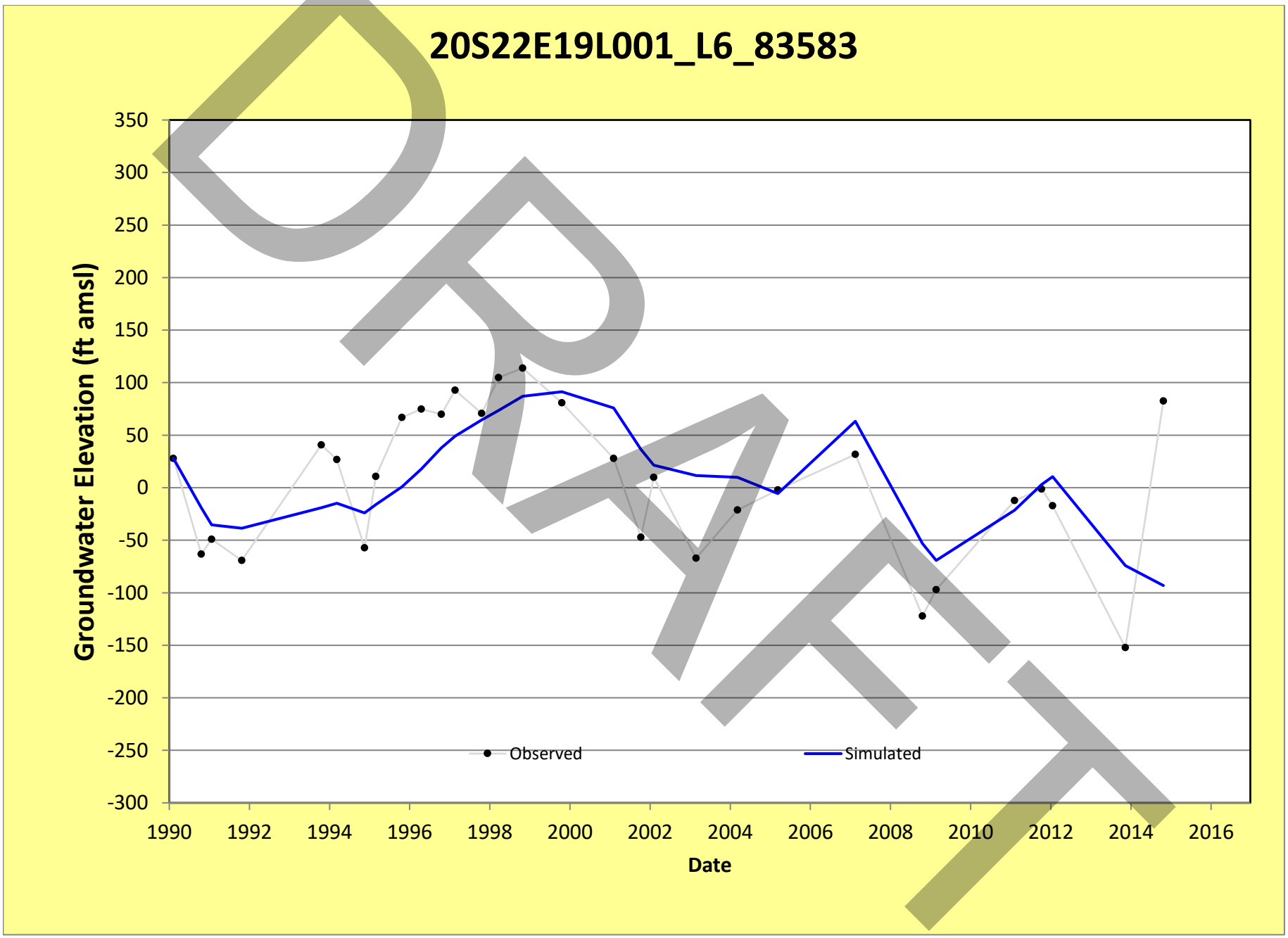
Date
Observed
Simulated
DRAFT


20S22E19L001_L6_83583
Groundwater Elevation (ft amsl)
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1990
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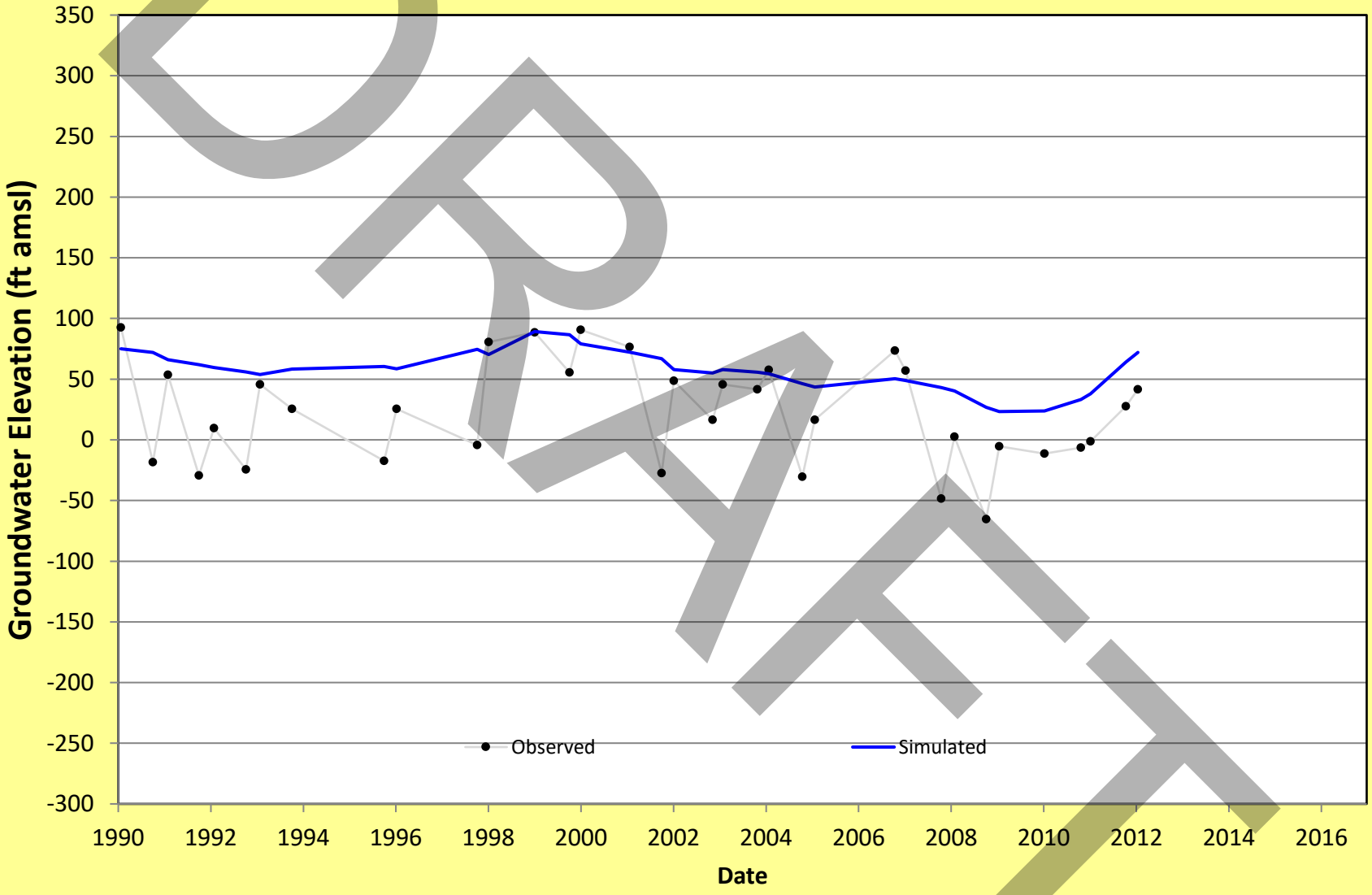
Date
Observed
Simulated
DRAFT

26S24E11P002_L6_85434



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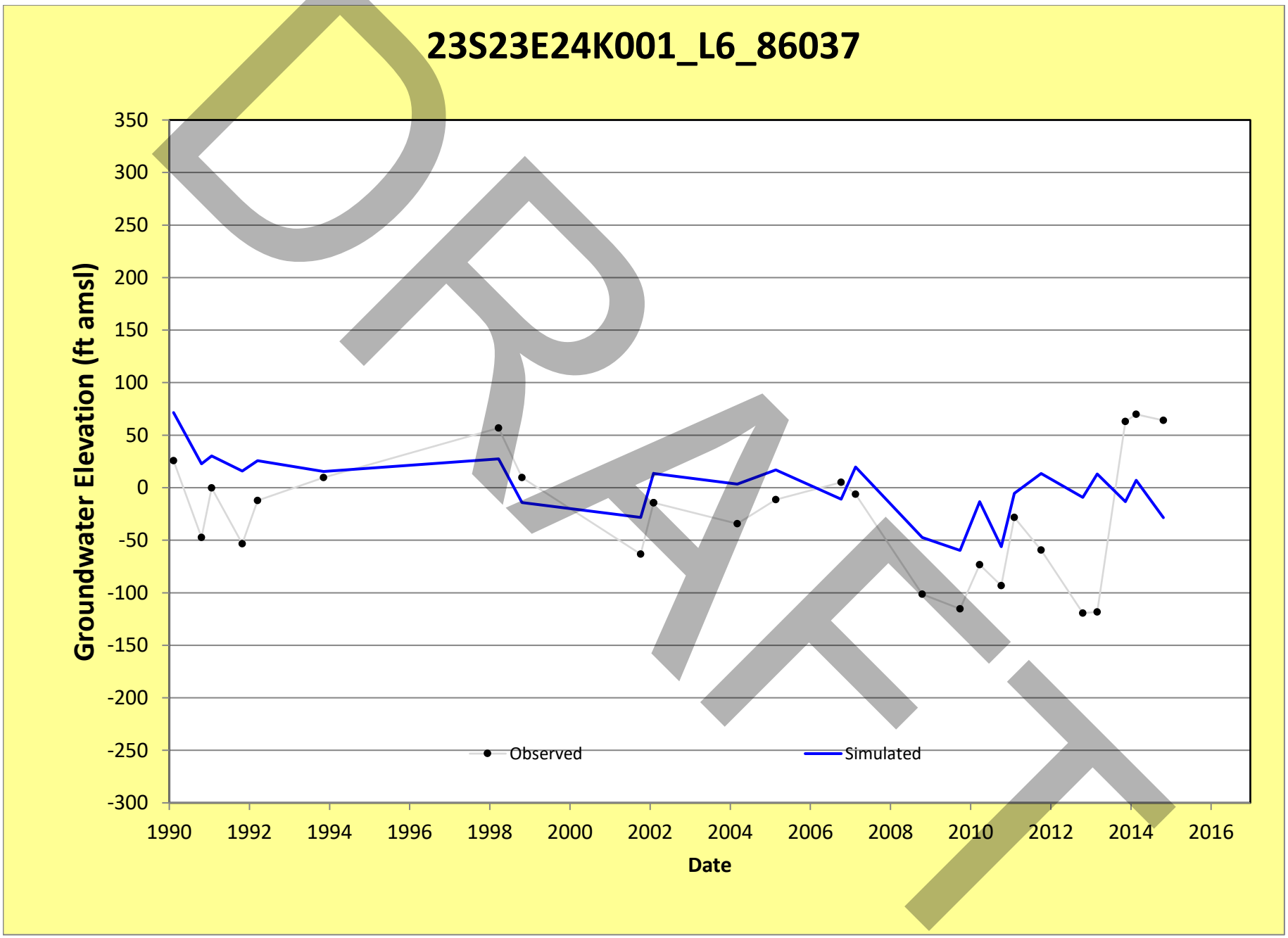
23S23E24K001_L6_86037
Groundwater Elevation (ft amsl)
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200
150
100
50
0
-50
-100
-150
-200
-250
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1990
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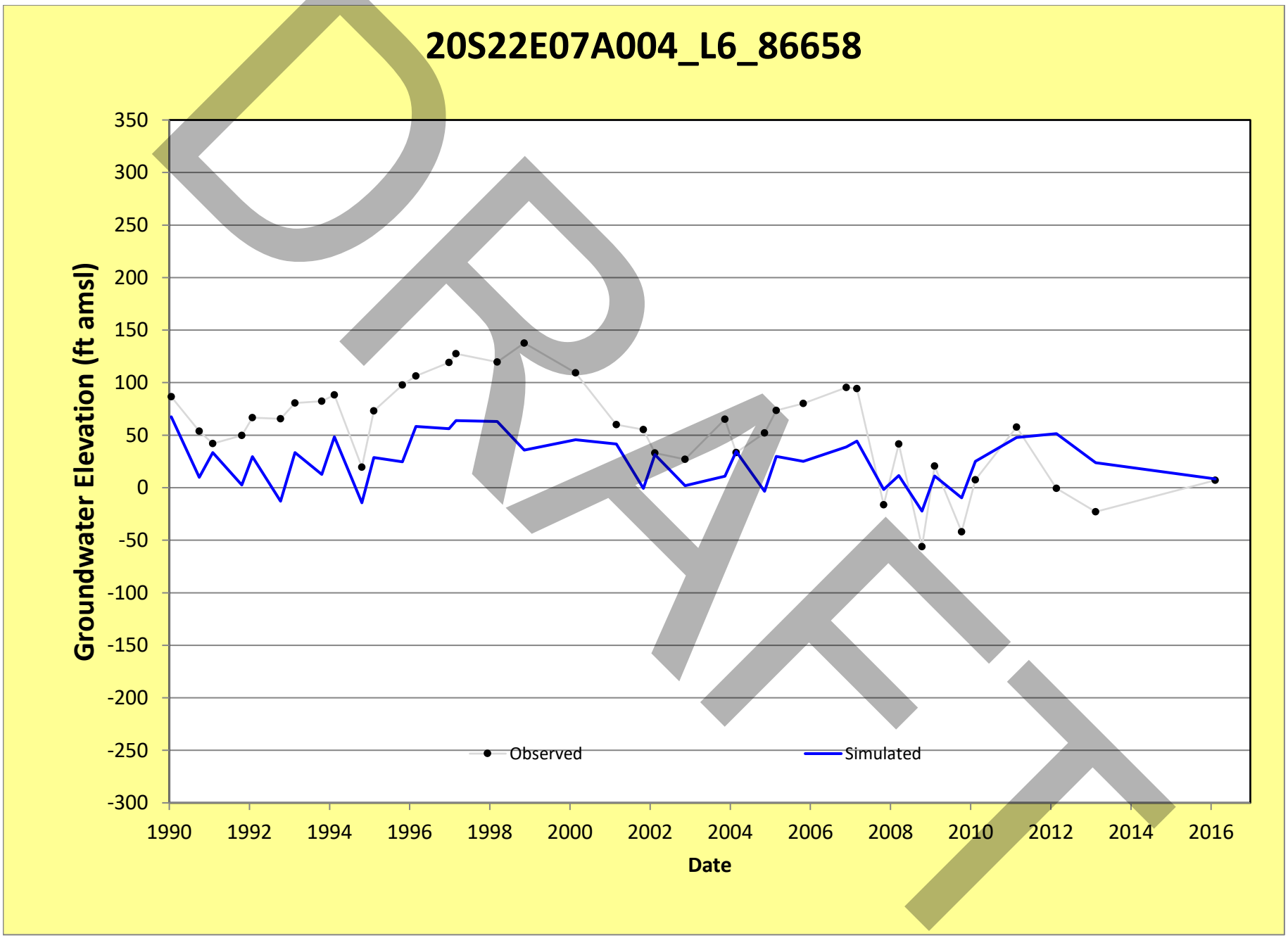
Date
Observed
Simulated
DRAFT


20S22E07A004_L6_86658
Groundwater Elevation (ft amsl)
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200
150
100
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-50
-100
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-200
-250
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Date
Observed
Simulated
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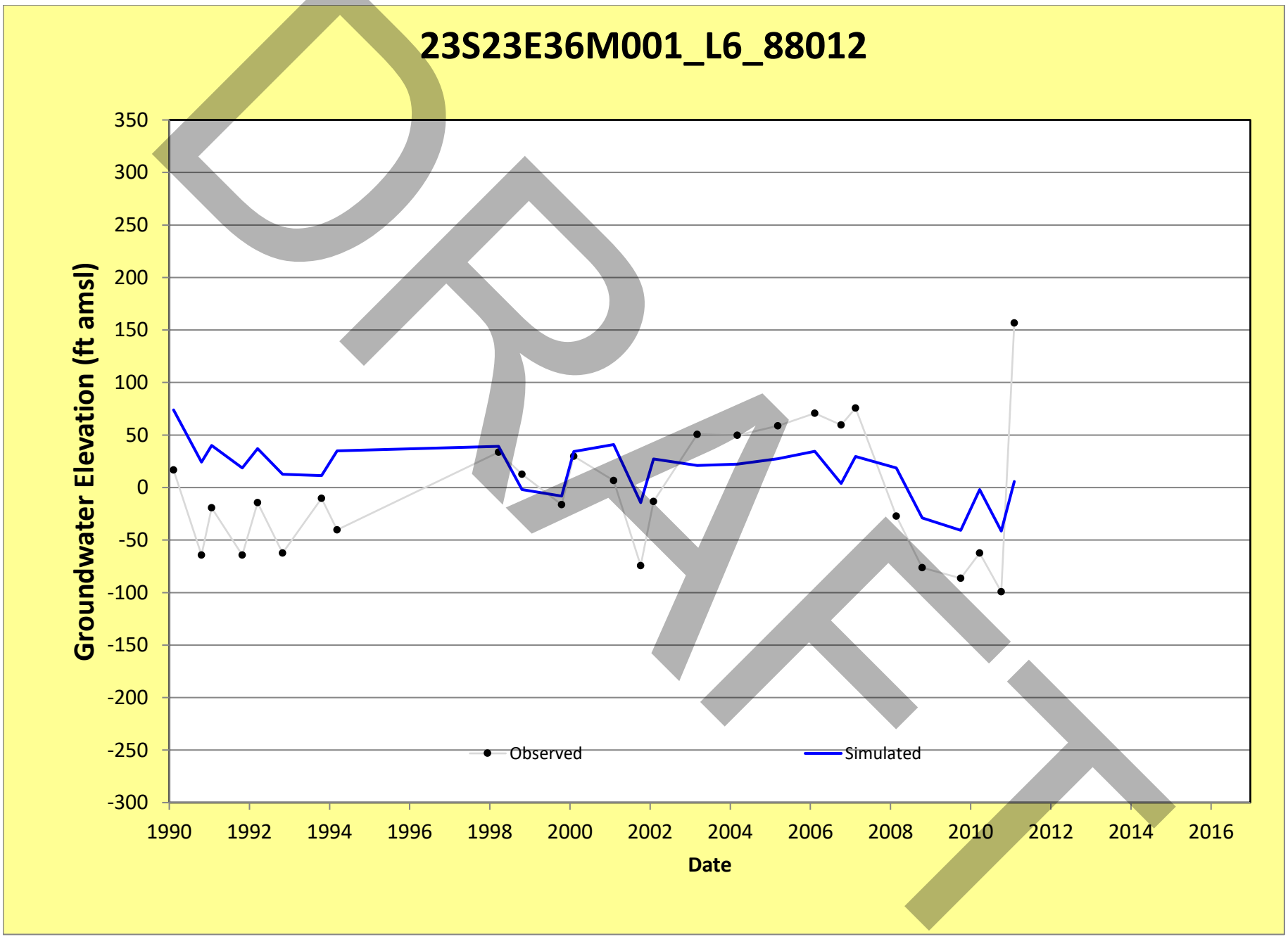
23S23E36M001_L6_88012
Groundwater Elevation (ft amsl)
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-50
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Observed
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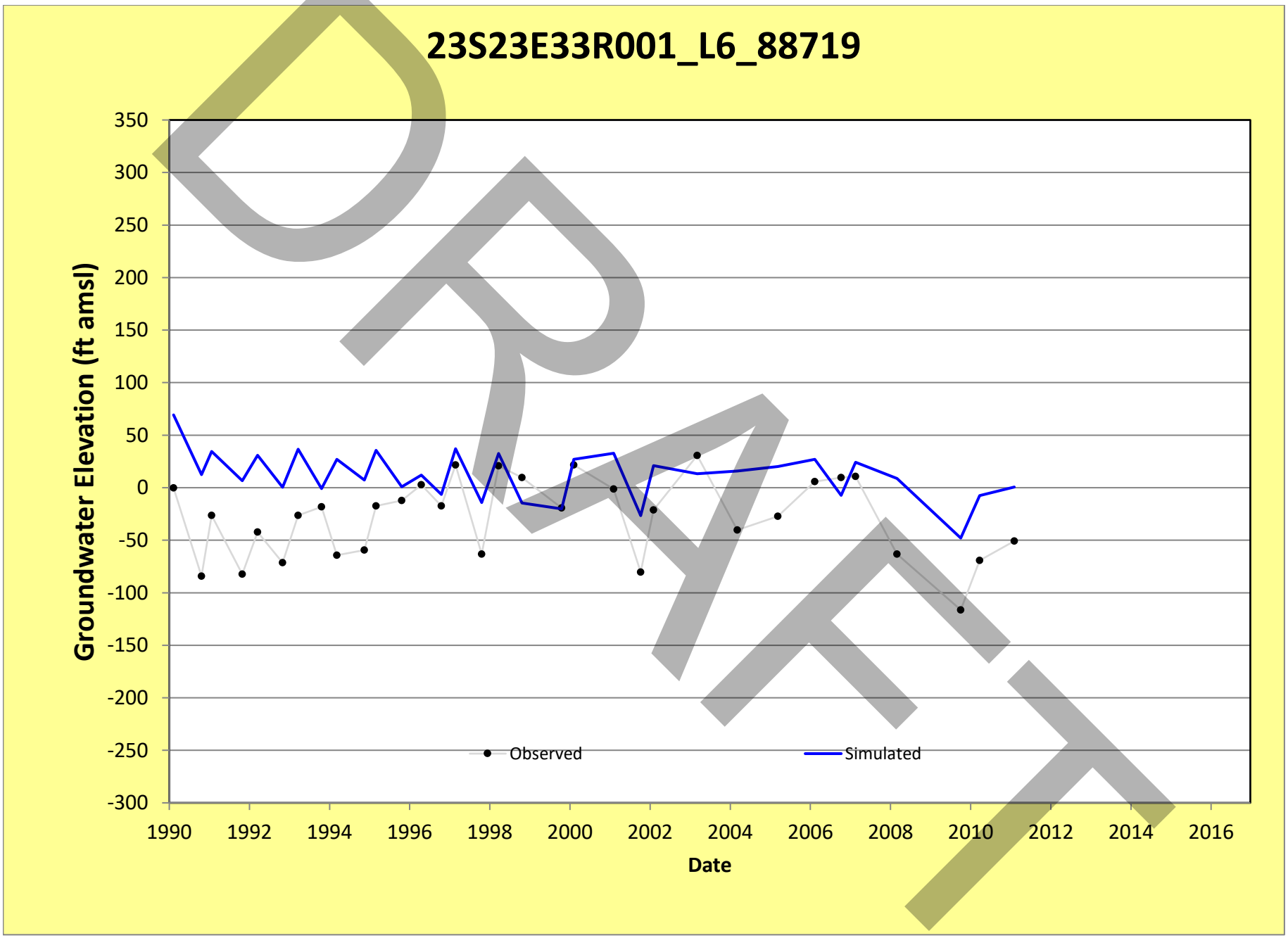
23S23E33R001_L6_88719
Groundwater Elevation (ft amsl)
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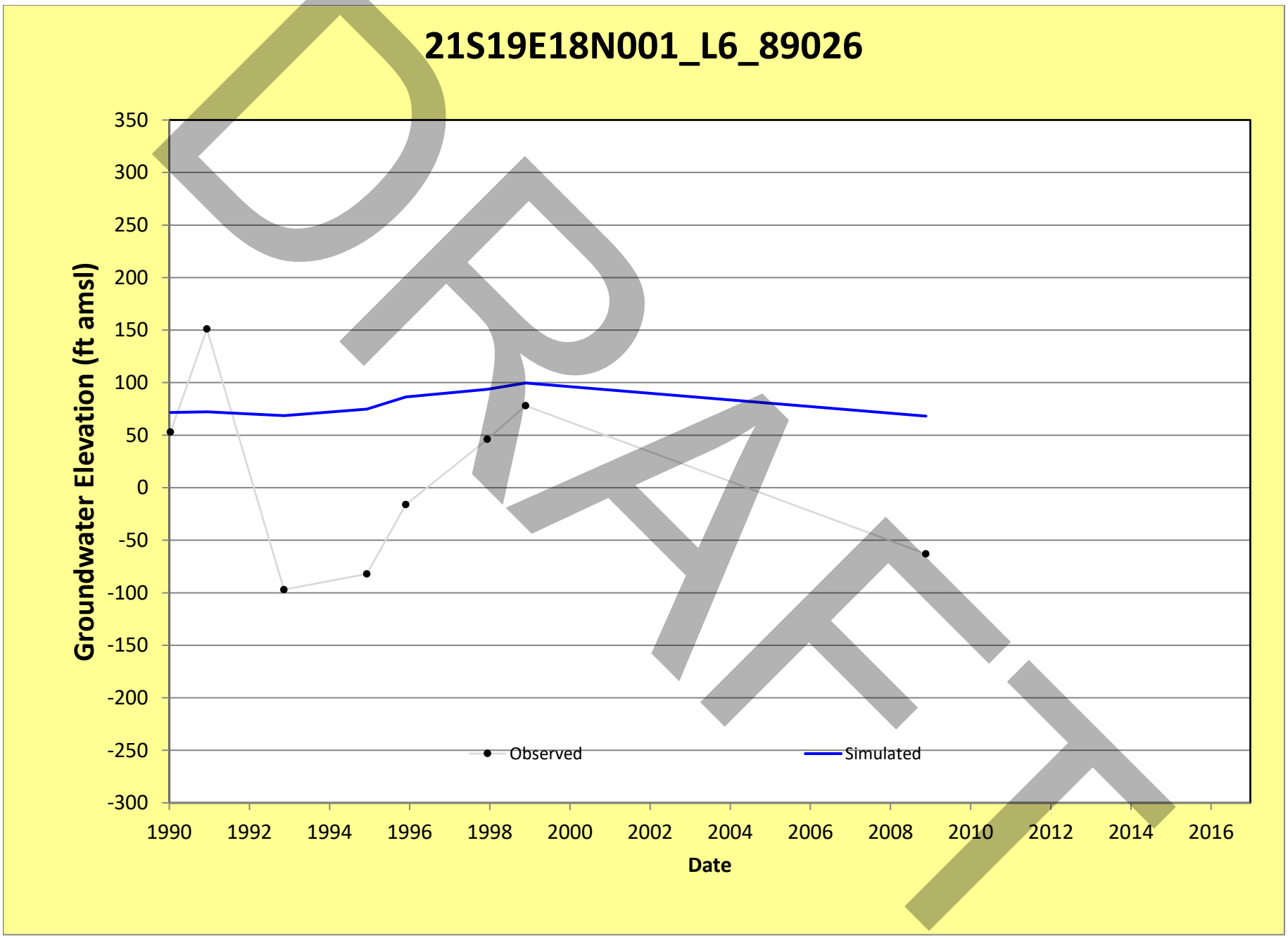
21S19E18N001_L6_89026
Groundwater Elevation (ft amsl)
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-50
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Observed
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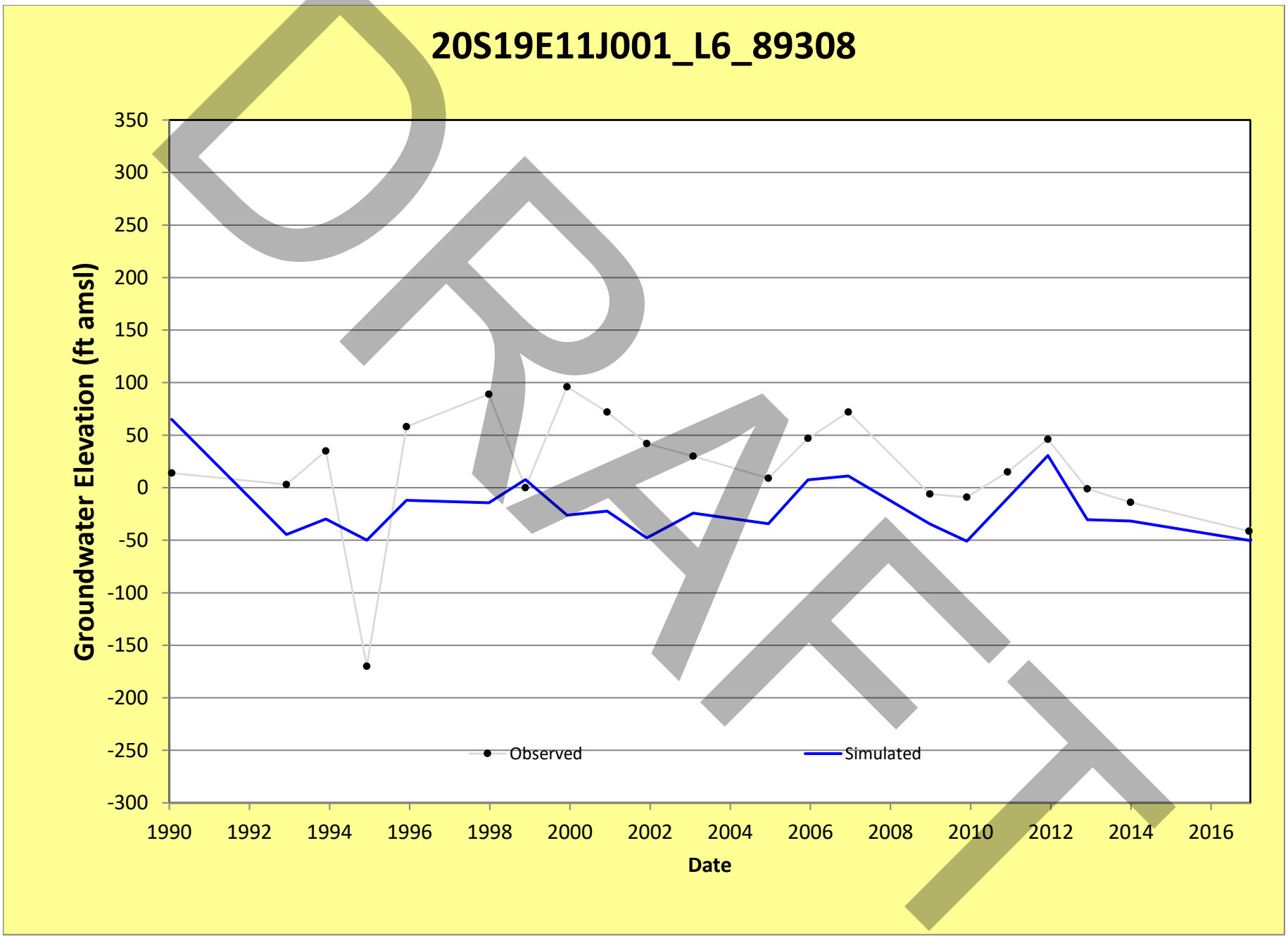
20S19E11J001_L6_89308
Groundwater Elevation (ft amsl)
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-250
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Observed
Simulated
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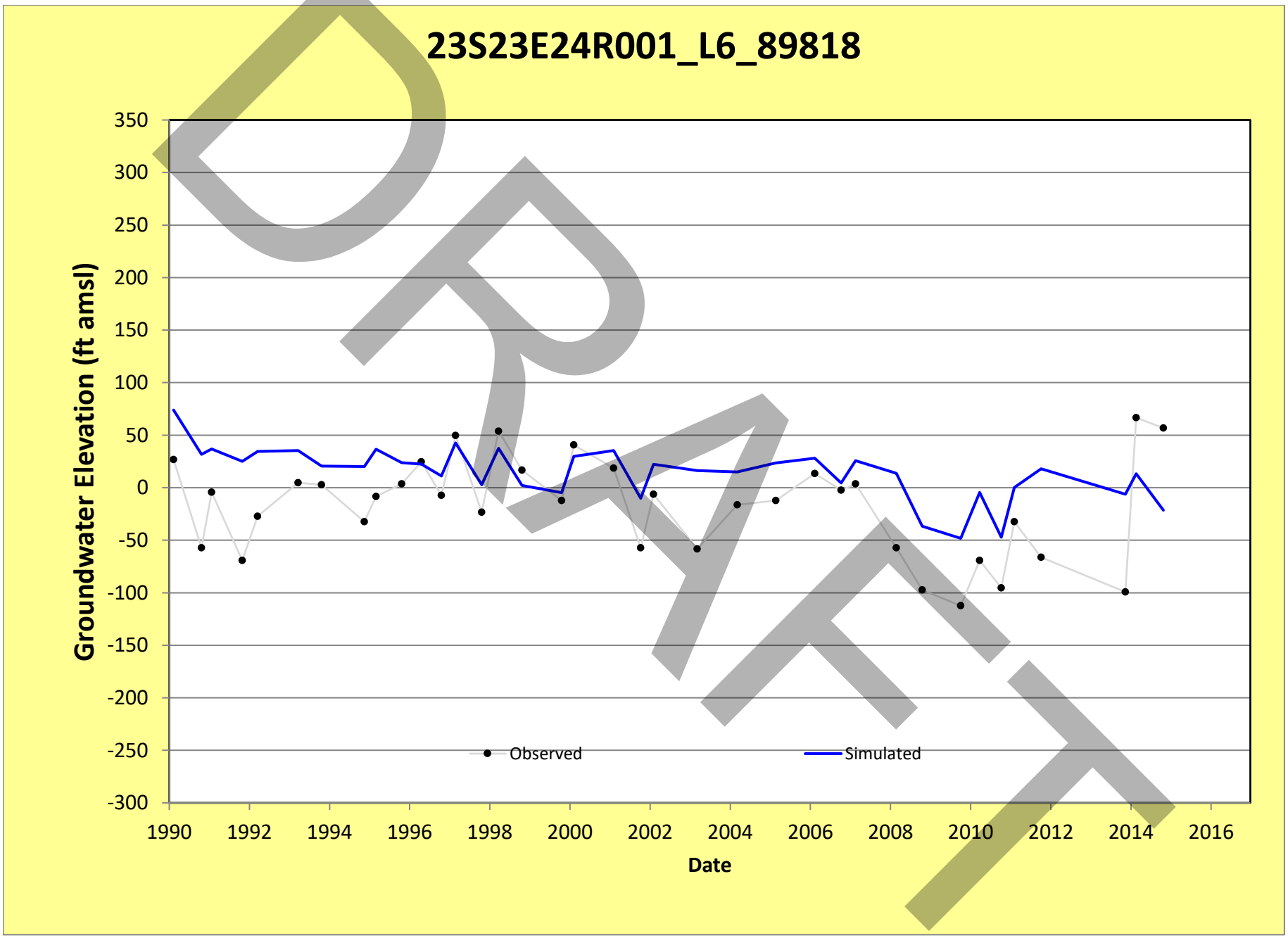
23S23E24R001_L6_89818
Groundwater Elevation (ft amsl)
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-200
-250
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Observed
Simulated
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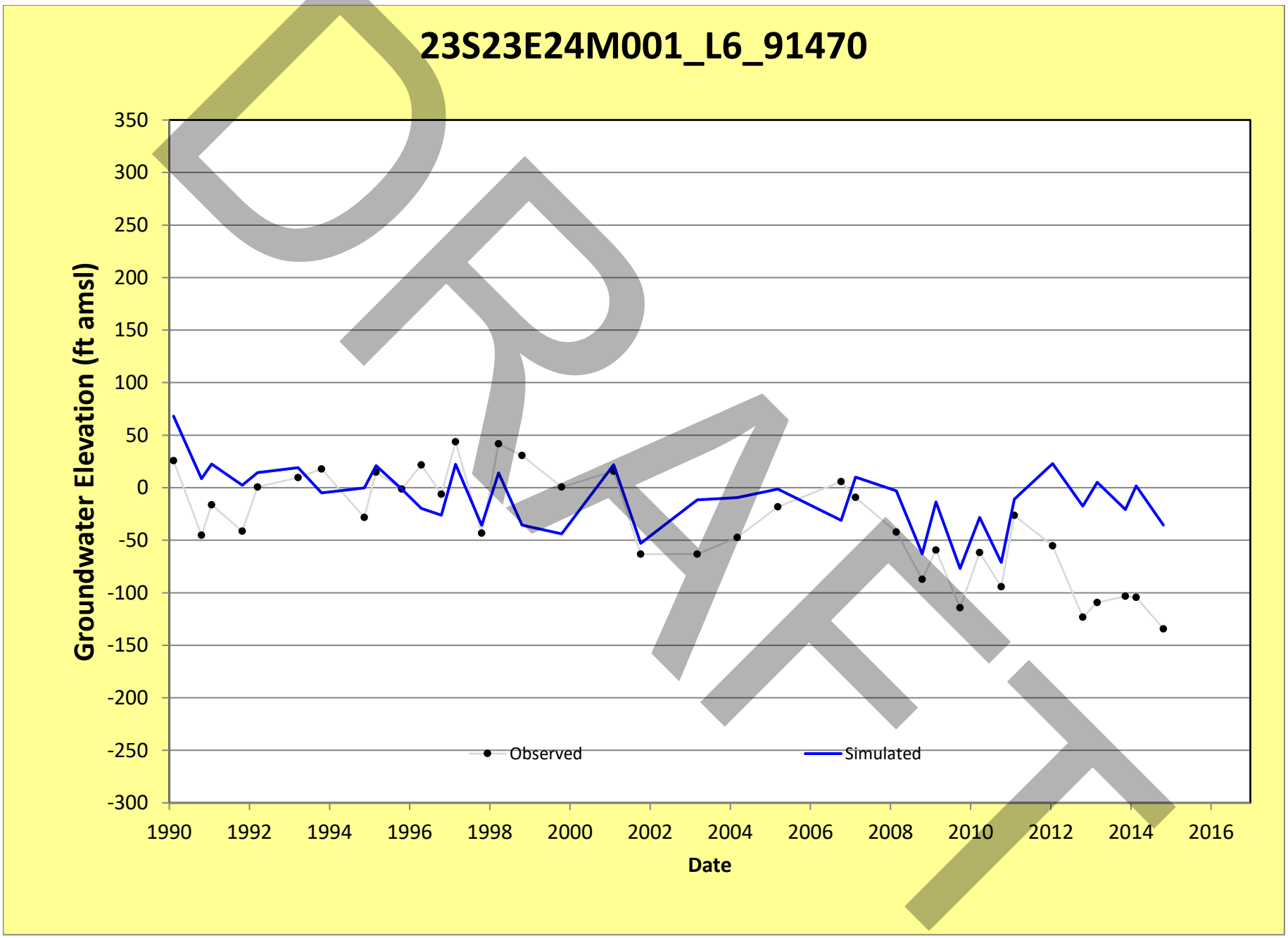
23S23E24M001_L6_91470
Groundwater Elevation (ft amsl)
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Observed
Simulated
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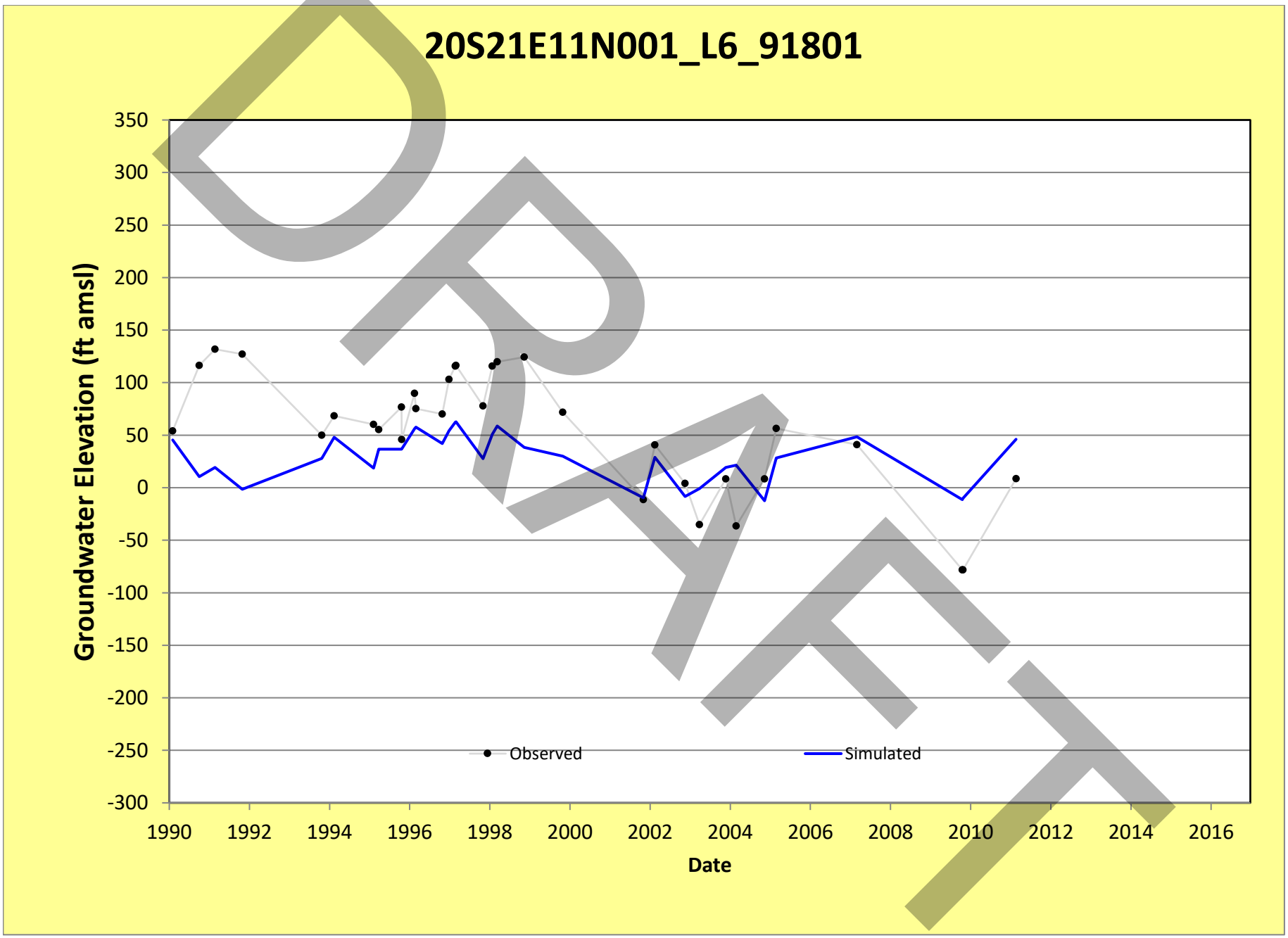
20S21E11N001_L6_91801
Groundwater Elevation (ft amsl)
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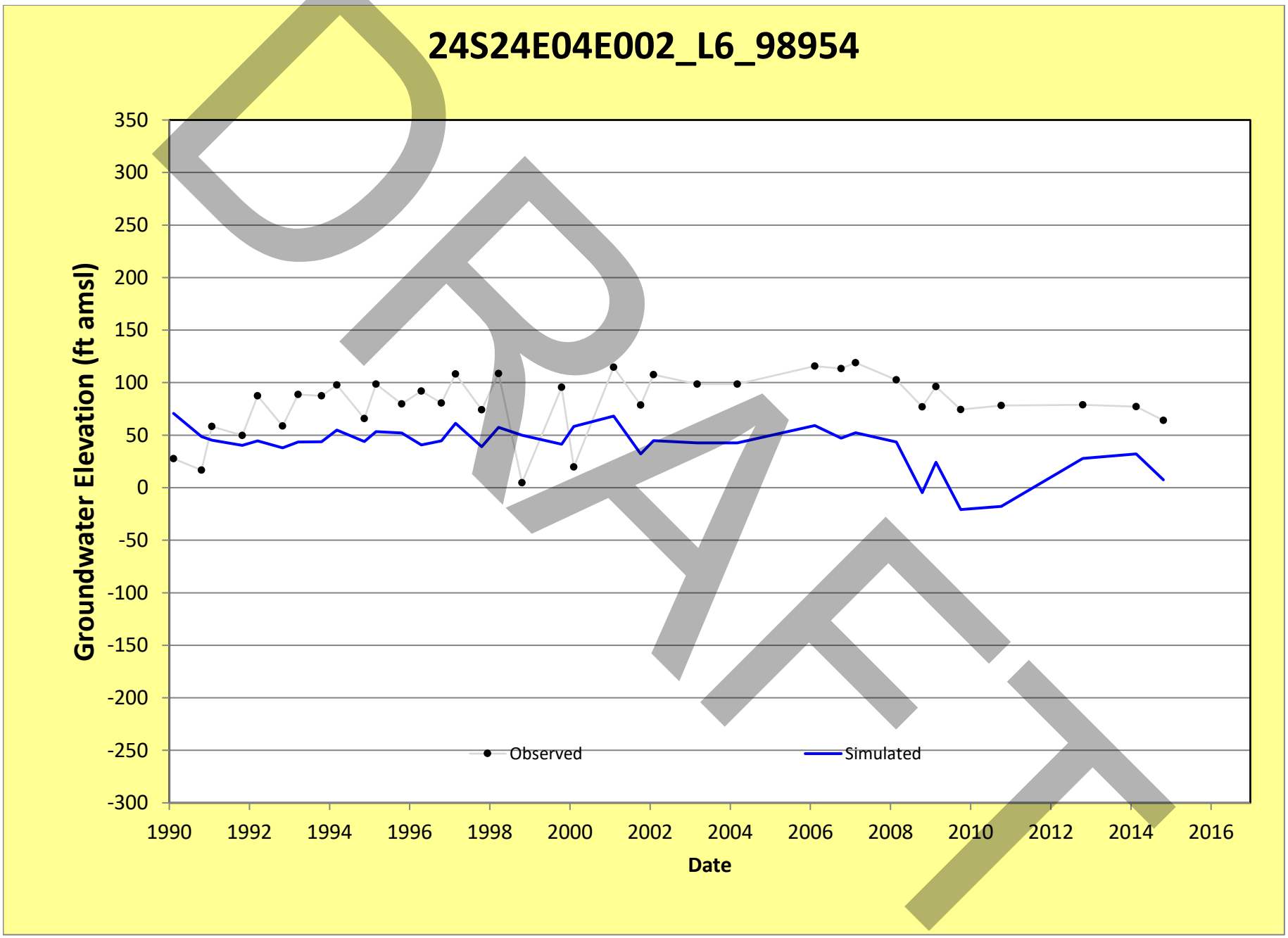
Observed
Simulated
DRAFT


