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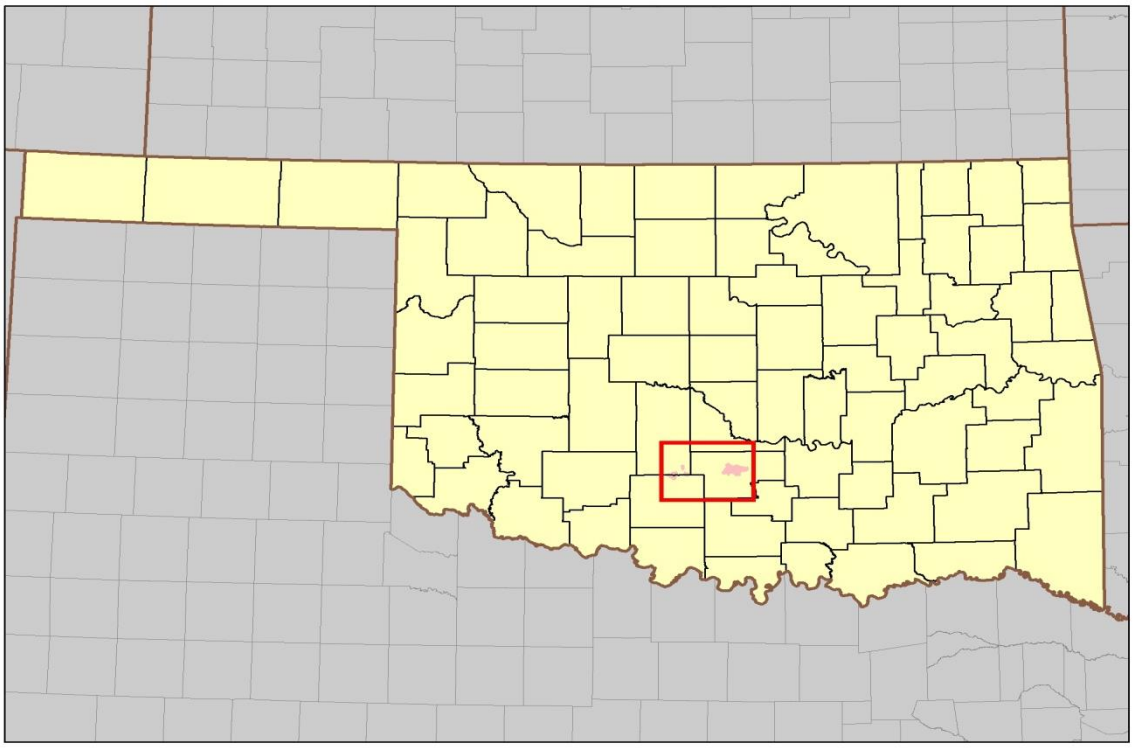
2013 MINERAL TOTAL MAXIMUM DAILY LOADS FOR RUSH CREEK WATERSHED, OKLAHOMA (OK310810)



Prepared for:

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

Prepared by:

PARSONS

JULY 2013

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2013 MINERAL TOTAL MAXIMUM DAILY LOADS FOR RUSH CREEK WATERSHED, OKLAHOMA (OK310810)

OKWBID

OK310810010090_10, OK310810010270_00, OK310810050040_00, OK310810050110_00, OK310810050120_00, OK310810050130_00, OK310810050140_00

Prepared for:

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

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JULY 2013

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ACRONYMS AND ABBREVIATIONS

AEMS	Agricultural Environmental Management Services
BMP	Best Management Practice
CAFO	Concentrated Animal Feeding Operation
CFR	Code of Federal Regulations
cfs	Cubic feet per second
CWA	Clean Water Act
DEQ	Oklahoma Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
LA	Load allocation
LDC	Load duration curve
mg/L	Milligram per liter
mgd	Million gallons per day
mL	Milliliter
MOS	Margin of safety
MS4	Municipal separate storm sewer system
NCDC	National Climate Data Center
NPDES	National Pollutant Discharge Elimination System
NSQD	National Stormwater Quality Database
OAC	Oklahoma Administrative Code
O.S.	Oklahoma Statute
ODAFF	Oklahoma Department of Agriculture, Food and Forestry
OCC	Oklahoma Conservation Commission
OKWBID	Oklahoma Waterbody Identification Number
OPDES	Oklahoma Pollutant Discharge Elimination System
OWRB	Oklahoma Water Resources Board
PFO	Poultry Feeding Operation
ppm	Parts per million
PRG	Percent reduction goal
RMSE	Root mean square error
SFO	Swine Feeding Operation
TDS	Total dissolved solids
TMDL	Total maximum daily load
USGS	U.S. Geological Survey
WLA	Wasteload allocation
WQM	Water quality monitoring

WQMP	Water Quality Management Plan
WQS	Water Quality Standard
WWAC	Warm Water Aquatic Community
WWTF	Wastewater treatment facility

Executive Summary

This report documents the data and assessment used to establish TMDLs for chlorides, sulfates and total dissolved solids (TDS) for selected waterbodies in the Rush Creek watershed. Data assessment and total maximum daily load (TMDL) calculations are conducted in accordance with requirements of Section 303(d) of the CWA, Water Quality Planning and Management Regulations (40 CFR Part 130), U.S. Environmental Protection Agency (EPA) guidance, and Oklahoma Department of Environmental Quality (DEQ) guidance and procedures. DEQ is required to submit all TMDLs to EPA for review. Approved 303(d) listed waterbody-pollutant pairs or surrogates TMDLs will received notification of the approval or disapproval action. Once the EPA approves a TMDL, then the waterbody may be moved to Category 4a of a state's Integrated Water Quality Monitoring and Assessment Report, where it remains until compliance with water quality standards (WQS) is achieved (EPA 2003).

The purpose of this TMDL report is to establish pollutant load allocations for minerals in impaired waterbodies, which is the first step toward restoring water quality and protecting public health. TMDLs determine the pollutant loading a waterbody can assimilate without exceeding the WQS for that pollutant. TMDLs also establish the pollutant load allocation necessary to meet the WQS established for a waterbody based on the relationship between pollutant sources and in-stream water quality conditions. A TMDL consists of a wasteload allocation (WLA), load allocation (LA), and a margin of safety (MOS). The WLA is the fraction of the total pollutant load apportioned to point sources, and includes stormwater discharges regulated under the National Pollutant Discharge Elimination System (NPDES). The LA is the fraction of the total pollutant load apportioned to nonpoint sources. MOS can be implicit and/or explicit. An implicit MOS is achieved by using conservative assumptions in the TMDL calculations. An explicit MOS is a percentage of the TMDL set aside to account for the lack of knowledge associated with natural process in aquatic systems, model assumptions, and data limitations.

This report does not stipulate specific control actions (regulatory controls) or management measures (voluntary best management practices) necessary to reduce the dissolved mineral concentrations within each watershed. Watershed-specific control actions and management measures will be identified, selected, and implemented under a separate process.

E.1 Problem Identification and Water Quality Target

This TMDL report focuses on waterbodies, identified in Table ES-1 that DEQ placed in Category 5 [303(d) list] of the *Water Quality in Oklahoma, 2010 Integrated Report* (2010 Integrated Report)[1] for nonsupport of the agriculture water supply beneficial use. Six of the waterbodies within the Study Area were listed as a result of elevated levels of chlorides, while Murray Creek was listed for elevated levels of sulfates and total dissolved solids (TDS).

[1] When the study was done, the 2008 Integrated Report was used. However, there were no differences in beneficial uses or impairments for these waterbodies in the Rush Creek watershed between the 2008 and 2010 Integrated Report.

Elevated levels of chloride, sulfates, and TDS above the WQS numeric criteria result in the requirement that a TMDL be developed. The TMDLs established in this report are a necessary step in the process to develop the pollutant loading controls needed to restore the agriculture water supply use designated for each waterbody. The TMDL priority shown in Table ES-1 is directly related to the TMDL target date.

Table ES-1 Excerpt from the 2010 Integrated Report – Oklahoma 303(d) List of Impaired Waters (Category 5)

Waterbody ID	Name	Stream Miles	TMDL Date	Priority	Chloride	Sulfates	TDS	Designated Use Agriculture Water Supply
OK310810050040_00	Murray Creek	6.66	2021	4		X	X	N
OK310810050130_00	Cox City Creek	3.206	2021	4	X			N
OK310810050140_00	West Cox City Creek	1.5	2021	4	X			N
OK310810050110_00	Rush Creek Tributary D	0.71	2021	4	X			N
OK310810050120_00	Rush Creek Tributary E	3.397	2021	4	X			N
OK310810010270_00	Rush Creek Tributary G	4.034	2021	4	X			N
OK310810010090_10	Rush Creek	10.302	2021	4	X			N

N = Not attaining; X = Criterion exceeded
Source: 2010 Integrated Report, DEQ 2010

Table ES-2 summarizes water quality data collected from the water quality monitoring (WQM) stations between 1997 and 2010. The data summary in Table ES-2 provides an understanding of the limited amount of water quality data available and an evaluation of the exceedances of the water quality criteria. This data was used to support the decision to place specific waterbodies within the Study Area on the DEQ 2010 §303(d) list (DEQ 2010). Within the Study Area, five of the waterbodies have elevated levels of chloride for which TMDLs will be required.

Further investigation of the chlorides data used to originally list Rush Creek Tributary D (OK310810050110_00) found that these samples were actually taken from a tributary to Rush Creek Tributary E; therefore no TMDL is required for Rush Creek Tributary D. Additionally, no water quality data was available for TDS in Murray Creek (OK310810050040_00); therefore no TMDL is required for this pollutant.

Table ES-2 Summary of Minerals Samples, 1997-2010

Waterbody ID	Waterbody Name	Indicator	Data Period of Record	Number of Samples	Arithmetic Mean Concentration (mg/L)*	Number of Samples Exceeding Single Sample Criterion**	% Samples Exceeding Single Sample Criterion (NS>10%)	AG Use	Notes
OK310810050040_00	Murray Creek	Sulfates	2/28/02 - 8/12/02	3	368	0	0	FS	TMDL Not Required
		TDS	- -	- -	- -	- -	- -	- -	Insufficient number of samples; TMDL not required
OK310810050130_00	Cox City Creek	Chlorides	12/14/05 - 02/8/06	2	513	2	100	NS	TMDL Required
OK310810050140_00	West Cox City Creek	Chlorides	2/12/07 - 4/16/07	2	892	2	100	NS	TMDL Required
		Sulfates[2]	2/12/07 - 4/16/07	2	169	0	0	FS	TMDL Not Required
OK310810050110_00	Rush Creek Tributary D	Chlorides	2/18/97 - 2/6/98	0	- -	0	0	X	TMDL Not Required; Lack of data; samples used for 2010 assessment were collected from adjacent watershed
OK310810050120_00	Rush Creek Tributary E	Chlorides	10/11/05 - 8/29/06	3	222	2	67	NS	TMDL Required
OK310810010270_00	Rush Creek Tributary G	Chlorides	8/29/05 - 3/12/07	4	304	2	50	NS	TMDL Required
OK310810010090_10	Rush Creek	Chlorides	8/24/04 - 3/2/10	31	132	14	45	NS	TMDL Required

NS = Not Supporting
* Long-term average water quality criteria: Chlorides = 127 mg/l; Sulfates = 755 mg/l; TDS = 3008 mg/l
** Single sample water quality criteria: Chlorides = 170 mg/l; Sulfates = 958 mg/l; TDS = 4409 mg/l

[2] West Cox City Creek was not listed on the 303(d) list for sulfates. But since the samples for chlorides and sulfates were collected at the same time, the sulfate data was also examined to make sure that West Cox City Creek was still supporting its beneficial use for Agriculture. Since West Cox City Creek was found to not be impaired for sulfates, it is still fully supporting its Agriculture beneficial use.

The definition of agriculture is summarized by the following excerpt from Chapter 45 (785:45-5-13) of the Oklahoma WQS.

785:45-5-13. Agriculture

(a) ***General.*** *The surface waters of the State shall be maintained so that toxicity does not inhibit continued ingestion by livestock or irrigation of crops.*

(b) ***Definitions.*** *The following words and terms, when used in this Section, shall have the following meaning unless the context clearly indicates otherwise:*

(1) "Long term average concentration" means the arithmetic mean of at least ten samples taken across at least twelve months.

(2) "Short term average concentration" means the arithmetic mean of all samples taken during any 30-day period.

(c) ***Subcategories of the Agriculture beneficial use.***

(1) The narrative and numerical criteria stated or referenced in this section and in Appendix F of this chapter are designed to maintain and protect the beneficial use classification of "Agriculture". This classification encompasses two subcategories which are capable of sustaining different agricultural applications. These subcategories are Irrigation Agriculture and Livestock Agriculture.

(2) Irrigation Agriculture means a subcategory of the Agriculture beneficial use requiring water quality conditions that are dictated by individual crop tolerances.

(3) Livestock Agriculture is a subcategory of the Agriculture beneficial use requiring much less stringent protection than crop irrigation.

(4) If a waterbody is designated in Appendix A of this Chapter with the Agriculture beneficial use but does not have a designation of a subcategory thereof, the criteria for Irrigation Agriculture shall be applicable.