24S24E04E002_L6_98954
Groundwater Elevation (ft amsl)
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Observed
Simulated
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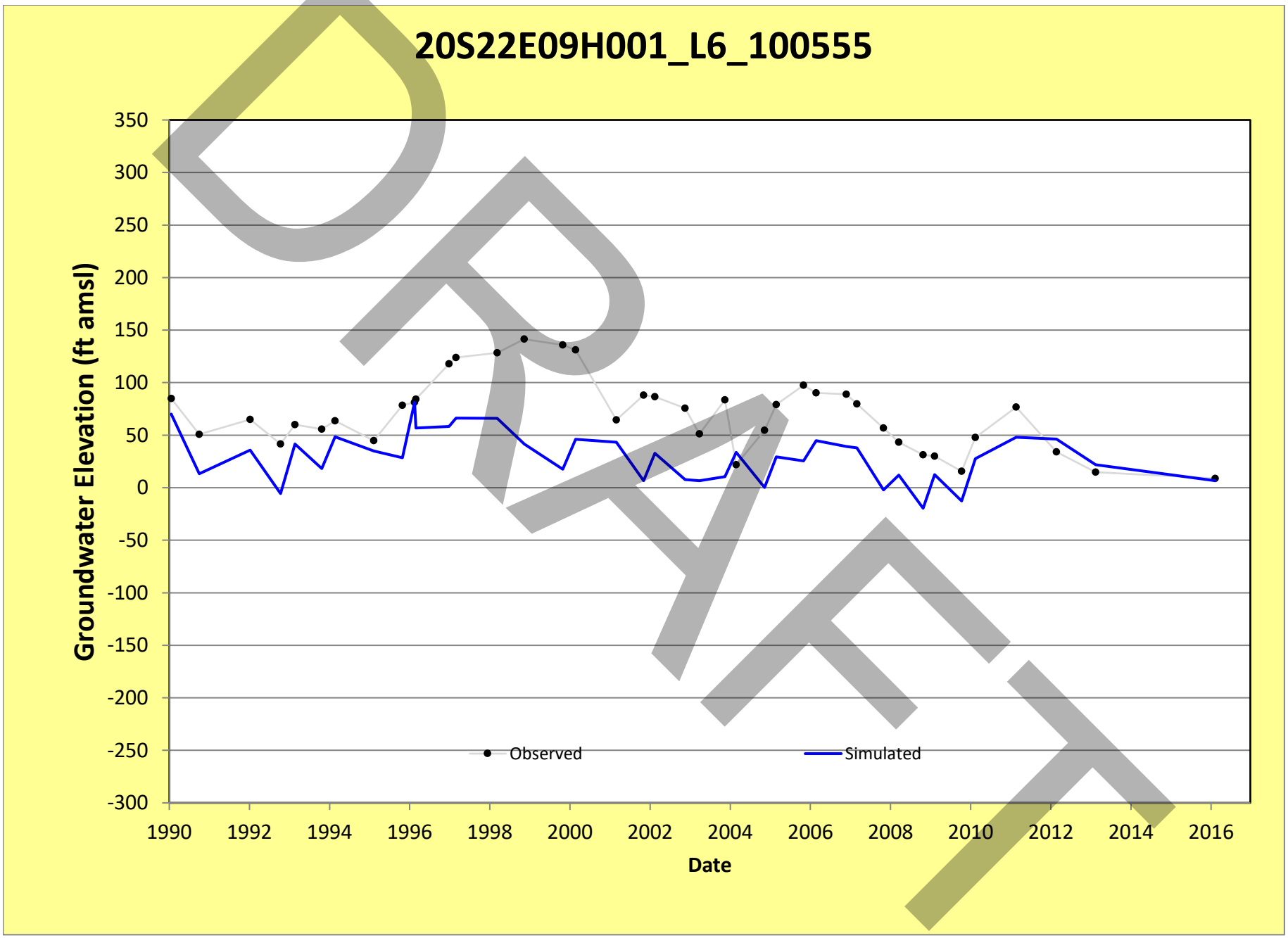
20S22E09H001_L6_100555
Groundwater Elevation (ft amsl)
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-150
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Simulated
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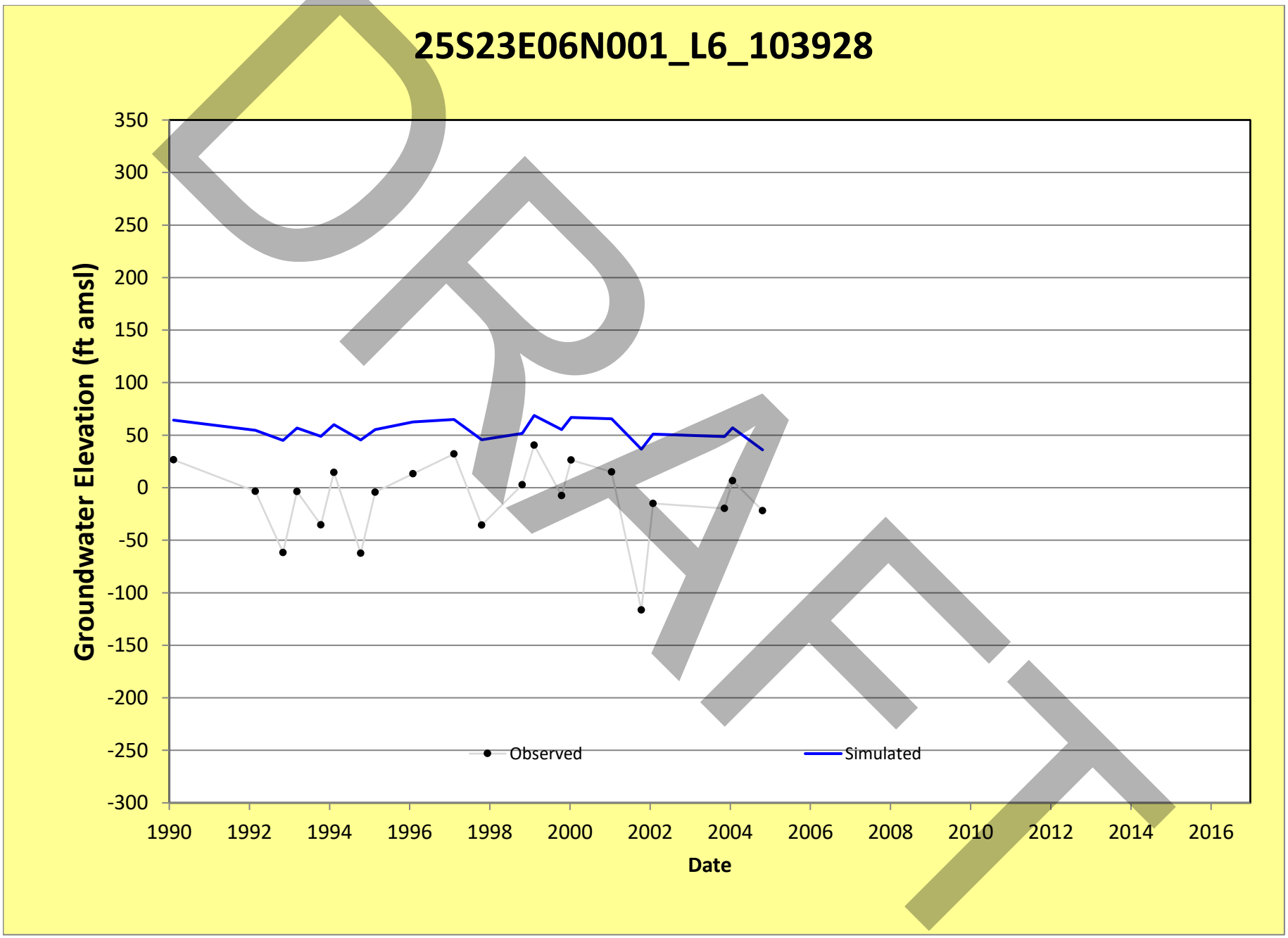
25S23E06N001_L6_103928
Groundwater Elevation (ft amsl)
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Observed
Simulated
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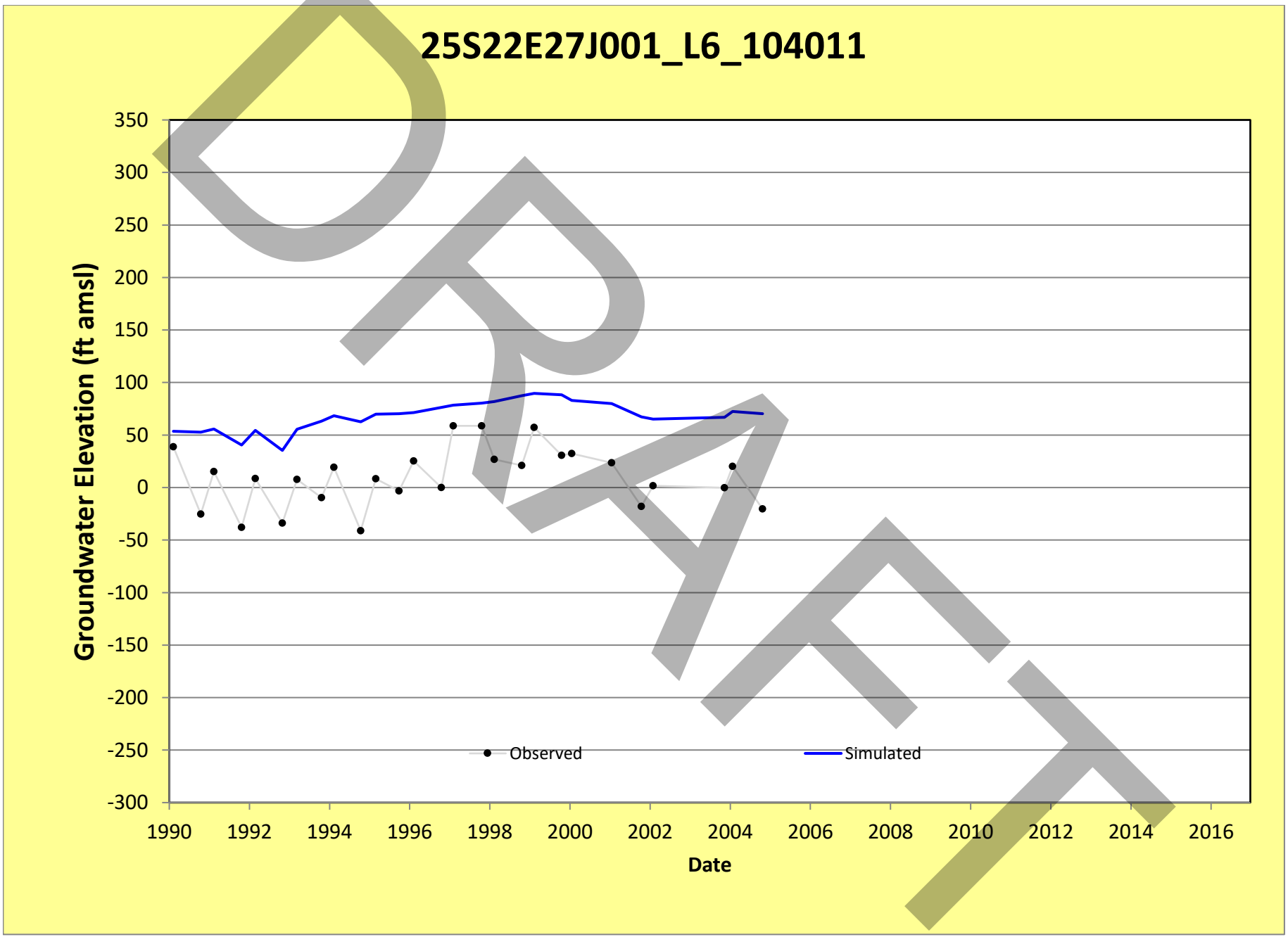
25S22E27J001_L6_104011
Groundwater Elevation (ft amsl)
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-150
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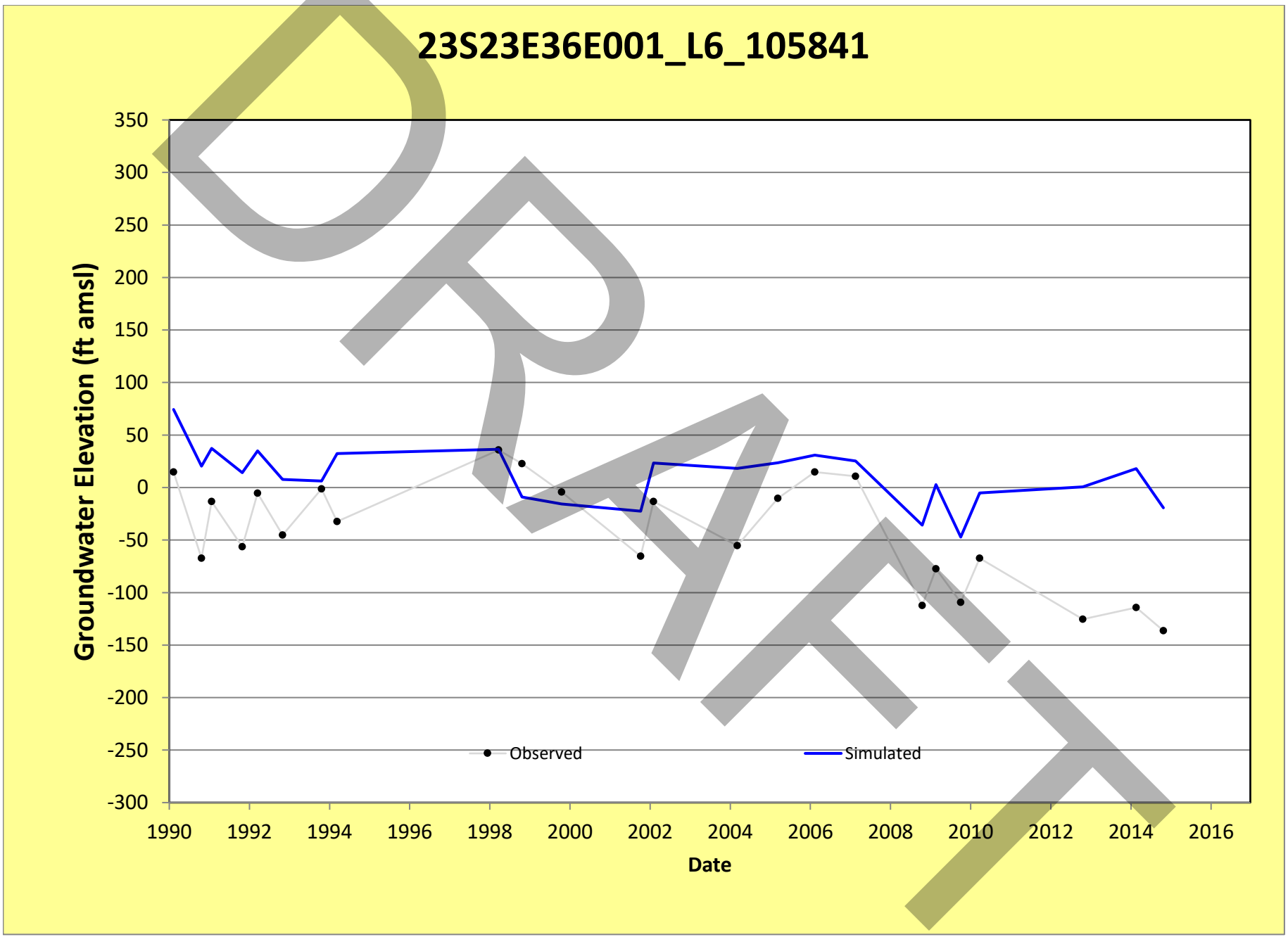
Date
Observed
Simulated
DRAFT


23S23E36E001_L6_105841
Groundwater Elevation (ft amsl)
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Date
Observed
Simulated
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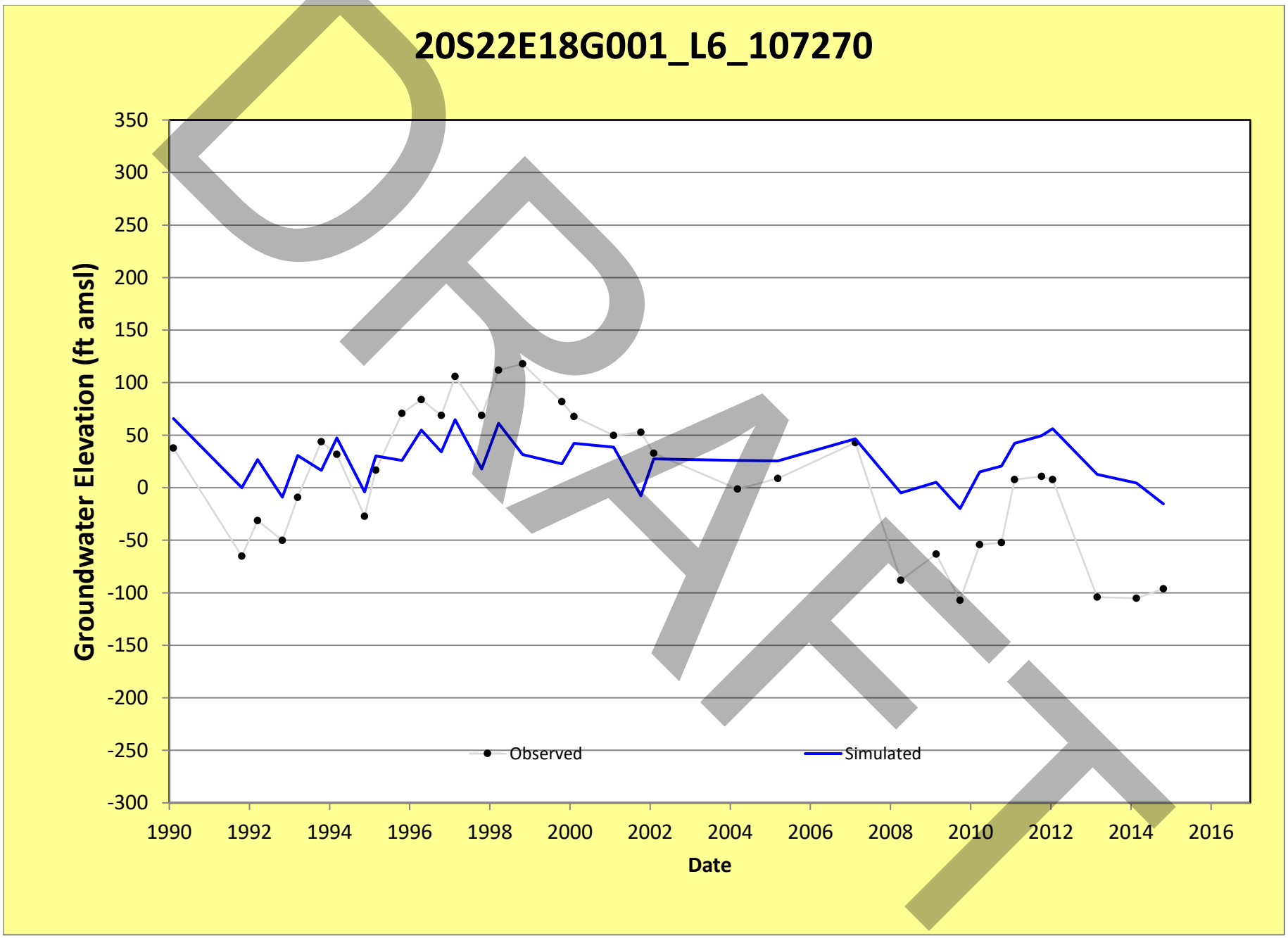
20S22E18G001_L6_107270
Groundwater Elevation (ft amsl)
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Simulated
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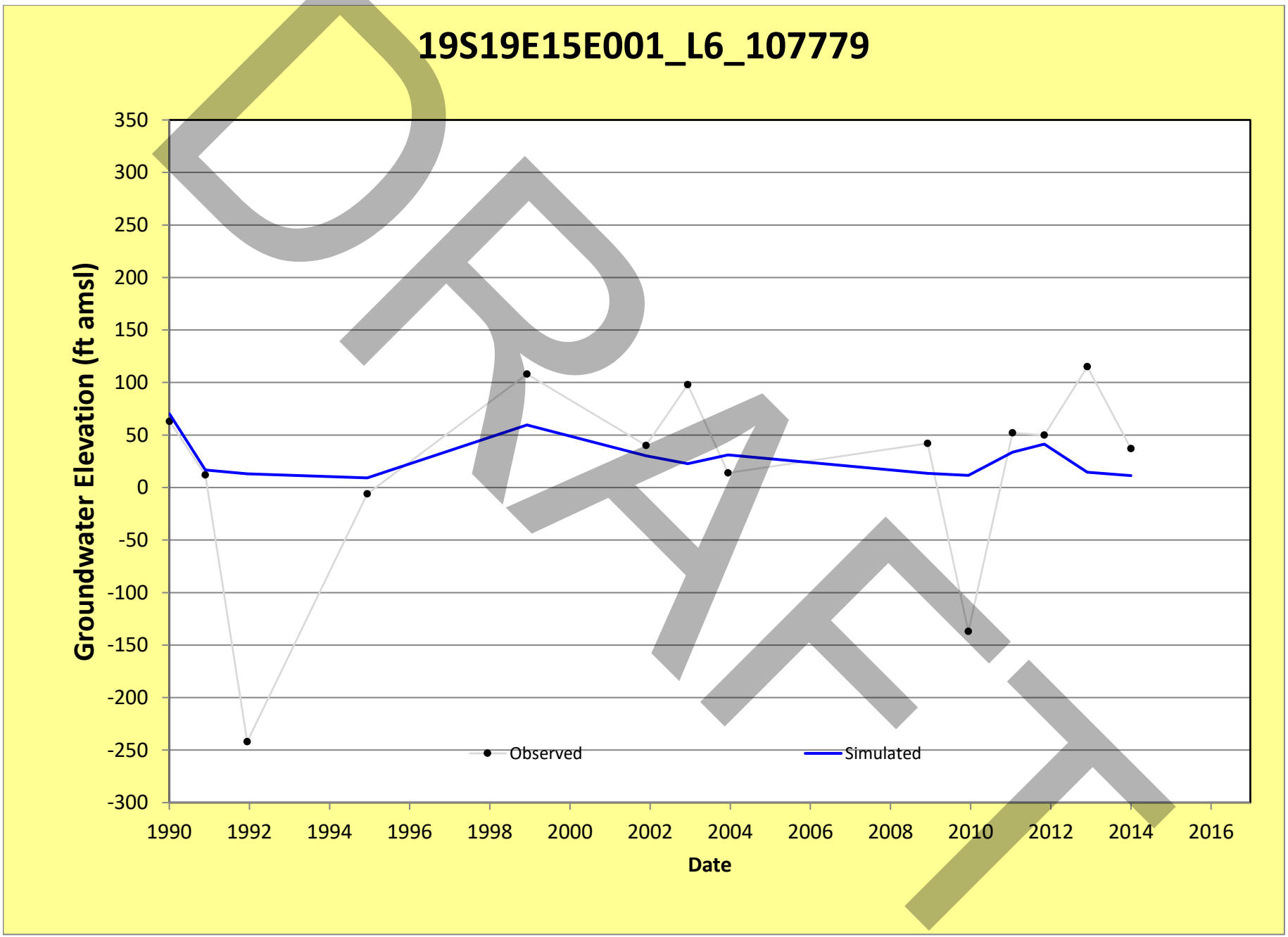
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Groundwater Elevation (ft amsl)
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Observed
Simulated
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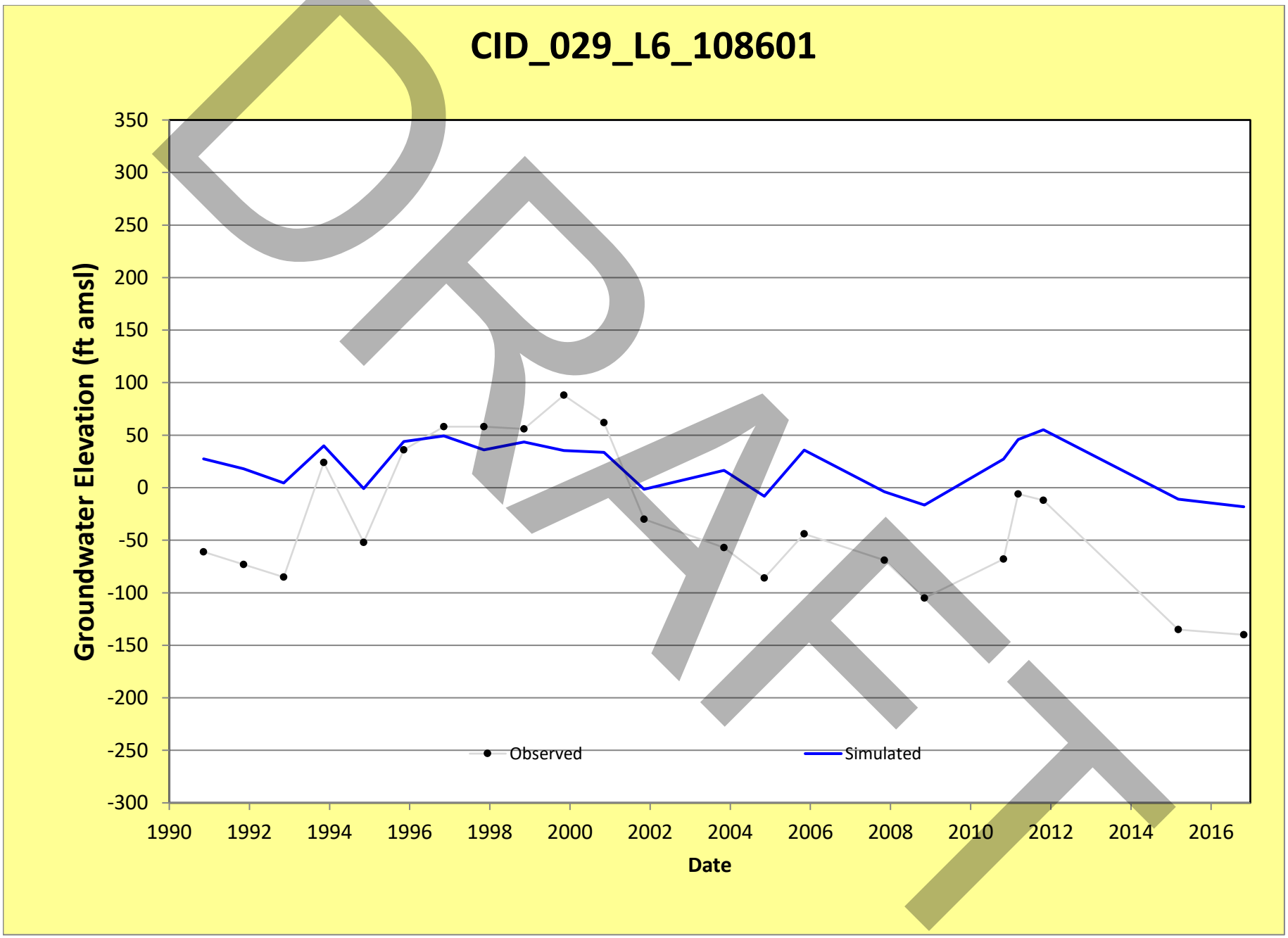
CID_029_L6_108601
Groundwater Elevation (ft amsl)
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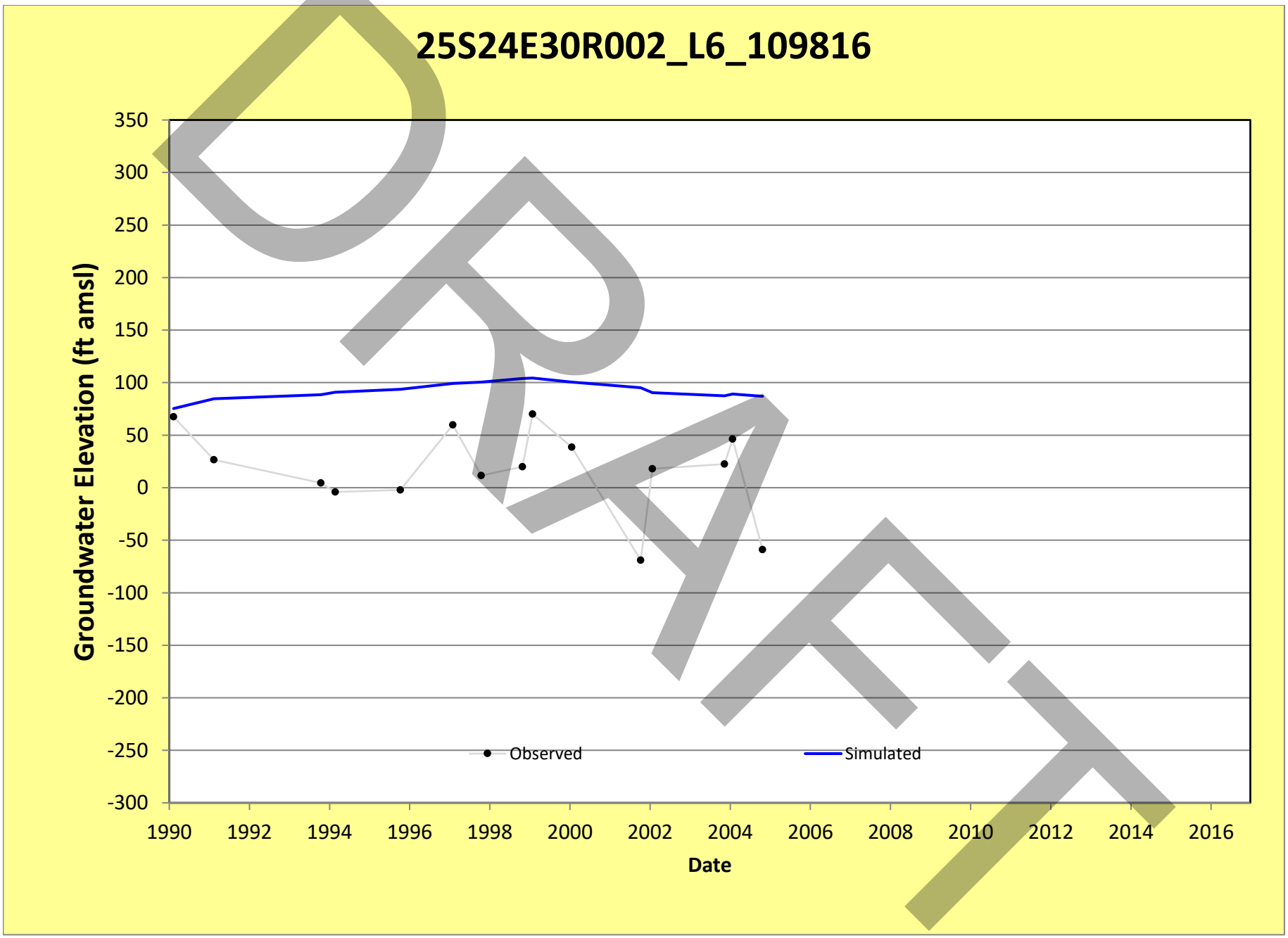
Observed
Simulated
DRAFT