(d) ***Highly saline water****. Highly saline water should be used with best management practices as outlined in "Diagnosis and Reclamation of Saline Soils," United States Department of Agriculture Handbook No. 60 (1958).*

(e) ***General criteria for the protection of Irrigation Agriculture.*** *This subsection prescribes general criteria to protect the Irrigation Agriculture subcategory. For chlorides, sulfates and total dissolved solids at 180°C (see Standard Methods); the arithmetic mean of the concentration of the samples taken for a year in a particular segment shall not exceed the historical "yearly mean standard" determined from the table in Appendix F of this Chapter. For permitting purposes, the long term average concentration shall not exceed the yearly mean standard. Yearly mean standards shall be implemented by the permitting authority using long term average flows*[3] *and complete mixing of effluent and receiving water. For permitting purposes, the short term average concentration shall not exceed the*

[3] OWRB has proposed revising this language to "using the greater of 1.47 cfs or long term average flows". See Page 3 of "Regulatory Default Flows for Implementing the Agriculture Beneficial Use" at: http://www.owrb.ok.gov/quality/standards/pdf_standards/2012DeterminationOfRegulatoryFlowsForImplementingTheAgricultureBeneficialUse.pdf.

sample standard. Sample standards shall be implemented by the permitting authority using short term average flows[4] and complete mixing of effluent and receiving water. The data from sampling stations in each segment are averaged, and the mean chloride, sulfate, and total dissolved solids at 180°C are presented in Appendix F of this Chapter. Segment averages shall be used unless more appropriate data are available.

(f) ***Historic concentrations.*** *The table in Appendix F of this Chapter contains statistical values from historical water quality data of mineral constituents. In cases where mineral content varies within a segment, the most pertinent data available should be used.*

(g) ***Criteria to protect Irrigation Agriculture subcategory.*** *For the purpose of protecting the Irrigation Agriculture subcategory, neither long term average concentrations nor short term average concentrations of minerals shall be required to be less than 700 mg/L for TDS, nor less than 250 mg/L for either chlorides or sulfates.*

To implement Oklahoma's WQS for agriculture use, OWRB promulgated Chapter 46, *Implementation of Oklahoma's Water Quality Standards* (OWRB 2011a). The excerpt below from Chapter 46: 785:46-15-8, stipulates how water quality data will be assessed to determine support of the agriculture use as well as how the water quality target for TMDLs will be defined for each mineral.

As stipulated in the WQS, both the arithmetic mean of all samples collected and the percentage of samples exceeding the single sample standard shall be used to assess the impairment status of the agriculture use for a waterbody. Therefore, both the arithmetic mean and the single sample criterion for each water body will be used to develop TMDLs for chlorides, sulfates and TDS.

785:46-15-8. Assessment of Agriculture support

(a) ***Scope.*** *The provisions of this Section shall be used to determine whether the beneficial use of Agriculture designated in OAC 785:45 for a waterbody is supported.*

(b) ***General support tests for chlorides, sulfates and TDS.***

(1) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to chloride if the mean of all chloride sample concentrations from that waterbody do not exceed the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45.

(2) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to chloride if the mean of all chloride sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45, or greater than 10%

[4] OWRB has proposed revising this language to "using the greater of 1.0 cfs or short term average flows". See Page 3 of "Regulatory Default Flows for Implementing the Agriculture Beneficial Use" at: http://www.owrb.ok.gov/quality/standards/pdf_standards/2012DeterminationOfRegulatoryFlowsForImplementingTheAgricultureBeneficialUse.pdf.

of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45. Provided, if the chloride sample concentrations are each less than 250 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to chloride.

(3) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to sulfate if the mean of all sulfate sample concentrations from that waterbody do not exceed the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45.

(4) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to sulfate if the mean of all sulfate sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45, or greater than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45. Provided, if the sulfate sample concentrations are each less than 250 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to sulfate.

(5) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to TDS if the mean of all TDS sample concentrations from that waterbody do not exceed the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45.

(6) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to TDS if the mean of all TDS sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45, or greater than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45. Provided, if the TDS sample concentrations are each less than 700 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to TDS.

785:46-15-3. Data Requirements

(d) Minimum number of samples.

(1) Streams. Except when (f) of this Section or any of subsections (e), (h), (i), (j), (k), (l), or (m) of 785:46-15-5 applies, a minimum of 20 samples shall be required to assess beneficial use support due to field parameters including but not limited to DO, pH and temperature, and due to routine water quality constituents including but not

limited to coliform bacteria, dissolved solids, and salts. Analyses may be aggregated to meet the 10 samples minimum requirements in non-wadable stream reaches that are 25 miles or less in length, and in wadable stream reaches that are 10 miles or less in length, if water quality conditions are similar at all sites. Provided, a minimum of 10 samples shall not be necessary if the existing samples already assure exceedance of the applicable percentage of a prescribed screening level.

E.2 Pollutant Source Assessment

A pollutant source assessment characterizes known and suspected sources of pollutant loading to impaired waterbodies. Sources within a watershed are categorized and quantified to the extent that information is available. Chlorides, sulfates and TDS may originate from point sources such as industrial and municipal continuous dischargers, mines, CAFOs, or nonpoint sources such as natural background sources from geological formations, roadway salts used for deicing, agricultural irrigation, groundwater diversions, and abandoned or improperly capped oil and gas wells.

A sodium/chloride (Na/Cl) ratio below 0.6 is indicative of a produced water/oilfield brine source. The Oklahoma Corporation Commission found this ratio in samples from the streams in question except Murray Creek. Unfortunately, before 1980 lax rules allowed produced water to be held in unlined or poorly lined open pits prior to re-injection into the subsurface; even further back evaporation in brine disposal pits (which seemingly made the high volumes of saline water go away) and discharge to streams were common. These practices have not been allowed for more than 30 years. In the study area there are many historic areas of saline polluted groundwater, which are now seeping into area streams.

Point sources discharge treated wastewater and are permitted through the NPDES program. Nonpoint sources are diffuse sources that typically cannot be identified as entering a waterbody through a discrete conveyance at a single location. There are no active permitted municipal or industrial point source facilities within the Study Area.

Nonpoint sources may emanate from natural sources or land activities that contribute or have historically contributed minerals to surface water as a result of rainfall runoff, or to groundwater that later flows into surface water. The potential nonpoint sources for chlorides, sulfates, or TDS considered in this report were:

- Background loads from local geological formations;
- Agricultural irrigation;
- Salts from roadway deicing;
- Groundwater;
- Commercial soil farming sites;
- Abandoned or improperly capped oil and gas wells;
- Historic oil and gas well related spill sites and drilling mud pits;
- Historic oilfield produced water/brine "evaporation pits" and holding pits; and
- Damaged and poorly maintained well casing and lines for underground injection wells.

For the TMDLs in this report, all sources of pollutant loading not regulated by NPDES permits are considered nonpoint sources.

Nonpoint sources include those sources that cannot be identified as entering a waterbody at a specific location. Minerals may originate from natural background loads from local geologic conditions and groundwater flows. Possible anthropogenic sources of minerals are septic wastes, animal waste, fertilizer, agricultural irrigation return flows, road salting for deicing of roadways, and produced water and drilling muds from oilfield operations. Possible origins of natural sources of minerals are groundwater and sandstone and gypsum geologic units. TDS can originate from natural sources (e.g. mineral springs, carbonate deposits, salt deposits) and urban and agricultural runoff (Wilkes University 2005). Sources of minerals can originate upstream at great distances or nearby the surface-water sampling sites (Mashburn and Sughru 2003).

E.3 Using Load Duration Curves to Develop TMDLs

The TMDL calculations presented in this report are derived from load duration curves (LDC). LDCs facilitate rapid development of TMDLs, and as a TMDL development tool can help identifying whether impairments are associated with point or nonpoint sources. The technical approach for using LDCs for TMDL development includes the three following steps:

- Preparing flow duration curves for gaged and ungaged WQM stations;
- Estimating existing loading in the waterbody using ambient water quality data; and estimating loading in the waterbody using measured water quality data; and
- Using LDCs to identify if there is a critical condition.

Use of the LDC obviates the need to determine a design storm or selected flow recurrence interval with which to characterize the appropriate flow level for the assessment of critical conditions. For waterbodies impacted by both point and nonpoint sources, the "nonpoint source critical condition" would typically occur during high flows, when rainfall runoff would contribute the bulk of the pollutant load, while the "point source critical condition" would typically occur during low flows, when WWTF effluents would dominate the base flow of the impaired water. However, flow range is only a general indicator of the relative proportion of point/nonpoint contributions. It is not used in this report to quantify point source or nonpoint source contributions. Violations that occur during low flows may not be caused exclusively by point sources. Violations during low flows have been noted in some watersheds that contain no point sources.

LDCs display the maximum allowable load over the complete range of flow conditions by a line using the calculation of flow multiplied by a water quality criterion. The TMDL can be expressed as a continuous function of flow, equal to the line, or as a discrete value derived from a specific flow condition. The basic steps to generating an LDC involve:

- Obtaining daily flow data for the site of interest from the USGS;
- Sorting the flow data and calculating flow exceedance percentiles;
- Obtaining the water quality data;

- Displaying a curve on a plot that represents the allowable load determined by multiplying the actual or estimated flow by the WQS numeric criterion for each parameter; and
- Matching the water quality observations with the flow data from the same date and determining the corresponding exceedance percentile.

The culmination of these steps is expressed in the following formula, which is displayed on the LDC as the TMDL curve:

TMDL (lb/day) = WQS * flow (cfs) * unit conversion factor

Where: 170 mg/L for chloride; or 958 mg/L for sulfate (single sample criteria)

unit conversion factor = 5.39377

Historical observations of chloride or sulfate concentrations are paired with flow data and are plotted on the LDC for a stream.

As noted earlier, runoff has a strong influence on loading of nonpoint pollution. Yet flows do not always correspond directly to runoff; high flows may occur in dry weather (e.g., lake release to provide water downstream) and runoff influence may be observed with low or moderate flows.

E.4 TMDL Calculations

A TMDL is expressed as the sum of all WLAs (point source loads), LAs (nonpoint source loads), and an appropriate MOS, which attempts to account for the lack of knowledge concerning the relationship between pollutant loading and water quality.

This definition can be expressed by the following mathematical equation:

$$TMDL = WLA\_{WWTF} + WLA\_{MS4} + LA + MOS$$

The WLA is the portion of the TMDL allocated to existing and future point sources. The LA is the portion of the TMDL allocated to nonpoint sources, including natural background sources. The MOS is intended to ensure that WQSs will be met. For chloride, TMDLs are expressed in pounds (lbs) per day which will represent the maximum one-day load the stream can assimilate while still attaining the WQS.

The LDC approach recognizes that the assimilative capacity of a waterbody depends on the flow, and that maximum allowable loading varies with flow condition. Existing loading and load reductions required to meet the TMDL water quality target can also be calculated under different flow conditions. The difference between existing loading and the water quality target is used to calculate the loading reductions required. PRGs for chloride or sulfate are calculated using two criteria: 1) through an iterative process of taking a series of percent reduction values, applying each value uniformly to the concentrations of samples and verifying than no more than 10% of the samples exceed the single sample WQS; and 2) calculating the required reduction for the average of all the data to be at or below the yearly mean WQS. The PRG is the greater of the two reductions. It was not possible to calculate a PRG for most of the waterbodies in the Study Area because of the very small number of samples available. Given

the lack of monitoring data, the PRG could only be calculated for one of the waterbodies within the Study Area: Rush Creek (OK310810010090_10). For Rush Creek, a 30% reduction is required to meet the single sample WQS, while a 13% reduction is required to meet the yearly mean WQS. Thus, the PRG for Rush Creek is 30%.

Since there are no NPDES-permitted facilities or areas designated as MS4 within the watersheds of the Study Area, the WLA is zero for each impaired waterbody. The LAs for each waterbodies are calculated as the difference between the TMDL, MOS, and WLA, as follows:

$$\mathbf{LA = TMDL - WLA_{\_WWTF} - WLA_{\_MS4} - MOS}$$

Since the WLA for the Study Area is zero, the equation is reduced to:

$$\mathbf{LA = TMDL - MOS}$$

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs account for seasonal variation in watershed conditions and pollutant loading. Seasonal variation for the mineral TMDLs established in this report was accounted for by using more than five years of water quality data and by using the longest period of USGS flow records when estimating flows to develop flow exceedance percentiles. Federal regulations (40 CFR §130.7(c)(1)) also require that TMDLs include an MOS. The MOS, which can be implicit or explicit, is a conservative measure incorporated into the TMDL equation that accounts for the lack of knowledge associated with calculating the allowable pollutant loading to ensure WQSs are attained. For chloride TMDLs, an explicit MOS was set at 10%.

The TMDL represents a continuum of desired load over all flow conditions, rather than fixed at a single value, because loading capacity varies as a function of the flow present in the stream. The higher the flow is, the more wasteload the stream can handle without violating water quality standards. Regardless of the magnitude of the WLA calculated in these TMDLs, future new discharges or increased load from existing discharges will be considered consistent with the TMDL provided the NPDES permit requires in-stream criteria to be met.

E.5 Reasonable Assurance

Reasonable assurance is required by the EPA guidance for a TMDL to be approvable only when a waterbody is impaired by both point and nonpoint sources and where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. The impairments to the waterbodies in this report are not be caused by point sources. Since there are no point source WLAs in this TMDL report, reasonable assurance does not apply.

SECTION 1
INTRODUCTION

1.1 TMDL Program Background

Section 303(d) of the Clean Water Act (CWA) and U.S. Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 Code of Federal Regulations [CFR] Part 130) require states to develop total maximum daily loads (TMDL) for all waterbodies and pollutants identified by the Regional Administrator as suitable for TMDL calculation. Waterbodies and pollutants identified on the approved 303(d) list as not meeting designated uses where technology-based controls are in place will be given a higher priority for development of TMDLs. TMDLs establish the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so states can implement water quality-based controls to reduce pollution from point and nonpoint sources (including pre-existing historic sources not regulated) and restore and maintain water quality (EPA 1991).