25S24E30R002_L6_109816
Groundwater Elevation (ft amsl)
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Observed
Simulated
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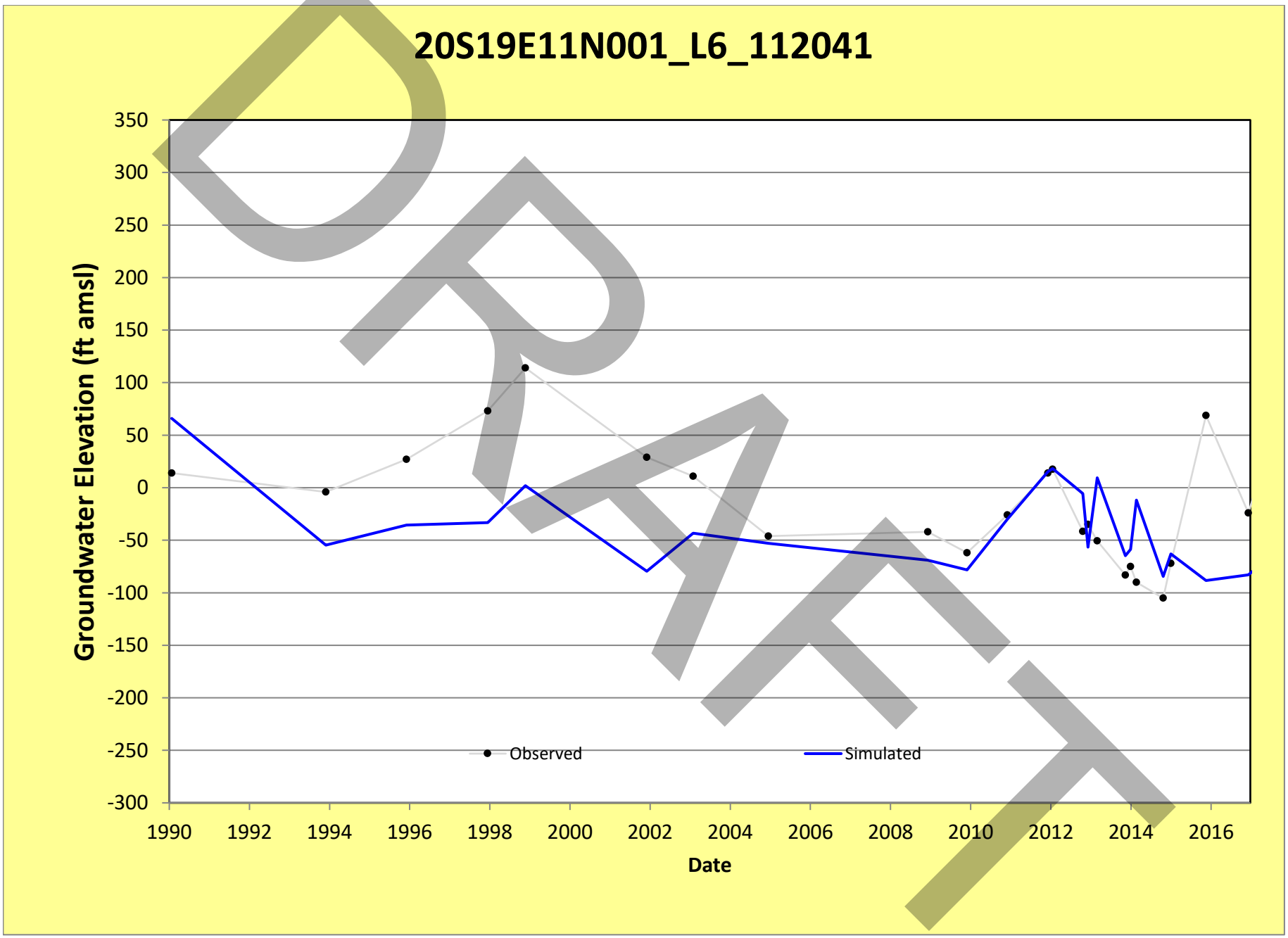
20S19E11N001_L6_112041
Groundwater Elevation (ft amsl)
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Observed
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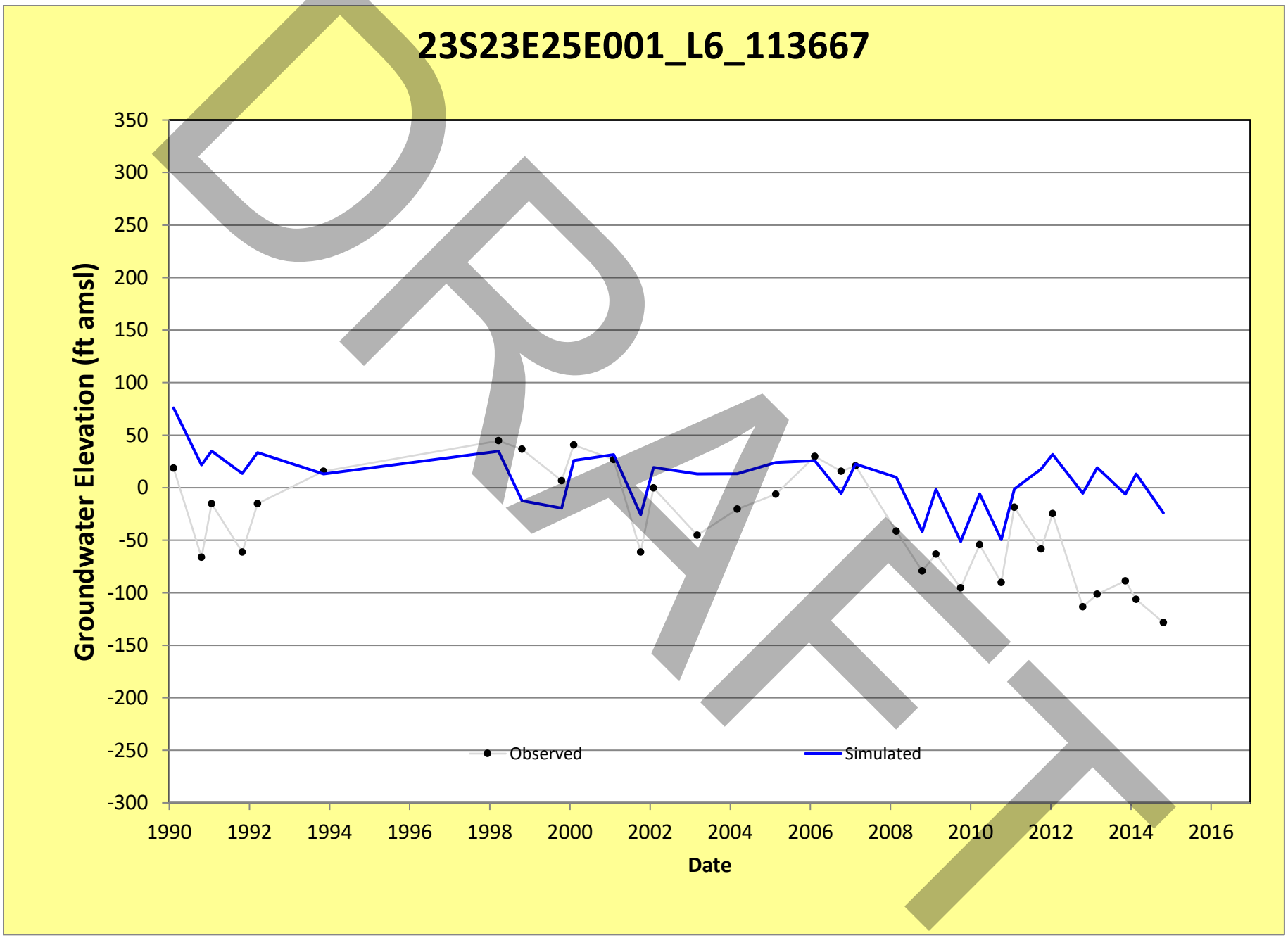
DRAFT


23S23E25E001_L6_113667
Groundwater Elevation (ft amsl)
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Observed
Simulated
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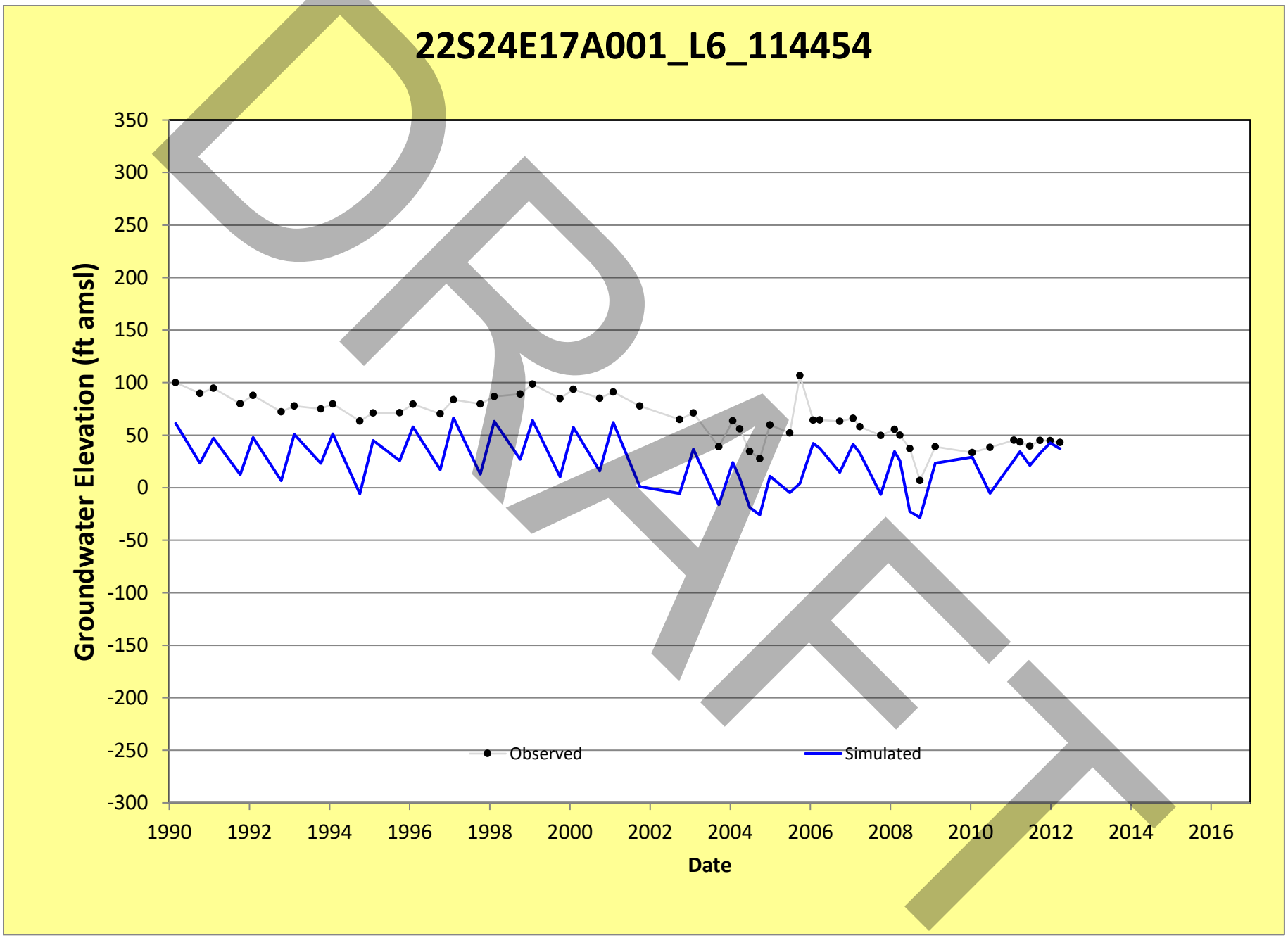
22S24E17A001_L6_114454
Groundwater Elevation (ft amsl)
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Observed
Simulated
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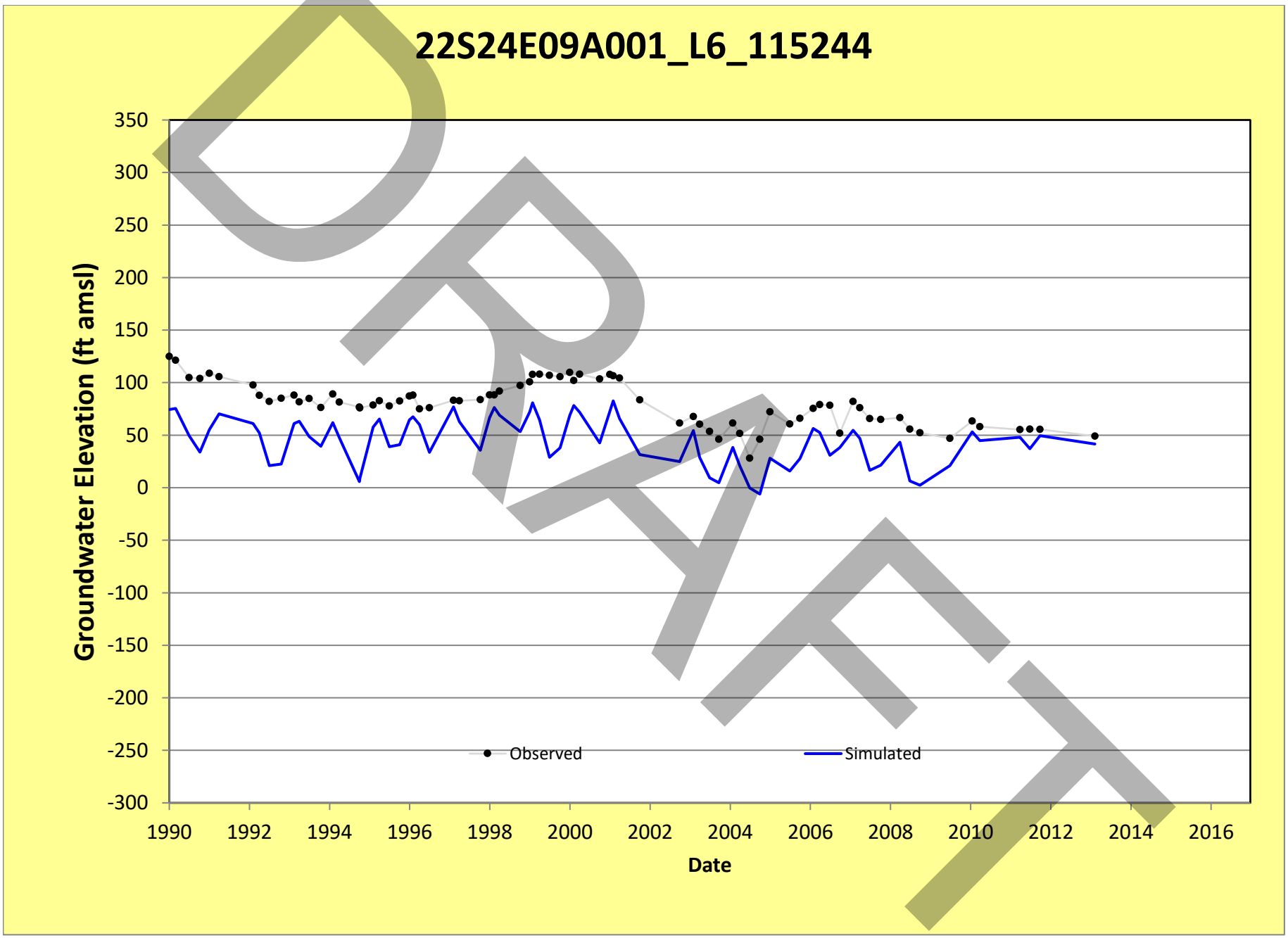
22S24E09A001_L6_115244
Groundwater Elevation (ft amsl)
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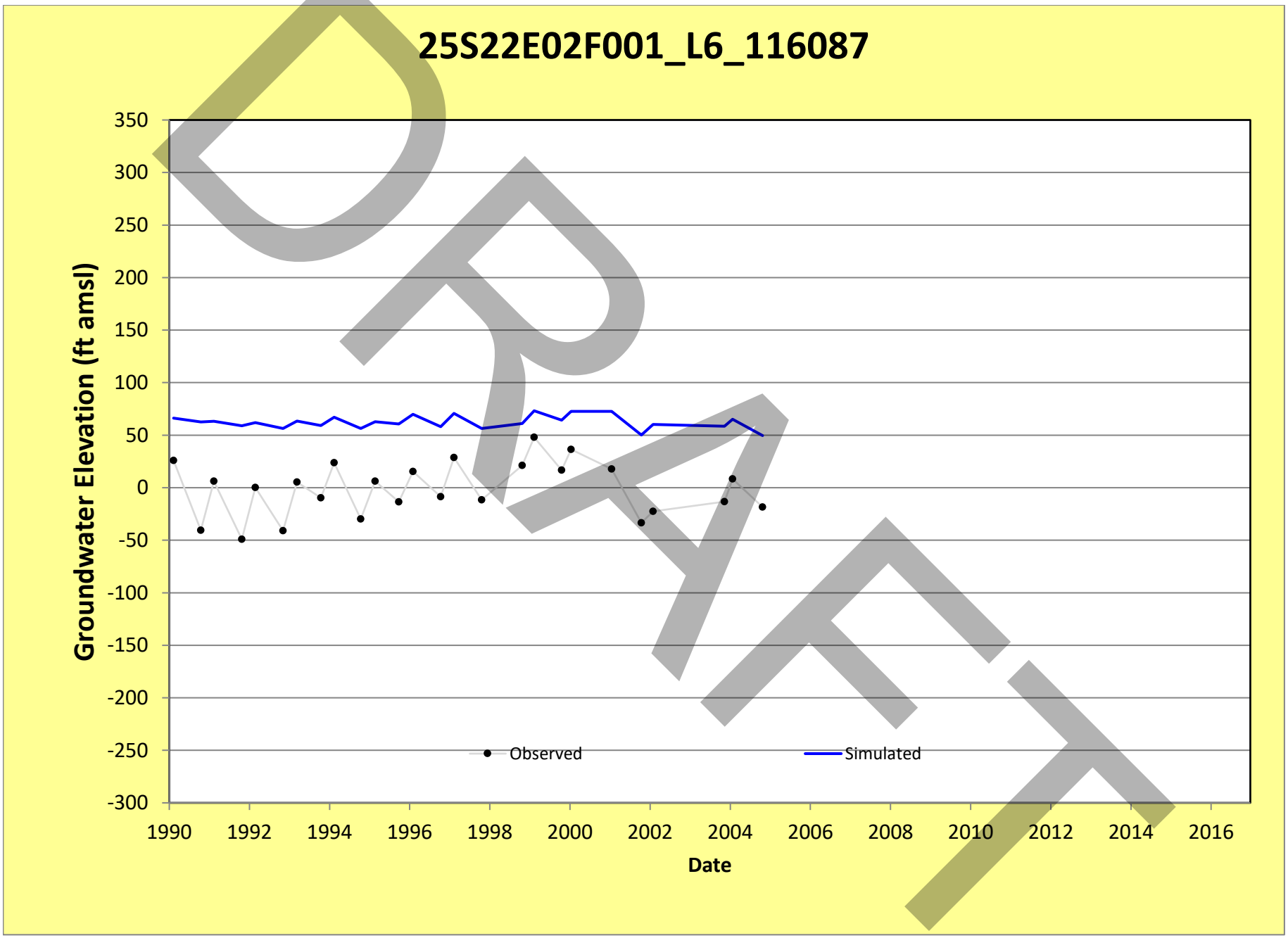
Observed
Simulated
DRAFT


25S22E02F001_L6_116087
Groundwater Elevation (ft amsl)
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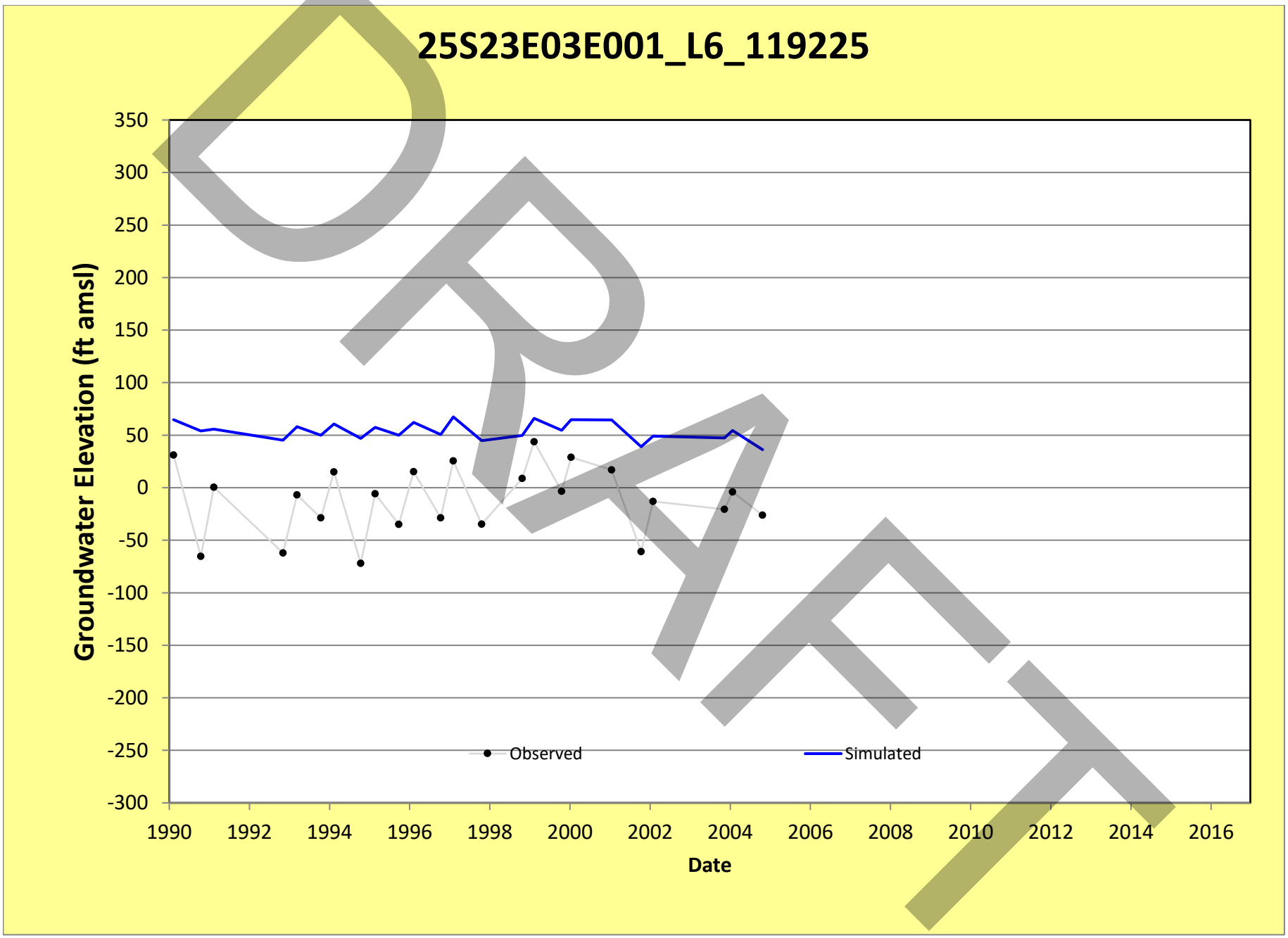
Observed
Simulated
DRAFT


25S23E03E001_L6_119225
Groundwater Elevation (ft amsl)
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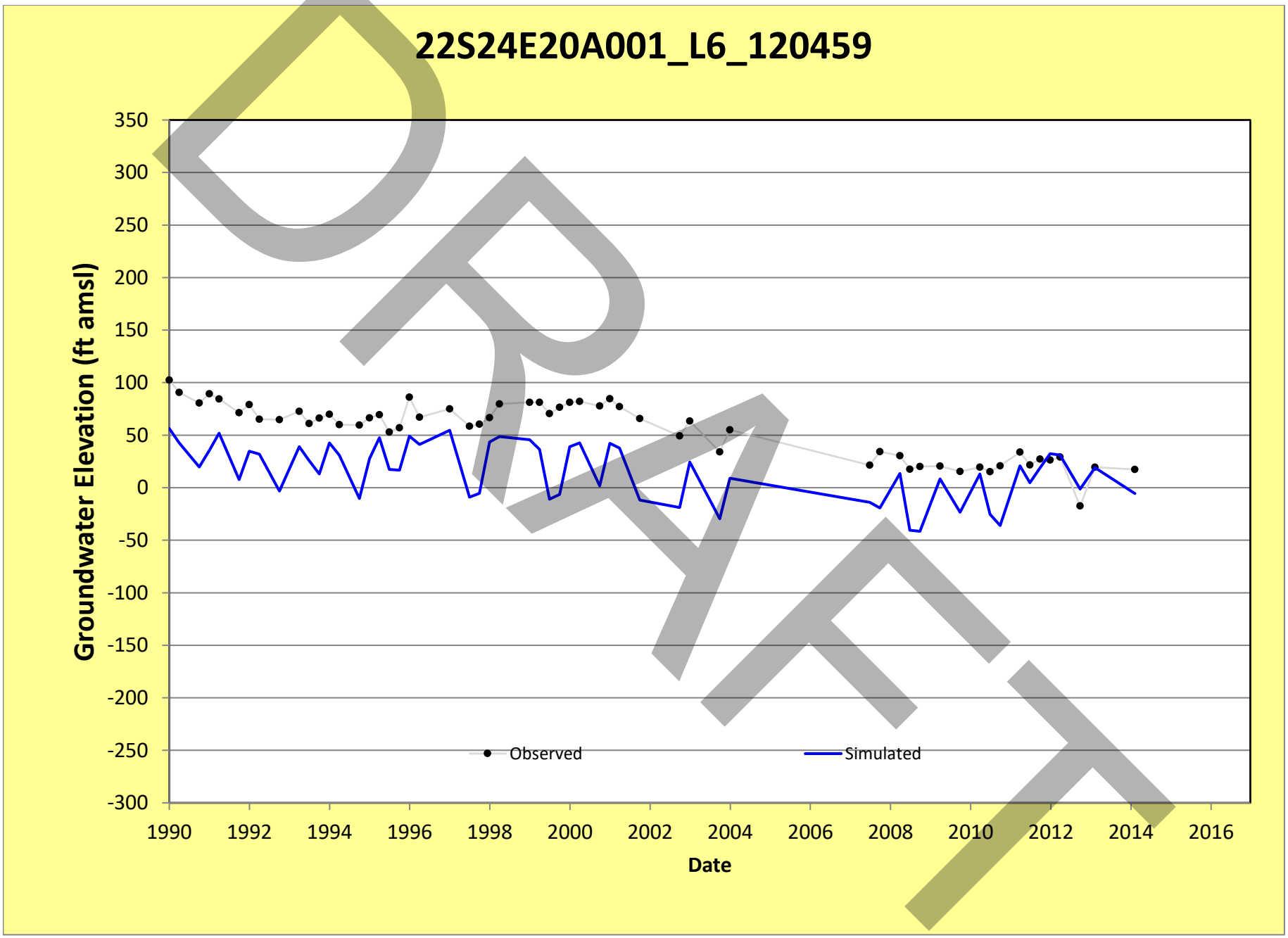
Observed
Simulated
DRAFT


22S24E20A001_L6_120459
Groundwater Elevation (ft amsl)
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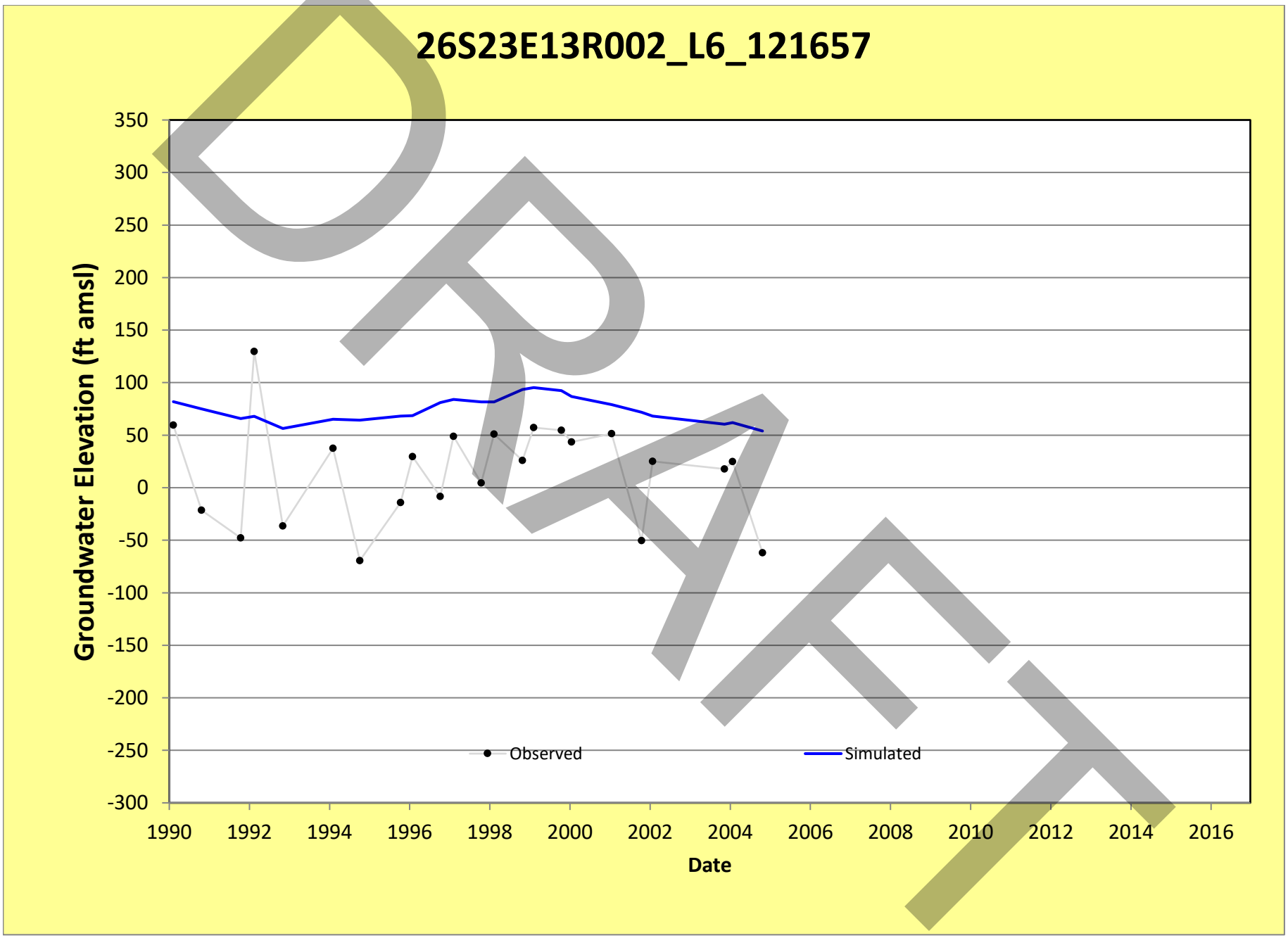
Observed
Simulated
DRAFT


26S23E13R002_L6_121657
Groundwater Elevation (ft amsl)
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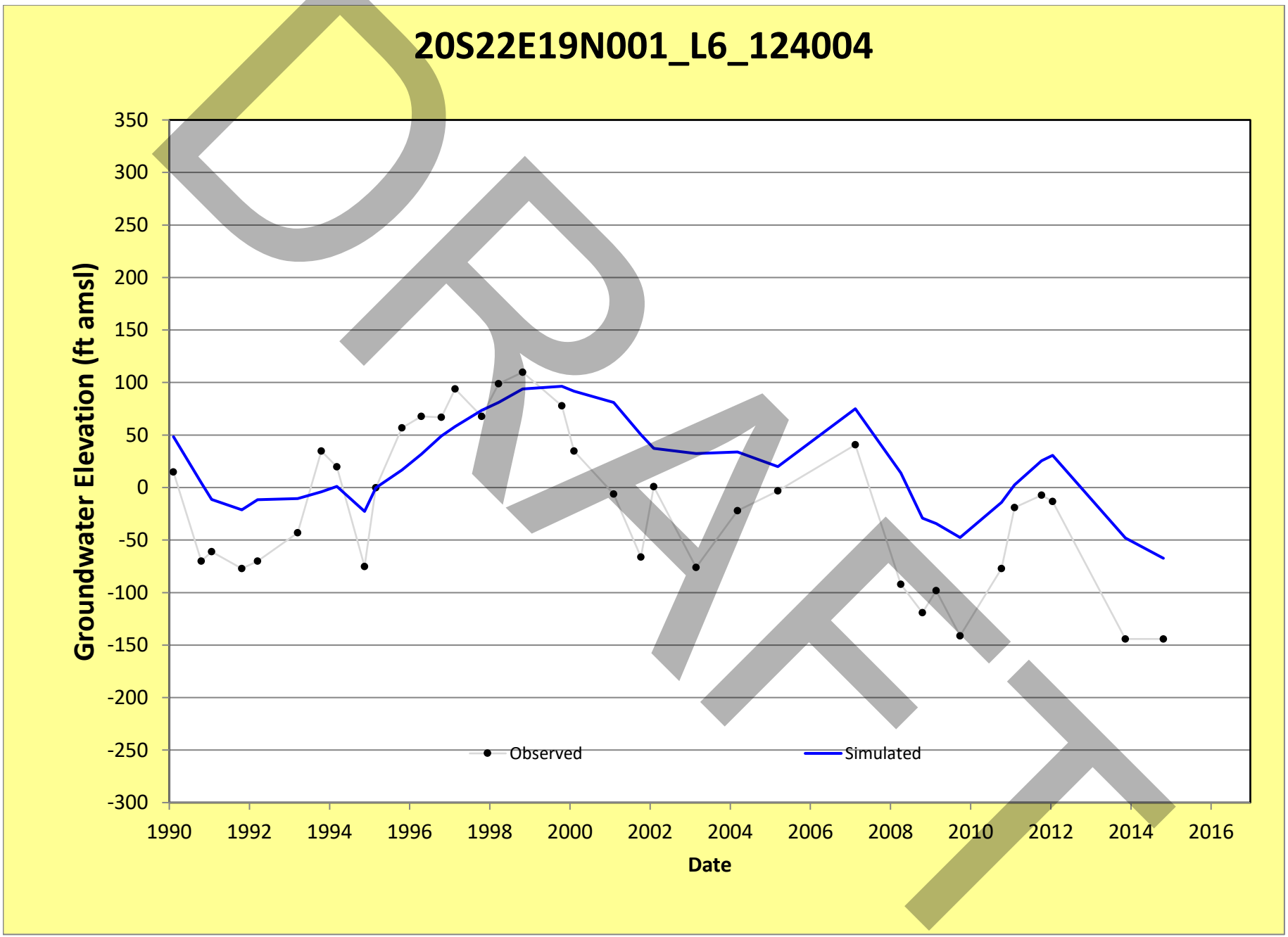
Observed
Simulated
DRAFT


20S22E19N001_L6_124004
Groundwater Elevation (ft amsl)
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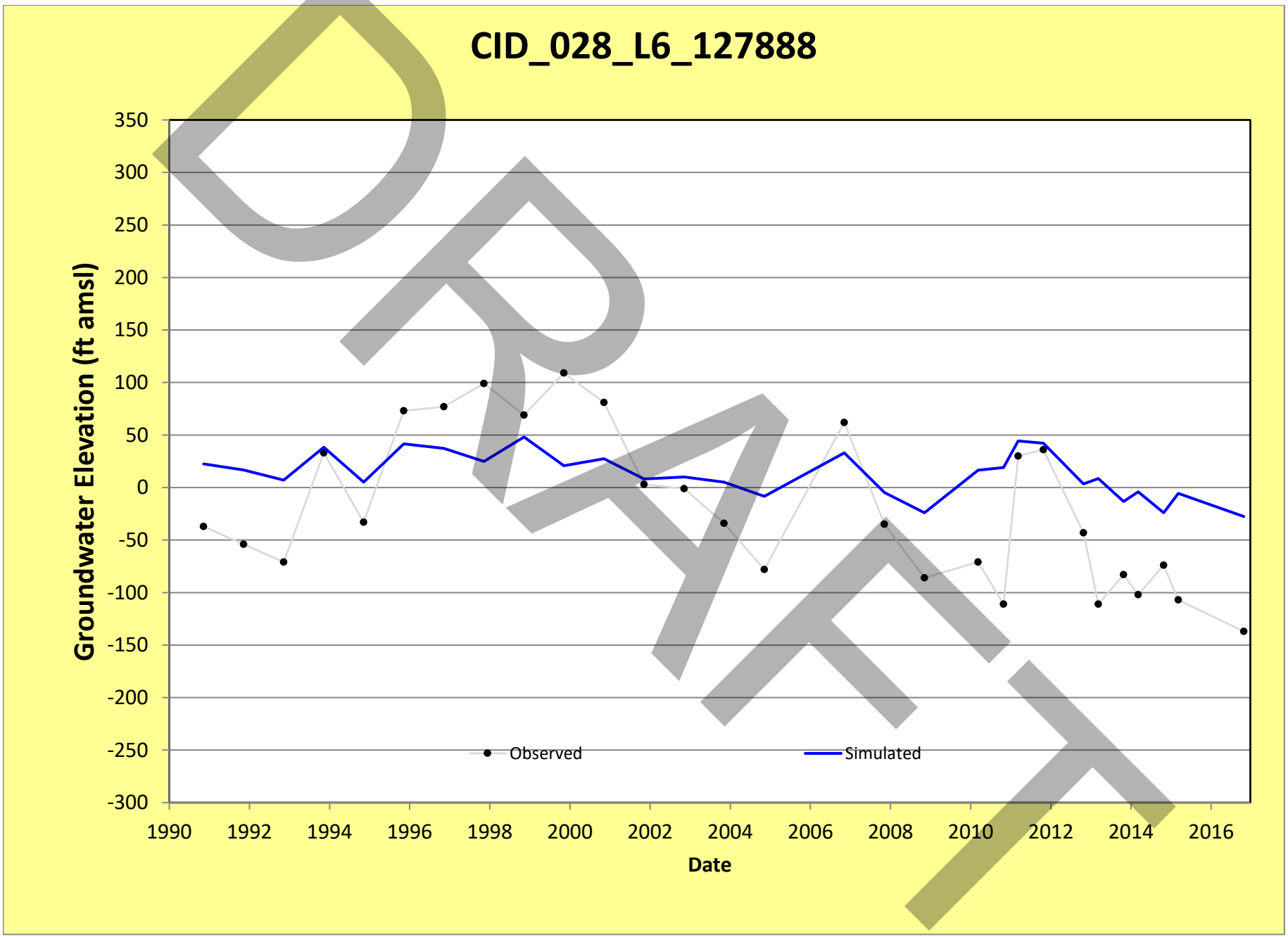
Observed
Simulated
DRAFT