This report documents the data and assessment used to establish TMDLs for chlorides, sulfates and total dissolved solids (TDS) for selected waterbodies in the Rush Creek watershed. Data assessment and TMDL calculations are conducted in accordance with requirements of Section 303(d) of the CWA, Water Quality Planning and Management Regulations (40 CFR Part 130), EPA guidance, and Oklahoma Department of Environmental Quality (DEQ) guidance and procedures. DEQ is required to submit all TMDLs to EPA for review. Approved 303(d) listed waterbody-pollutant pairs or surrogates TMDLs will received notification of the approval or disapproval action. Once the EPA approves a TMDL, then the waterbody may be moved to Category 4a of a state's Integrated Water Quality Monitoring and Assessment Report, where it remains until compliance with water quality standards (WQS) is achieved (EPA 2003).

The purpose of this TMDL report is to establish pollutant load allocations for minerals in impaired waterbodies, which is the first step toward restoring water quality and protecting public health. TMDLs determine the pollutant loading a waterbody can assimilate without exceeding the WQS for that pollutant. TMDLs also establish the pollutant load allocation necessary to meet the WQS established for a waterbody based on the relationship between pollutant sources and in-stream water quality conditions. A TMDL consists of a wasteload allocation (WLA), load allocation (LA), and a margin of safety (MOS). The WLA is the fraction of the total pollutant load apportioned to point sources, and includes stormwater discharges regulated under the National Pollutant Discharge Elimination System (NPDES). The LA is the fraction of the total pollutant load apportioned to nonpoint sources. MOS can be implicit and/or explicit. An implicit MOS is achieved by using conservative assumptions in the TMDL calculations. An explicit MOS is a percentage of the TMDL set aside to account for the lack of knowledge associated with natural process in aquatic systems, model assumptions, and data limitations.

This report does not stipulate specific control actions (regulatory controls) or management measures (voluntary best management practices) necessary to reduce the dissolved mineral concentrations within each watershed. Watershed-specific control actions and management measures will be identified, selected, and implemented under a separate process involving

stakeholders who live and work in the watersheds, along with tribes, and local, state, and federal government agencies.

This TMDL report focuses on waterbodies that DEQ placed in Category 5 [303(d) list] of the *Water Quality in Oklahoma, 2010 Integrated Report* (2010 Integrated Report)[5] for nonsupport of the agriculture water supply beneficial use. The waterbodies considered for TMDL development in this report, which are presented upstream to downstream, include:

• Murray Creek	OK310810050040_00
• West Cox City Creek	OK310810050140_00
• Cox City Creek	OK310810050130_00
• Rush Creek Tributary D	OK310810050110_00
• Rush Creek Tributary E	OK310810050120_00
• Rush Creek Tributary G	OK310810010270_00
• Rush Creek	OK310810010090_10

Figure 1-1 shows these Oklahoma waterbodies and their contributing watersheds. The map also displays locations of the water quality monitoring (WQM) stations used as the basis for placement of these waterbodies on the Oklahoma 303(d) list. These waterbodies and their surrounding watersheds are hereinafter referred to as the Study Area.

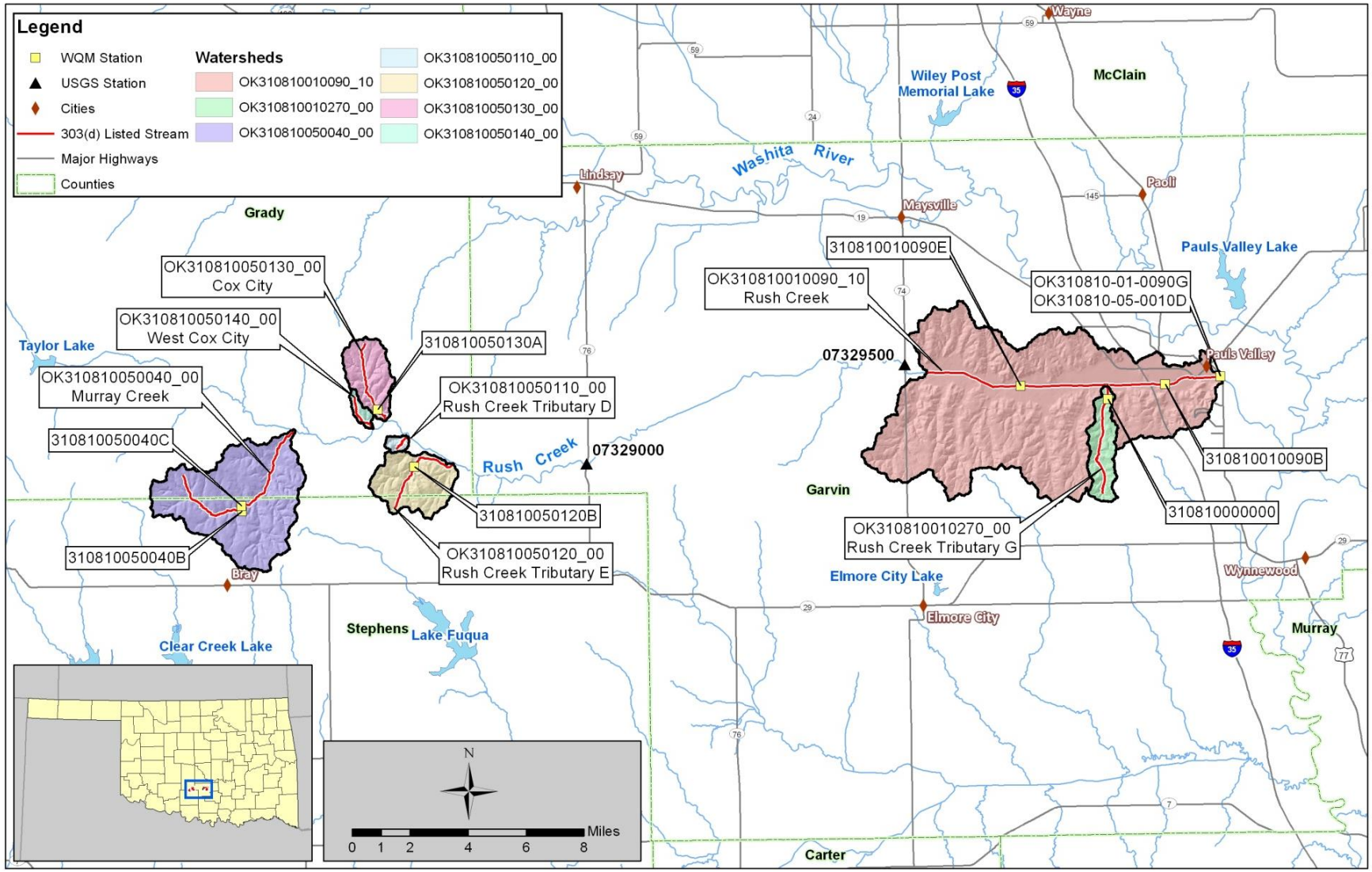
Elevated levels of chloride, sulfates, and TDS above the WQS numeric criteria result in the requirement that a TMDL be developed. The TMDLs established in this report are a necessary step in the process to develop the pollutant loading controls needed to restore the agriculture water supply use designated for each waterbody. Table 1-1 provides a list and description of the locations of WQM stations from which water quality data was obtained to conduct beneficial use assessments. A station identification number was not assigned to the location which water quality samples were collected from West Cox City Creek; therefore this waterbody was not listed in Table 1-1.

Table 1-1 Water Quality Monitoring Stations used for Assessment of Streams

Station ID	Waterbody Name and Station Location	Waterbody ID
310810050040B	Murray Creek	OK310810050040_00
310810050040C	Murray Creek	OK310810050040_00
310810050130A	Cox City Creek (Rush Trib)	OK310810050130_00
310810050110A	Rush Creek Tributary D	OK310810050110_00
310810050110B	Rush Creek Tributary D	OK310810050110_00
310810050120B	Rush Creek Tributary E 34-3N-5W	OK310810050120_00
310810000000	Rush Creek Tributary G 22-3N-1W	OK310810010270_00
310810010090E	Rush Creek	OK310810010090_10
310810010090B	Rush Creek	OK310810010090_10
OK310810-01-0090G	Rush Creek	OK310810010090_10
OK310810-05-0010D	Rush Creek	OK310810010090_10

[5] When the study was done, the 2008 Integrated Report was used. However, there were no differences in beneficial uses or impairments for these waterbodies in the Rush Creek watershed between the 2008 and 2010 Integrated Report.

Figure 1-1 Rush Creek Watersheds Not Supporting Agriculture Beneficial Use



1.2 Watershed Description

General: The watersheds addressed in the Study Area are located in the southern portion of Oklahoma. The waterbodies addressed in this report flow through portions of Garvin, Grady and Stephens Counties. These counties are part of the Central Great Plains and Cross Timbers Level III ecoregions (Woods, A.J, Omerik, J.M., et al 2005). The watersheds in the Study Area are located in the Anadarko Basin geological province. Within the Anadarko Basin geological province the targeted watersheds in the Study Area are part of the Central Red-Bed Plains and Western Sandstone Hills geomorphic provinces (Goines and Goble 2006). Table 1-2, derived from the 2010 U.S. Census, demonstrates that the counties in which these watersheds are located are sparsely populated (U.S. Census Bureau 2010). The only city within the Rush Creek watershed (OK310810010090_10) is Pauls Valley, which is in Garvin County and has a population of approximately 6,250 (U.S. Census Bureau 2010).

Table 1-2 County Population and Density

County Name	Population (2010 Census)	Population Density (per square mile)
Garvin	27,576	34
Grady	52,431	47
Stephens	45,048	51

Climate: Table 1-3 summarizes the average annual precipitation for each Oklahoma waterbody derived from a geospatial layer developed to display annual precipitation using data collected from Oklahoma weather stations between 1971 through 2000. The average annual precipitation (includes moisture from snow) values among the watersheds in this portion of Oklahoma range between 35 and 39 inches (NOAA 2002).

Table 1-3 Average Annual Precipitation by Watershed

Waterbody Name	Waterbody ID	Average Annual Precipitation (inches)
Murray Creek	OK310810050040_00	35
West Cox City Creek	OK310810050140_00	35
Cox City Creek	OK310810050130_00	35
Rush Creek Tributary D	OK310810050110_00	35
Rush Creek Tributary E	OK310810050120_00	35
Rush Creek Tributary G	OK310810010270_00	39
Rush Creek	OK310810010090_10	39

Land Use: Table 1-4 summarizes the percentages and acreages of the land use categories for the contributing watershed associated with each respective Oklahoma waterbody addressed in the Study Area. The land use/land cover data were derived from the U.S. Geological Survey (USGS) 2001 National Land Cover Dataset (USGS 2007). The percentages provided in Table 1-4 are rounded so in some cases may not total exactly 100%. The land use categories are displayed in Figure 1-2. The most dominant land use category of the watersheds within the Study Area is grasslands. Deciduous forest is the second most dominant category for all watersheds, except Murray Creek (OK310810050040_00) and West Cox City Creek (OK310810050140_00) which have a high percentage of cultivated crops. The aggregated total of low, medium, and high intensity developed land accounts for less than 3% of the land use in each watershed. The watersheds targeted for TMDL development in this Study Area range in size from 236 acres (Rush Creek tributary D, OK310810050110_00) to 29,702 acres (Rush Creek, OK310800030010_00).

1.3 Stream Flow Conditions

Stream flow characteristics and data are key information when conducting water quality assessments such as TMDLs. The USGS operates flow gages throughout Oklahoma, from which long-term stream flow records can be obtained. Not all of the waterbodies in this Study Area have historical flow data available. Flow data from the surrounding USGS gage stations and the instantaneous flow measurement data taken with water quality samples have been used to estimate flows for ungaged streams. The water chemistry data results available for each waterbody are provided in Appendix A. A summary of the method used to project flows for ungaged streams and flow exceedance percentiles from projected flow data are provided in Appendix B.