CID_028_L6_127888
Groundwater Elevation (ft amsl)
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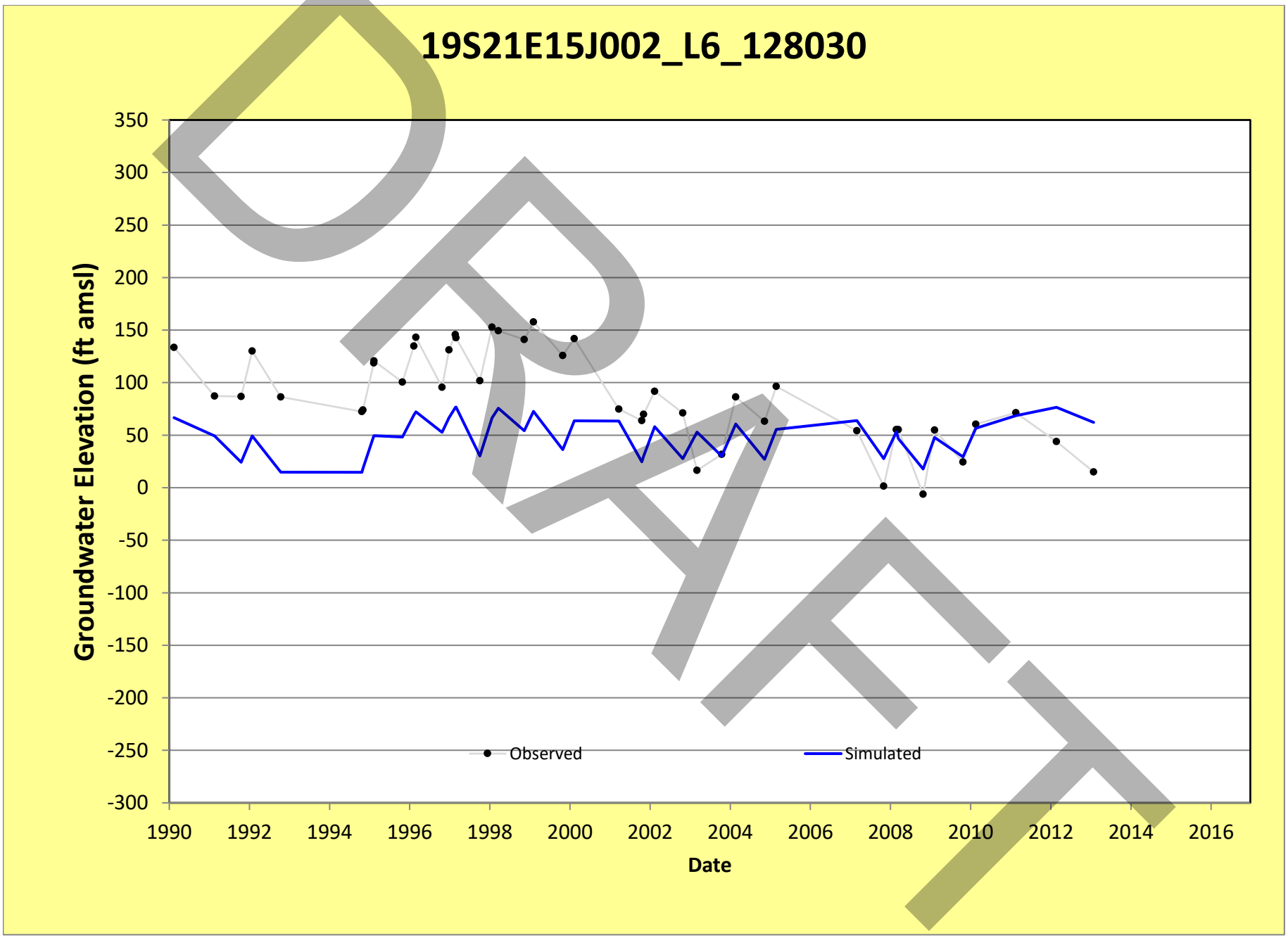
Date
Observed
Simulated
DRAFT


19S21E15J002_L6_128030
Groundwater Elevation (ft amsl)
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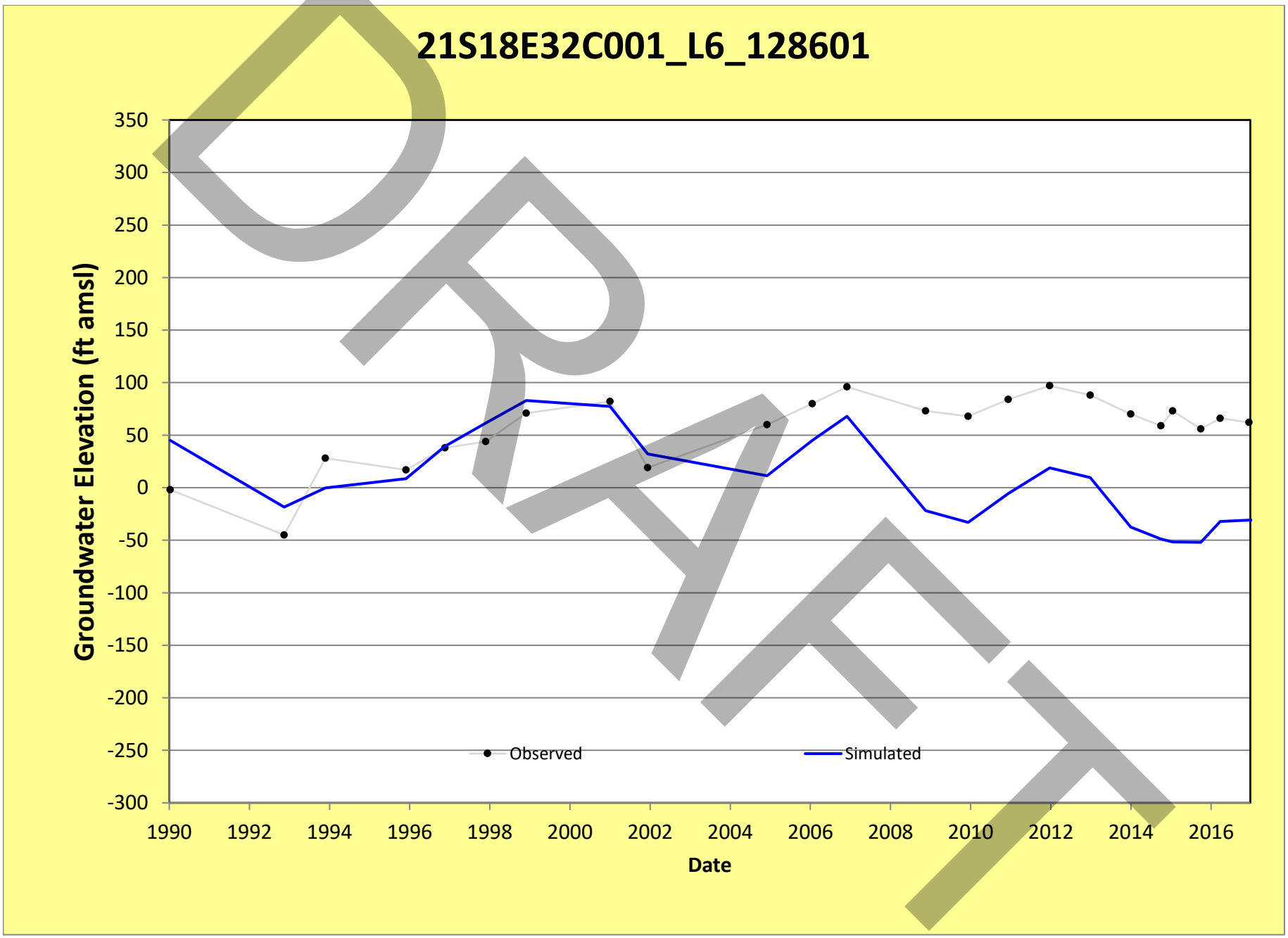
Observed
Simulated
DRAFT


21S18E32C001_L6_128601
Groundwater Elevation (ft amsl)
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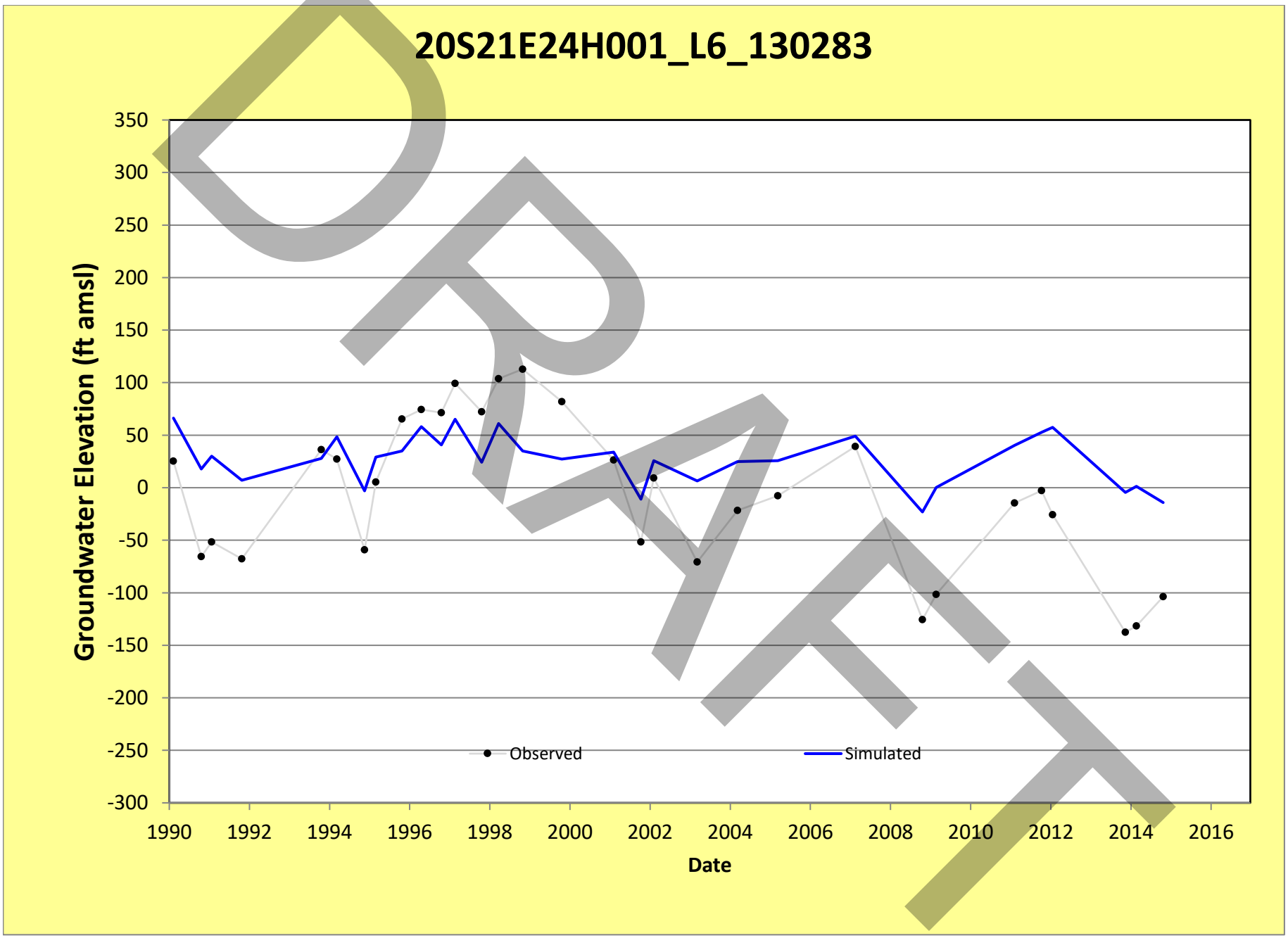
Observed
Simulated
DRAFT


20S21E24H001_L6_130283
Groundwater Elevation (ft amsl)
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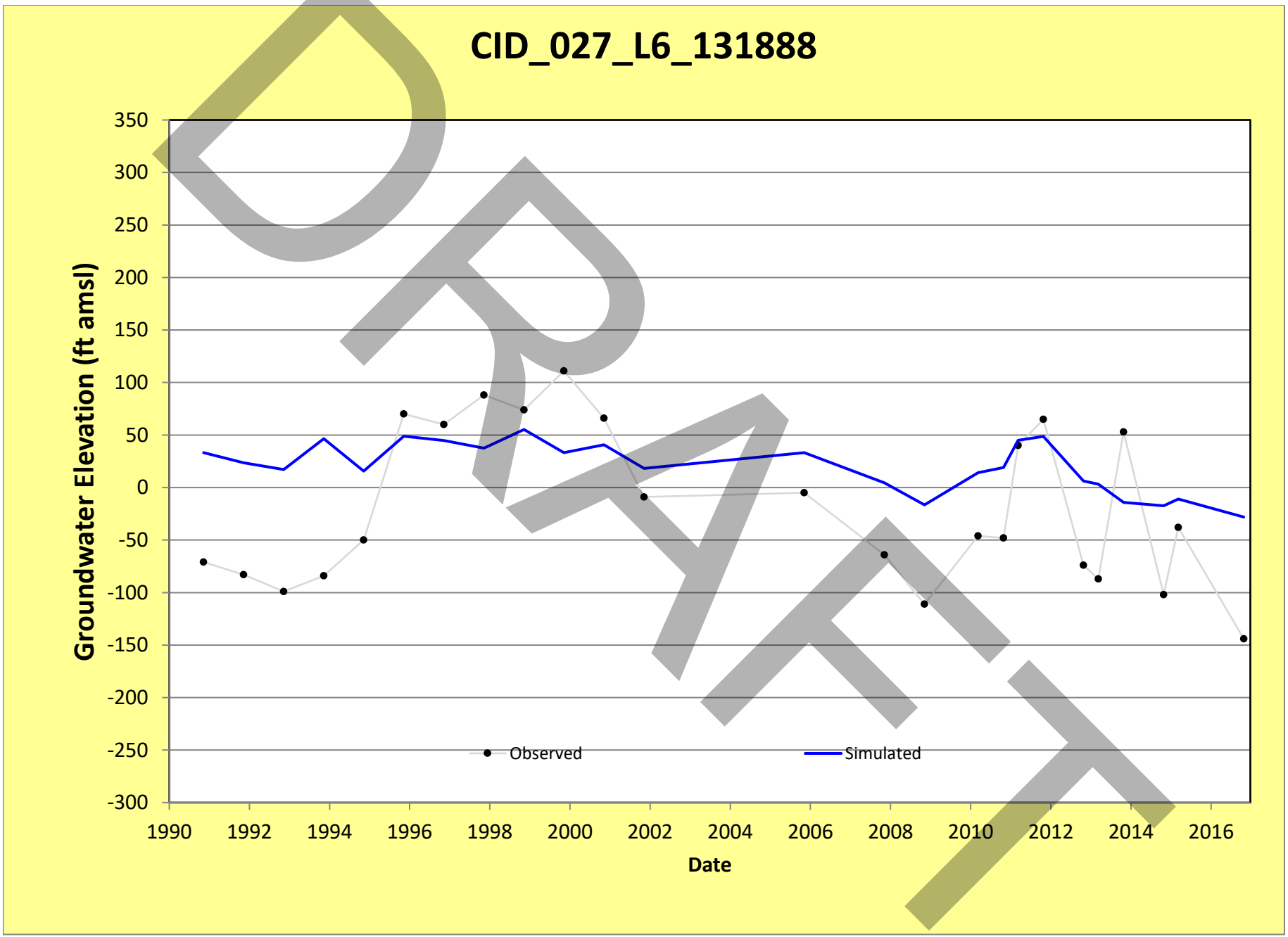
Observed
Simulated
DRAFT