Figure 1-2 Land Use Map

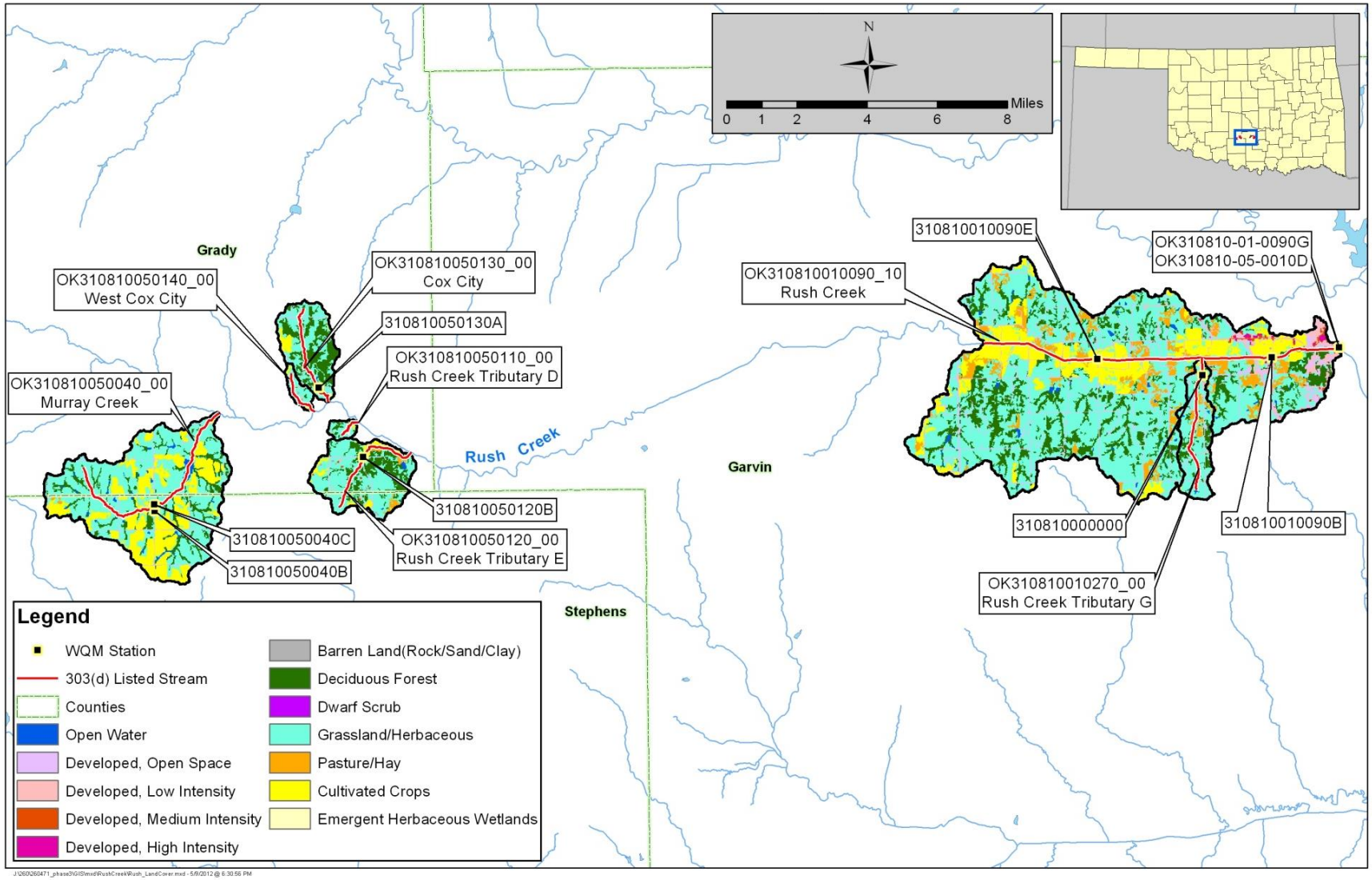


Table 1-4 Land Use Summaries by Watershed

Landuse Category	Watershed						
	Murray Creek	West Cox City Creek	Cox City Creek	Rush Creek, Trib D	Rush Creek, Trib E	Rush Creek, Trib G	Rush Creek
Waterbody ID	**OK310810050040_00**	**OK310810050140_00**	**OK310810050130_00**	**OK310810050110_00**	**OK310810050120_00**	**OK310810010270_00**	**OK310810010090_10**
Percent of Open Water	2.12	0.00	1.39	0.00	0.66	0.74	0.68
Percent of Developed, Open Space	2.67	4.16	2.40	0.66	2.37	6.04	6.45
Percent of Developed, Low Intensity	0.01	1.39	0.20	0.56	0.45	0.76	1.93
Percent of Developed, Medium Intensity	0.00	0.79	0.04	0.00	0.31	0.00	0.42
Percent of Developed, High Intensity	0.00	0.00	0.00	0.00	0.00	0.00	0.24
Percent of Barren Land (Rock/Sand/Clay)	0.00	1.78	0.21	0.47	0.47	0.00	0.01
Percent of Deciduous Forest	11.97	4.49	40.98	19.57	24.75	17.91	15.03
Percent of Shrub/Scrub	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Percent of Grassland/Herbaceous	54.65	74.92	48.94	72.44	59.24	65.03	53.40
Percent of Pasture/Hay	0.24	0.00	0.00	0.00	3.23	8.05	7.75
Percent of Cultivated Crops	28.30	12.48	5.85	6.30	8.52	1.48	14.10
Percent of Emergent Herbaceous Wetlands	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Acres Open Water	205	0	30	0	21	14	201
Acres Developed, Open Space	258	14	52	2	75	117	1,915
Acres Developed, Low Intensity	1	5	4	1	14	15	573
Acres Developed, Medium Intensity	0	3	1	0	10	0	126
Acres Developed, High Intensity	0	0	0	0	0	0	71
Acres Barren Land (Rock/Sand/Clay)	0	6	4	1	15	0	2
Acres Deciduous Forest	1,157	15	886	46	780	347	4,463
Acres Shrub/Scrub	1	0	0	0	0	0	0
Acres Grassland/Herbaceous	5,283	252	1,058	171	1,867	1,259	15,861
Acres Pasture/Hay	23	0	0	0	102	156	2,303
Acres Cultivated Crops	2,736	42	127	15	268	29	4,187
Acres Emergent Herbaceous Wetlands	2	0	0	0	0	0	0
Total (Acres)	**9,667**	**337**	**2,162**	**236**	**3,151**	**1,936**	**29,702**

SECTION 2
PROBLEM IDENTIFICATION AND WATER QUALITY TARGET

2.1 Oklahoma Water Quality Standards

Title 785 of the Oklahoma Administrative Code contains Oklahoma's Water Quality Standards in Chapter 45 (OWRB 2011) and implementation procedures in Chapter 46 (OWRB 2011a). The Oklahoma Water Resources Board (OWRB) has statutory authority and responsibility concerning establishment of State water quality standards, as provided under 82 Oklahoma Statute [O.S.], §1085.30. This statute authorizes the OWRB to promulgate rules *…which establish classifications of uses of waters of the State, criteria to maintain and protect such classifications, and other standards or policies pertaining to the quality of such waters*. [O.S. 82:1085:30(A)]. Beneficial uses are designated for all waters of the State. Such uses are protected through restrictions imposed by the antidegradation policy statement, narrative water quality criteria, and numerical criteria (OWRB 2011). An excerpt of the Oklahoma WQS (Title 785) summarizing the State of Oklahoma Antidegradation Policy is provided in Appendix C. Table 2-1, an excerpt from the 2010 Integrated Report (DEQ 2010), lists beneficial uses designated for each impaired stream in the Study Area. The beneficial uses include:

- AES – Aesthetics
- AG – Agriculture Water Supply
- Fish and Wildlife Propagation
    - WWAC – Warm Water Aquatic Community
- FISH – Fish Consumption
- PBCR – Primary Body Contact Recreation

Table 2-1 Designated Beneficial Uses for Each Waterbody in this Report

Waterbody ID	Waterbody Name	AES	AG	WWAC	FISH	PBCR
OK310810050040_00	Murray Creek	I	N	I	X	X
OK310810050140_00	West Cox City Creek	I	N	I	X	X
OK310810050130_00	Cox City Creek	I	N	I	X	X
OK310810050110_00	Rush Creek, Tributary D	I	N	I	X	X
OK310810050120_00	Rush Creek, Tributary E	I	N	I	X	X
OK310810010270_00	Rush Creek, Tributary G	I	N	I	X	X
OK310810010090_10	Rush Creek	I	N	F	X	X

F = Fully Supporting; N = Not Supporting; I = Insufficient Information; X = Not Assessed

Table 2-2 summarizes the dissolved mineral impairment status for streams in the Study Area. The TMDL priority shown in Table 2-2 is directly related to the TMDL target date. The TMDLs established in this report, which are a necessary step in the process of restoring water quality, only address dissolved solid impairments that affect the agriculture beneficial use.

Table 2-2 Excerpt from the 2010 Integrated Report – Oklahoma 303(d) List of Impaired Waters (Category 5)

Waterbody ID	Name	Stream Miles	TMDL Date	Priority	Chloride	Sulfates	TDS	Designated Use Agriculture Water Supply
OK310810050040_00	Murray Creek	6.66	2021	4		X	X	N
OK310810050130_00	Cox City Creek	3.206	2021	4	X			N
OK310810050140_00	West Cox City Creek	1.5	2021	4	X			N
OK310810050110_00	Rush Creek Tributary D	0.71	2021	4	X			N
OK310810050120_00	Rush Creek Tributary E	3.397	2021	4	X			N
OK310810010270_00	Rush Creek Tributary G	4.034	2021	4	X			N
OK310810010090_10	Rush Creek	10.302	2021	4	X			N

N = Not Attaining; X = Criterion Exceeded
Source: 2010 Integrated Report, DEQ 2010.

The definition of agriculture is summarized by the following excerpt from Chapter 45 (785:45-5-13) of the Oklahoma WQS.

785:45-5-13. Agriculture

(a) ***General.*** *The surface waters of the State shall be maintained so that toxicity does not inhibit continued ingestion by livestock or irrigation of crops.*

(b) ***Definitions.*** *The following words and terms, when used in this Section, shall have the following meaning unless the context clearly indicates otherwise:*

(1) "Long term average concentration" means the arithmetic mean of at least ten samples taken across at least twelve months.

(2) "Short term average concentration" means the arithmetic mean of all samples taken during any 30-day period.

(c) ***Subcategories of the Agriculture beneficial use.***

(1) The narrative and numerical criteria stated or referenced in this section and in Appendix F of this chapter are designed to maintain and protect the beneficial use classification of "Agriculture". This classification encompasses two subcategories which are capable of sustaining different agricultural applications. These subcategories are Irrigation Agriculture and Livestock Agriculture.

(2) Irrigation Agriculture means a subcategory of the Agriculture beneficial use requiring water quality conditions that are dictated by individual crop tolerances.

(3) Livestock Agriculture is a subcategory of the Agriculture beneficial use requiring much less stringent protection than crop irrigation.

(4) If a waterbody is designated in Appendix A of this Chapter with the Agriculture beneficial use but does not have a designation of a subcategory thereof, the criteria for Irrigation Agriculture shall be applicable.

(d) ***Highly saline water****. Highly saline water should be used with best management practices as outlined in "Diagnosis and Reclamation of Saline Soils," United States Department of Agriculture Handbook No. 60 (1958).*

(e) ***General criteria for the protection of Irrigation Agriculture.*** *This subsection prescribes general criteria to protect the Irrigation Agriculture subcategory. For chlorides, sulfates and total dissolved solids at 180°C (see Standard Methods); the arithmetic mean of the concentration of the samples taken for a year in a particular segment shall not exceed the historical "yearly mean standard" determined from the table in Appendix F of this Chapter. For permitting purposes, the long term average concentration shall not exceed the yearly mean standard. Yearly mean standards shall be implemented by the permitting authority using long term average flows[6] and complete mixing of effluent and receiving water. For permitting purposes, the short term average concentration shall not exceed the sample standard. Sample standards shall be implemented by the permitting authority using short term average flows[7] and complete mixing of effluent and receiving water. The data from sampling stations in each segment are averaged, and the mean chloride, sulfate, and total dissolved solids at 180°C are presented in Appendix F of this Chapter. Segment averages shall be used unless more appropriate data are available.*

(f) ***Historic concentrations.*** *The table in Appendix F of this Chapter contains statistical values from historical water quality data of mineral constituents. In cases where mineral content varies within a segment, the most pertinent data available should be used.*

(g) ***Criteria to protect Irrigation Agriculture subcategory.*** *For the purpose of protecting the Irrigation Agriculture subcategory, neither long term average concentrations nor short term average concentrations of minerals shall be required to be less than 700 mg/L for TDS, nor less than 250 mg/L for either chlorides or sulfates.*

To implement Oklahoma's WQS for agriculture use, OWRB promulgated Chapter 46, *Implementation of Oklahoma's Water Quality Standards* (OWRB 2011a). The excerpt below from Chapter 46: 785:46-15-8, stipulates how water quality data will be assessed to determine support of the agriculture use as well as how the water quality target for TMDLs will be defined for each mineral.

As stipulated in the WQS, both the arithmetic mean of all samples collected and the percentage of samples exceeding the single sample standard shall be used to assess the

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6 OWRB has proposed revising this language to "using the greater of 1.47 cfs or long term average flows". See Page 3 of "Regulatory Default Flows for Implementing the Agriculture Beneficial Use" at: http://www.owrb.ok.gov/quality/standards/pdf_standards/2012DeterminationOfRegulatoryFlowsForImplementingTheAgricultureBeneficialUse.pdf.

7 OWRB has proposed revising this language to "using the greater of 1.0 cfs or short term average flows". See Page 3 of "Regulatory Default Flows for Implementing the Agriculture Beneficial Use" at: http://www.owrb.ok.gov/quality/standards/pdf_standards/2012DeterminationOfRegulatoryFlowsForImplementingTheAgricultureBeneficialUse.pdf.

impairment status of the agriculture use for a waterbody. Therefore, both the arithmetic mean of the long-term average and the single sample criterion for each water body will be used to develop TMDLs for chlorides, sulfates and TDS.

785:46-15-8. Assessment of Agriculture support

(a) ***Scope.*** *The provisions of this Section shall be used to determine whether the beneficial use of Agriculture designated in OAC 785:45 for a waterbody is supported.*

(b) ***General support tests for chlorides, sulfates and TDS.***

(1) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to chloride if the mean of all chloride sample concentrations from that waterbody do not exceed the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45.

(2) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to chloride if the mean of all chloride sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45, or greater than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45. Provided, if the chloride sample concentrations are each less than 250 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to chloride.

(3) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to sulfate if the mean of all sulfate sample concentrations from that waterbody do not exceed the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45.

(4) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to sulfate if the mean of all sulfate sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45, or greater than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45. Provided, if the sulfate sample concentrations are each less than 250 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to sulfate.

(5) The Agriculture beneficial use designated for a waterbody shall be deemed to be fully supported with respect to TDS if the mean of all TDS sample concentrations

from that waterbody do not exceed the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45 and no more than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45.