CID_027_L6_131888
Groundwater Elevation (ft amsl)
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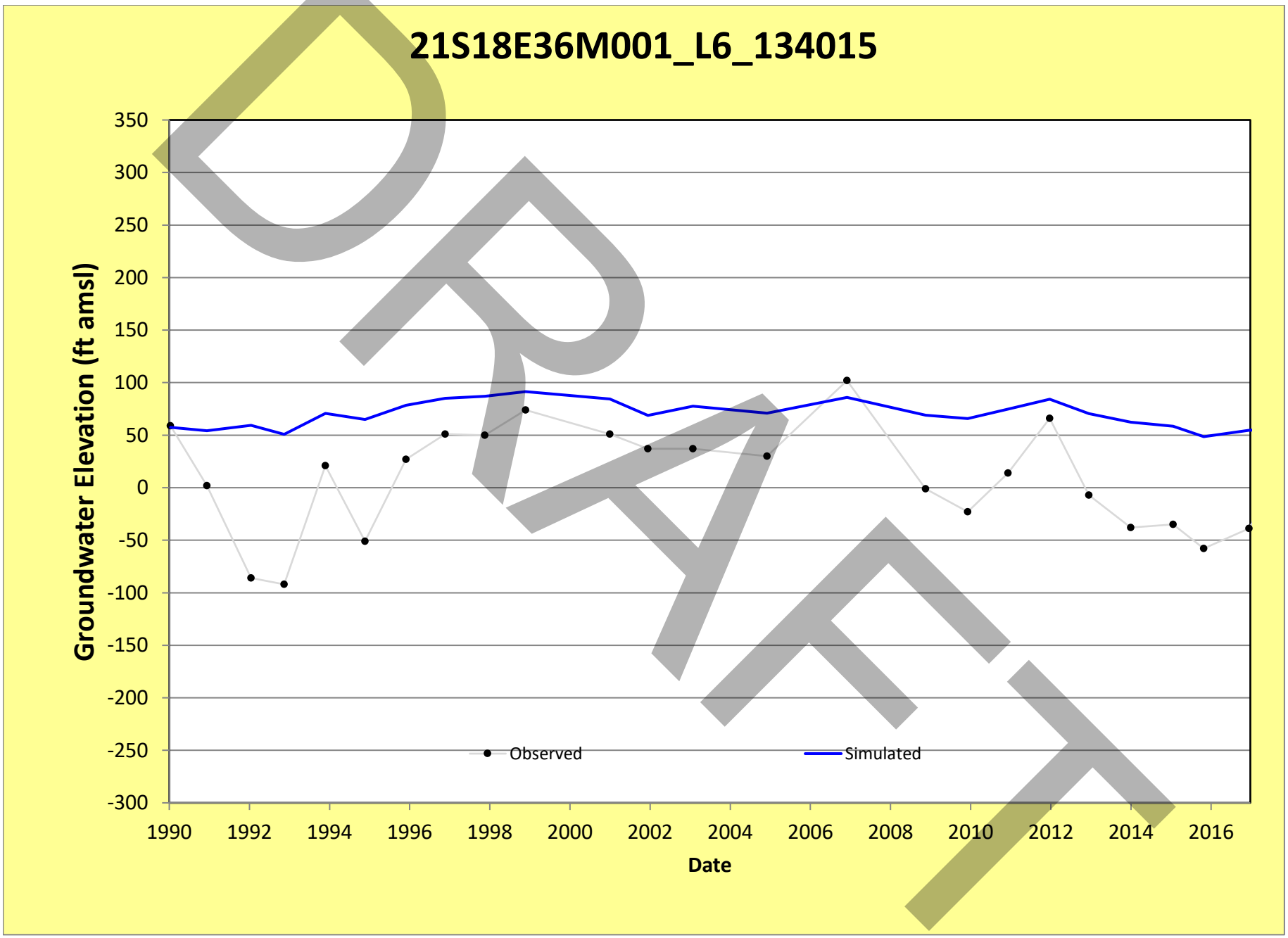
21S18E36M001_L6_134015
Groundwater Elevation (ft amsl)
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-50
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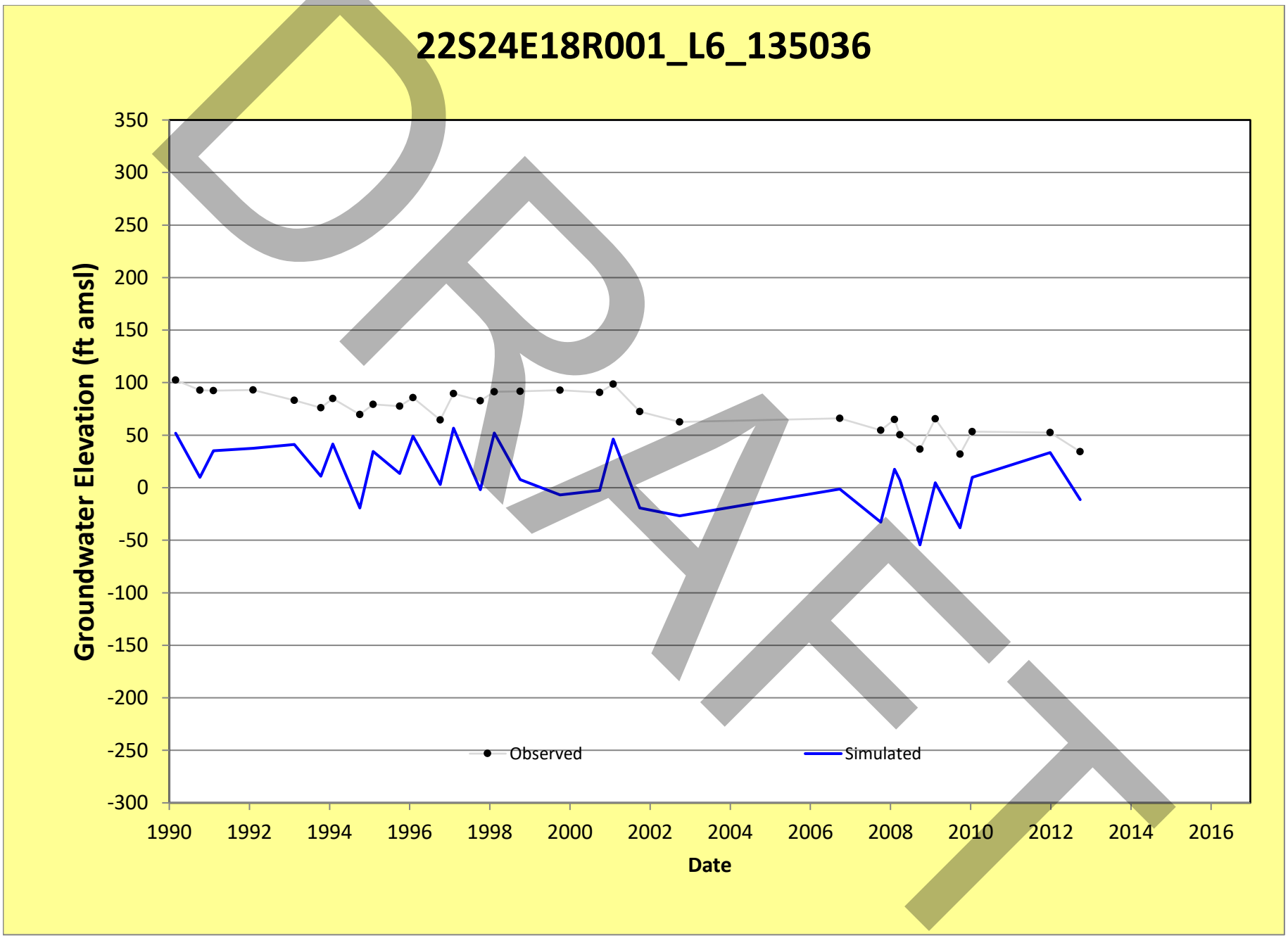
22S24E18R001_L6_135036
Groundwater Elevation (ft amsl)
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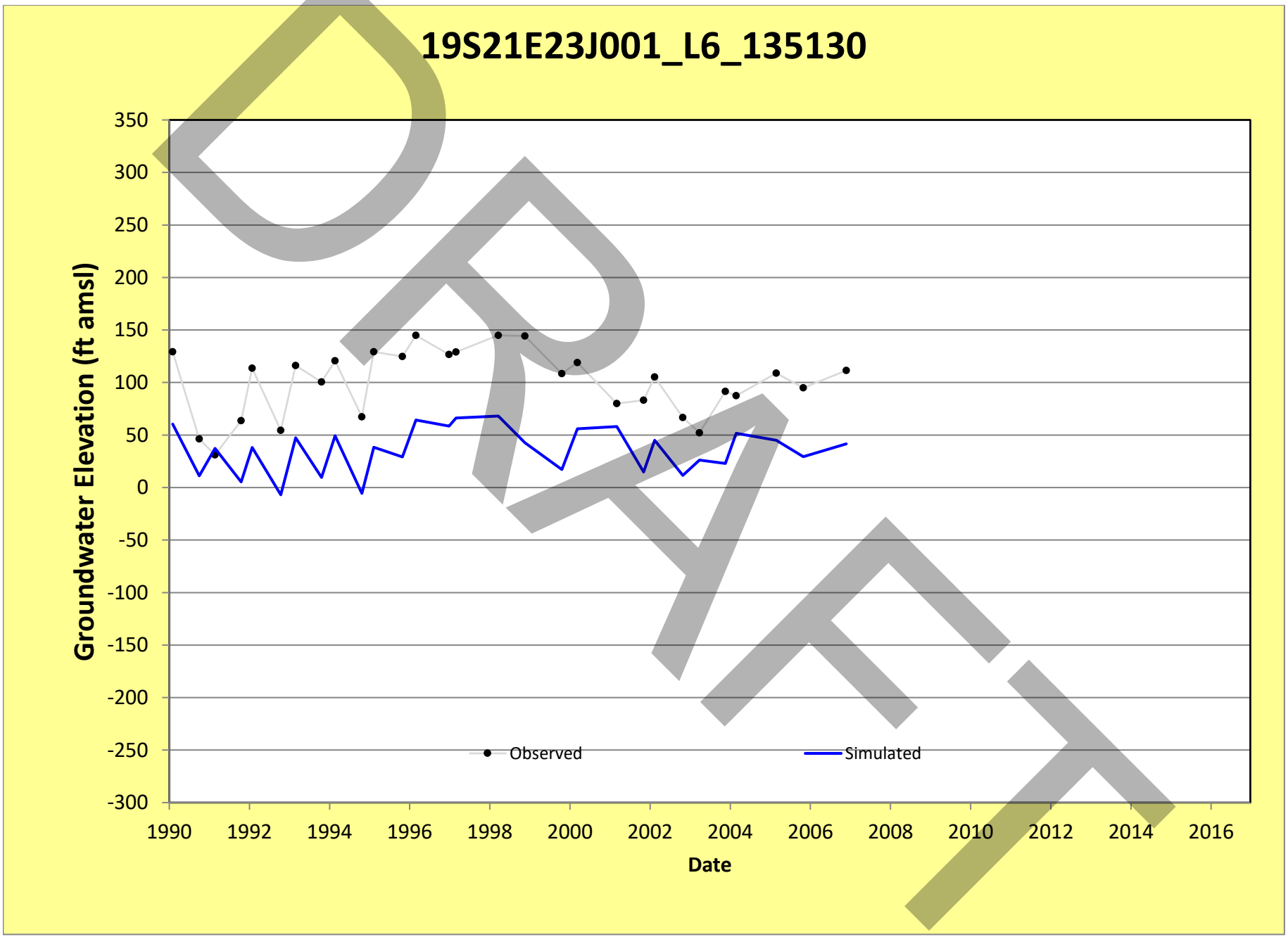
19S21E23J001_L6_135130
Groundwater Elevation (ft amsl)
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-150
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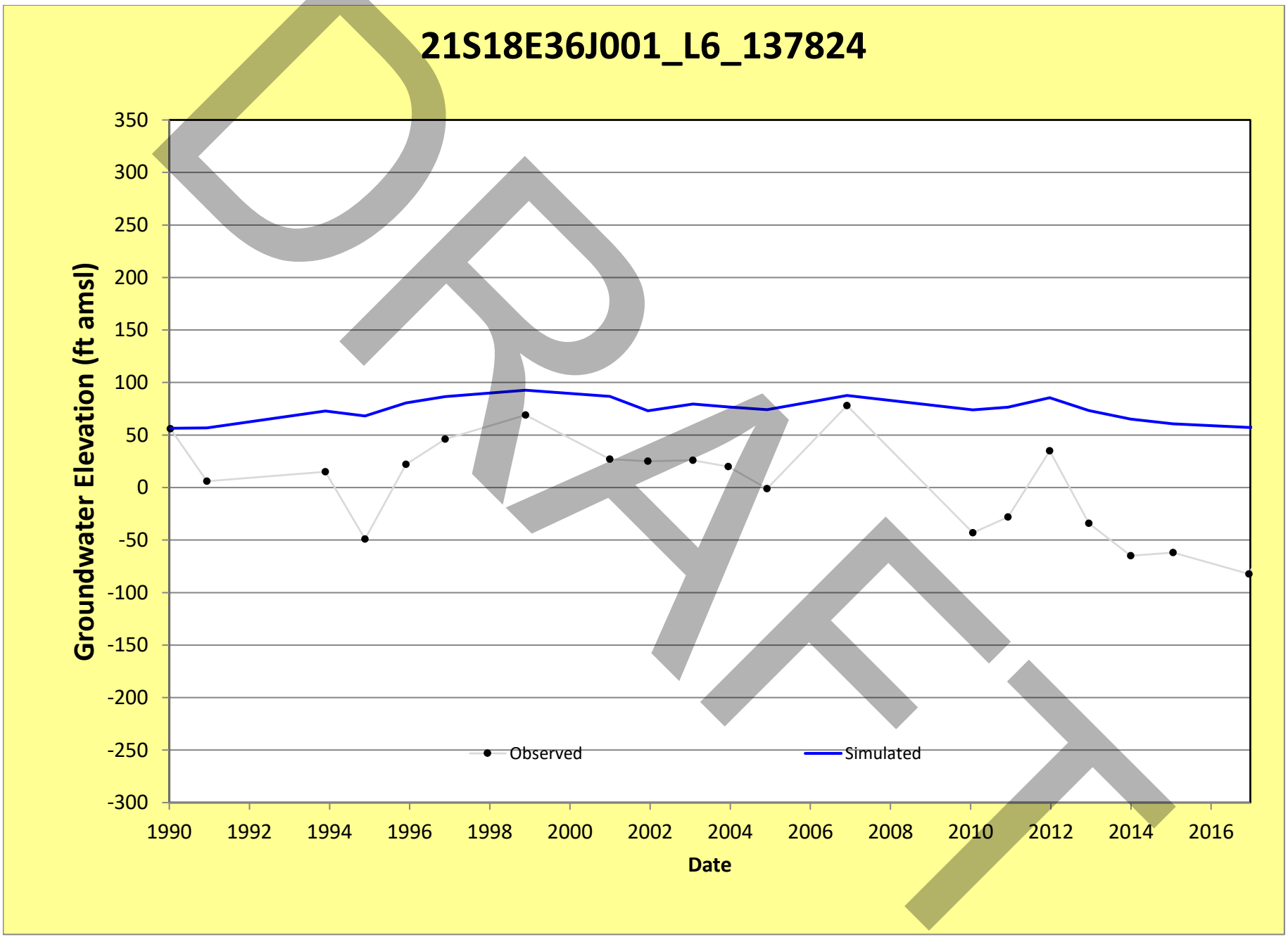
21S18E36J001_L6_137824
Groundwater Elevation (ft amsl)
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-150
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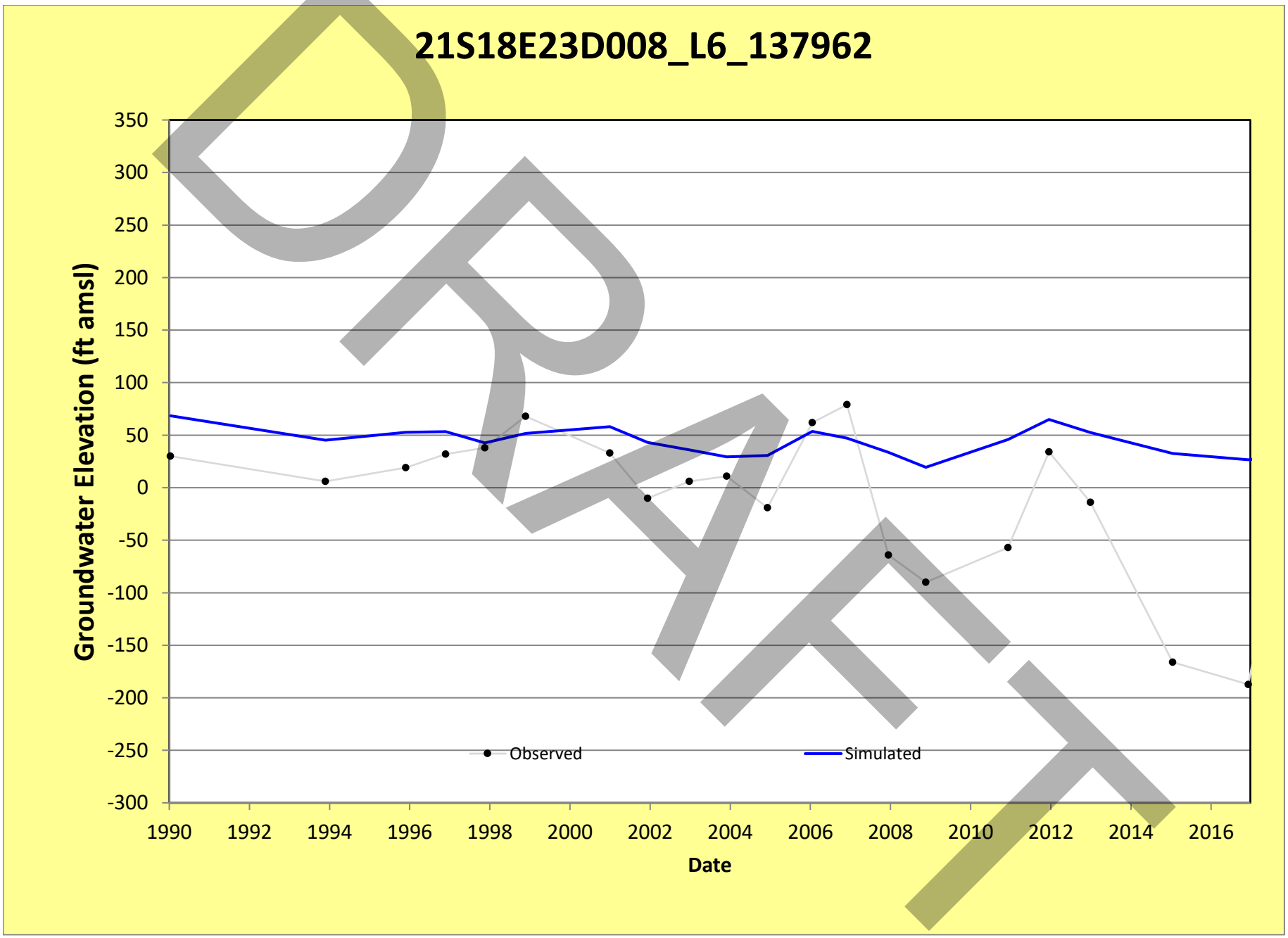
21S18E23D008_L6_137962
Groundwater Elevation (ft amsl)
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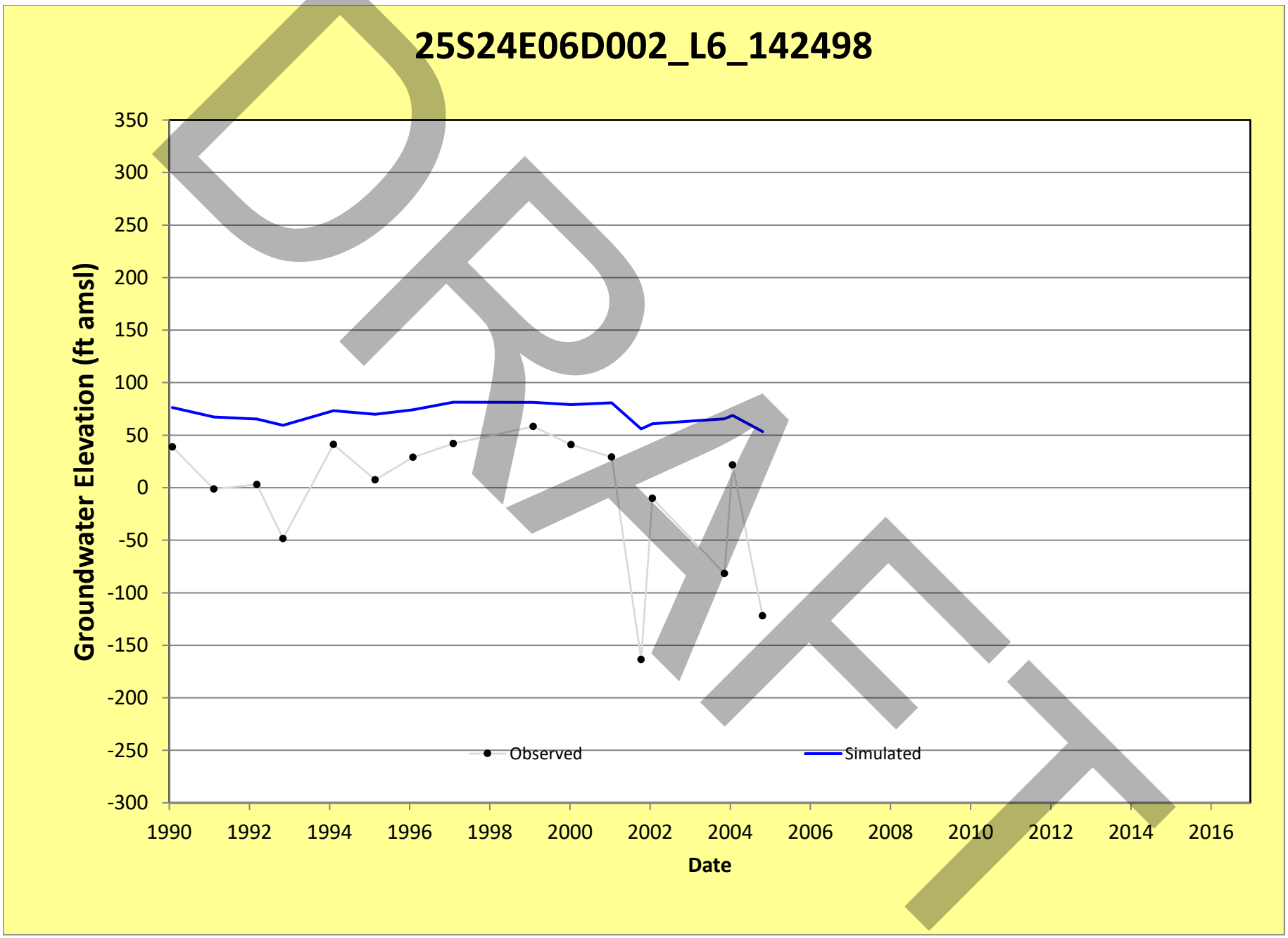
25S24E06D002_L6_142498
Groundwater Elevation (ft amsl)
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-150
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Observed
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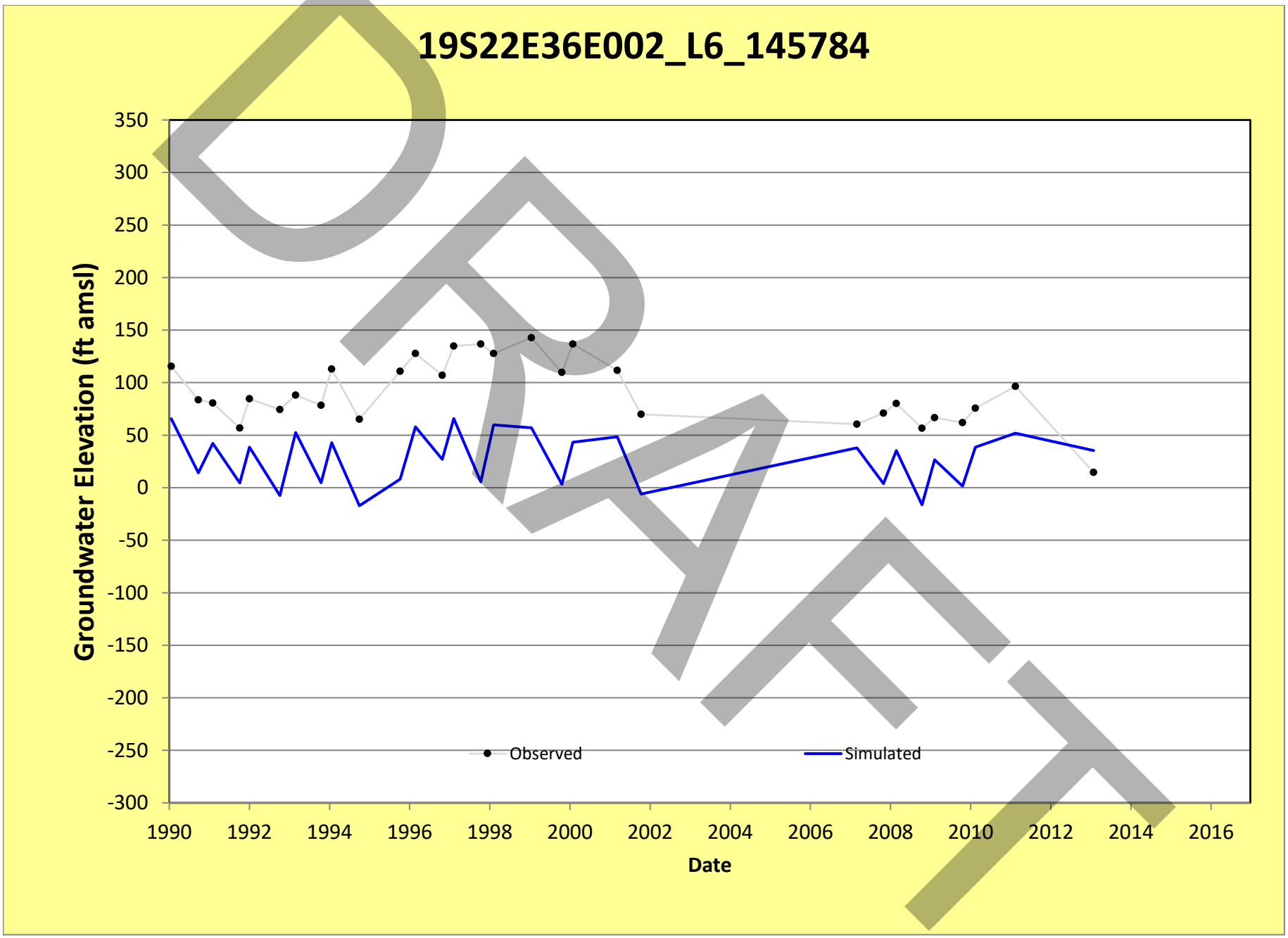
19S22E36E002_L6_145784
Groundwater Elevation (ft amsl)
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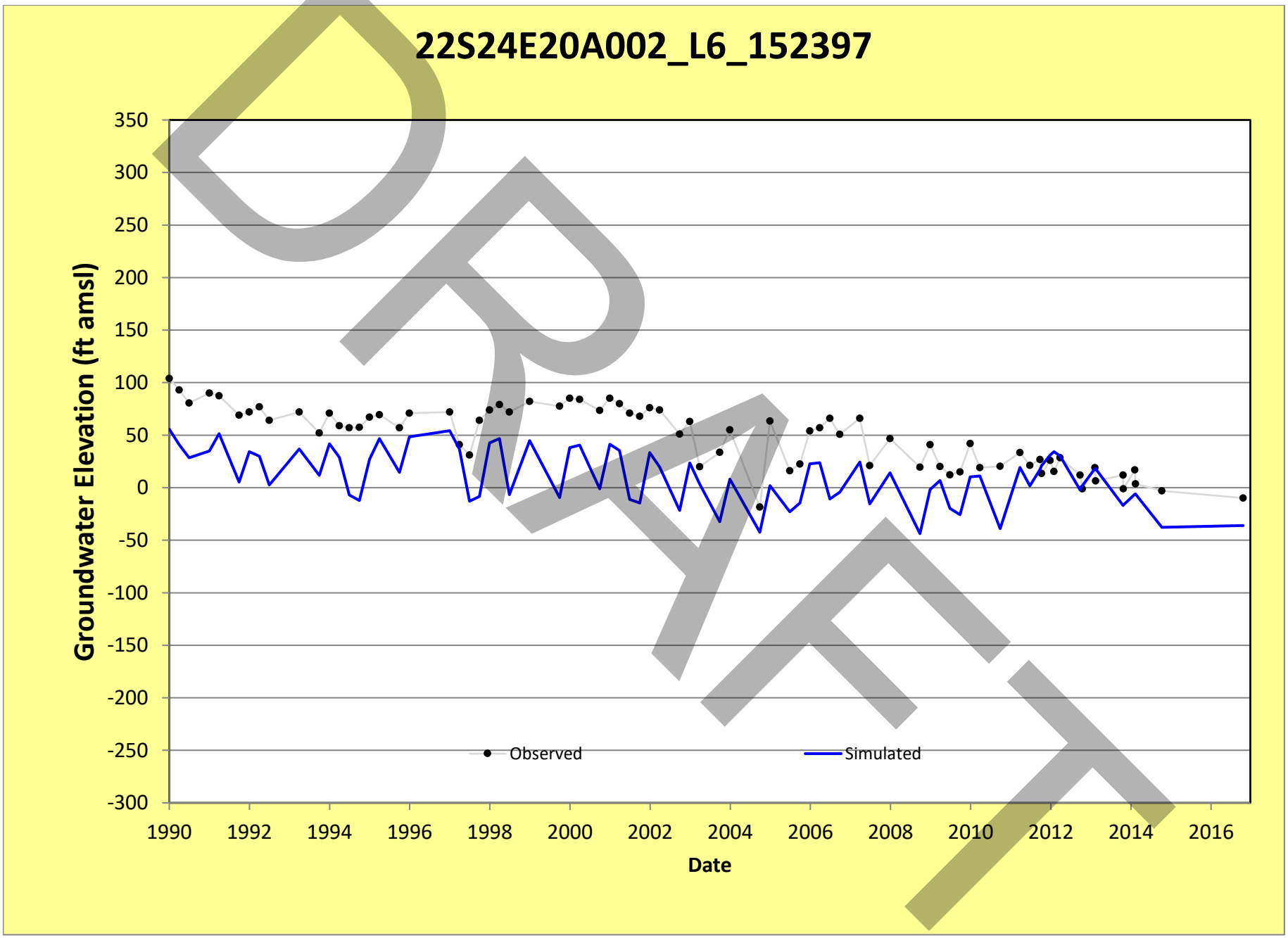
22S24E20A002_L6_152397
Groundwater Elevation (ft amsl)
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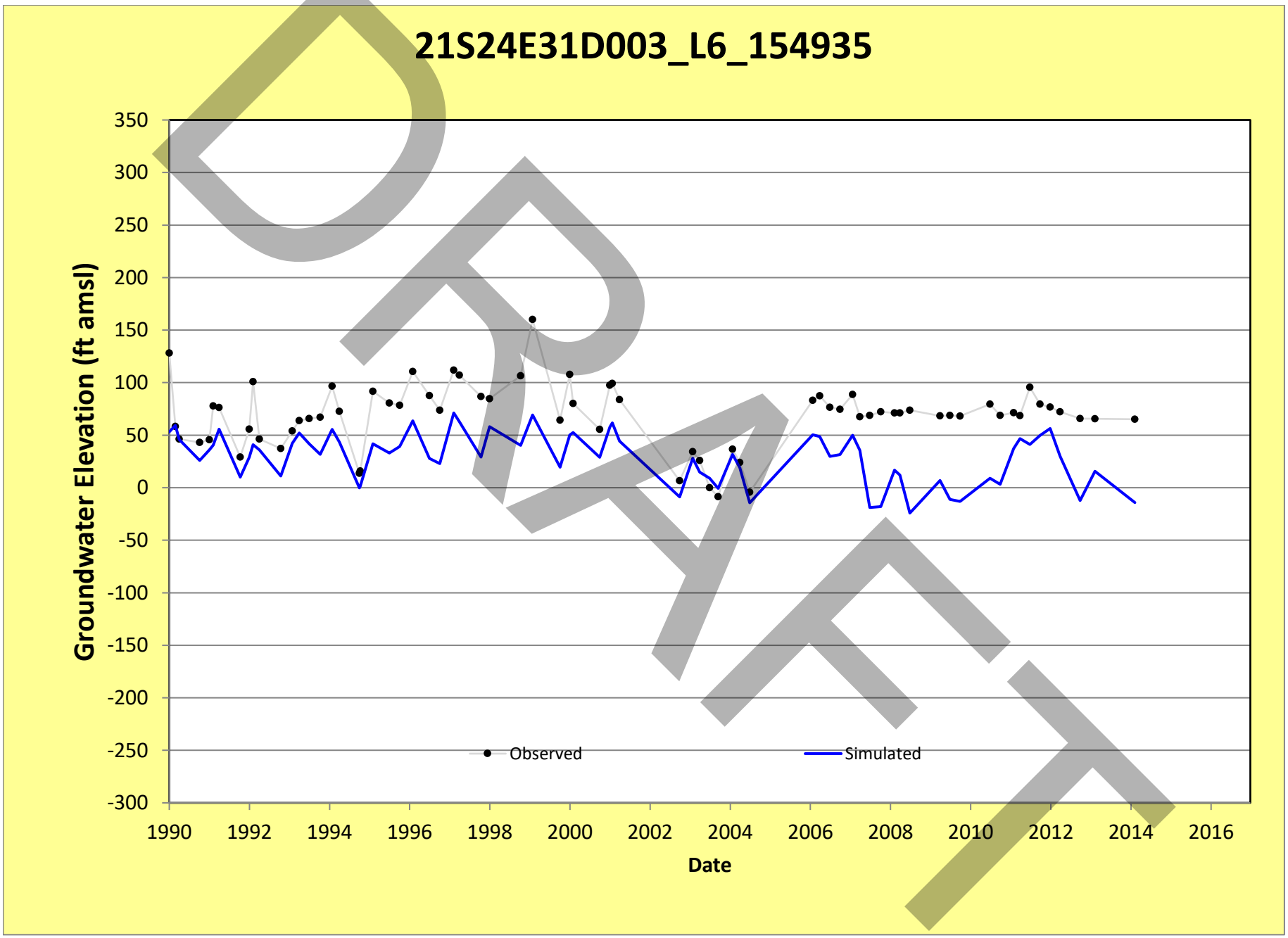
21S24E31D003_L6_154935
Groundwater Elevation (ft amsl)
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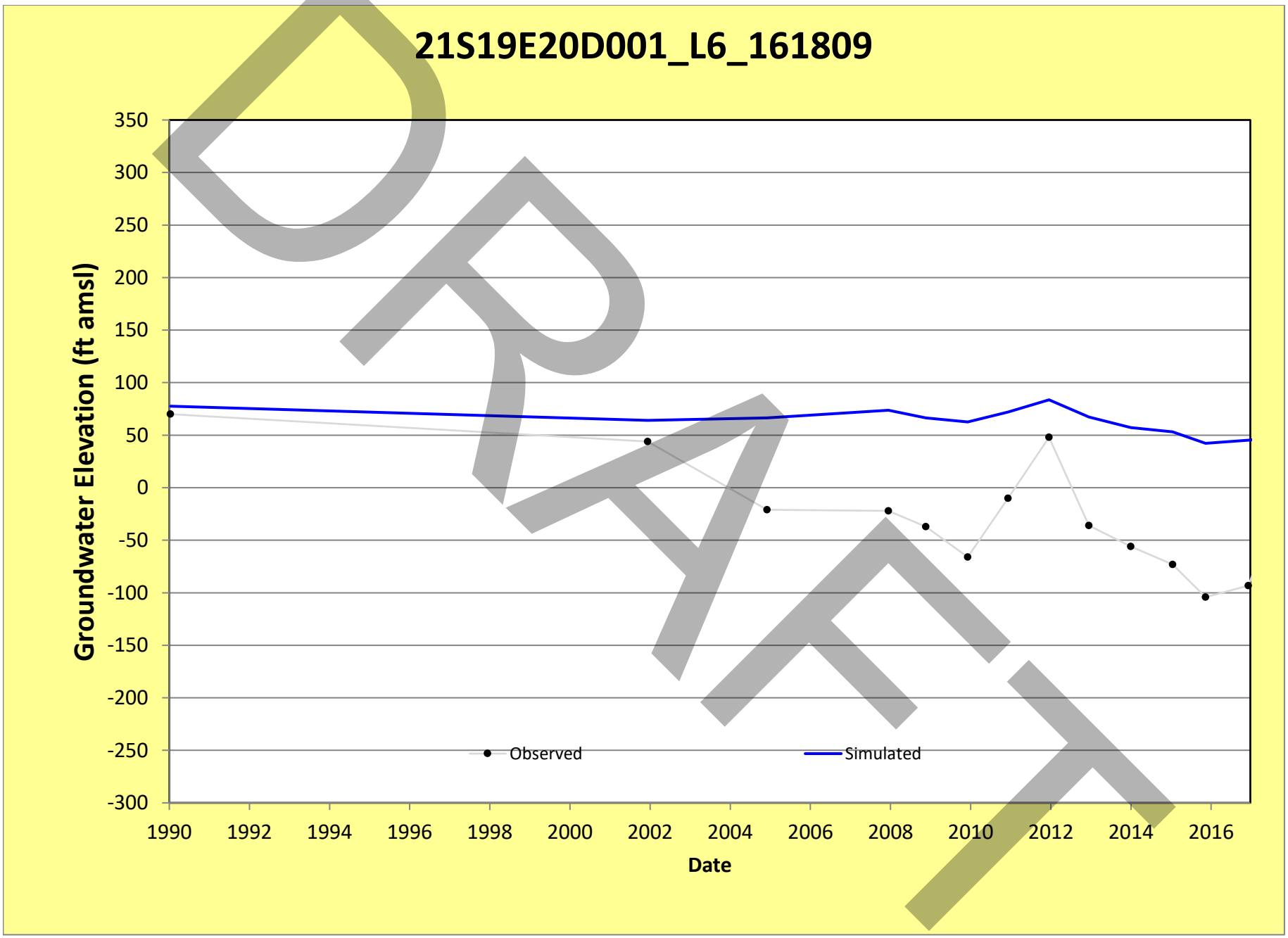
21S19E20D001_L6_161809
Groundwater Elevation (ft amsl)
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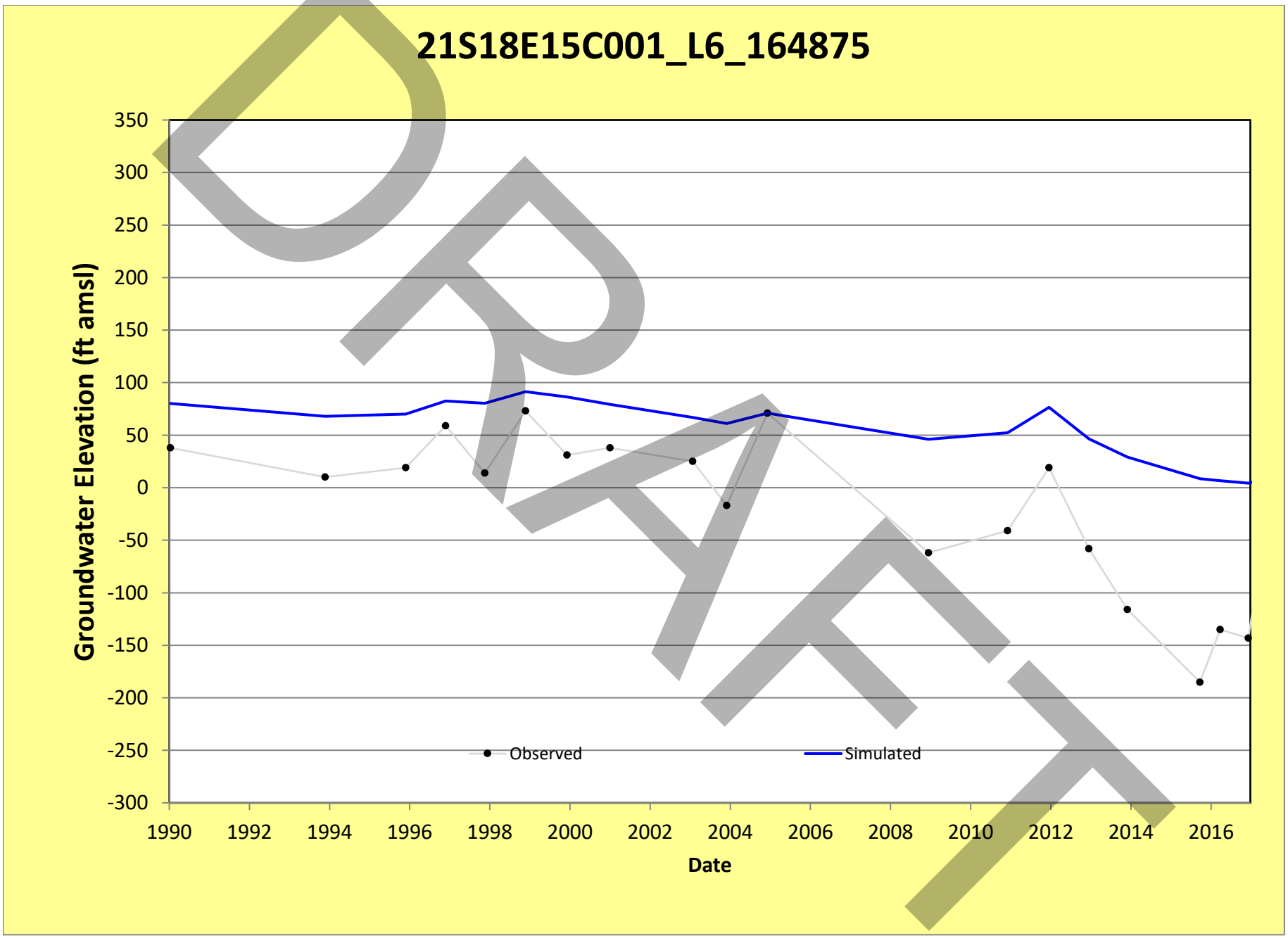
21S18E15C001_L6_164875
Groundwater Elevation (ft amsl)
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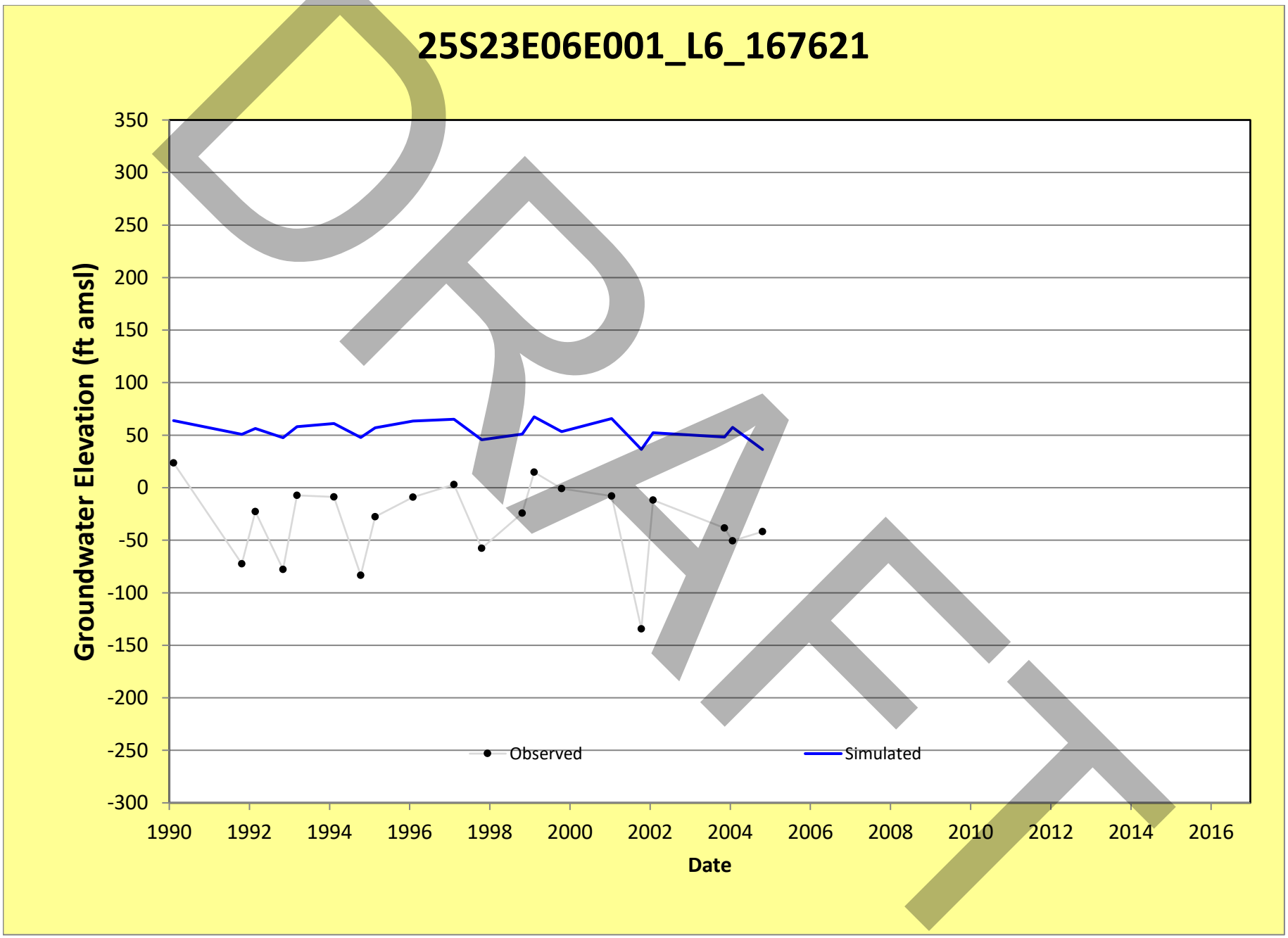
25S23E06E001_L6_167621
Groundwater Elevation (ft amsl)
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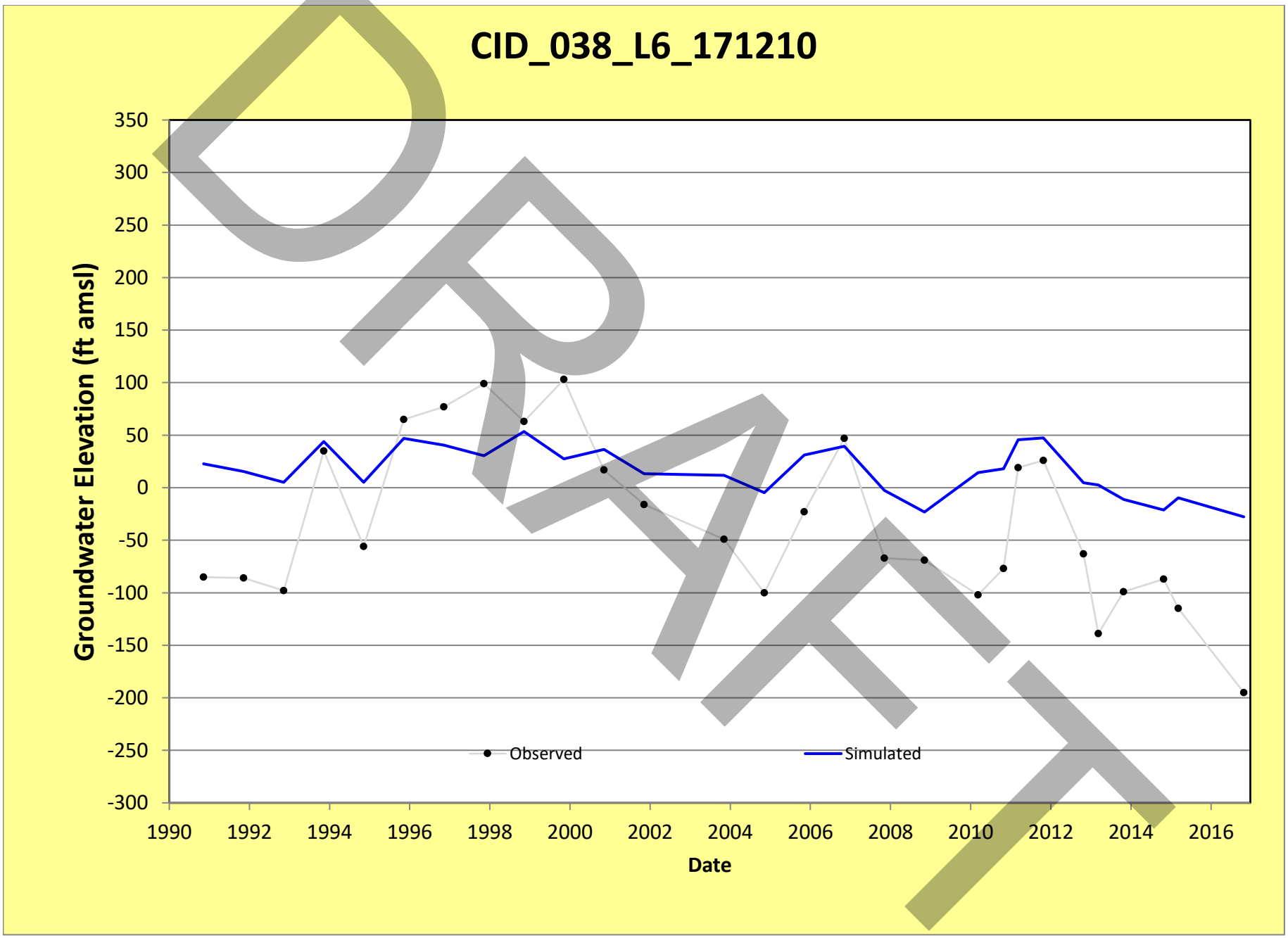
CID_038_L6_171210
Groundwater Elevation (ft amsl)
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Observed
Simulated
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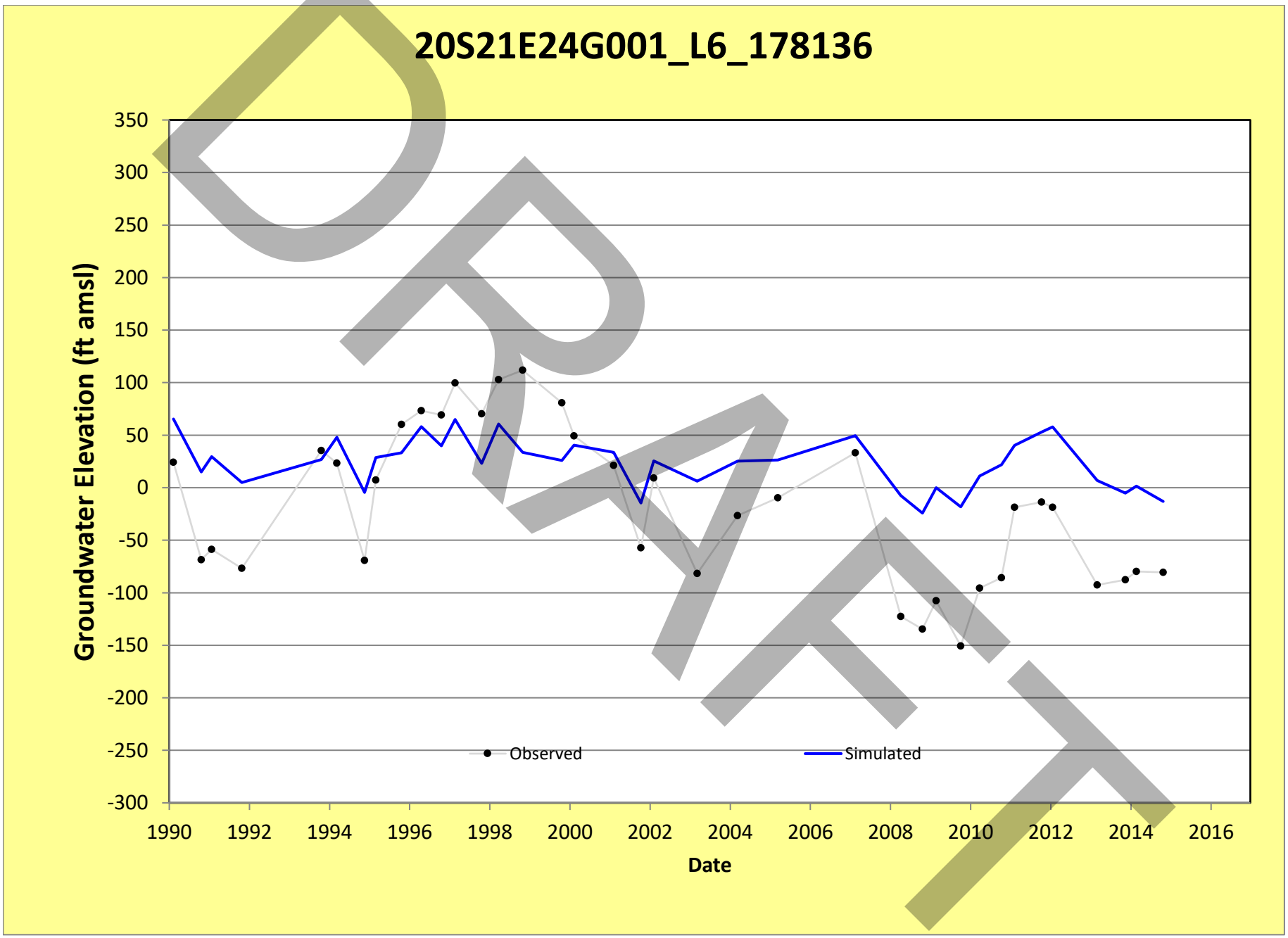
20S21E24G001_L6_178136
Groundwater Elevation (ft amsl)
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Simulated
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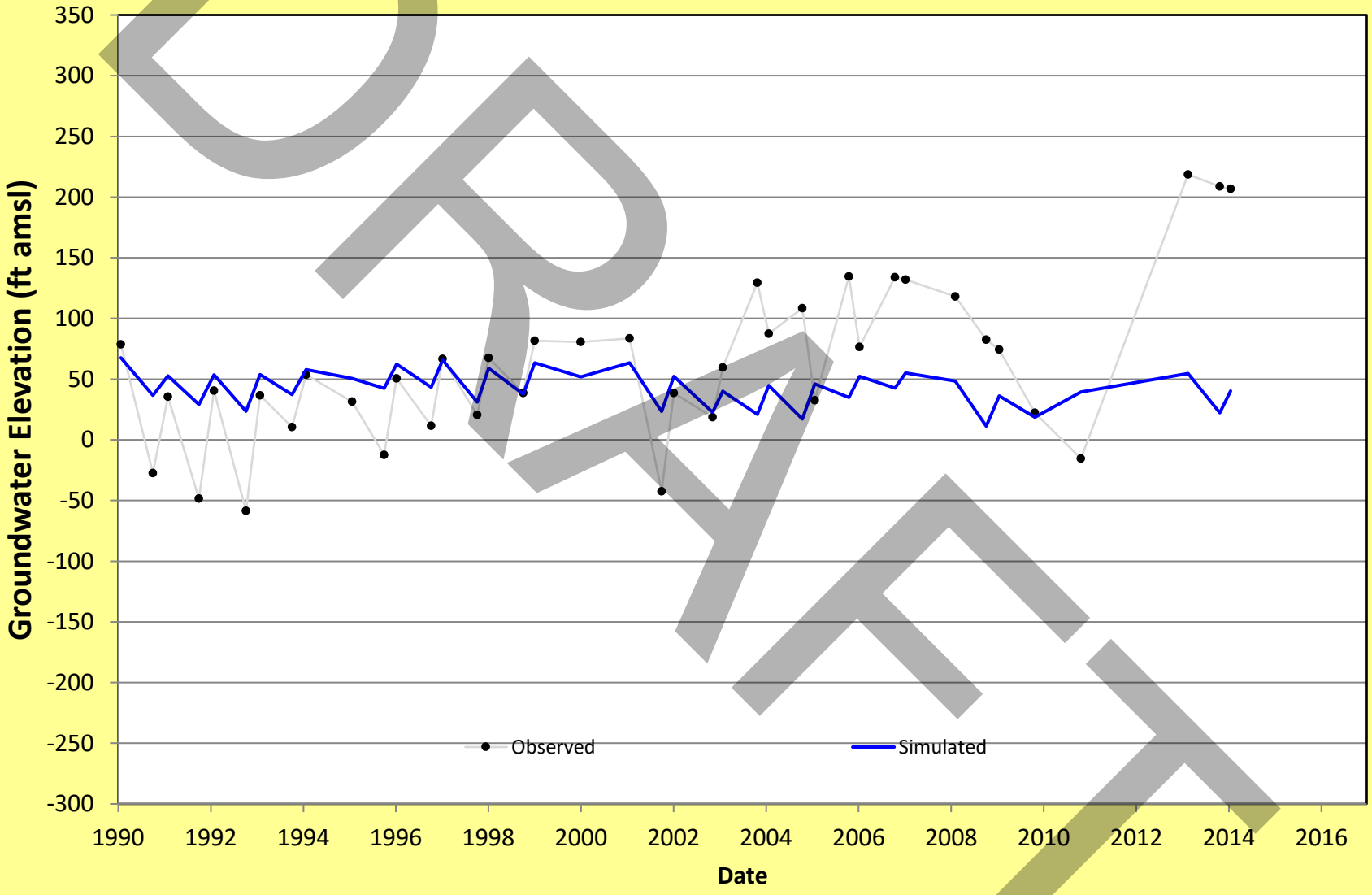
26S24E17R001_L6_180317



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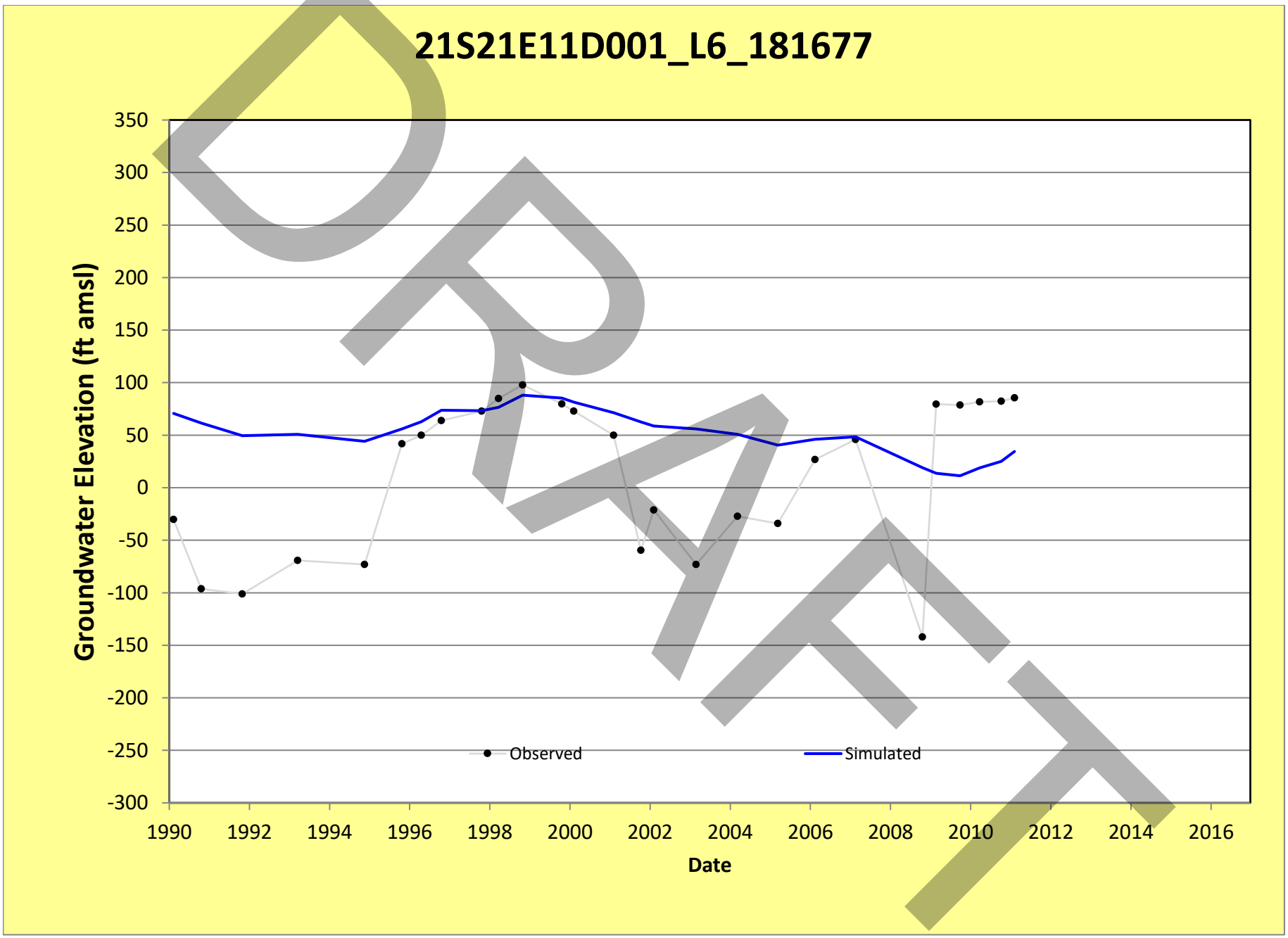
21S21E11D001_L6_181677
Groundwater Elevation (ft amsl)
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Observed
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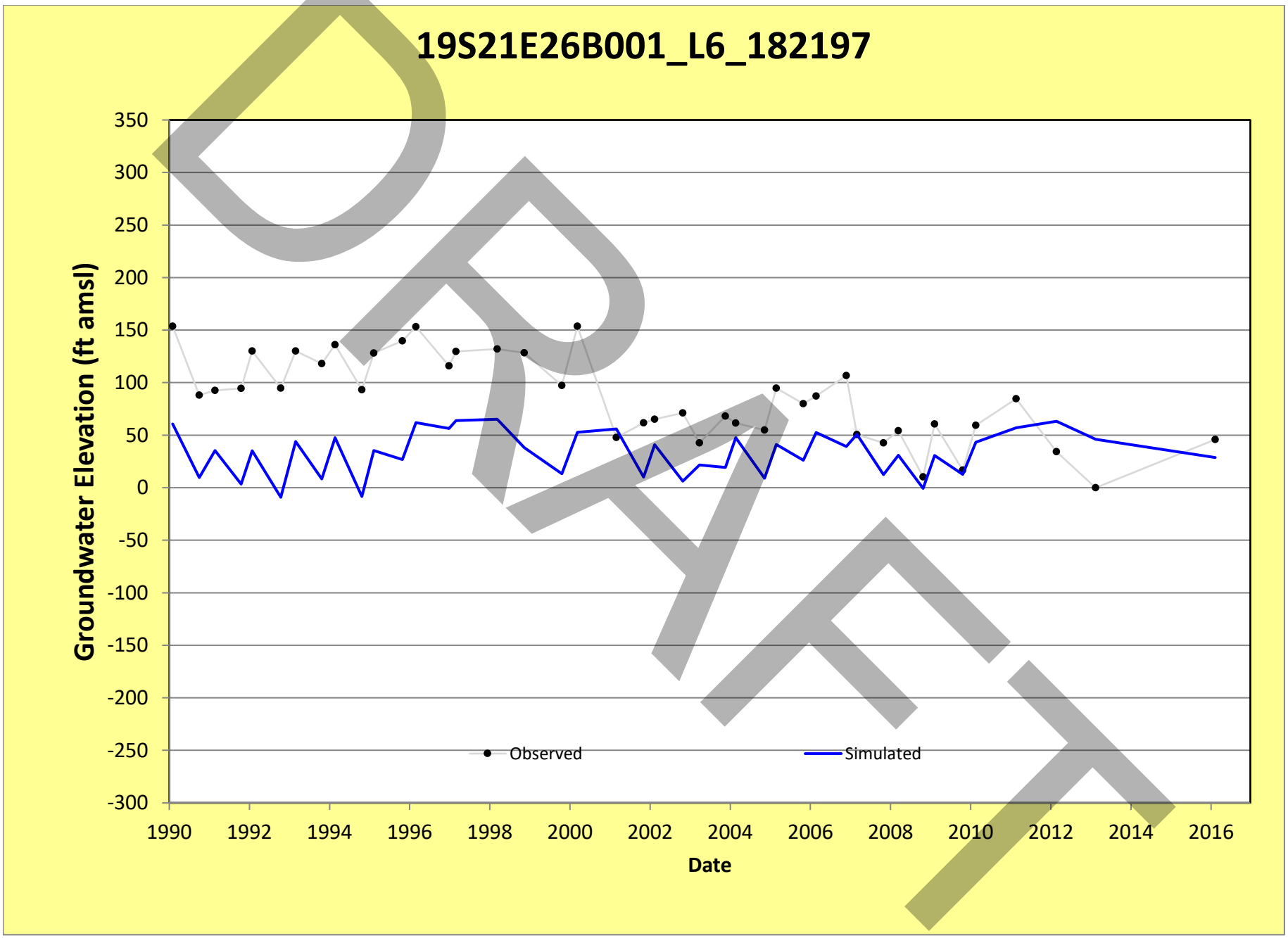
19S21E26B001_L6_182197
Groundwater Elevation (ft amsl)
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Observed
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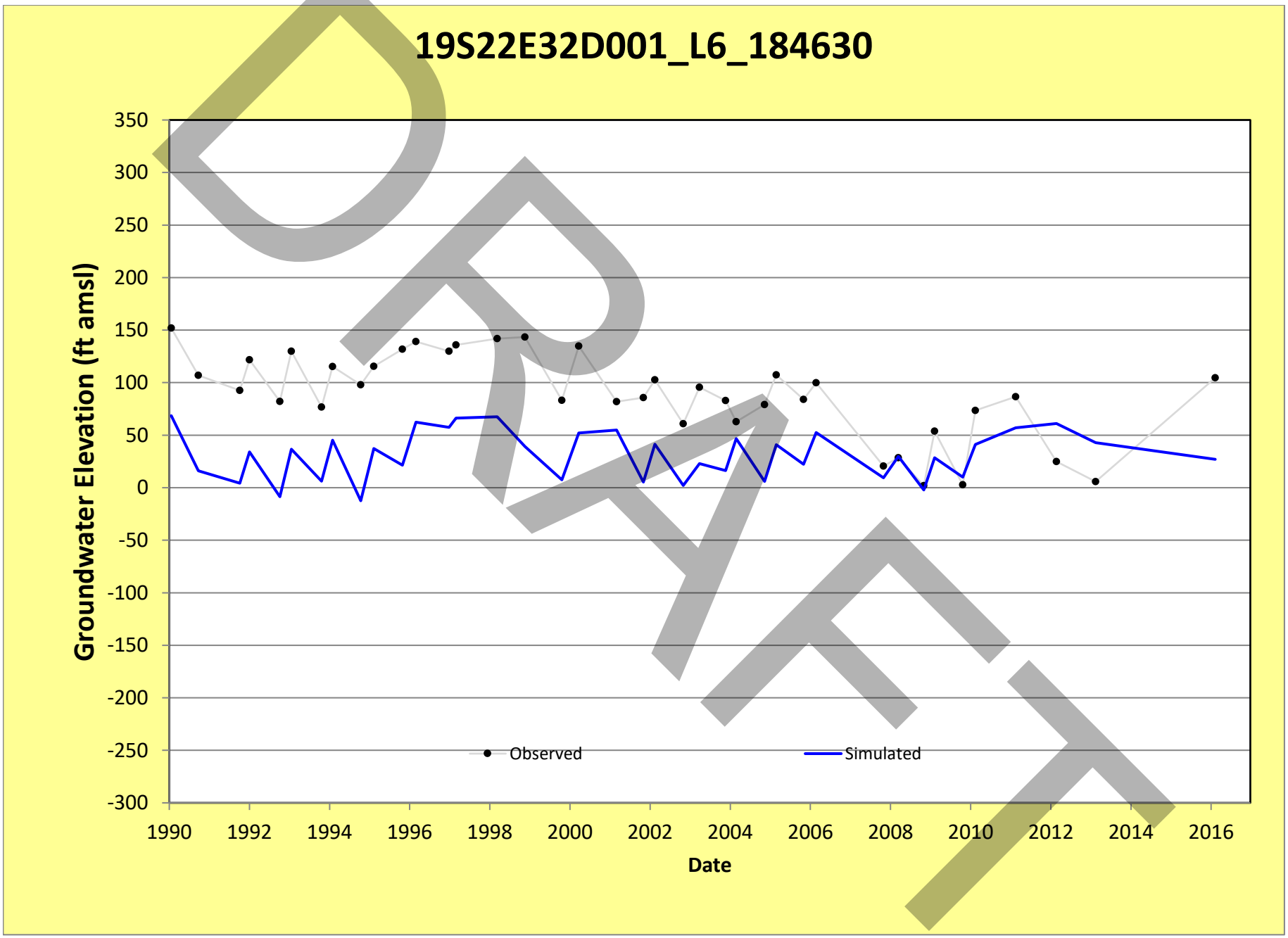
19S22E32D001_L6_184630
Groundwater Elevation (ft amsl)
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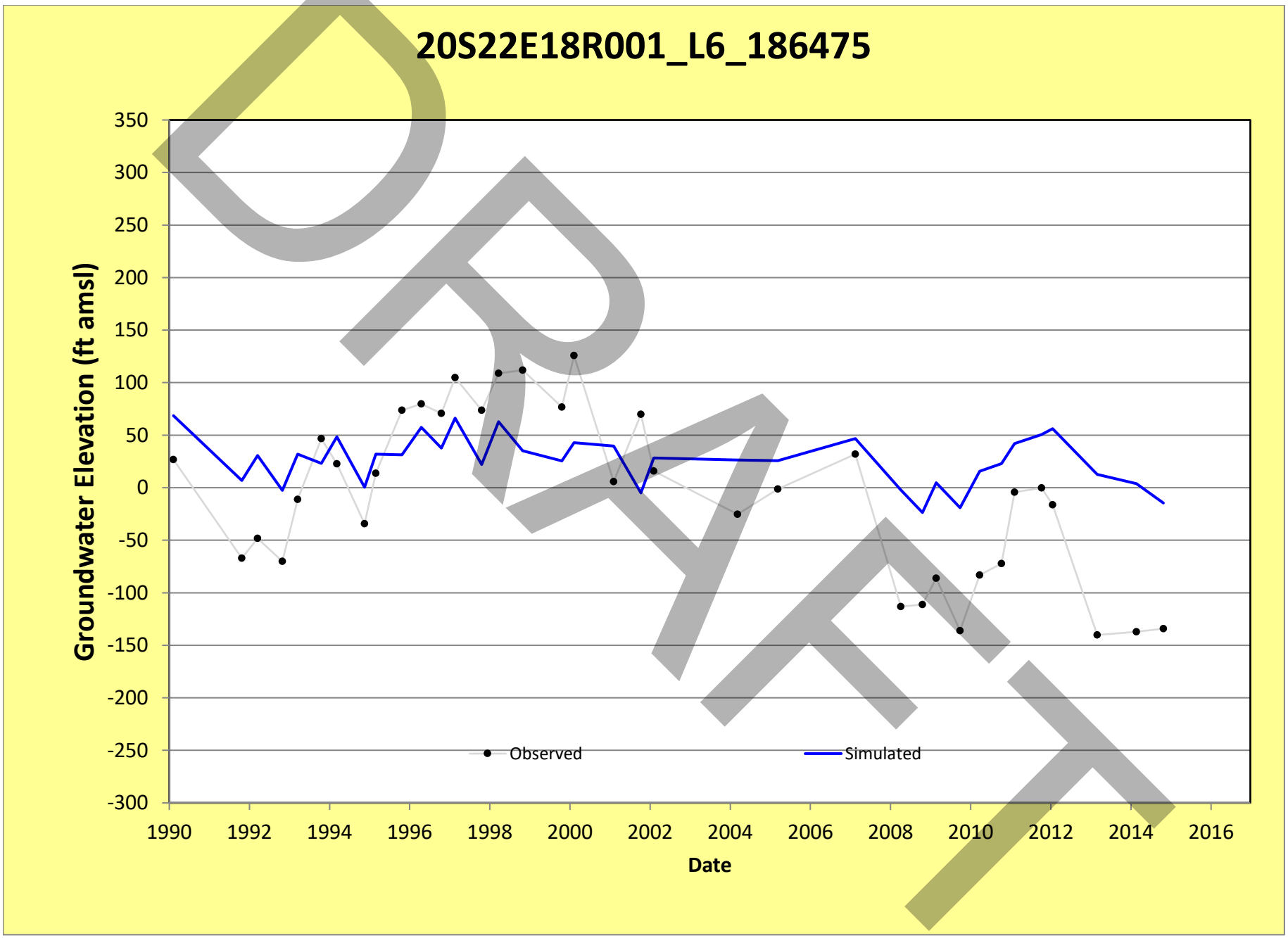
20S22E18R001_L6_186475
Groundwater Elevation (ft amsl)
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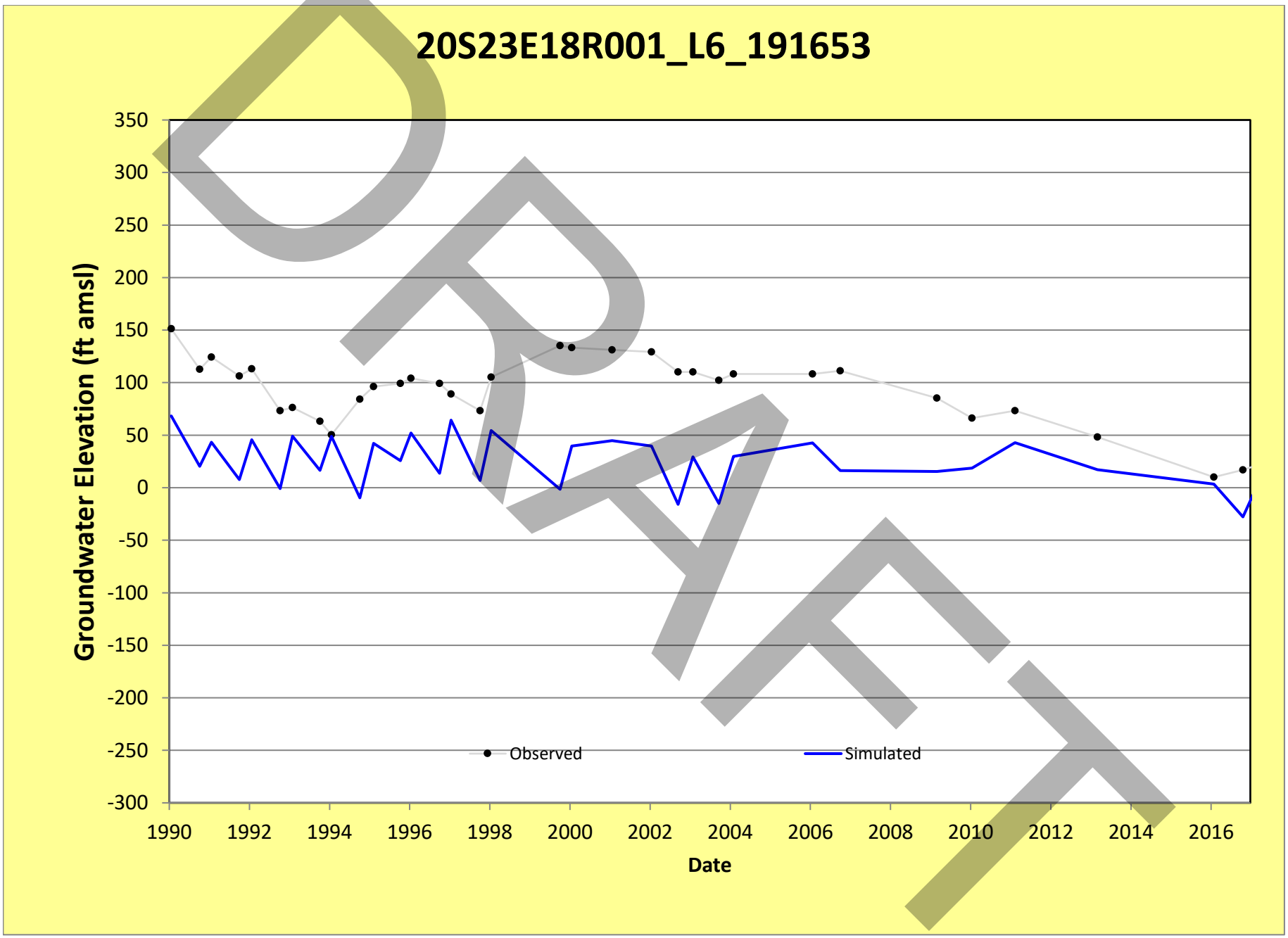
20S23E18R001_L6_191653
Groundwater Elevation (ft amsl)
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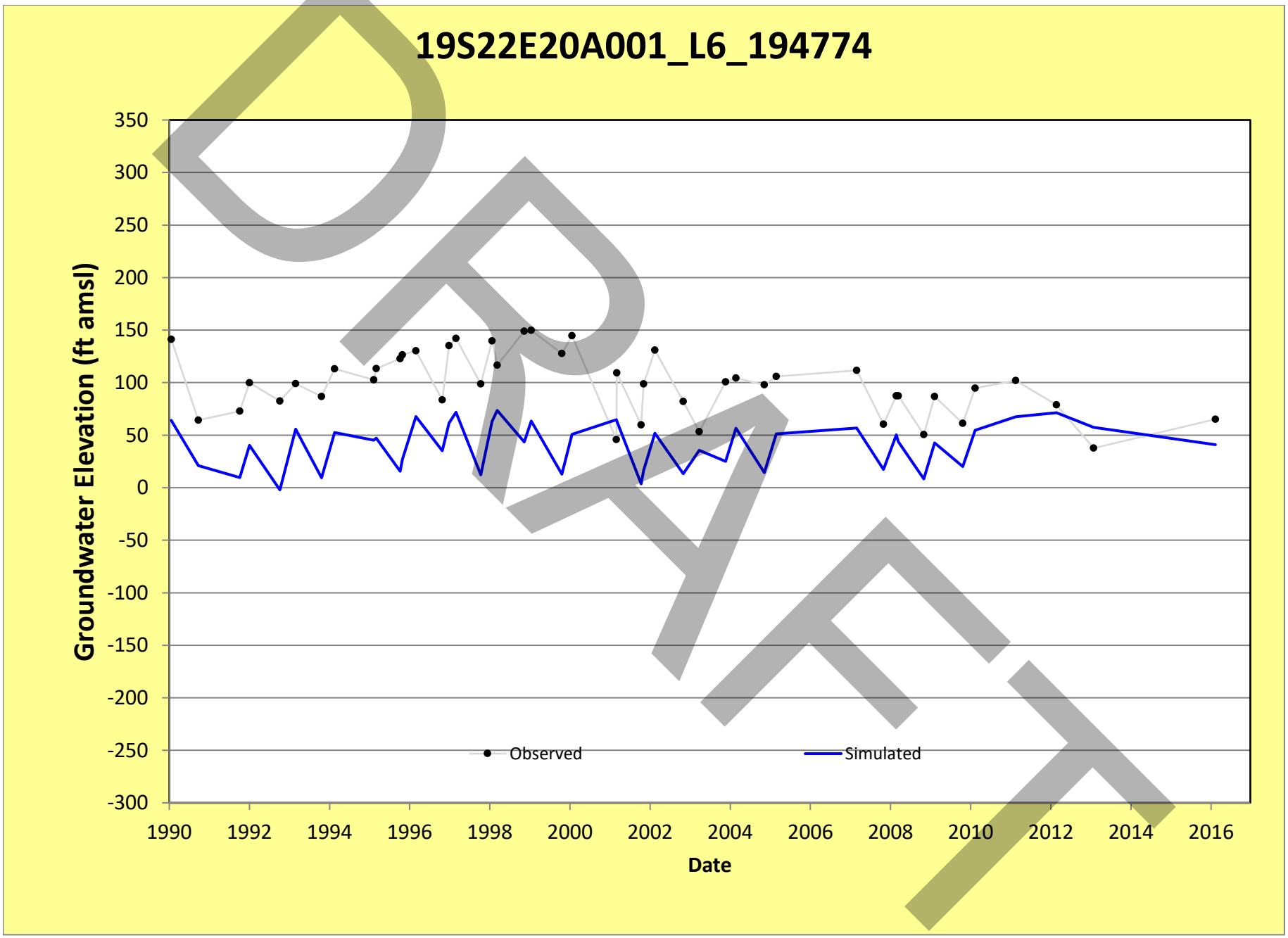
19S22E20A001_L6_194774
Groundwater Elevation (ft amsl)
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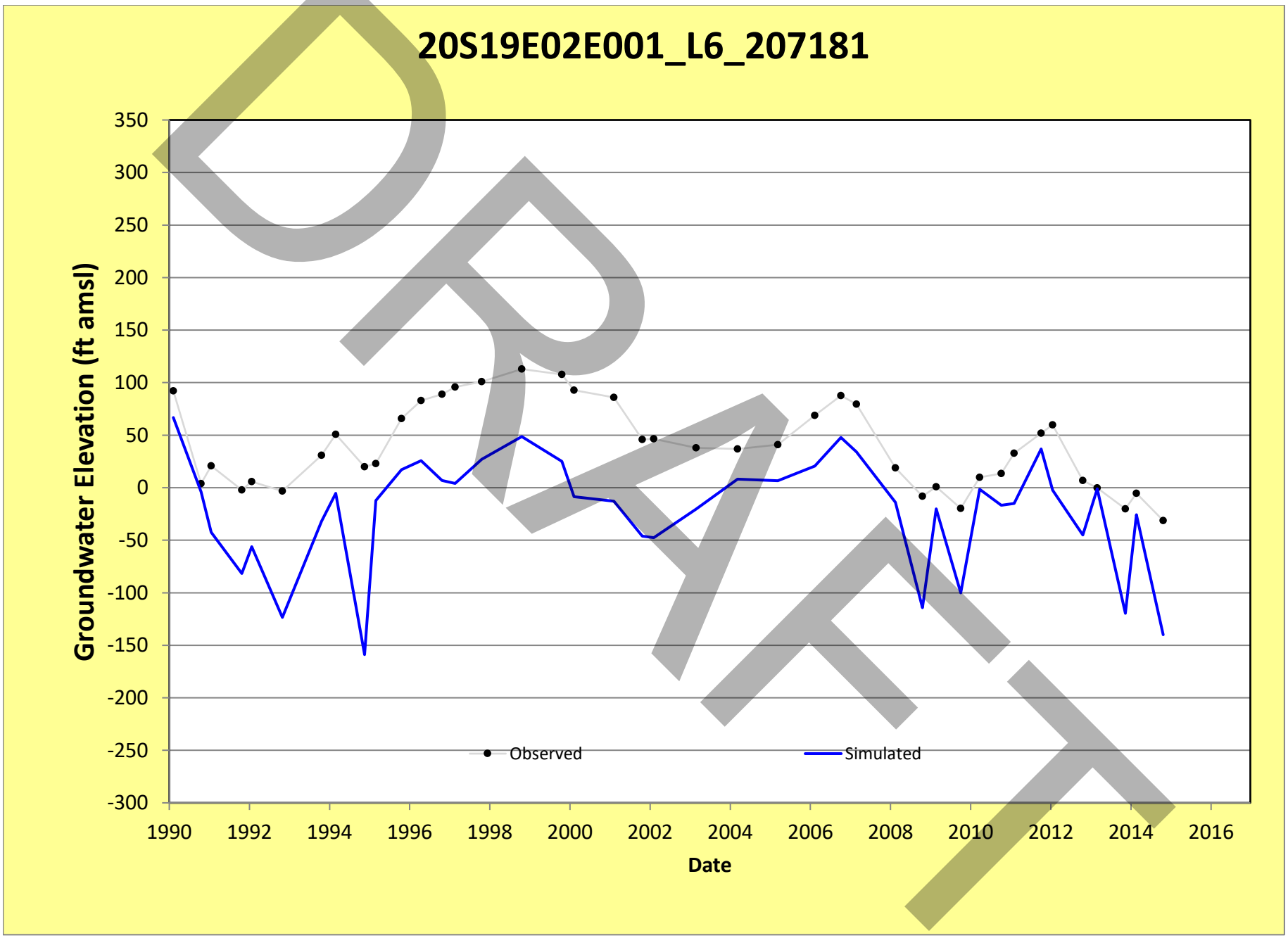
20S19E02E001_L6_207181
Groundwater Elevation (ft amsl)
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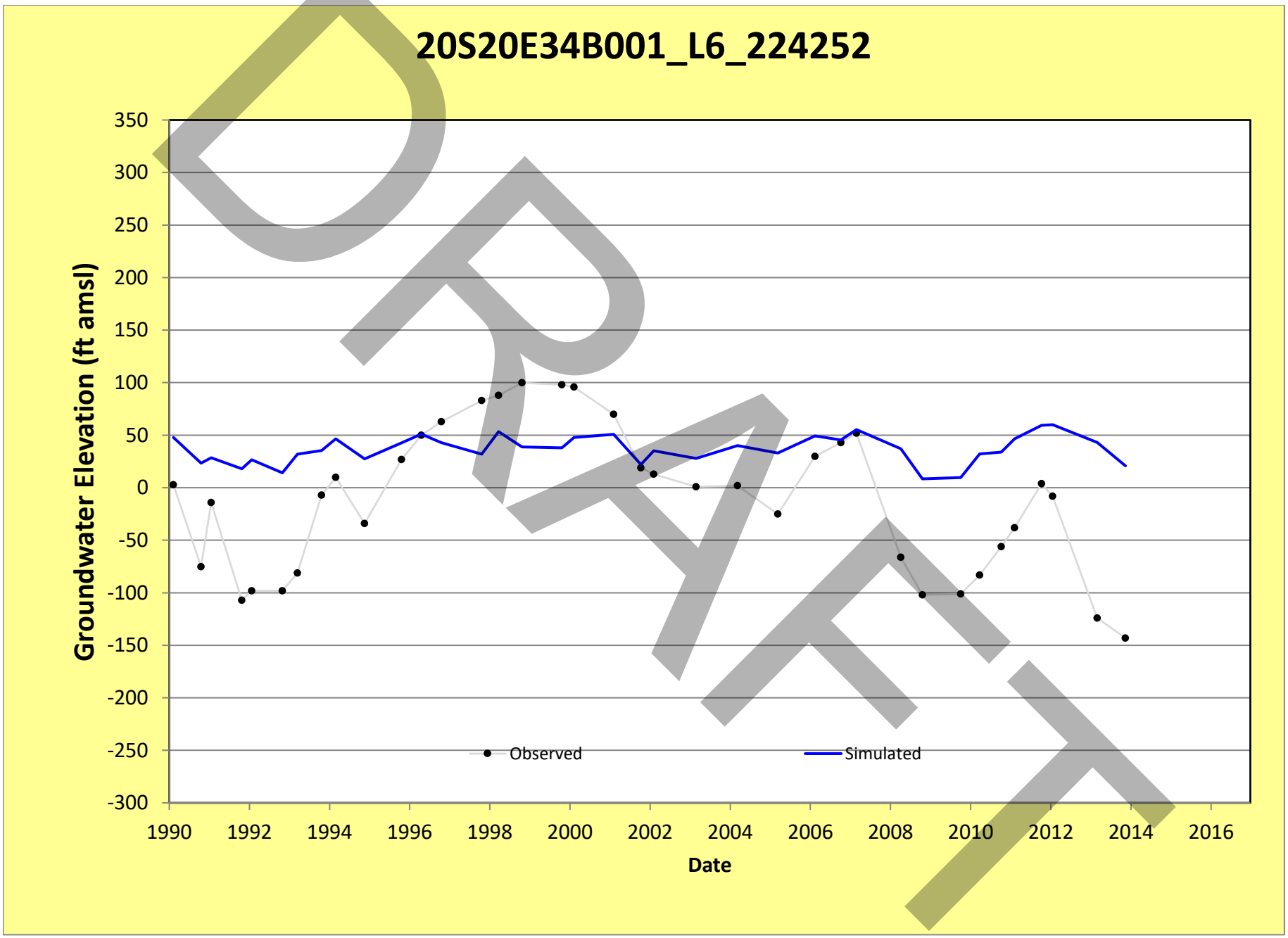
20S20E34B001_L6_224252
Groundwater Elevation (ft amsl)
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Simulated
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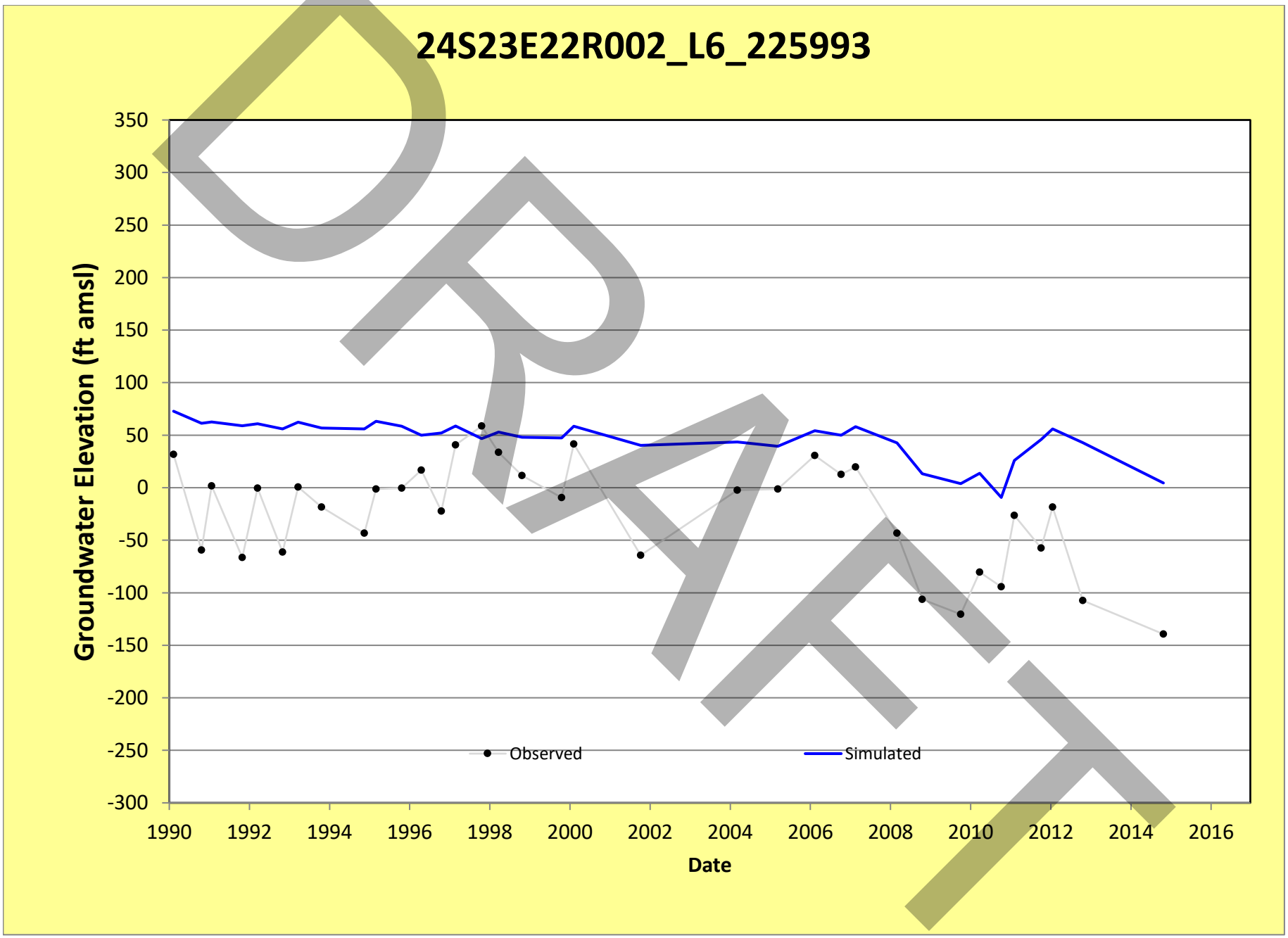
24S23E22R002_L6_225993
Groundwater Elevation (ft amsl)
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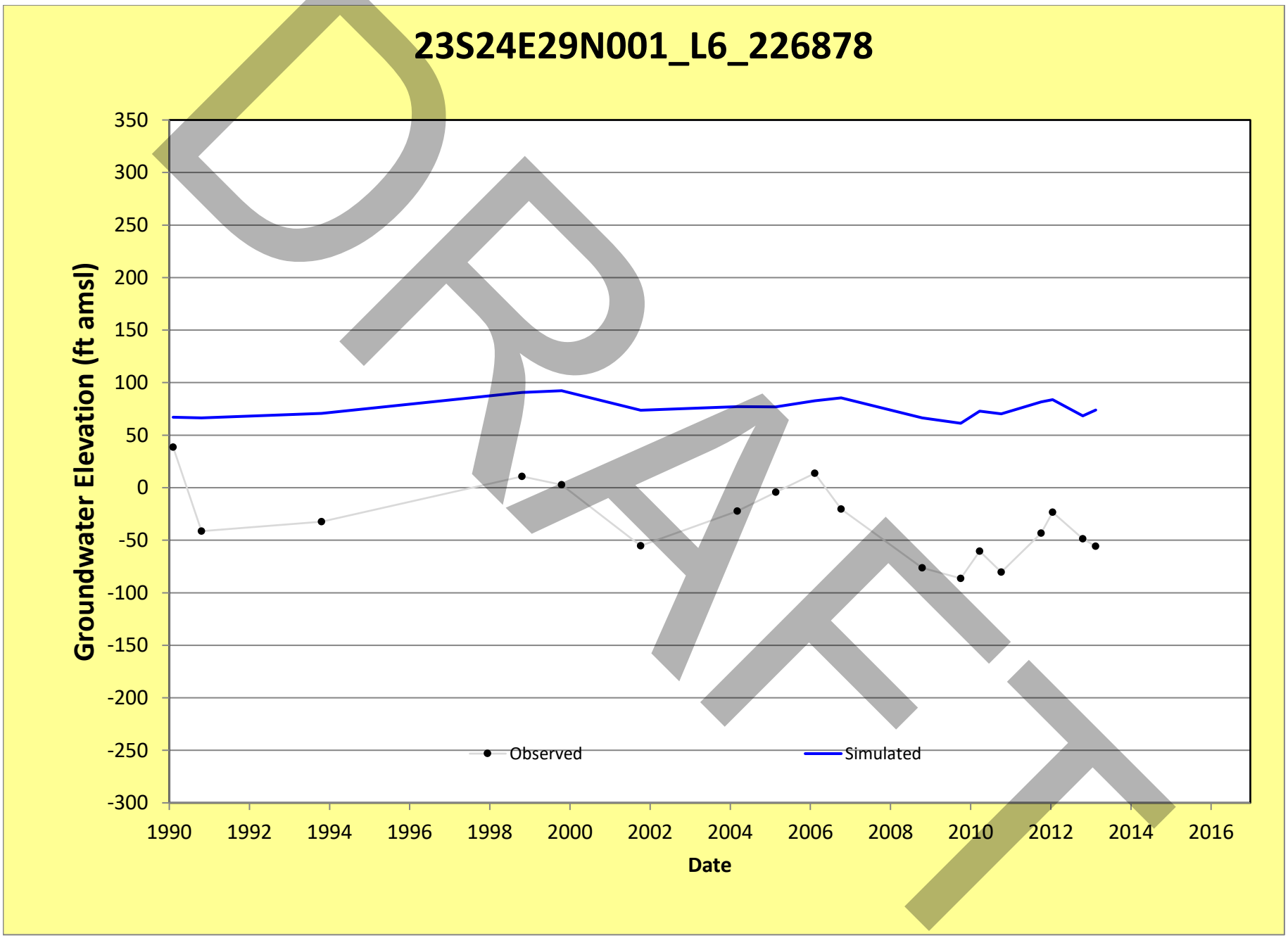
23S24E29N001_L6_226878
Groundwater Elevation (ft amsl)
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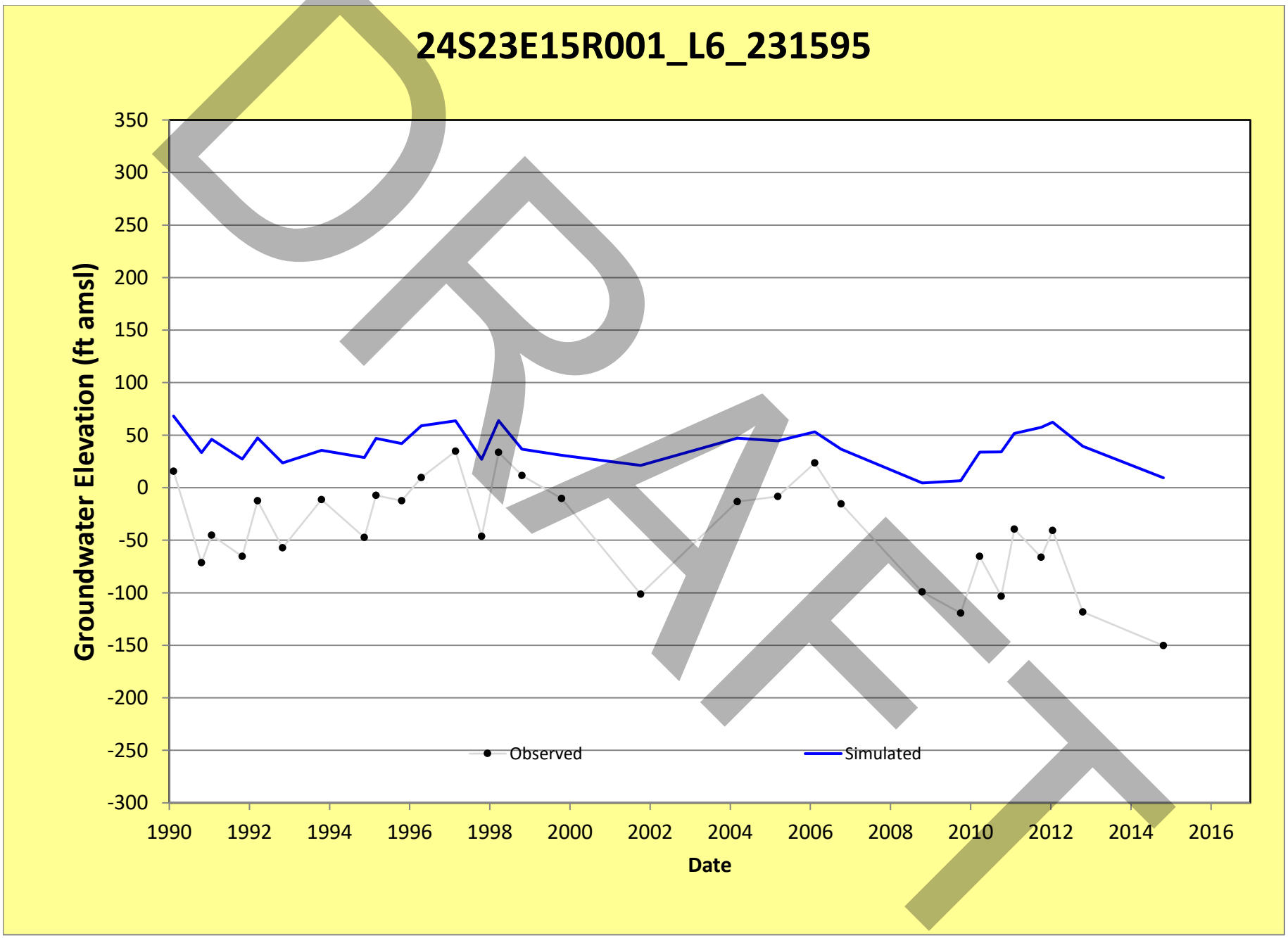
24S23E15R001_L6_231595
Groundwater Elevation (ft amsl)
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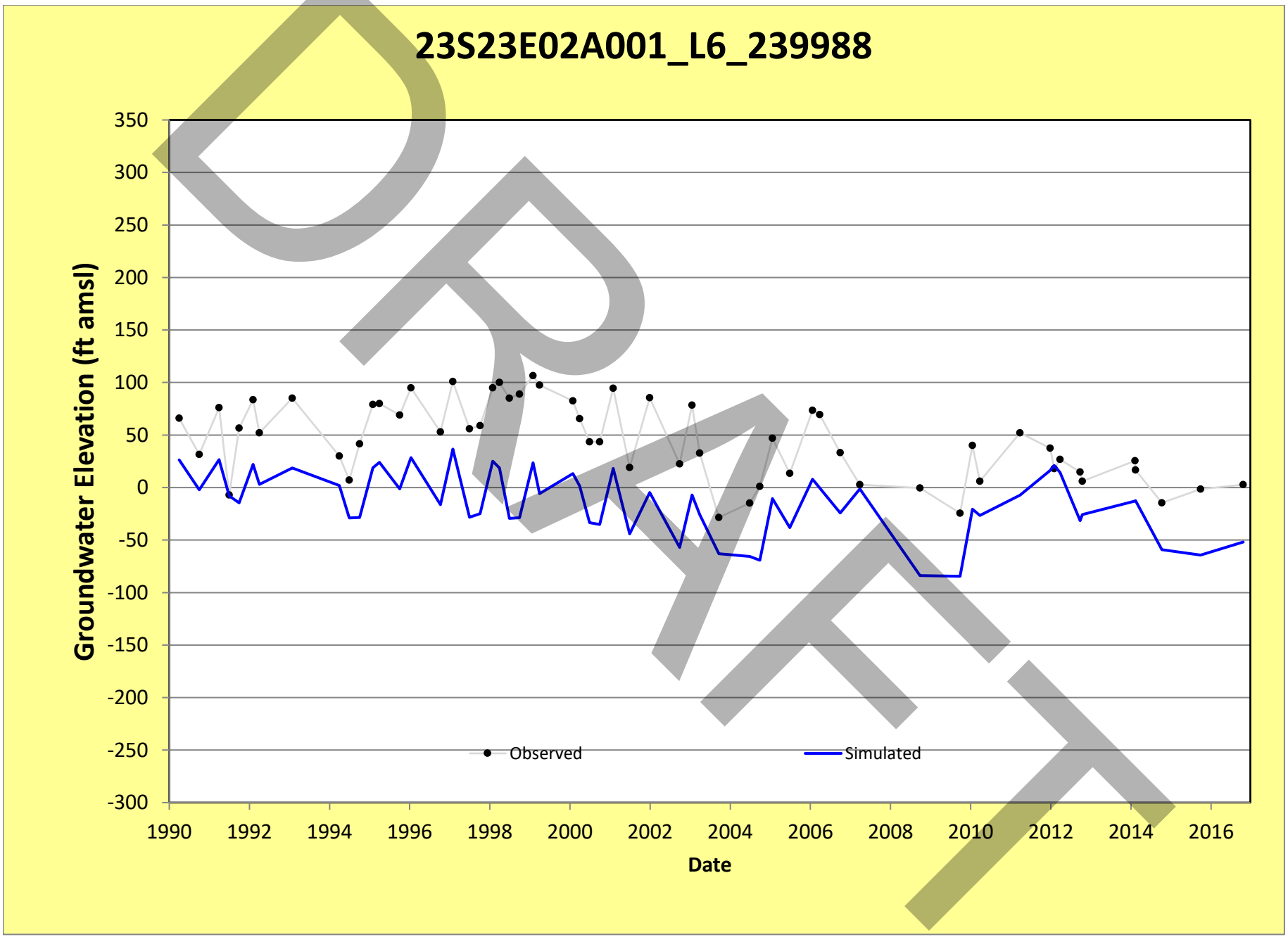
23S23E02A001_L6_239988
Groundwater Elevation (ft amsl)
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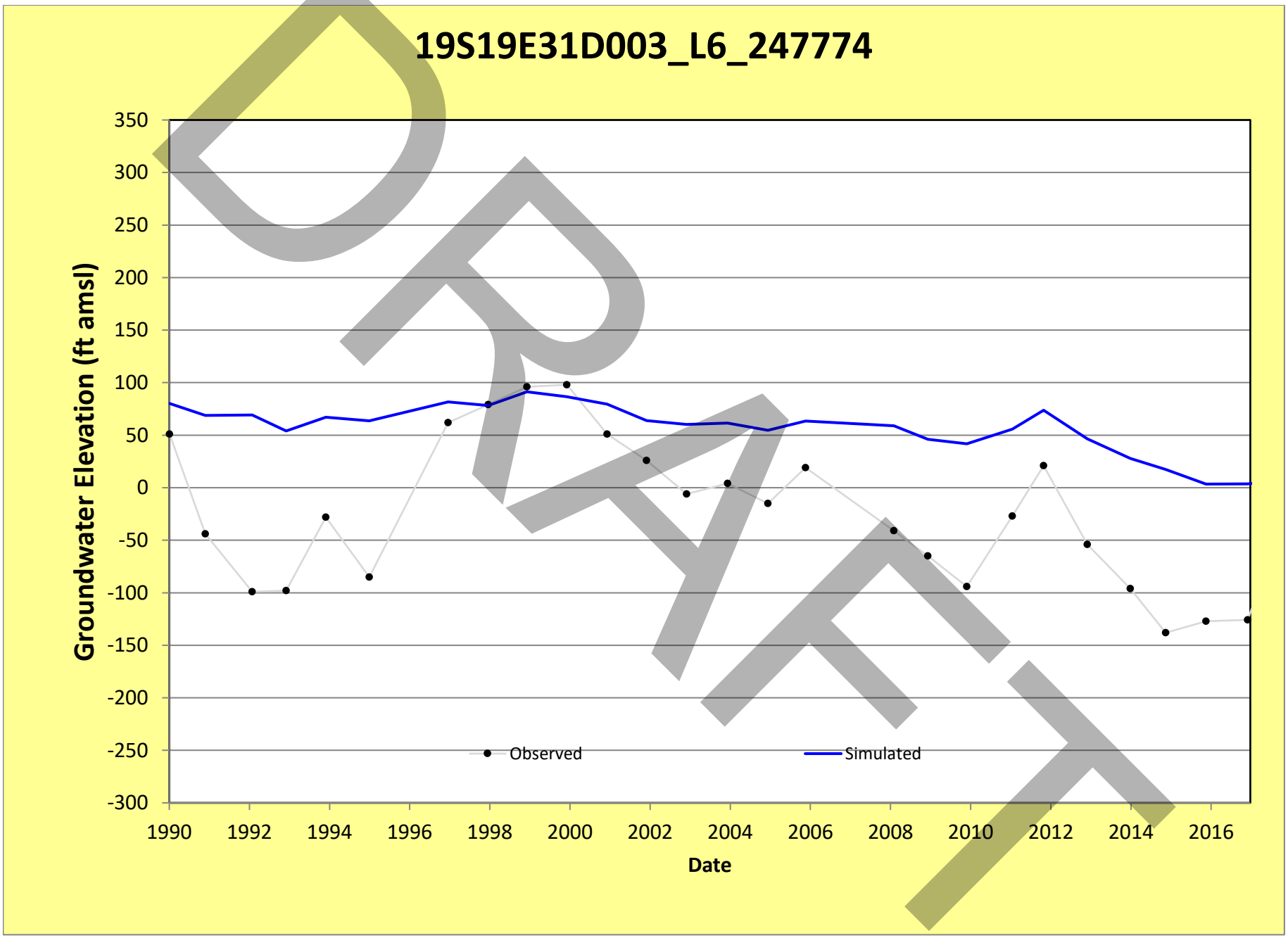
19S19E31D003_L6_247774
Groundwater Elevation (ft amsl)
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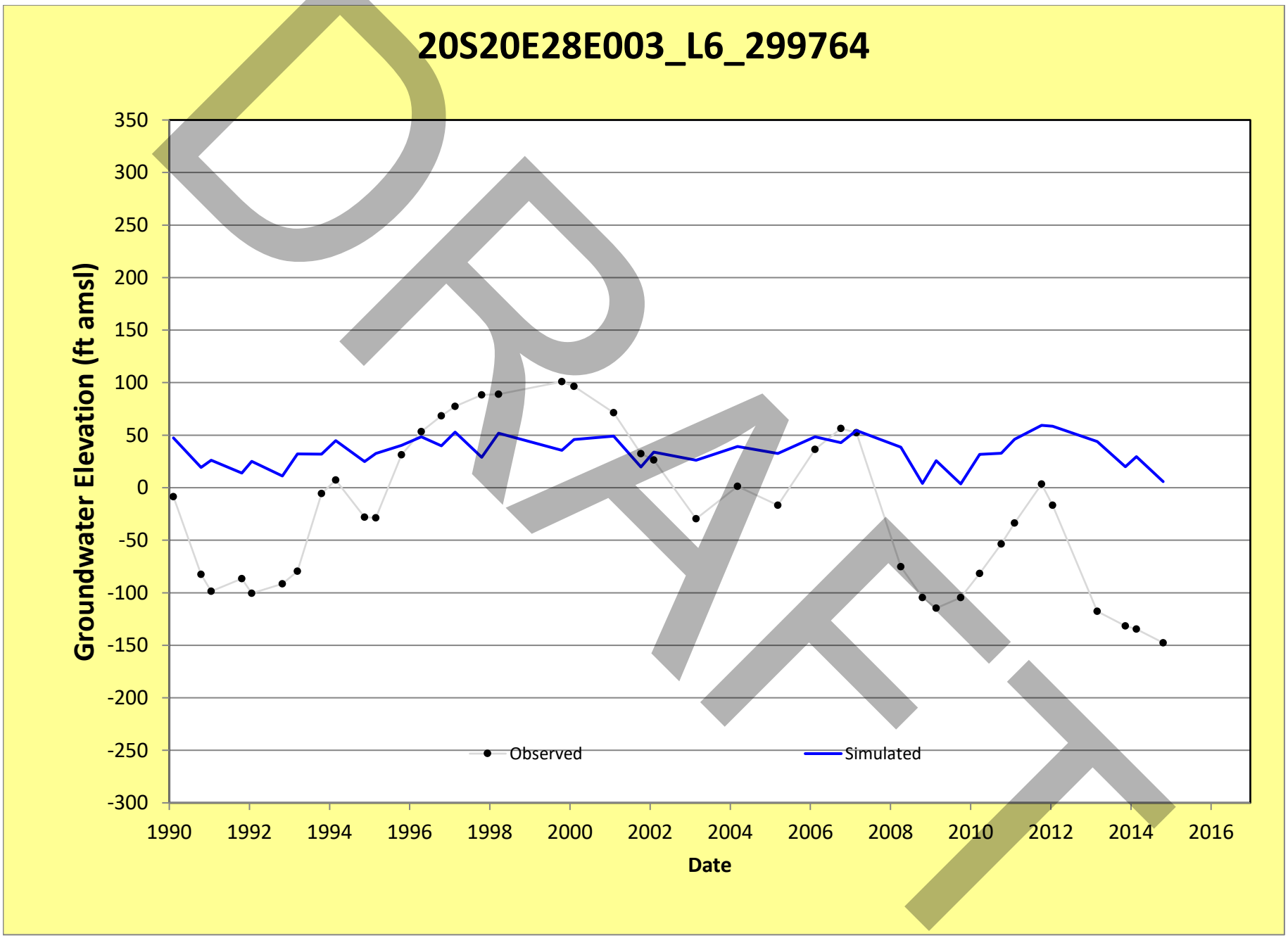
20S20E28E003_L6_299764
Groundwater Elevation (ft amsl)
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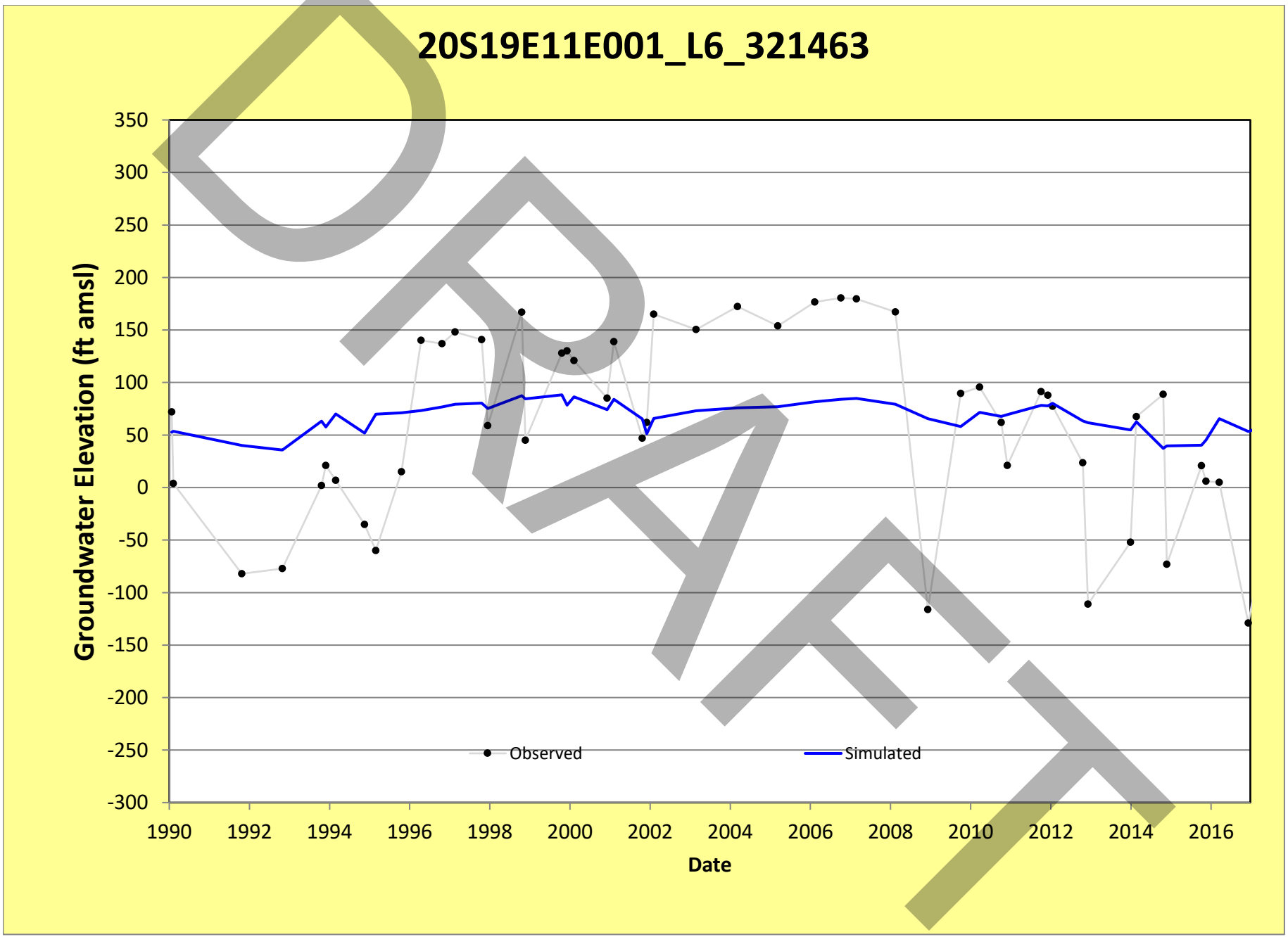
20S19E11E001_L6_321463
Groundwater Elevation (ft amsl)
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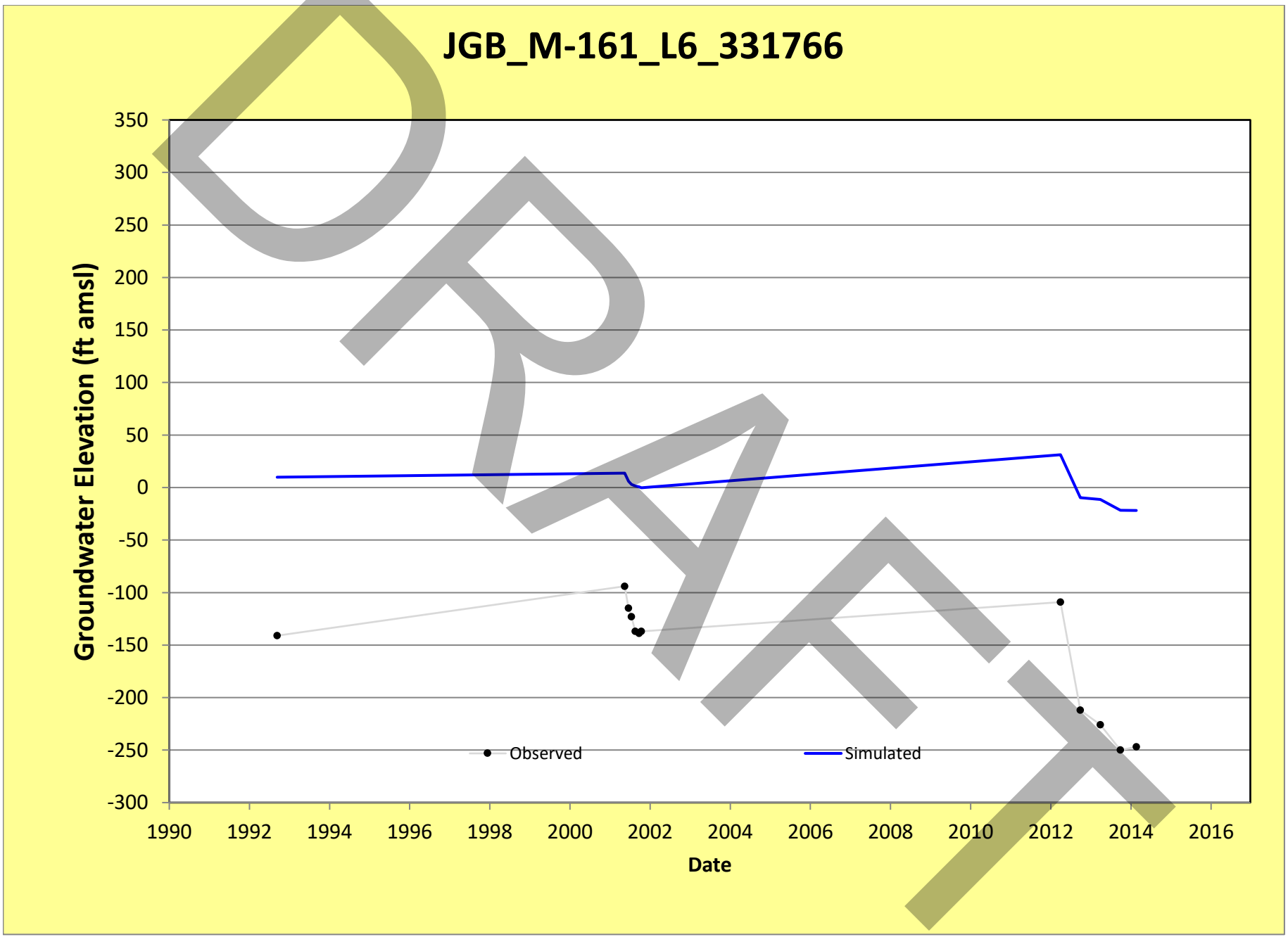
Observed
Simulated
DRAFT