(6) The Agriculture beneficial use designated for a waterbody shall be deemed to be not supported with respect to TDS if the mean of all TDS sample concentrations from that waterbody exceeds the yearly mean standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45, or greater than 10% of the sample concentrations from that waterbody exceed the sample standard prescribed in Appendix F or site specific criteria promulgated in Appendix E of OAC 785:45. Provided, if the TDS sample concentrations are each less than 700 mg/L, then the Agriculture beneficial use shall be deemed to be fully supported with respect to TDS.

785:46-15-3. Data Requirements

(d) Minimum number of samples.

(1) Streams. Except when (f) of this Section or any of subsections (e), (h), (i), (j), (k), (l), or (m) of 785:46-15-5 applies, a minimum of 20 samples shall be required to assess beneficial use support due to field parameters including but not limited to DO, pH and temperature, and due to routine water quality constituents including but not limited to coliform bacteria, dissolved solids, and salts. Analyses may be aggregated to meet the 10 samples minimum requirements in non-wadable stream reaches that are 25 miles or less in length, and in wadable stream reaches that are 10 miles or less in length, if water quality conditions are similar at all sites. Provided, a minimum of 10 samples shall not be necessary if the existing samples already assure exceedance of the applicable percentage of a prescribed screening level.

2.2 Problem Identification

In this subsection water quality data summarizing waterbody impairments caused by elevated levels of chlorides, sulfates and TDS are summarized. Table 2-3 summarizes all available water quality data collected from the WQM stations identified in Table 1-1 between 1997 and 2010. The data summary in Table 2-3 provides an understanding of the limited amount of water quality data available and an evaluation of the exceedances of the water quality criteria. This data was used to determine if a TMDL is necessary for the specific waterbody/pollutant combinations that were originally identified on the DEQ 2010 §303(d) list (DEQ 2010) within the Study Area. Within the Study Area, five of the waterbodies have elevated levels of chloride for which TMDLs will be required. Water quality data used to prepare Table 2-3 are provided in Appendix A.

Further investigation of the chlorides data used to originally list Rush Creek Tributary D (OK310810050110_00) found that these samples were actually taken from a tributary to Rush Creek Tributary E. Therefore since there is no water quality data collected directly from Rush Creek Tributary D no TMDL is required for this waterbody. Additionally, no water quality data was available for TDS in Murray Creek (OK310810050040_00); therefore no TMDL is required for this pollutant.

2.2.1 Chlorides

Given the small amount of chloride data available from the waterbodies in the Study Area, no seasonal pollutant concentration pattern can be discerned. Comparing chloride concentrations to stream flow and precipitation can help identify if there is seasonal variation in pollutant loading, however, this type of data analysis was not performed on the waterbodies in the Study Area because of the limited available data.

Despite the dearth of water quality and flow data, some general inferences can be made about minerals and their effect on water quality. The highest concentrations of minerals usually occur during relatively low flow periods and high flow periods usually have low concentrations. This pattern is consistent with the assumption that chronic nonpoint source loads being transported under dry conditions are the primary source for minerals in the Study Area. Because high flow periods usually have low concentrations of minerals, storm runoff from the watershed does not appear to be a major cause of water quality standards violations for chloride, sulfate, or TDS.

2.2.2 Sulfates

TMDLs for sulfates for Murray Creek (OK310810050040_00) and West Cox City Creek (OK310810050140_00) are not required. No seasonal pattern is discernible from the limited number of sulfate samples available for Murray Creek (OK310810050040_00) and West Cox City Creek (OK310810050140_00). A comparison of sulfate concentrations to stream flow and precipitation was not conducted for either creek given the small amount of sulfate samples available.

2.2.3 Total Dissolved Solids

No TDS data were available for Murray Creek (OK310810050040_00), therefore a TDS TMDL will not be performed for Murray Creek.

2.3 Water Quality Targets

The Code of Federal Regulations (40 CFR §130.7(c)(1)) states that, "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards." Each individual water quality target established for chloride, sulfate or TDS must demonstrate compliance with the both the long-term numeric and short-term numeric criteria prescribed in Oklahoma WQS Chapter 45 (785:45-5-13) (OWRB 2011). TMDLs for chloride, sulfates, and TDS in streams designated with an agriculture use must maintain both the yearly mean standard and no more than 10% of the samples may exceed the single sample standard prescribed in Chapter 45 and 46. The water quality targets for chlorides, sulfates and TDS summarized in Table 2-4 are derived from Chapter 45 Appendix F of the Oklahoma WQS. These criteria are used when one or more samples in each data set for each pollutant exceed the default criteria in 250, 250, and 700 mg/L for chloride, sulfates, and TDS respectfully, as defined in OAC 785:45-5-13(g). The allowable mineral load is derived by using the actual or estimated flow record multiplied by the water quality target. The line drawn through the water quality target (single sample standard) for any given flow represents the maximum load that still satisfies the WQS.

Table 2-3 Summary of Minerals Samples, 1997-2010

Waterbody ID	Waterbody Name	Indicator	Data Period of Record	Number of Samples	Long-term Arithmetic Mean Concentration (mg/L)*	Number of Samples Exceeding Single Sample Criterion**	% Samples Exceeding Single Sample Criterion (NS>10%)	AG Use	Notes
OK310810050040_00	Murray Creek	Sulfates	2/28/02 - 8/12/02	3	368	0	0	FS	TMDL not required
		TDS	- -	- -	- -	- -	- -	- -	Insufficient number of samples; TMDL not required
OK310810050130_00	Cox City Creek	Chlorides	12/14/05 - 02/8/06	2	513	2	100	NS	TMDL required
OK310810050140_00	West Cox City Creek	Chlorides	2/12/07 - 4/16/07	2	892	2	100	NS	TMDL required
		Sulfates[8]	2/12/07 - 4/16/07	2	169	0	0	FS	TMDL not required
OK310810050110_00	Rush Creek Tributary D	Chlorides	2/18/97 - 2/6/98	0	- -	0	0	X	TMDL not required; Lack of data; samples used for 2010 assessment were collected from adjacent watershed
OK310810050120_00	Rush Creek Tributary E	Chlorides	10/11/05 - 8/29/06	3	222	2	67	NS	TMDL required
OK310810010270_00	Rush Creek Tributary G	Chlorides	8/29/05 - 3/12/07	4	304	2	50	NS	TMDL required
OK310810010090_10	Rush Creek	Chlorides	8/24/04 - 3/2/10	31	132	14	45	NS	TMDL required

NS = Not Supporting; FS = Full Support; X = Not Assessed
* Yearly mean water quality criteria: Chlorides = 127 mg/l; Sulfates = 755 mg/l; TDS = 3008 mg/l
** Single sample water quality criteria: Chlorides = 170 mg/l; Sulfates = 958 mg/l; TDS = 4409 mg/l

[8] West Cox City Creek was not listed on the 303(d) list for sulfates. But since the samples for chlorides and sulfates were collected at the same time, the sulfate data was also examined to make sure that West Cox City Creek was still supporting its beneficial use for Agriculture. Since West Cox City Creek was found to not be impaired for sulfates, it is still fully supporting its Agriculture beneficial use.

2.4 Water Quality Targets

The Code of Federal Regulations (40 CFR §130.7(c)(1)) states that, "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards." Each individual water quality target established for chloride, sulfate or TDS must demonstrate compliance with the both the long-term numeric and short-term numeric criteria prescribed in Oklahoma WQS Chapter 45 (785:45-5-13) (OWRB 2011). TMDLs for chloride, sulfates, and TDS in streams designated with an agriculture use must maintain both the yearly mean standard and no more than 10% of the samples may exceed the single sample standard prescribed in Chapter 45 and 46. The water quality targets for chlorides, sulfates and TDS summarized in Table 2-4 are derived from Chapter 45 Appendix F of the Oklahoma WQS. These criteria are used when one or more samples in each data set for each pollutant exceed the default criteria in 250, 250, and 700 mg/L for chloride, sulfates, and TDS respectfully, as defined in OAC 785:45-5-13(g). The allowable mineral load is derived by using the actual or estimated flow record multiplied by the water quality target. The line drawn through the water quality target (single sample standard) for any given flow represents the maximum load that still satisfies the WQS.

Table 2-4 Water Quality Criteria (Chapter 45)

WQ Segment (Sub-watershed)	Chloride (mg/L)		Sulfate (mg/L)		TDS at 180°C (mg/L)	
	Yearly Mean Standard	Sample Standard	Yearly Mean Standard	Sample Standard	Yearly Mean Standard	Sample Standard
310810	127[1]	170[1]	755[1]	958[1]	3008[1]	4409[1]

Source: OWRB 2011; Oklahoma Water Resources Board.
1 = Chapter 45, Appendix F

SECTION 3
POLLUTANT SOURCE ASSESSMENT

A pollutant source assessment characterizes known and suspected sources of pollutant loading to impaired waterbodies. Sources within a watershed are categorized and quantified to the extent that information is available. Chlorides, sulfates, and TDS may originate from point sources such as industrial and municipal continuous dischargers, mines, CAFOs, or nonpoint sources such as natural background sources from geological conditions, roadway salts used for deicing, agricultural irrigation, groundwater diversions, and abandoned or improperly capped oil and gas wells.

Point sources discharge treated wastewater and are permitted through the NPDES program. Nonpoint sources are diffuse sources that typically cannot be identified as entering a waterbody through a discrete conveyance at a single location. Nonpoint sources may emanate from natural sources or land activities that contribute or have historically contributed minerals to surface water as a result of rainfall runoff, or to groundwater that later flows into surface water. The potential nonpoint sources of chlorides, sulfates, and TDS considered in this report include:

- Underlying local geological formations and its effect on groundwater;
- Agricultural irrigation;
- Salts from roadway deicing;
- Commercial soil farming sites;
- Abandoned or improperly capped oil and gas wells;
- Historic oil and gas well related spill sites and drilling mud pits;
- Historic oilfield produced water/brine "evaporation pits" and holding pits; and
- Damaged and poorly maintained well casing and lines for underground injection wells.

For the TMDLs in this report, all sources of pollutant loading not regulated by NPDES permits are considered nonpoint sources. The following discussion describes what is known regarding point and nonpoint sources of chlorides, sulfates, and TDS in the impaired watersheds.

3.1 Continuous Point Source Dischargers (NPDES-Permitted Facilities)

Under 40 CFR, §122.2, a point source is described as a discernible, confined, and discrete conveyance from which pollutants are or may be discharged to surface waters. NPDES-permitted facilities classified as point sources that may contribute minerals include:

- NPDES municipal wastewater treatment facility (WWTF);
- NPDES industrial WWTF;
- NPDES Concentrated Animal Feeding Operation (CAFO); and
- NPDES-regulated stormwater discharges [MS4 (Municipal separate storm sewer system) permits, Industrial multi-sector general permits, and Construction general permits].

Continuous point source discharges such as municipal or industrial WWTFs, could result in discharge of elevated concentrations of chlorides. Sodium chloride is a common constituent

in sewage, and any appreciable pollution is marked by an increase in chloride. Stormwater runoff from MS4 areas, which is now regulated under the EPA NPDES Program, can also contain dissolved mineral concentrations. 40 C.F.R. § 130.2(h) requires that NPDES-regulated stormwater discharges must be addressed by the wasteload allocation component of a TMDL. CAFOs are recognized by EPA as significant sources of pollution, and may have the potential to cause serious impacts to water quality if not properly managed.

3.1.1 NPDES Municipal Wastewater Treatment Facility (WWTF)

There are no active permitted municipal point source facilities within the Study Area.

3.1.2 NPDES Industrial WWTF

There are no active permitted industrial point source facilities within the Study Area.

3.1.3 Concentrated Animal Feeding Operations

The Agricultural Environmental Management Services (AEMS) of the Oklahoma Department of Agriculture, Food and Forestry (ODAFF) was created to help develop, coordinate, and oversee environmental policies and programs aimed at protecting the Oklahoma environment from pollutants associated with agricultural animals and their waste. Through regulations established by the Oklahoma Concentrated Animal Feeding Operation (CAFO) Act, Swine Feeding Operation (SFO) Act and Poultry Feeding Operation (PFO) Registration ACT, AEMS works with producers and concerned citizens to ensure that animal waste does not impact the waters of the State.

A CAFO is an animal feeding operation that confines and feeds at least 1,000 animal units for 45 days or more in a 12-month period (ODAFF 2012). The CAFO Act is designed to protect water quality through the use of best management practices (BMP) such as dikes, berms, terraces, ditches, or other similar structures used to isolate animal waste from outside surface drainage, except for a 25-year, 24–hour rainfall event (ODAFF 2012). CAFOs are considered no-discharge facilities for the purpose of the TMDL calculations in this report.

CAFOs are designated by EPA as significant sources of pollution and may have the potential to cause serious impacts to water quality if not managed properly (ODAFF 2012). CAFOs can contribute chlorides which are found in animal waste. There are no CAFOs located in the Study Area.

Poultry feeding operations not licensed under the Oklahoma Concentrated Animal Feeding Operation Act must register with the State Board of Agriculture. A registered PFO is an animal feeding operation which raises poultry and generates more than 10 tons of poultry waste (litter) per year. PFOs are required to develop an Animal Waste Management Plan or an equivalent document such as a Nutrient Management Plan. These plans describe how litter will be stored and applied properly in order to protect water quality of streams and lakes located in the watershed. Applicable BMPs shall be included in the Plan. There are no PFOs located in the Study Area.

3.1.4 NPDES Municipal Separate Storm Sewer System

Phase I MS4

In 1990, the EPA developed rules establishing Phase I of the NPDES Stormwater Program which was designed to prevent harmful pollutants from being washed by stormwater runoff into MS4s (or from being dumped directly into the MS4) and then discharged into local water bodies (EPA 2005). Phase I of the program required operators of medium and large MS4s (those generally serving populations of 100,000 or greater) to implement a stormwater management program as a means to control polluted discharges. Approved stormwater management programs for medium and large MS4s are required to address a variety of water quality-related issues, including roadway runoff management, municipal-owned operations, and hazardous waste treatment. The National Stormwater Quality Database (NSQD) summarizes concentrations for a number of pollutants of concern in stormwater runoff from around the country (Pitt et. al. 2008). Based on data summarized in the NSQD, median chloride concentrations for runoff from urban land uses (commercial, industrial, open space, and residential) were all below 10 mg/L (Pitt et. al. 2008). In the NSQD median effluent TDS concentrations in stormwater from urban land uses ranged from 61 to 119 mg/L. There are no Phase I MS4 permits within the watersheds addressed in the Study Area.

Phase II MS4

Phase II of the rule extends coverage of the NPDES stormwater program to certain small MS4s. Small MS4s are defined as any MS4 that is not a medium or large MS4 covered by Phase I of the NPDES Stormwater Program. Phase II requires operators of regulated small MS4s to obtain NPDES permits and develop a stormwater management program. Programs are designed to reduce discharges of pollutants to the "maximum extent practicable," protect water quality, and satisfy appropriate water quality requirements of the CWA. Small MS4 stormwater programs must address the following minimum control measures:

- Public Education and Outreach;
- Public Participation/Involvement;
- Illicit Discharge Detection and Elimination;
- Construction Site Runoff Control;
- Post-Construction Runoff Control; and
- Pollution Prevention/Good Housekeeping.

The small MS4 General Permit for communities in Oklahoma became effective on February 8, 2005. DEQ provides information on the current status of the MS4 program on its website, which can be found at:

http://www.deq.state.ok.us/WQDnew/stormwater/ms4/.

There are no Phase II MS4s permits in the Study Area.

3.2 Nonpoint Sources

The following section provides general information on nonpoint sources contributing chlorides, sulfates and TDS loading within the watersheds of the Study Area. Nonpoint sources include those sources that cannot be identified as entering a waterbody at a specific location. Nonpoint sources of minerals from natural sources include surface water runoff, soils, bedrock, and groundwater. Possible anthropogenic sources of minerals are septic wastes, animal waste, fertilizer, agricultural irrigation runoff, road salting for deicing of roadways, and various oilfield operations (e.g. mud pits, produced water, soil farming, injection disposal wells). Based on data from the NSQD presented in subsection 3.1.4, runoff from urban areas is not considered to be a significant source of minerals.

3.2.1 Natural Background Loads

The Rush Springs Study Area mostly consists of grasslands and deciduous forests. Rain falling onto and through soils, alluvium deposits, bedrock outcroppings (e.g. sandstone, siltstones, shale), is a natural source of minerals as it flows into the watershed. Sulfate is dissolved from many rocks and soils - especially from large quantities of gypsum and beds of shale. Chloride and TDS is present in surface water runoff, being dissolved from rocks or from natural salt deposits.

The Rush Springs hydrologic basin which consists of the Permian-age Rush Springs and Marlow Formations of the White Horse group geologic formations which are exposed at the surface. This hydrologic basin is in western Oklahoma, and encompasses parts of Blaine, Caddo, Canadian, Comanche, Custer, Dewey, Ellis, Grady, Harper, Kiowa, Major, Stephens, Washita, Woods, and Woodward counties (Osborn and Hardy 1999). The Rush Springs Aquifer includes the Rush Springs Formation which is massive, fine-grained, poorly-cemented sandstone with some interbedded dolomite, gypsum, shale, alluvial and terrace deposits along major streams. The Marlow Formation is in the eastern part of the Aquifer boundary area and is composed of interbedded sandstones, siltstones, mudstones, gypsum-anhydrite, and dolomite (OSDH 1983; Becker and Runkle 1998). The parts of the Marlow Formation that have high permeability and porosity are where the Marlow Formation is included as part of the Rush Springs Aquifer (Becker 1997).

The Rush Springs Aquifer underlies about 2,400 square miles in west-central Oklahoma where the Aquifer is used predominantly for agricultural water supply (Mashburn and Becker 2012). The Rush Springs sandstone contains very large quantities of groundwater in storage, and the topography of the surface and the texture of the sandstone are favorable for recharge. Most of the communities overlying the Aquifer rely either solely or partly on groundwater from this Aquifer. The Rush Springs Aquifer is also an important source of water for industrial, municipal, and domestic use (Becker 1997). Figures 3-1a and Figure 3-1b display the general boundaries of the groundwater aquifers in the Study Area. Perennial streamflow occurs in many creeks overlying the Rush Springs Aquifer and originate from springs and seeps discharging from the Rush Springs Aquifer. Therefore groundwater quality in the Study Area has a direct impact on surface water quality.

All groundwater contains minerals dissolved from rocks and soils through which aquifers have come in contact. The quality of dissolved minerals in groundwater primarily depends on the type of rock or soil through which the water has passed, the length of time of contact, and the pressure and temperature conditions (Norman 1955). Many aquifers in western Oklahoma have high concentrations of naturally occurring minerals because of various salt deposits in the Permian-age rock formations.

Chloride comes from groundwater in direct contact with halite (NaCl). Chloride concentrations in groundwater influence surface water quality either through groundwater/surface water interaction or by transporting groundwater to the land or receiving streams through human activities. In some groundwater, sodium chloride is the principal chemical constituent and occurs in such high concentrations that it makes the water unsuitable for most industrial, agricultural, and/or domestic uses. The residue left over from the evaporation of water consists primarily of minerals.

Sulfates come from groundwater in direct contact with gypsum (CaS04*2H2O). Gypsum is a very soluble mineral and can lead to very high sulfate concentrations when dissolved in groundwater. Gypsum deposits in adjoining geologic units and within the Rush Springs Aquifer can result in very high sulfate concentrations (Mashburn and Becker 2012).

Saline waters (such as those with chloride and sulfates) from adjoining Permian bedrock aquifers can migrate into portions of alluvial aquifers. Salinity also increases with depth in most bedrock aquifers from brines that are present in underlying geologic units (OWRB 2011b).

Table 3-1 provides a limited data set of groundwater quality samples collected from water wells in the vicinity of the Rush Creek watershed. The date range for this groundwater data collected by OWRB was from June 1984 to August 1992. Figures 3-1a and Figure 3-1b display the location of the six wells near the Study Area used to characterize the concentrations of chlorides, sulfates and TDS in groundwater. While all six wells are not located directly in the watersheds of the Study Area, the data results do provide a general characterization of the groundwater quality in the area. The TDS content in a water sample is often used as a general indicator of water quality. Although OWRB considers groundwater with dissolved solid concentrations less than 5,000 mg/L (milligrams per liter) to be *fresh*, water is not considered desirable for drinking if the quantity of minerals exceeds 500 mg/L (OWRB 2011b).

The concentration of TDS in groundwater based on OWRB well sampling data ranged from 1,504 ppm to 377 ppm; averaging 789 ppm. The chloride content of groundwater based on OWRB well sampling data ranged from 110 ppm to less than 10 ppm; averaging 56 mg/L. The sulfate concentrations in groundwater ranged from 841 ppm to less than 20 ppm; averaging 191 ppm.

Table 3-1 Rush Creek Groundwater Sampling Data

Well ID	Date Collected	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
10147	7/12/1990	388	< 10	53
10148	7/17/1986	1298	68	497
10148	8/6/1987	1095	45	439
10148	7/13/1988	554	13	100
10148	7/11/1989	1335	84	583
10148	9/11/1991	1504	73	841
10148	7/7/1992	1119	46	264
10168	8/6/1987	654	31	60
10168	7/13/1988	767	21	42
10168	7/11/1989	854	40	87
10168	7/12/1990	842	91	68
10168	7/9/1991	834	24	158
19497	7/28/1987	704	87	< 20
19497	8/21/1992	605	110	< 20
19497	8/22/1991	601	62	300
19497	7/27/1990	642	103	68
19497	7/28/1989	741	105	72
19497	7/7/1988	545	54	< 20
B029	6/27/1984	778	66	164
B029	7/2/1985	699	84	145
C047	6/27/1984	415	12	126
C047	7/2/1985	377	12	77
	Average-->	**789**	**56**	**191**

For results that are reported as less than the detection limit, the values at the detection limit were used in the calculations.

3.2.2 Agricultural Irrigation

In addition to natural processes, minerals can be transported to receiving streams by human activities such as diversions, use of groundwater for irrigation of croplands and many other purposes including drainage from oil and gas fields (Norman 1955).

Irrigation return flows occur when artificially applied water that is not consumed by plants or evaporation, eventually migrates to an aquifer or surface water body, such as a lake or stream. Irrigation return flows are expressly exempted from permit requirements under the Clean Water Act (P.L. 92-500, as amended). In the Study Area, the dominant land uses are grasslands and deciduous forests which are not irrigated for increased production purposes. Irrigation return flows are not considered to be a significant transport medium for dissolved minerals. Using less groundwater and more surface water for irrigation would likely reduce the chloride concentrations in streams throughout the area.

3.2.3 Oil and Gas Well Operations

The Oklahoma Corporation Commission regulates oil and gas activities through various Oil and Gas Division programs including Field Operations, Technical, Pollution Abatement, Underground Injection Control and Brownfields. These programs include regulatory oversight of field operations (exploration and/or production) for oil, gas, and brines; reclaiming facilities; underground injection; storage tank farms and transmission pipelines; waste disposal (waste mud pits and land application); spill cleanups from any of these; and sub-surface storage of oil and gas. The Corporation Commission has jurisdiction over the construction, operation, maintenance, site remediation, closure and abandonment of these facilities and activities. The Corporation Commission has sampled surface and groundwater around spills to determine the extent of any pollution. It has also sampled (and had other State agencies sample) streams in old oilfield areas to determine if historic oilfield activities have caused adverse impacts to the waters of the State, and to determine background water quality in these watersheds. Figures 3-1a and Figure 3-1b display 1,325 historic wells within the Study Area watershed.

Production spills, mud pits and/or associated brine "disposal" pits can contribute to chlorides and TDS through groundwater filtration and surface runoff to nearby streams. Table 3-2 provides a summary of the number of oil and gas wells located in each watershed. Detailed data is not available to quantify or differentiate natural from man-induced nonpoint source loading of chlorides and TDS.

Table 3-2 Oil and Gas Wells in Study Area

Waterbody ID	Oil & Gas Well Count	Waterbody Name
OK310810050040_00	9	Murray Creek
OK310810050140_00	83	West Cox City Creek
OK310810050130_00	129	Cox City Creek
OK310810050120_00	301	Rush Creek, Tributary E
OK310810010270_00	48	Rush Creek, Tributary G
OK310810010090_10	755	Rush Creek
Total	**1,325**	

Source: 2011 OK Corp Comm Database

3.2.3.1 Produced Water Sampling

An historic data set (1947-1976) of oil production water samples from oil wells located in Garvin and Grady counties provided by the Corporation Commission was assessed. Drilled to depths of 0.5 to 5 miles, oil wells historically tapped into porous sandstone and limestone, and now also into fractured shale formations. Table 3-3 summarizes the sample concentration results of oil production water collected from eight different wells which are located within the watersheds of the Study Area. The locations of the oil wells from which these samples were collected are displayed in Figures 3-1a and Figure 3-1b. These samples demonstrated high levels of chlorides with all concentrations exceeding 40,000 mg/L and high levels of TDS with all concentrations exceeding 68,000 mg/L. Sulfate concentrations from these wells were insignificant.