JGB_M-161_L6_331766
Groundwater Elevation (ft amsl)
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300
250
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150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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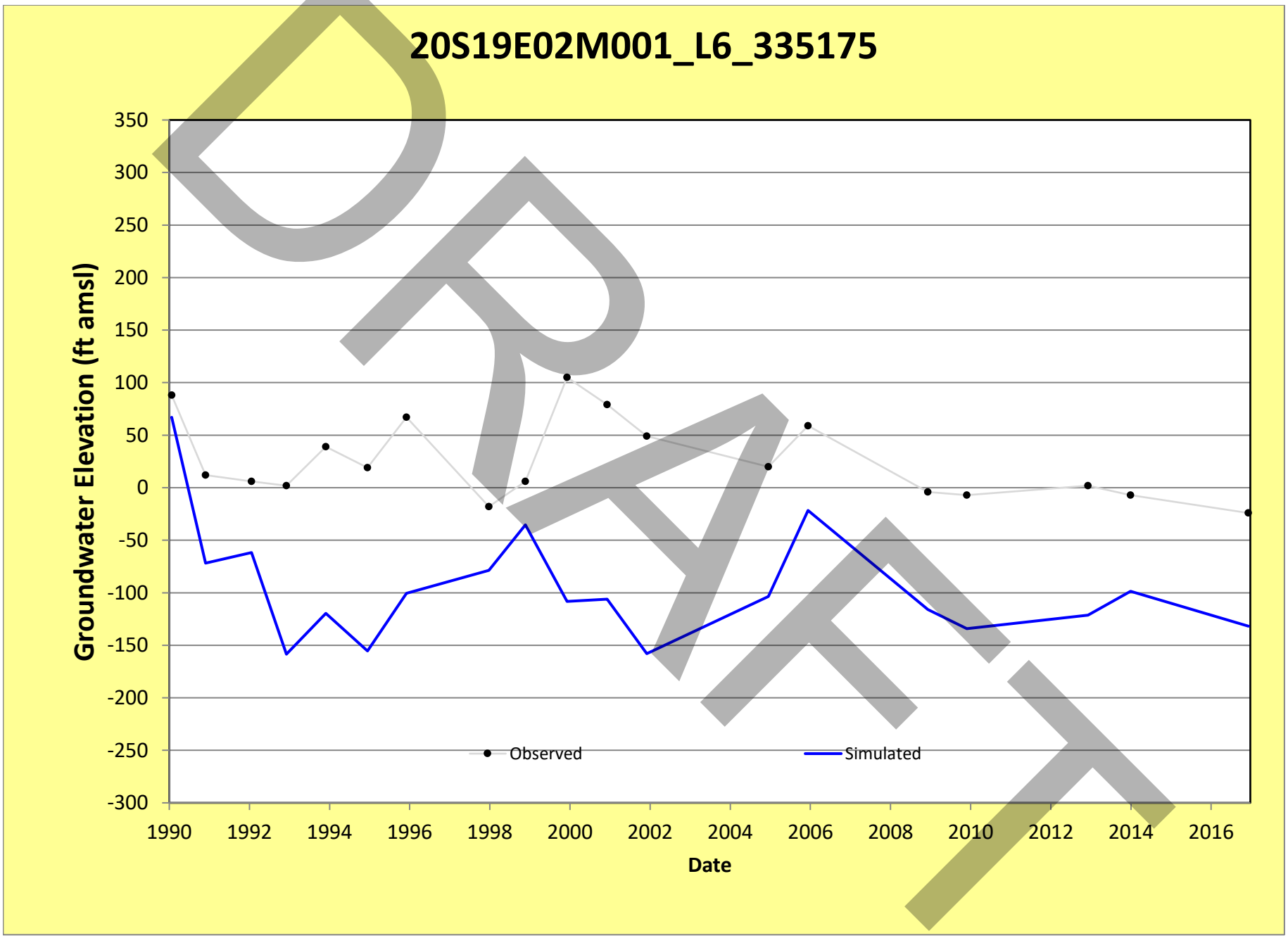
Date
Observed
Simulated
DRAFT


20S19E02M001_L6_335175
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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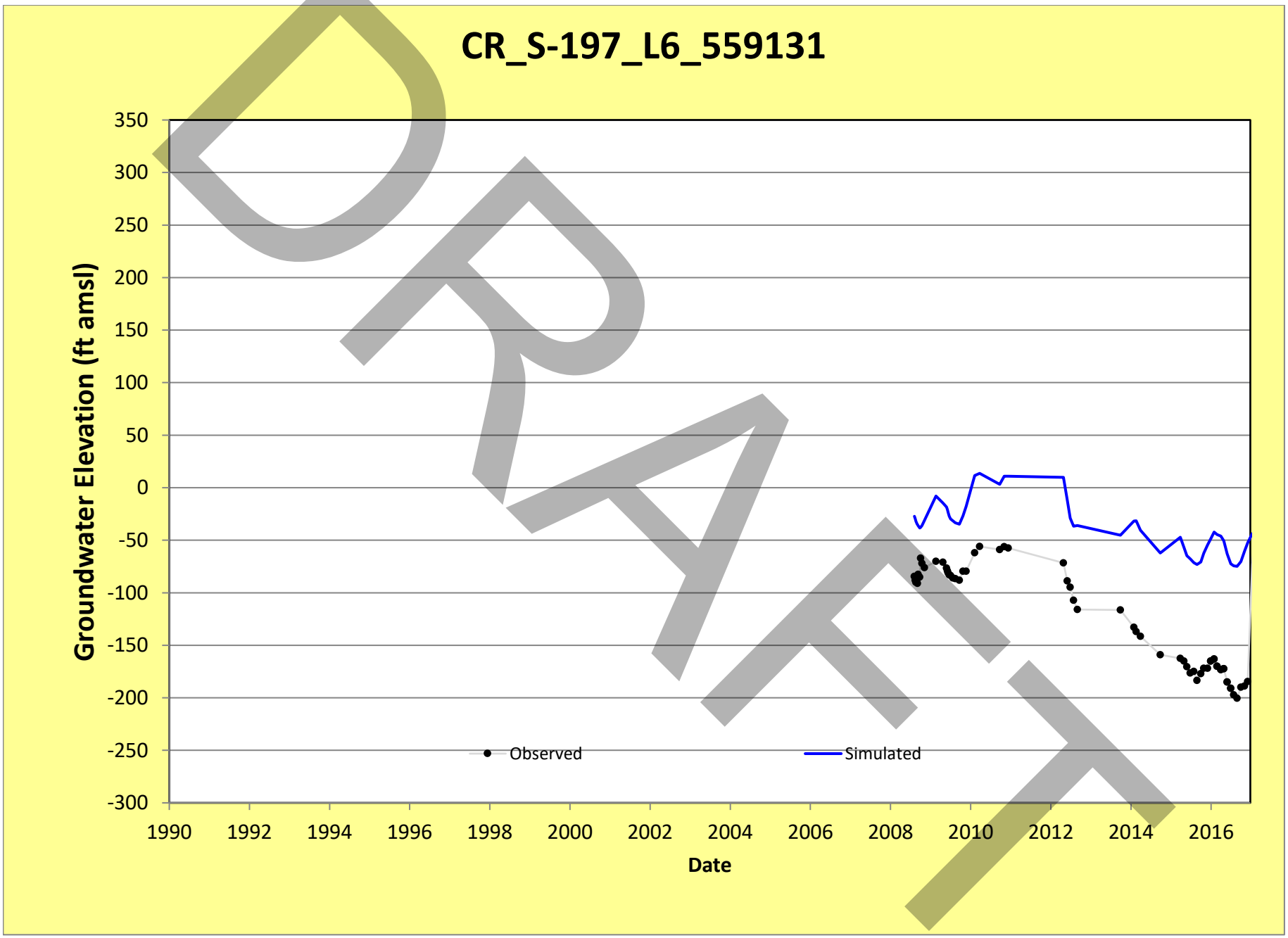
Date
Observed
Simulated
DRAFT


CR_S-197_L6_559131
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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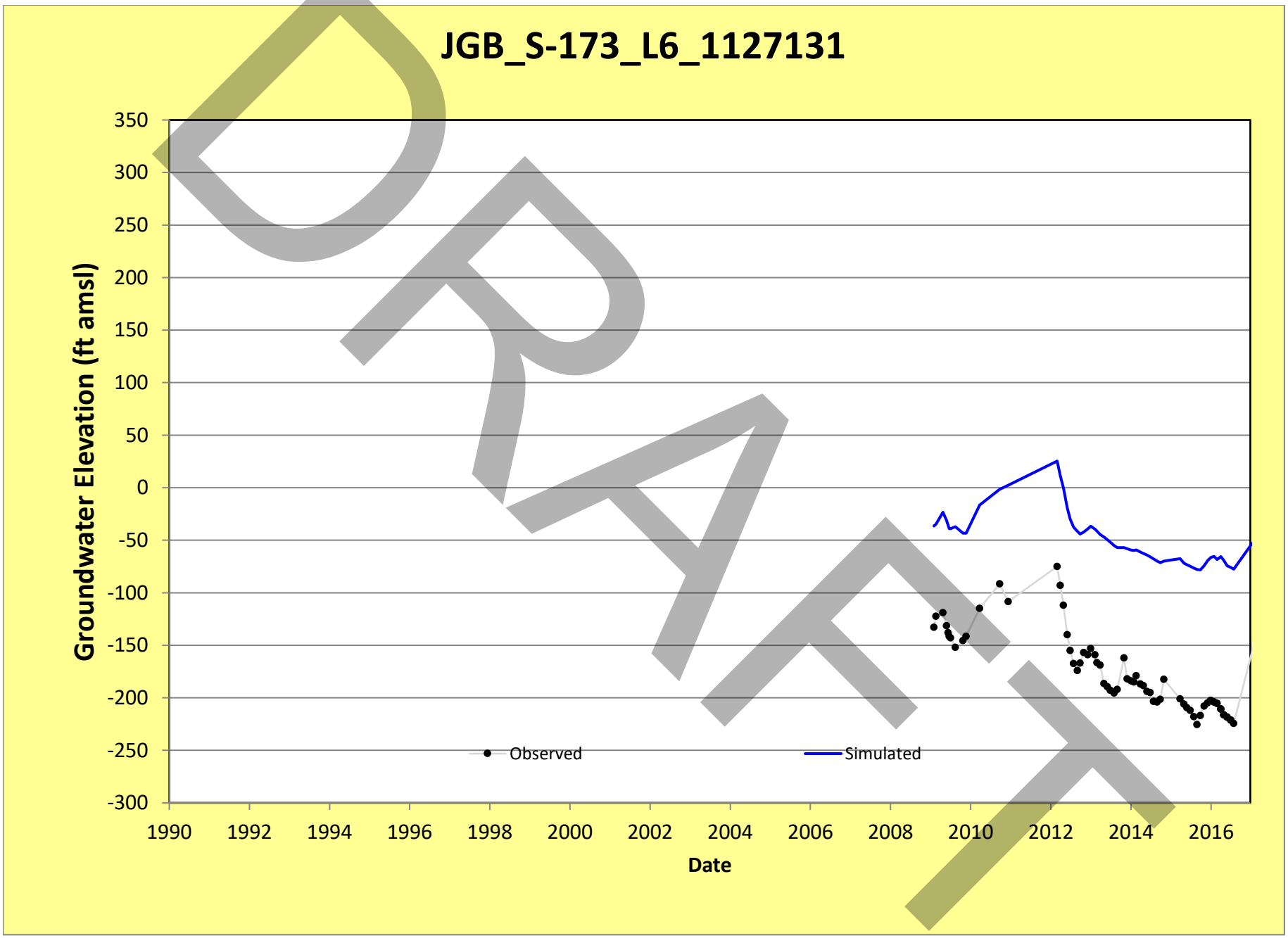
Date
Observed
Simulated
DRAFT


JGB_S-173_L6_1127131
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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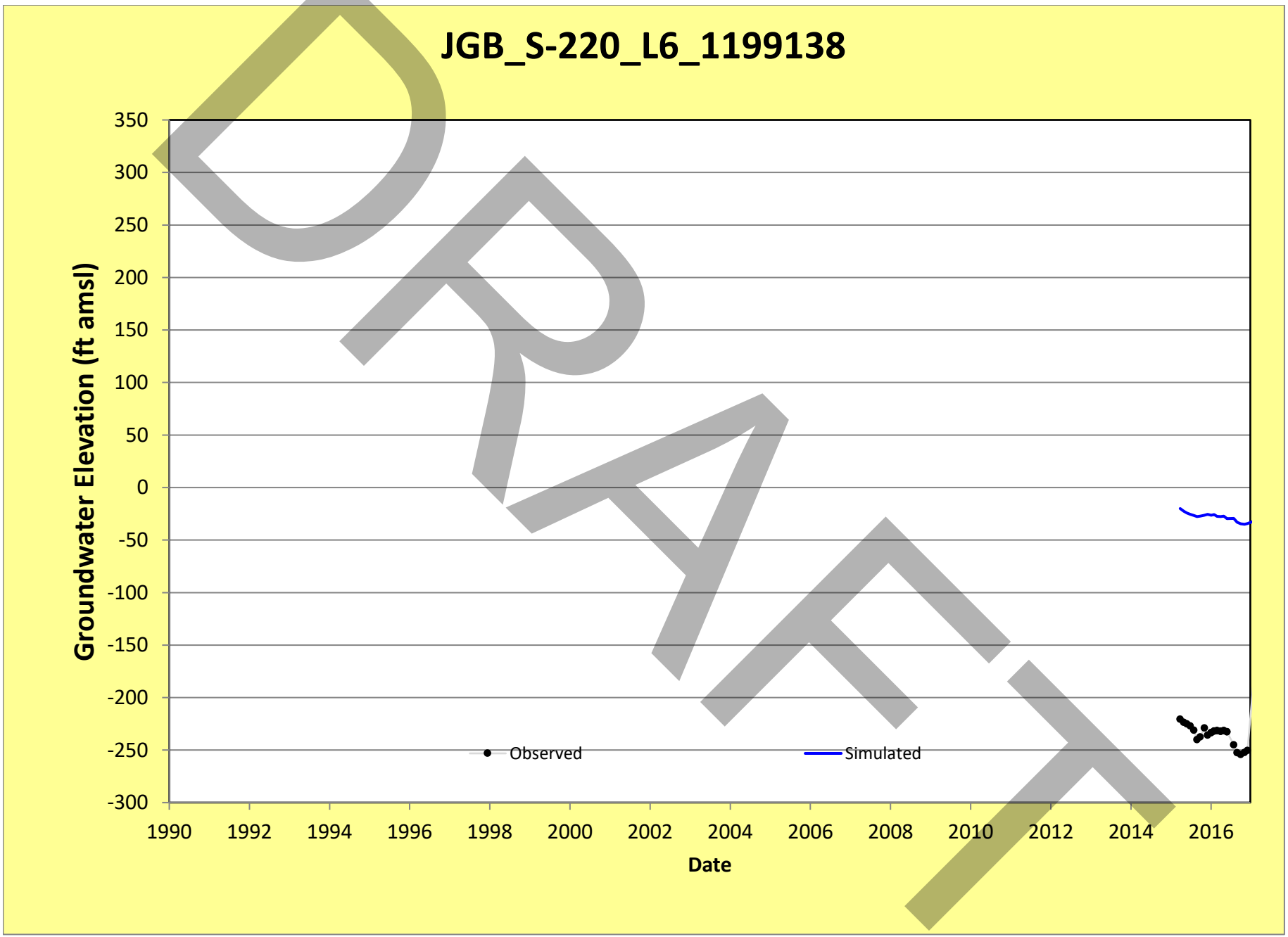
Date
Observed
Simulated
DRAFT


JGB_S-220_L6_1199138
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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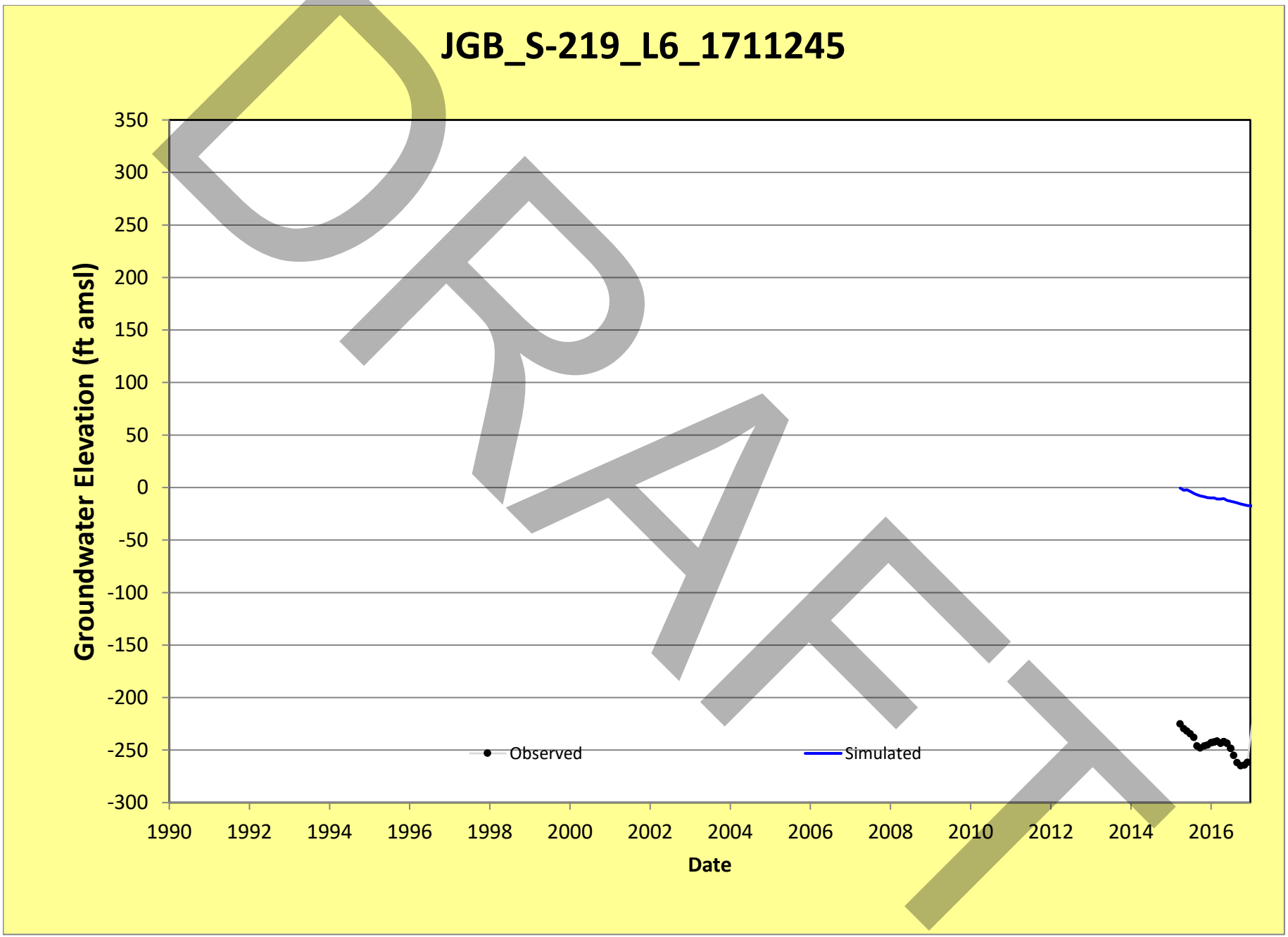
Date
Observed
Simulated
DRAFT


JGB_S-219_L6_1711245
Groundwater Elevation (ft amsl)
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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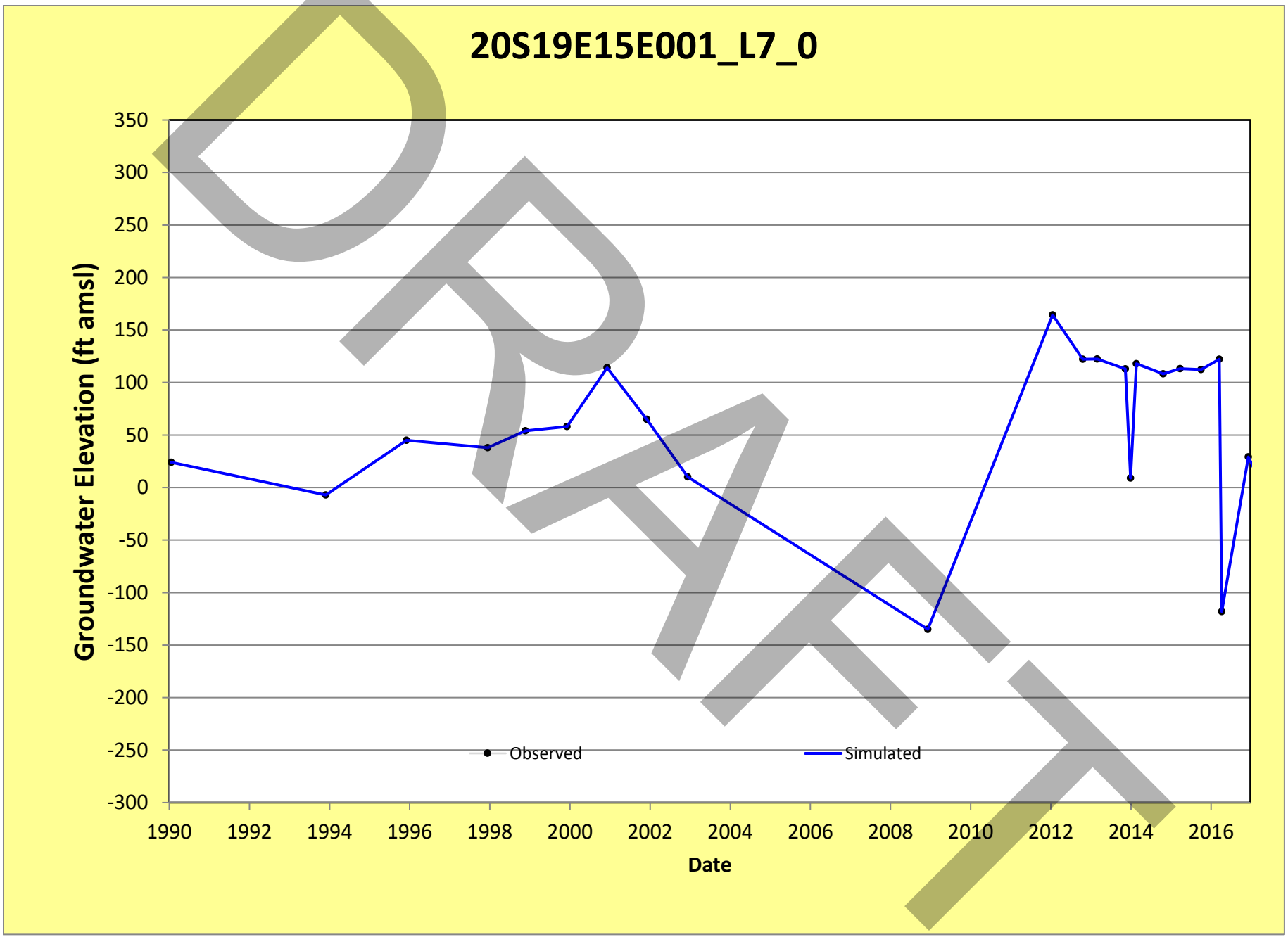
Date
Observed
Simulated
DRAFT