Figure 3-1a Oilfield Map – Potential Pollutant Sources – East

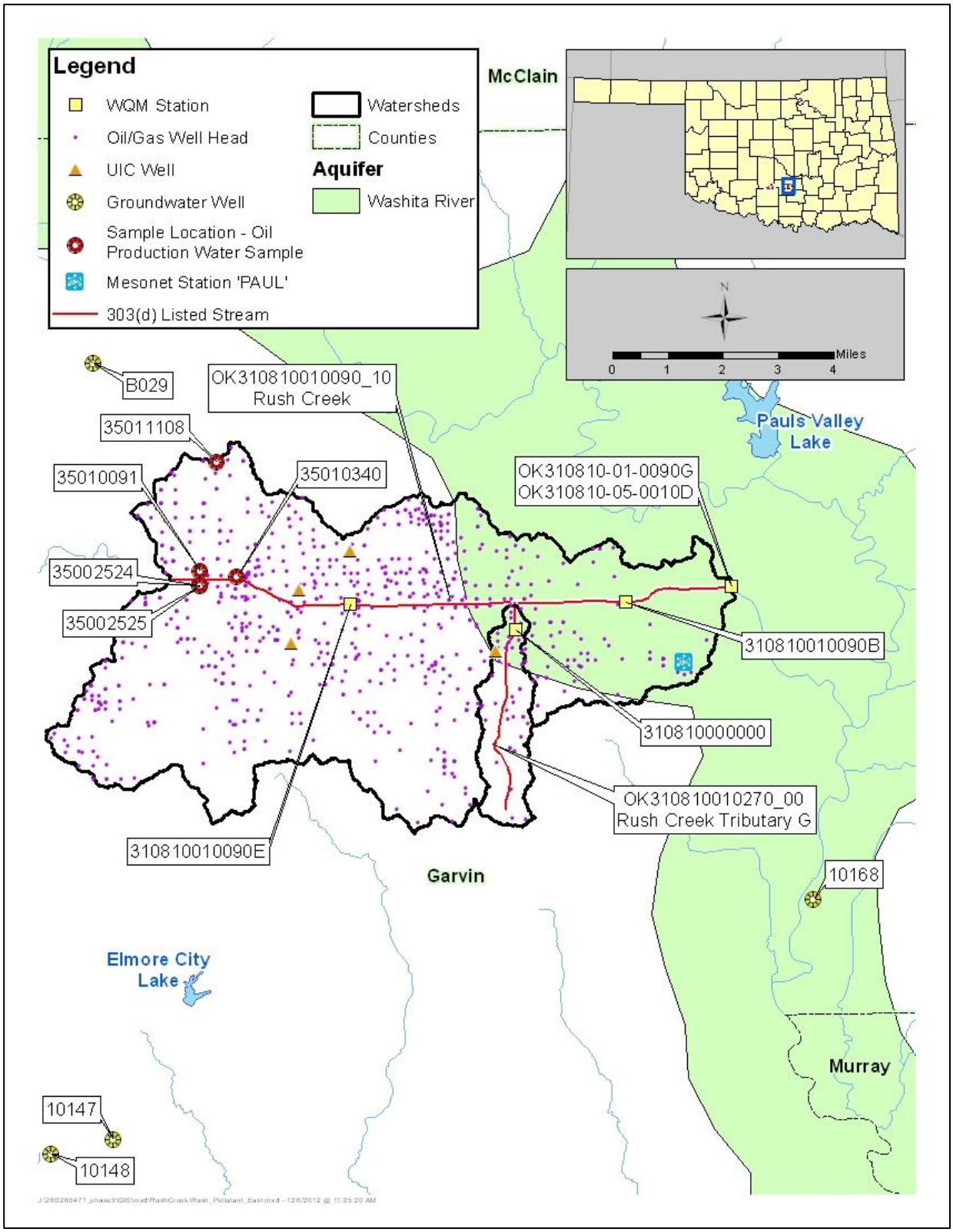


Figure 3-1b Oilfield Map – Potential Pollutant Sources - West

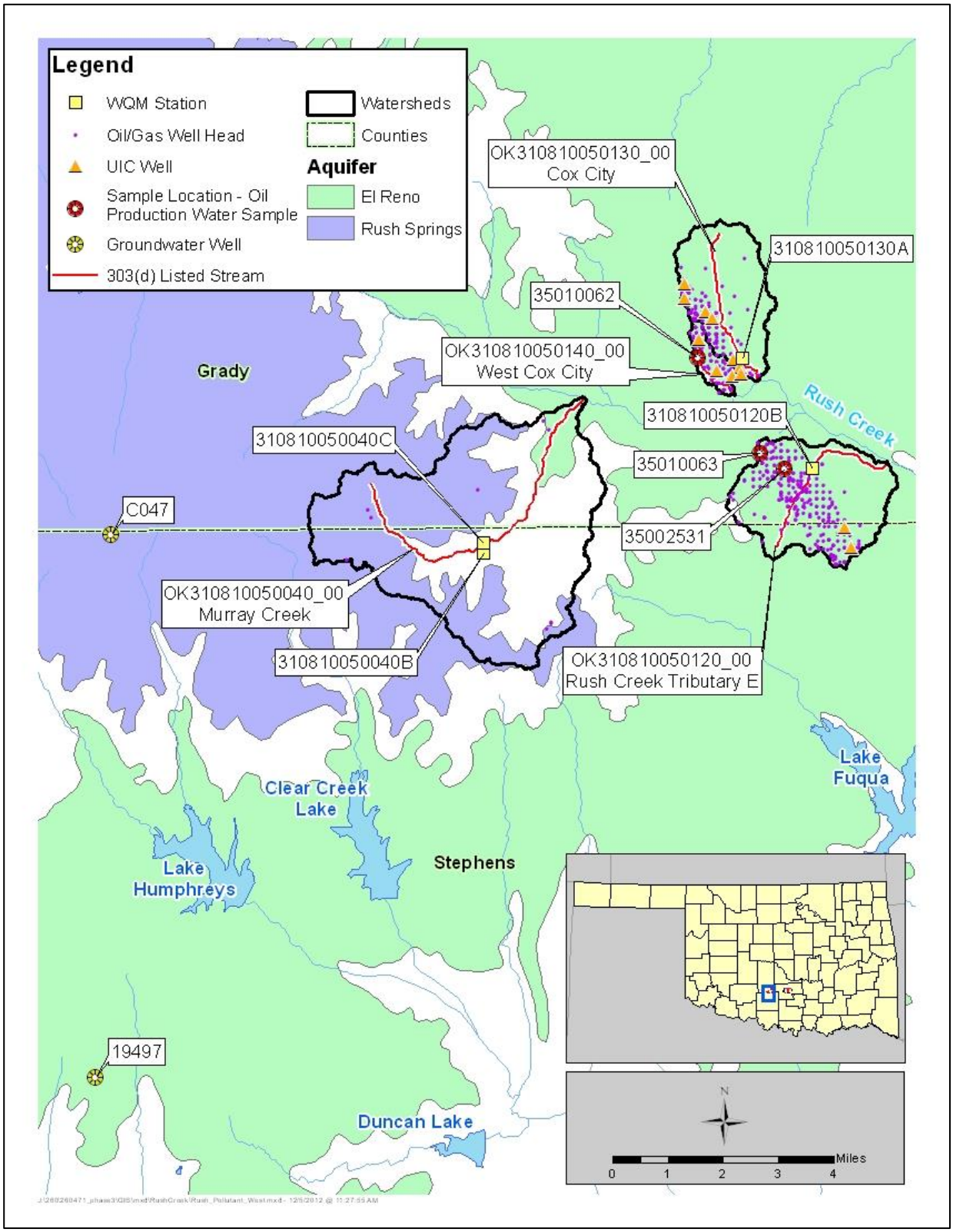


Table 3-3 Rush Creek Oil Production Water Sampling Data

Waterbody	Waterbody Name	Well ID	County	Date	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
OK310810010090	Rush Creek	35011108	Garvin	1976 05 05	128,464	93	207,264
OK310810010090	Rush Creek	35010091	Garvin	1953 06 26	141,112	836	229,633
OK310810010090	Rush Creek	35010340	Garvin	1959 05 25			216,900
OK310810010090	Rush Creek	35002525	Garvin	1948 01 12	138,275	584	226,371
OK310810010090	Rush Creek	35002524	Garvin	1948 01 27	58,130	342	95,187
OK310810050140	West Cox City Creek	35010062	Grady	1953 06 10	40,872	111	68,219
OK310810050120	Rush Creek Tributary E	35010063	Grady	1953 06 10	76,430		123,688
OK310810050120	Rush Creek Tributary E	35002531	Grady	1947 03 03	60,248	13	97,252

3.2.3.2 Land Application Activities

Soil farming is a land application activity that can be a source of pollutant loading to surface waters in the form of brine, metals, sediments and other organics. Soil farming, which is overseen by the Oklahoma Corporation Commission, is the application of oilfield drilling fluids to the soil for the purpose of disposing of the production waste without being a detriment to land or water (OAC 165:10-9-2). Drilling fluids or drilling muds are produced as waste constituents from oil well drilling. As a waste management approach, the land application of drilling wastes to the land is done to allow the soil's naturally occurring microbial population to metabolize, transform, and assimilate waste constituents in place. Land application of drilling wastes containing brine must be carefully applied to soil. Salts, unlike hydrocarbons, cannot biodegrade but may accumulate in excessive amounts in soils. If salt levels become too high, the soils may be damaged and treatment of hydrocarbons can be inhibited.

The Corporation Commission is responsible for administering the regulations that cover the permitting, construction, operation, and closure requirements for any commercial soil farming facility in accordance with OAC 165:10-9-2. These regulations define specific design criteria that must be adhered to by all commercial soil farming operations. Adherence to the design criteria outlined in OAC 165:10-9-2 includes requirements that: *All commercial soil farming facilities shall be operated and maintained at all times so as to prevent pollution. In the event of a non-permitted discharge from a commercial soil farming facility, sufficient measures shall be taken to stop or control the loss of materials and reporting procedures in 165:10-7-5 (c) shall be followed. Any materials lost due to such discharge shall be cleaned up as directed by a representative of the Conservation Division.* [OAC 165: 10-9-2(i)(12)]

3.2.3.3 Underground Injection Control (UIC)

There are several different approaches used for injecting drilling wastes into underground formations for permanent disposal. The Corporation Commission is the lead agency for Oklahoma's Class II injection wells. DEQ implements the applicable

Underground Injection Control (UIC) program requirements for all other injection wells in the State. The Corporation Commission is responsible for implementing the regulations under Title 165 OAC Chapter 10, Subsection 5-1 through 5-15 to manage the UIC program statewide (Corporation Commission 2012). The regulations are designed to control and mitigate the potential for contamination from different classifications of underground injection wells. Figures 3-1a and Figure 3-1b display 23 UIC wells located within the Study Area watersheds.

3.2.3.4 Abandoned Oil and Gas Wells

Many formations are permeated with brine that is up to five times saltier than sea water and that can have radioactivity, heavy metals and/or other toxins. Without extensive and costly plugging, brine can flow up the well shaft and seep into fresh water aquifers or reach the surface. In the mid-1960s oil-producing states enacted regulations to protect fresh water supplies by requiring that hundreds of feet of cement be poured in the wells at different levels in the process of closing them properly (Suro 1992).

There are at minimum 2.5 million abandoned oil and gas wells – none permanently capped – across the United States. Faulty installation of cement caps puts a select set of wellheads at risk, but aging cement and casing leakages mean that every abandoned well has a potential for contributing pollutants from aquifers to surface waters (Kotler 2011). Chlorides, brine and TDS pollutant loadings from uncapped wells can also build up on the ground surface and be transported by rainfall runoff to receiving streams, as well as being carried down into groundwater which later seeps into streams. Figures 3-1a and Figure 3-1b display 1,325 historic wells within the Study Area watersheds.

3.2.4 Roadway Salts

In 2010, salt for highway deicing accounted for approximately 37% of the U.S. salt demand which equates to approximately 16,300,000 metric tons of salt being applied to our roads, parking lots, sidewalks and driveways (USGS 2010). U.S. consumption of salt for roadway deicing was about 11% more than that of 2009 (USGS 2010). Oklahoma used approximately 119,000 and 122,000 metric tons of rock salt, respectively in 2009 and 2010, most of which was used for roadway deicing (USGS 2010).

Studies have shown that, in urbanized areas, about 95% of the chloride inputs to a watershed are from road and parking lot deicing (USGS 2012). Applied salt typically dissolves into 40% sodium ions (Na+) and 60% chloride ions (Cl-) in the melting snow and ice and make their way into our environment (NHDES 2011). In highway deicing, salt has been associated with corrosion of bridge decks, motor vehicles, reinforcement bar and wire, and unprotected steel structures used in road construction. Surface runoff, vehicle spraying, and windblown actions also affect soil, roadside vegetation, and local surface water and groundwater supplies. Although evidence of environmental loading of salt has been found during peak usage, the spring rains and thaws usually dilute the concentrations of sodium in the area where salt was applied (USGS 2010). Given the low density of roadways traversing the watersheds in the Study Area, roadway salt contributions to in-stream pollutant loading is not considered a significant source.

3.3 Summary of Sources of Impairments

The data analyses discussions provided in Sections 2 and 3 were conducted to evaluate whether certain flow conditions and spatial or temporal characteristics identify critical conditions associated with elevated levels of chlorides, sulfates and TDS. Although concentrations of dissolved minerals appear to be slightly higher during the summer low flow months, no significant relationships were found for minerals with flow or season. The exceedance of water quality standards for minerals occurred uniformly throughout the year. However, despite limited data the following general deductions can be stated:

- Groundwater flow can contribute TDS and chloride to receiving streams even under low flow conditions.

- During high flow conditions, stream TDS is lower because stormwater runoff as the primary source of water provides dilution.

- The persistent availability of minerals is attributed to historical oil and gas field development, underground injection well activities, natural geology, and high concentrations in groundwater, despite various remediation efforts within the Study Area.

- Land application activities such as commercial soil farming or one-time land application sites can result in the buildup of mineral concentrations on the land surface which could be transported to receiving waters under some rainfall runoff conditions.

- Background concentrations of sulfate are expected to be high and originate from drainage of Permian geologic formations and their high gypsum content.

- Since there are no point source dischargers in the impaired watersheds the pollutant loading of chlorides, sulfates and TDS originate from a variety of nonpoint sources, both background and anthropogenic sources.

- No critical conditions were identified for mineral TMDLs and therefore, mean annual conditions will need to be used to guide implementation.

SECTION 4
TECHNICAL APPROACH AND METHODS

The objective of a TMDL is to estimate allowable pollutant loads and to allocate these loads to the known pollutant sources in the watershed so appropriate control measures can be implemented and the WQS achieved. A TMDL is expressed as the sum of three elements as described in the following mathematical equation:

$$TMDL = WLA\_{WWTF} + WLA\_{MS4} + LA + MOS$$

The WLA is the portion of the TMDL allocated to existing and future point sources. The LA is the portion of the TMDL allocated to nonpoint sources, including natural background sources. The MOS is intended to ensure that WQSs will be met. For chloride, sulfates, and TDS, TMDLs are expressed in pounds (lbs) per day which will represent the maximum one-day load the stream can assimilate while still attaining the WQS.

4.1 Using Load Duration Curves to Develop TMDLs

The TMDL calculations presented in this report are derived from load duration curves (LDC). LDCs facilitate rapid development of TMDLs, and as a TMDL development tool can help identifying whether impairments are associated with point or nonpoint sources. The technical approach for using LDCs for TMDL development includes the three following steps that are described in Subsections 4.3 through 4.5 below:

- Preparing flow duration curves for gaged and ungaged WQM stations;
- Estimating existing loading in the waterbody using ambient water quality data; and estimating loading in the waterbody using measured water quality data; and
- Using LDCs to identify if there is a critical condition.