20S19E15E001_L7_0
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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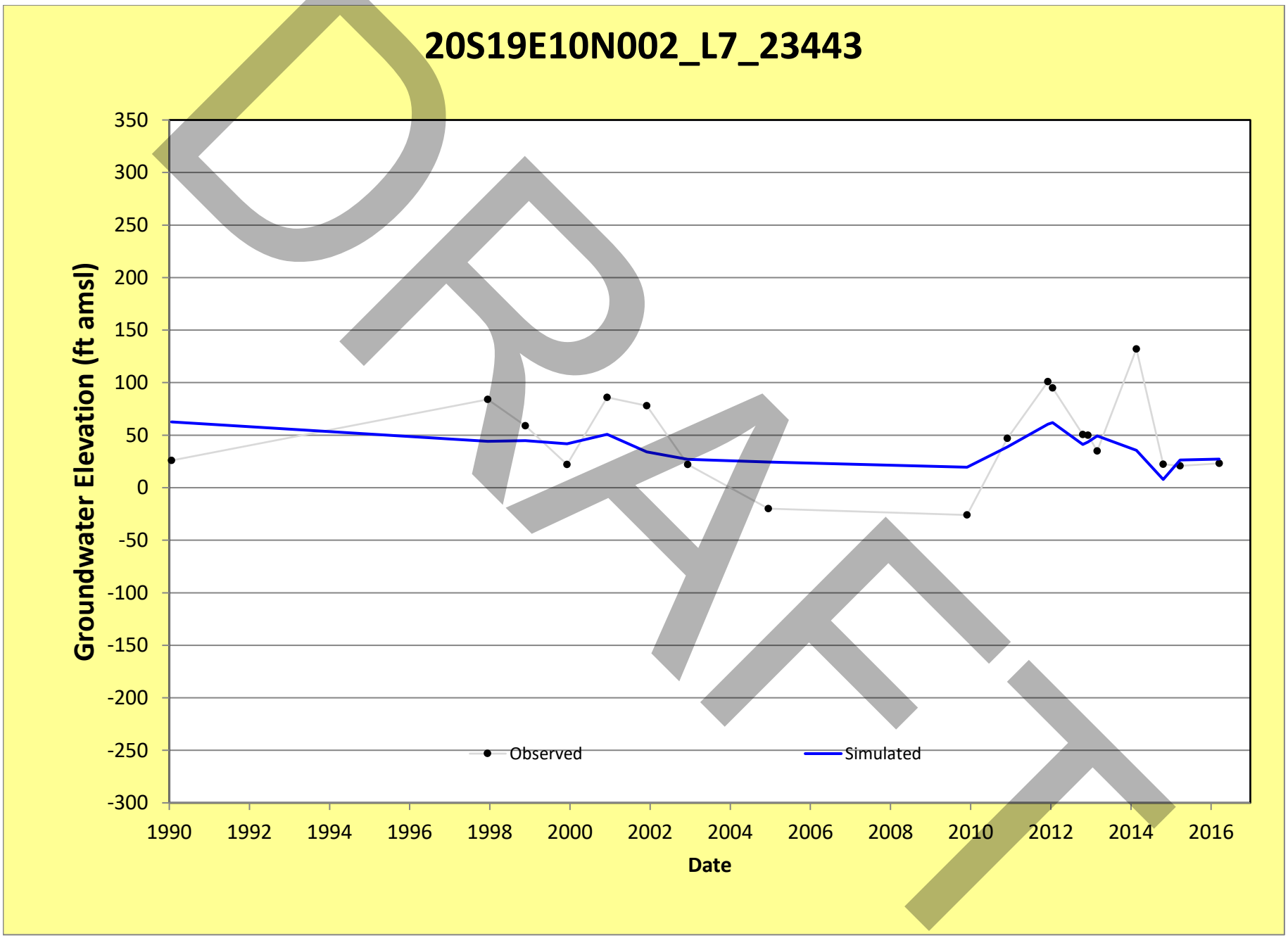
Date
Observed
Simulated
DRAFT


20S19E10N002_L7_23443
Groundwater Elevation (ft amsl)
350
300
250
200
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100
50
0
-50
-100
-150
-200
-250
-300
1990
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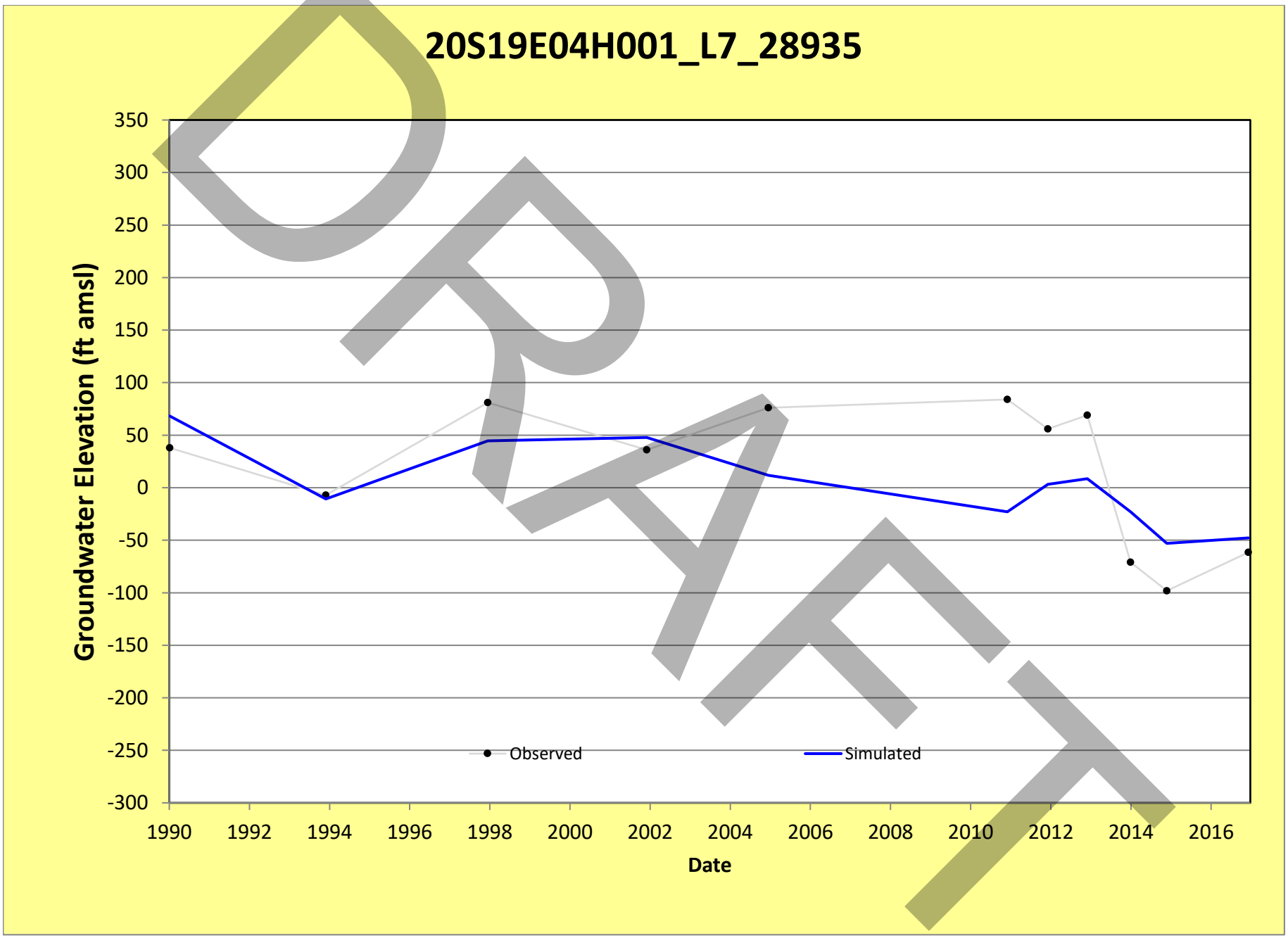
Date
Observed
Simulated
DRAFT


20S19E04H001_L7_28935
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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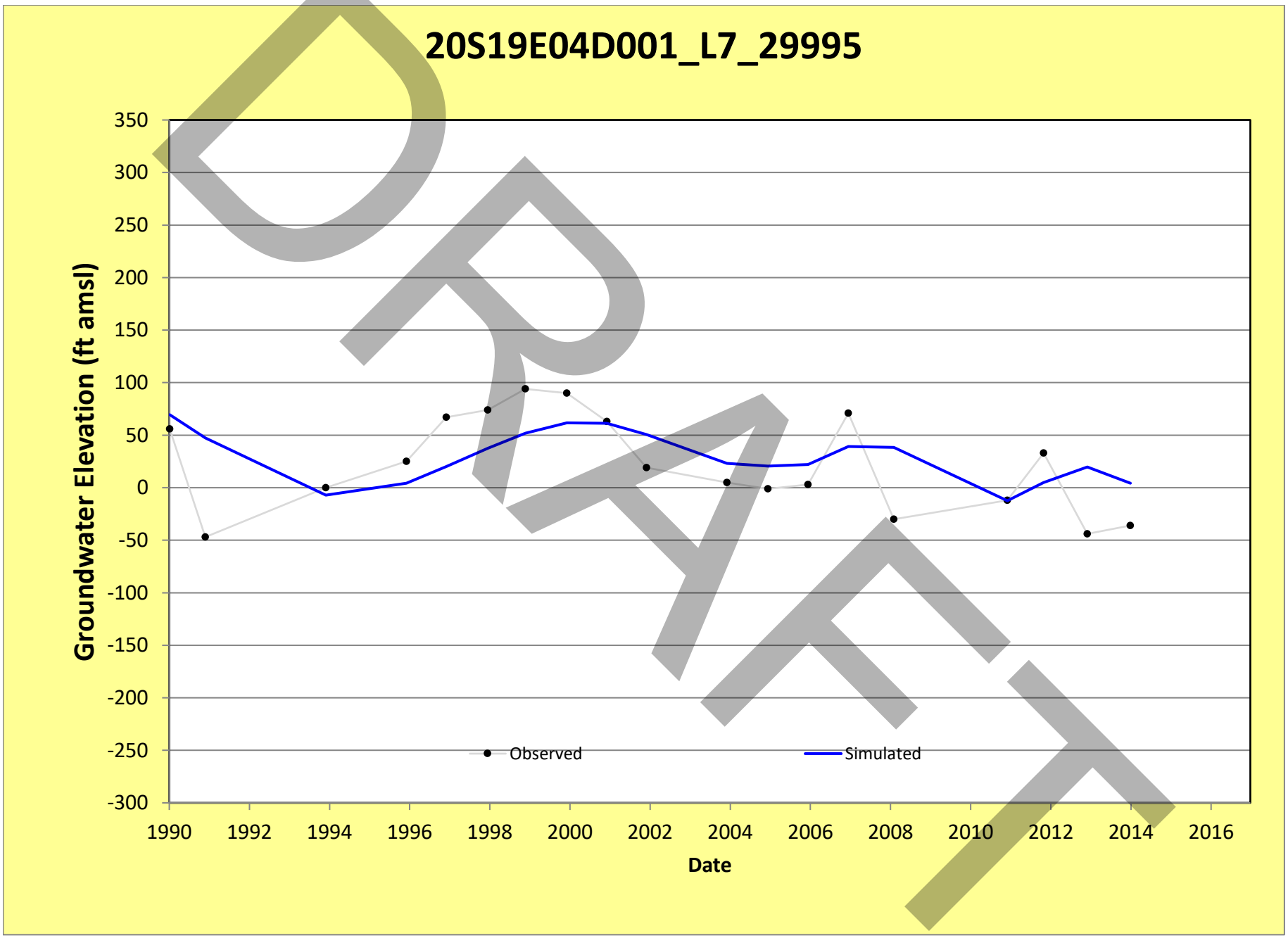
Date
Observed
Simulated
DRAFT


20S19E04D001_L7_29995
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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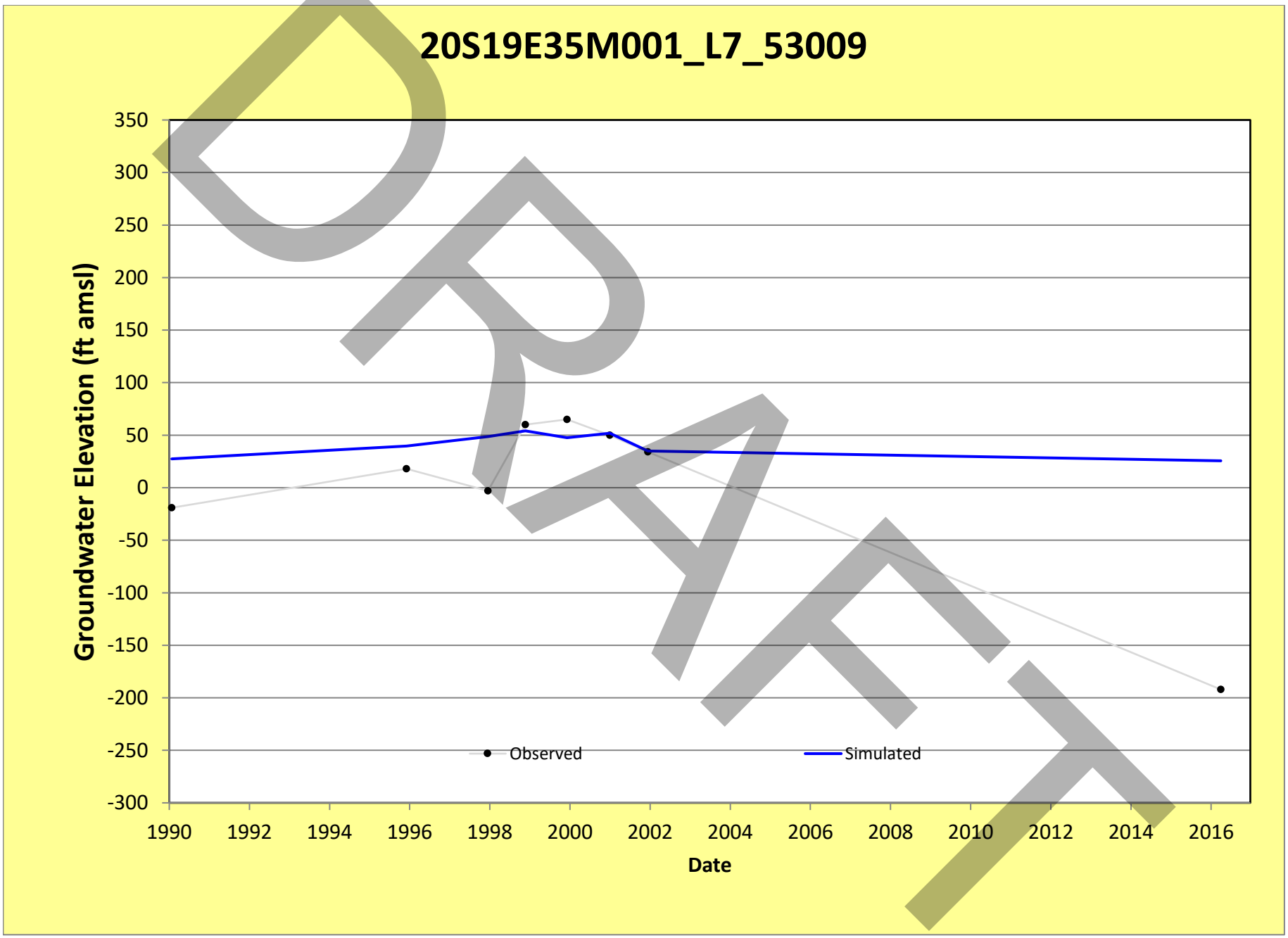
Date
Observed
Simulated
DRAFT


20S19E35M001_L7_53009
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
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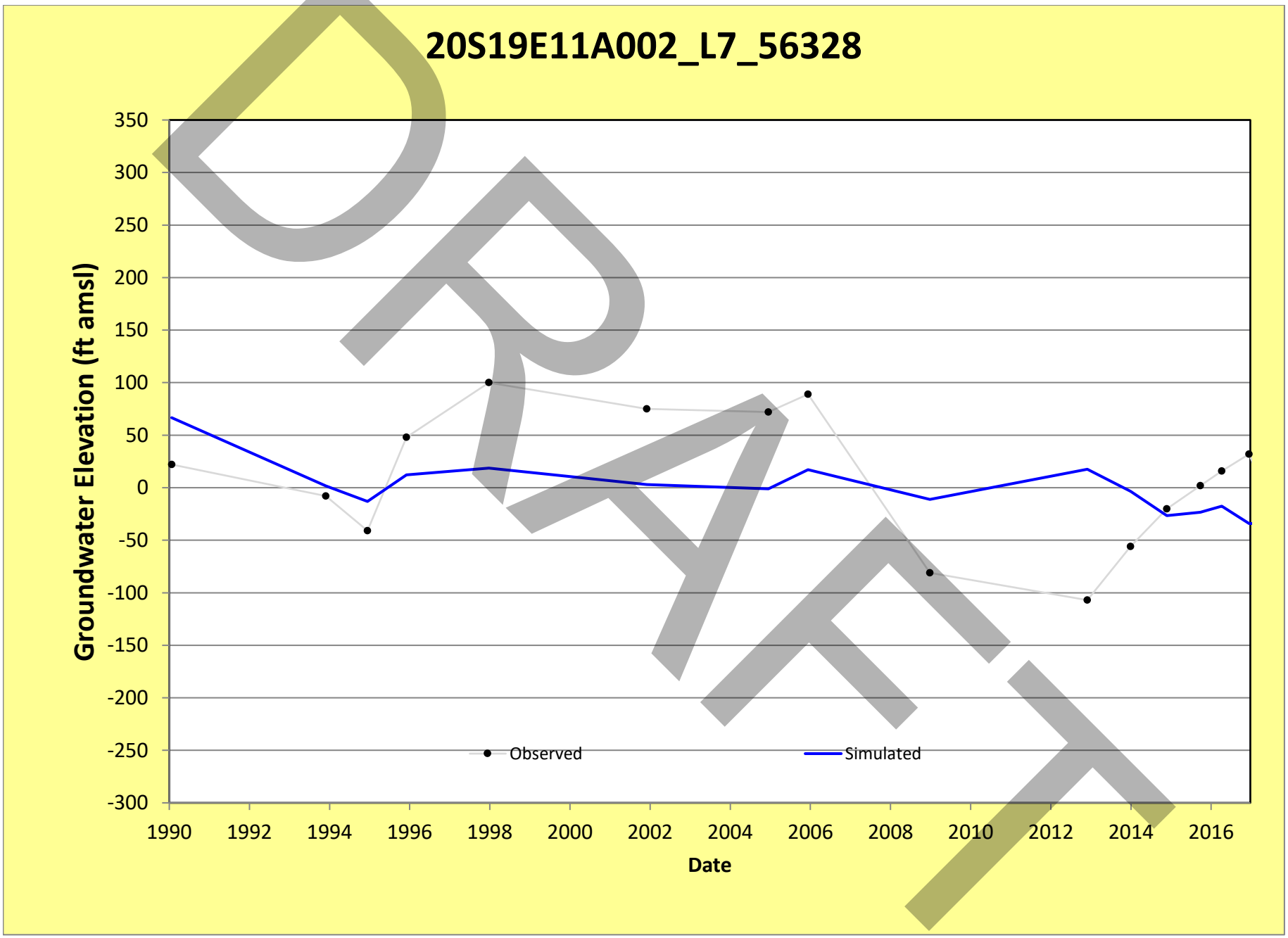
Date
Observed
Simulated
DRAFT


20S19E11A002_L7_56328
Groundwater Elevation (ft amsl)
350
300
250
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100
50
0
-50
-100
-150
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-300
1990
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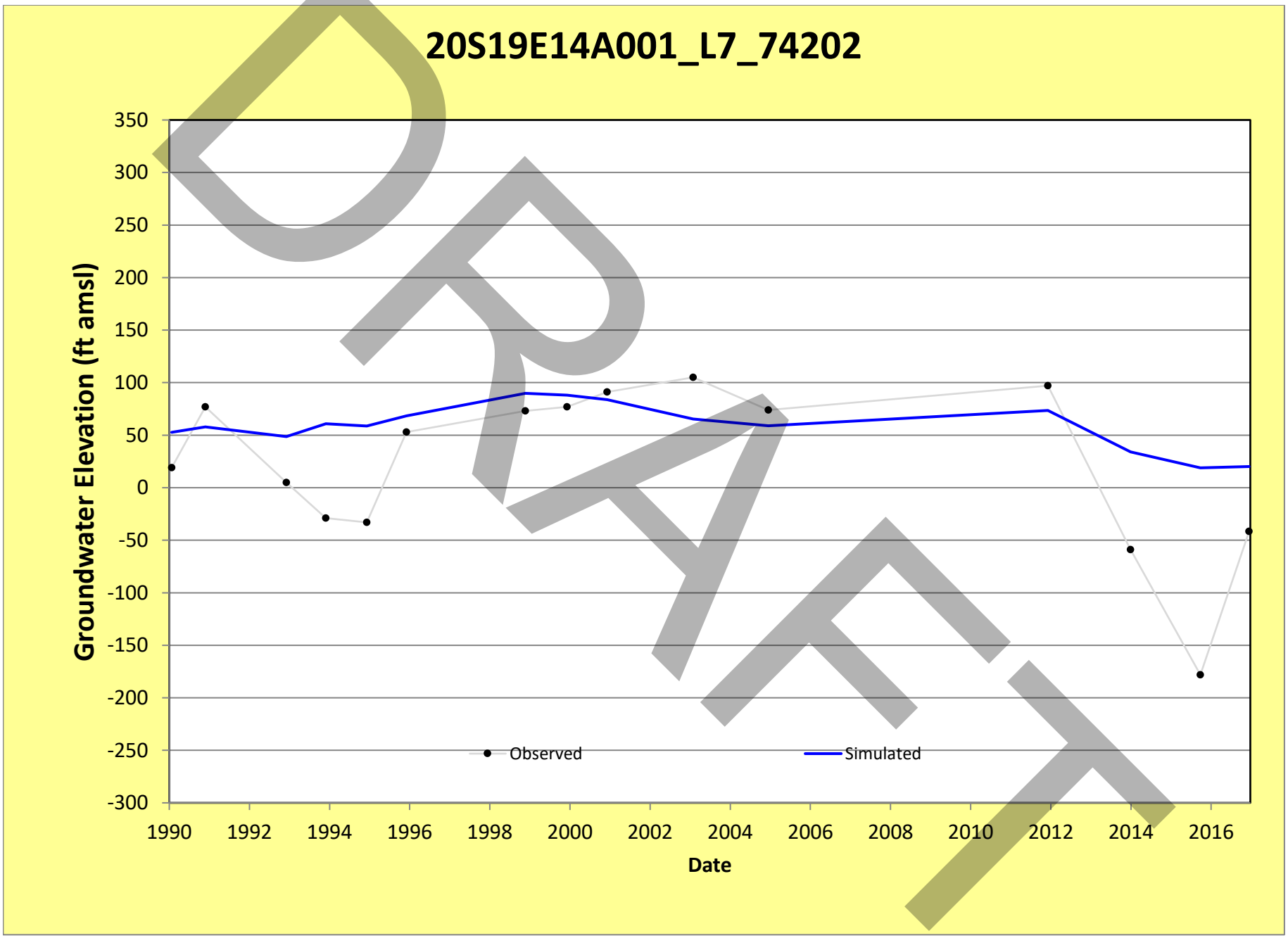
Date
Observed
Simulated
DRAFT


20S19E14A001_L7_74202
Groundwater Elevation (ft amsl)
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300
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-50
-100
-150
-200
-250
-300
1990
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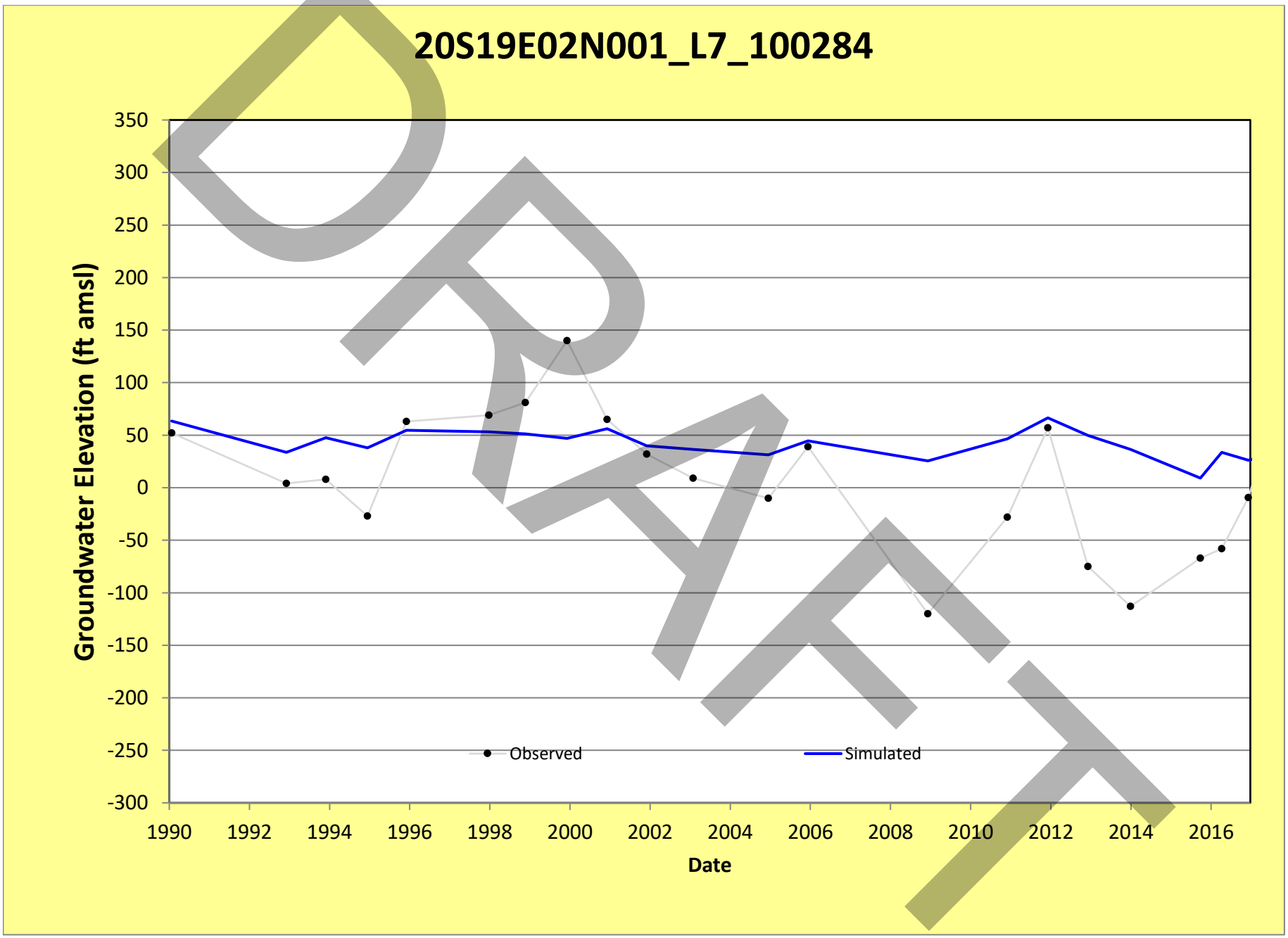
Date
Observed
Simulated
DRAFT


20S19E02N001_L7_100284
Groundwater Elevation (ft amsl)
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300
250
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100
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-50
-100
-150
-200
-250
-300
1990
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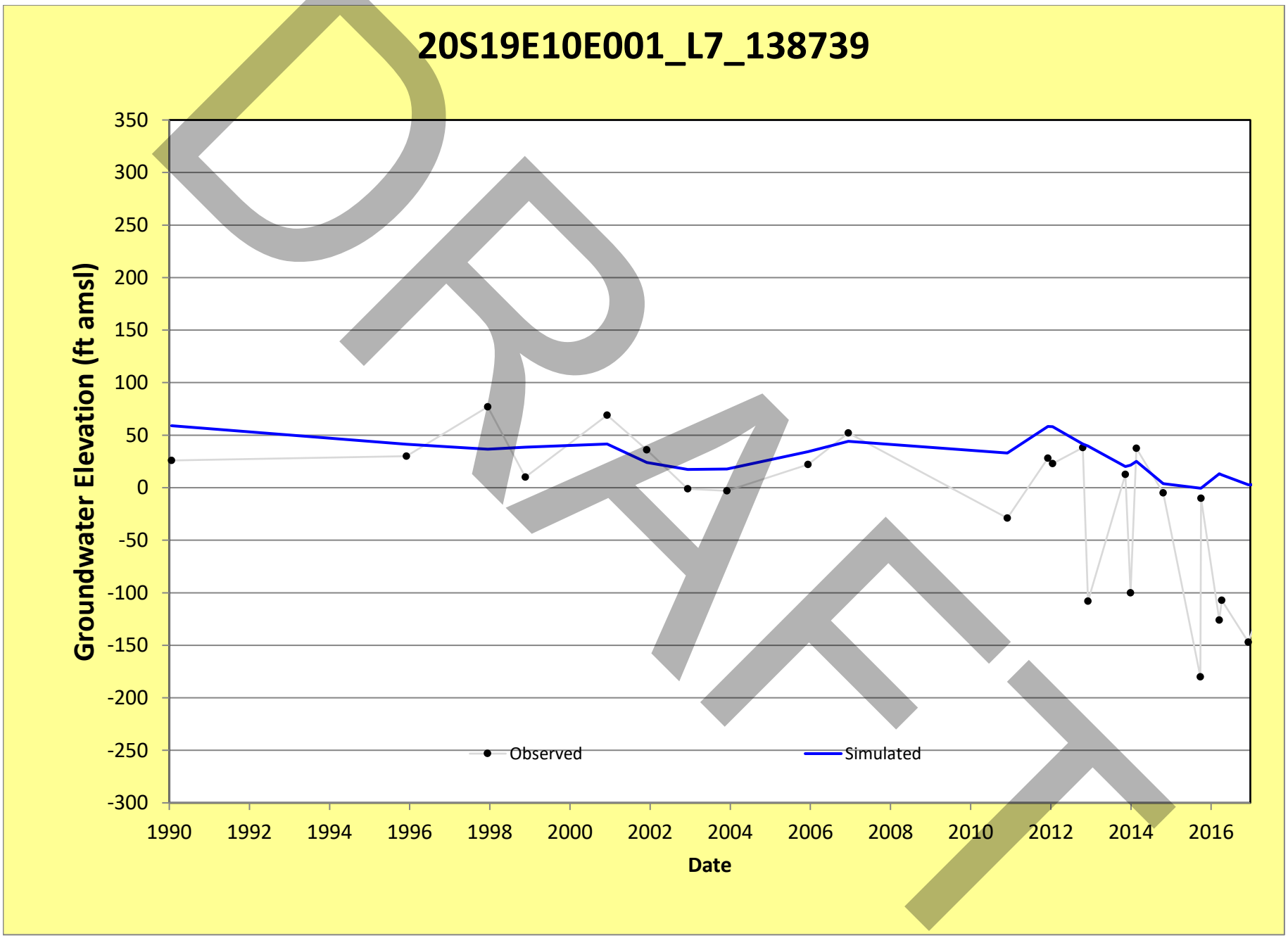
Date
Observed
Simulated
DRAFT


20S19E10E001_L7_138739
Groundwater Elevation (ft amsl)
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300
250
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100
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-50
-100
-150
-200
-250
-300
1990
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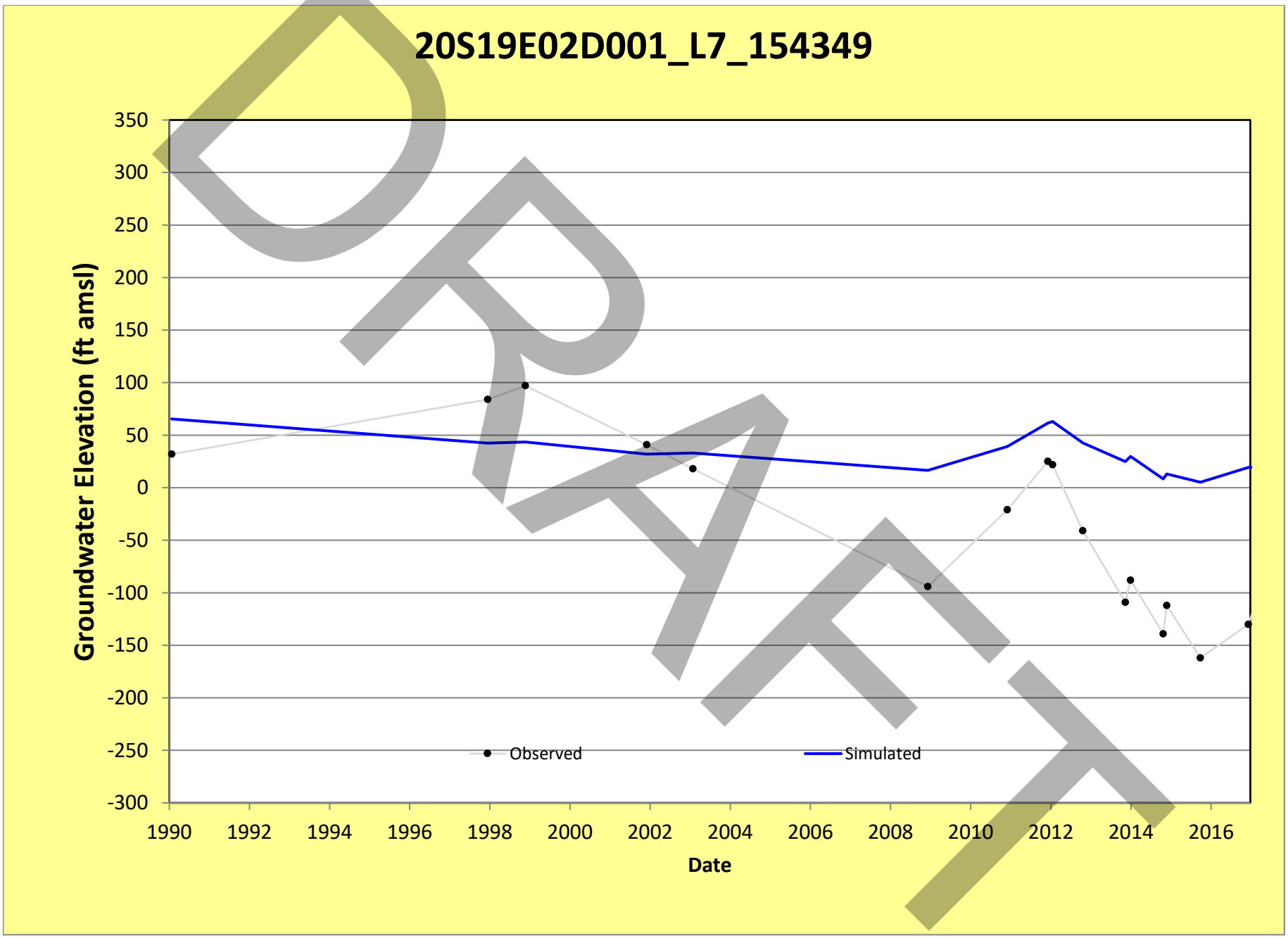
Date
Observed
Simulated
DRAFT


20S19E02D001_L7_154349
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
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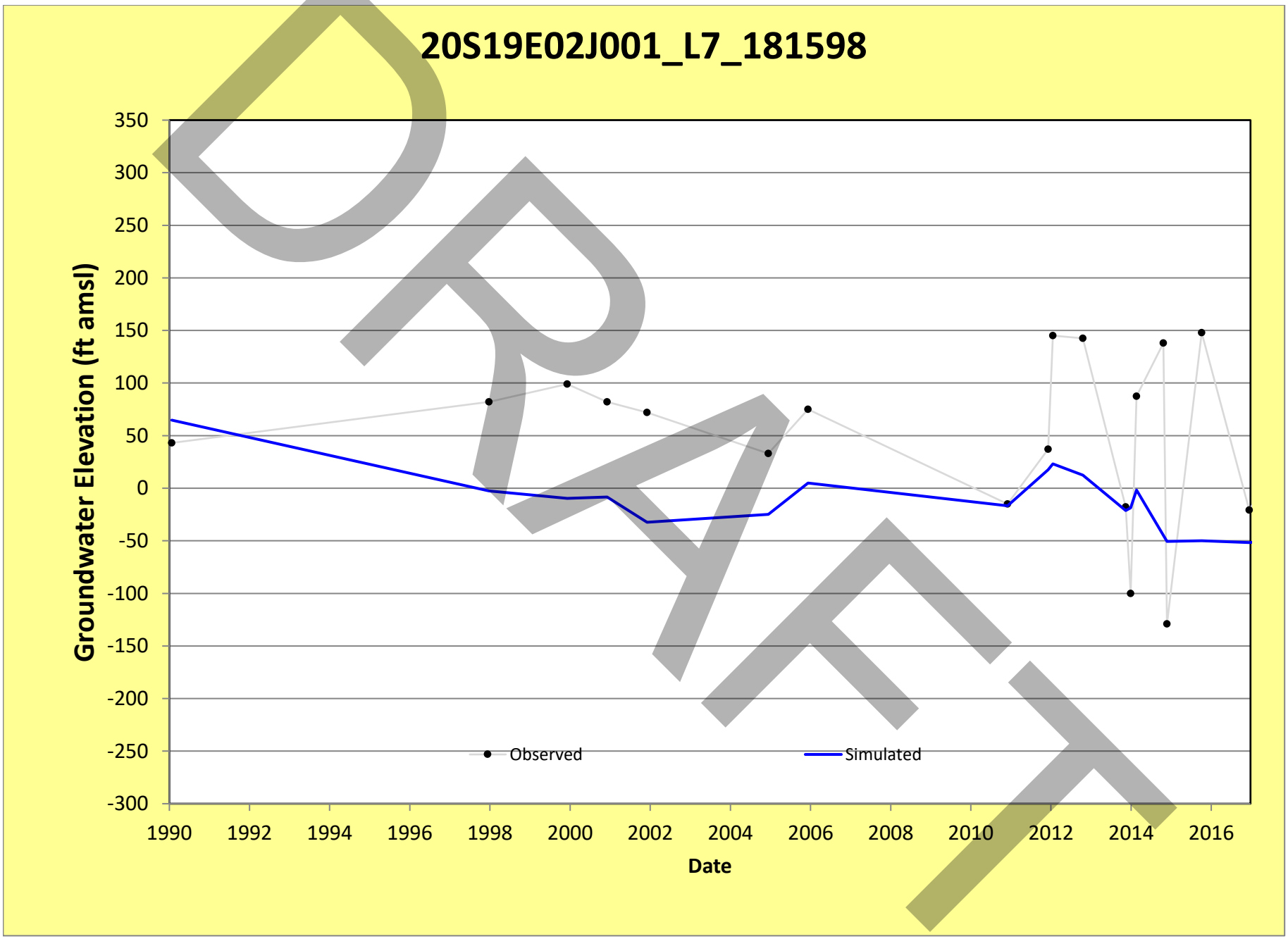
Date
Observed
Simulated
DRAFT


20S19E02J001_L7_181598
Groundwater Elevation (ft amsl)
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300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
1990
1992
1994
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2010
2012
2014
2016
Date
Observed
Simulated
DRAFT