Historically, in developing WLAs for pollutants from point sources, it was customary to designate a critical low flow condition (*e.g.*, 7Q2) at which the maximum permissible loading was calculated. As water quality management efforts expanded in scope to quantitatively address nonpoint sources of pollution and types of pollutants, it became clear that this single critical low flow condition was inadequate to ensure adequate water quality across a range of flow conditions. Use of the LDC obviates the need to determine a design storm or selected flow recurrence interval with which to characterize the appropriate flow level for the assessment of critical conditions. For waterbodies impacted by both point and nonpoint sources, the "nonpoint source critical condition" would typically occur during high flows, when rainfall runoff would contribute the bulk of the pollutant load, while the "point source critical condition" would typically occur during low flows, when WWTF effluents would dominate the base flow of the impaired water. However, flow range is only a general indicator of the relative proportion of point/nonpoint contributions. It is not used in this report to quantify point source or nonpoint source contributions. Violations that occur during low flows may not be caused exclusively by point sources. Violations during low flows have been noted in some watersheds that contain no point sources.

LDCs display the maximum allowable load over the complete range of flow conditions by a line using the calculation of flow multiplied by a water quality criterion. The TMDL can be expressed as a continuous function of flow, equal to the line, or as a discrete value derived from a specific flow condition.

4.2 Development of Flow Duration Curves

Flow duration curves serve as the foundation of LDCs and are graphical representations of the flow characteristics of a stream at a given site. Flow duration curves utilize the historical hydrologic record from stream gages to forecast future recurrence frequencies. Many WQM stations throughout Oklahoma do not have long-term flow data and therefore, flow frequencies must be estimated. Nine of the eleven waterbodies in the Study Area do not have USGS gage stations. The default approach used to develop flow frequencies necessary to establish flow duration curves considers watershed differences in rainfall, land use, and the hydrologic properties of soil that govern runoff and retention. A detailed explanation of the methods for estimating flow for ungaged streams is provided in Appendix B. The most basic method to estimate flows at an ungaged site involves 1) identifying an upstream or downstream flow gage; 2) calculating the contributing drainage areas of the ungaged sites and the flow gage; and 3) calculating daily flows at the ungaged site by using the flow at the gaged site multiplied by the drainage area ratio.

Flow duration curves are a type of cumulative distribution function. The flow duration curve represents the fraction of flow observations that exceed a given flow at the site of interest. The observed flow values are first ranked from highest to lowest, then, for each observation, the percentage of observations exceeding that flow is calculated. The flow value is read from the ordinate (y-axis), which is typically on a logarithmic scale since the high flows would otherwise overwhelm the low flows. The flow exceedance frequency is read from the abscissa (x-axis), which is numbered from 0 to 100%, and may or may not be logarithmic. The lowest measured flow occurs at an exceedance frequency of 100% indicating that flow has equaled or exceeded this value 100% of the time, while the highest measured flow is found at an exceedance frequency of 0%. The median flow occurs at a flow exceedance frequency of 50%. The flow exceedance percentiles for each waterbody addressed in this report are provided in Appendix B.

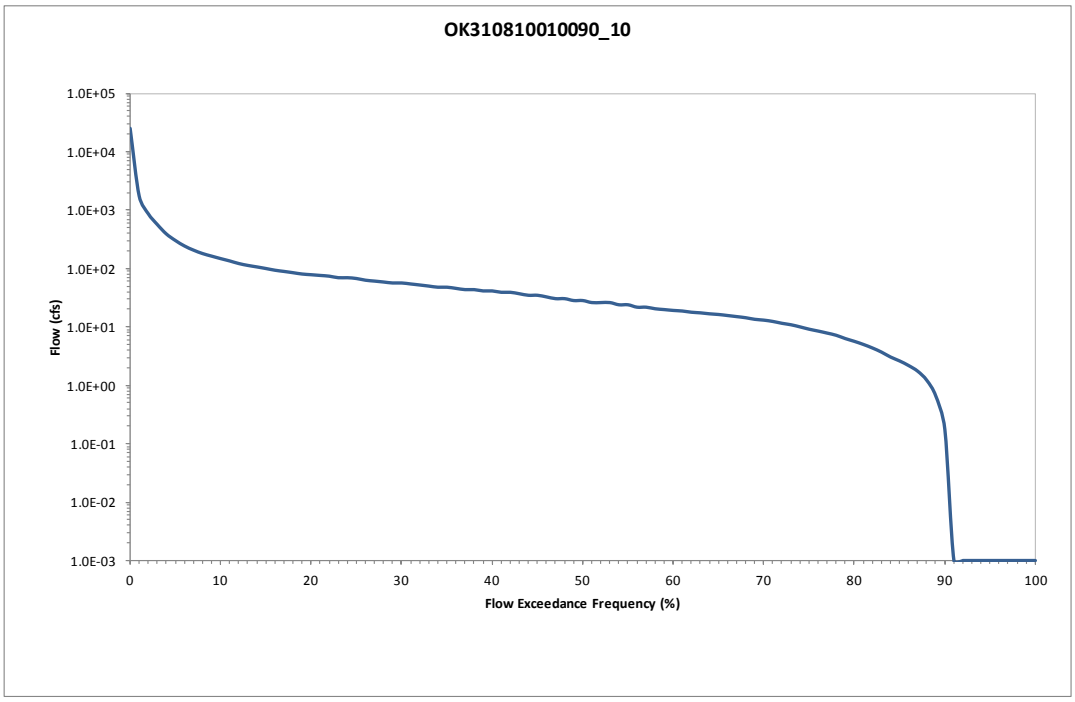
While the number of observations required to develop a flow duration curve is not rigorously specified, a flow duration curve is usually based on more than 1-year of observations, and encompasses inter-annual and seasonal variation. Ideally, the drought of record and flood of record are included in the observations. For this purpose, the long-term flow gaging stations operated by the USGS are utilized (USGS 2009) to support the Oklahoma TMDL Toolbox.

The USGS National Water Information System serves as the primary source of flow measurements for the Oklahoma TMDL Toolbox. All available daily average flow values for all gages in Oklahoma, as well as the nearest upstream and downstream gages in adjacent states, were retrieved for use in the Oklahoma TMDL Toolbox to generate flow duration curves for gaged and ungaged waterbodies. The application includes a data update module that automatically downloads the most recent USGS data and appends it to the existing flow database.

Some instantaneous flow measurements were available from various agencies. These were not combined with the daily average flows or used in calculating flow percentiles, but were matched to chlorides, sulfates or TDS grab measurements collected at the same site and time. When available, these instantaneous flow measurements were used in lieu of projected flows to calculate pollutant loads.

A typical semi-log flow duration curve exhibits a sigmoidal shape, bending upward near a flow exceedance frequency value of 0% and downward at a frequency near 100%, often with a relatively constant slope in between. For sites that on occasion exhibit no flow, the curve will intersect the abscissa at a frequency less than 100%. As the number of observations at a site increases, the line of the LDC tends to appear smoother. However, at extreme low and high flow values, flow duration curves may exhibit a "stair step" effect due to the USGS flow data rounding conventions near the limits of quantization. An example of a typical flow duration curve is shown in Figure 4-1.

Figure 4-1 Flow Duration Curve for Rush Creek (OK310810010090_10)



Flow duration curves for each impaired waterbody in the Study Area are provided in Section 5.1.

4.3 Estimating Existing Loading

Existing instream loads can be estimated using LDCs. For chloride, TDS and sulfate, this is accomplished by:

Matching the water quality observations with the flow data from the same date;

Converting measured concentration values to loads by multiplying the flow at the time the sample was collected by the water quality parameter concentration.

4.4 Development of TMDLs Using Load Duration Curves

The final step in the TMDL calculation process involves a group of additional computations derived from the preparation of LDCs. These computations are necessary to derive a percent reduction goal (PRG), which is one method of presenting how much pollutant loads must be reduced to meet WQSs in the impaired watershed.

Step 1: **Generate LDCs.** LDCs are similar in appearance to flow duration curves; however, for chloride, sulfate or TDS the ordinate is expressed in terms of a load in lbs/day. The curve represents the single sample water quality criterion for chloride, sulfate, or TDS expressed in terms of a load through multiplication by the continuum of flows historically observed at the site. The basic steps to generating an LDC involve:

- Obtaining daily flow data for the site of interest from the USGS;
- Sorting the flow data and calculating flow exceedance percentiles;
- Obtaining the water quality data;
- Displaying a curve on a plot that represents the allowable load determined by multiplying the actual or estimated flow by the WQS numeric criterion for each parameter; and
- Matching the water quality observations with the flow data from the same date and determining the corresponding exceedance percentile (See Section 5).

The culmination of these steps is expressed in the following formula, which is displayed on the LDC as the TMDL curve:

TMDL (lb/day) = WQS * flow (cfs) * unit conversion factor

Where: WQS = 170 mg/L for chloride; 4409 mg/L for TDS; or 958 mg/L for sulfate (single sample criteria)

unit conversion factor = 5.39377

The flow exceedance frequency (x-value of each point) is obtained by looking up the historical exceedance frequency of the measured or estimated flow, in other words, the percent of historical observations that are equal to or exceed the measured or estimated flow. Historical observations of chloride, TDS, or sulfate concentrations are paired with flow data and are plotted on the LDC for a stream. Loads representing exceedance of water quality criteria fall above the TMDL line.

As noted earlier, runoff has a strong influence on loading of nonpoint pollution. Yet flows do not always correspond directly to runoff; high flows may occur in dry weather (e.g., lake release to provide water downstream) and runoff influence may be observed with low or moderate flows.

Step 2: **Define MOS.** The MOS may be defined explicitly or implicitly. A typical explicit approach would reserve some specific fraction of the TMDL as the MOS. In an implicit approach, conservative assumptions used in developing the TMDL are relied upon to provide an MOS to assure that WQSs are attained. For the TMDLs in this report, an explicit MOS of 10% was selected. The 10% MOS has been used in other approved mineral TMDLs.

Step 3: Calculate WLA. As previously stated, the pollutant load allocation for point sources is defined by the WLA. For mineral TMDLs a point source can be either a wastewater (continuous) or stormwater (MS4) discharge. Stormwater point sources are typically associated with urban and industrialized areas, and recent EPA guidance includes NPDES-permitted stormwater discharges as point source discharges and, therefore, part of the WLA.

The LDC approach recognizes that the assimilative capacity of a waterbody depends on the flow, and that maximum allowable loading will vary with flow condition. WLAs can be expressed in terms of a single load, or as different loads allowable under different flows. WLAs may be set to zero in cases of watersheds with no existing or planned continuous permitted point sources.

WLA for WWTF: For watersheds with permitted point sources discharging the pollutant of concern, NPDES permit limits are used to derive WLAs for evaluation as appropriate for use in the TMDL. The permitted flow rate used for each point source discharge and the water quality concentration defined in a permit are used to estimate the WLA for each wastewater facility. In cases where a permitted flow rate is not available for a WWTF, then the average of monthly flow rates derived from discharge monitoring reports can be used. WLA values for each NPDES wastewater discharger are then summed to represent the total WLA for a given waterbody. Using this information WLAs can be calculated using the approach as shown in the equations below.

WLA:

WLA = WQ goal * flow * unit conversion factor (lb/day)

flow (mgd) = permitted flow or average monthly flow

unit conversion factor = 8.3445

Step 4: Calculate LA and WLA for MS4s. Given the lack of data and the variability of storm events and discharges from storm sewer system discharges, it is difficult to establish numeric limits on stormwater discharges that accurately address projected loadings. As a result, EPA regulations and guidance recommend expressing NPDES permit limits for MS4s as BMPs.

LAs can be calculated under different flow conditions. The LA at any particular flow exceedance is calculated as shown in the equation below:

$$\mathbf{LA = TMDL - WLA\_{WWTF} - WLA\_{MS4} – MOS}$$

WLA for MS4s. If there are no permitted MS4s in the study area, WLA_MS4 is set to zero. When there are permitted MS4s in a watershed, first calculate the sum of LA + WLA_MS4 using the above formula, then separate WLA for MS4s from the sum based on the percentage of a watershed that is under a MS4 jurisdiction. This WLA for MS4s may not be the total load allocated for permitted MS4s unless the whole MS4 area is located within the study watershed boundary. However, in most cases the study watershed intersects only a portion of the permitted MS4 coverage areas.

Step 5: **Estimate Percent Load Reduction.** Percent load reductions are not required and are provided for informational purposes when making inferences about individual TMDLs or between TMDLs usually in regard to implementation of the TMDL.

The LDC approach recognizes that the assimilative capacity of a waterbody depends on stream flow and that the maximum allowable loading varies with flow condition. Existing loading and load reductions required to meet the TMDL can also be calculated under different flow conditions. The difference between existing loading and the TMDL is used to calculate the loading reductions required. Percent reduction goals are calculated through an iterative process of taking a series of percent reduction values applying each value uniformly to the measured concentrations of samples and verifying if the arithmetic mean of the reduced values of all samples is less than the annual average criteria.

Estimate LA Load Reduction. After existing loading estimates are computed for each pollutant, nonpoint load reduction estimates for each waterbody are calculated by using the difference between the estimate of existing loading and the allowable loading (TMDL) under all flow conditions. This difference is expressed as the overall PRG for the impaired waterbody. The PRG serves as a guide for the amount of pollutant reduction necessary to meet the TMDL. The PRG is the greater of: 1) load reduction that ensures that no more than 10% of the samples under baseflow conditions exceed the TMDL or 2) load reduction that ensures that the arithmetic mean of all data is less than the yearly mean standard.

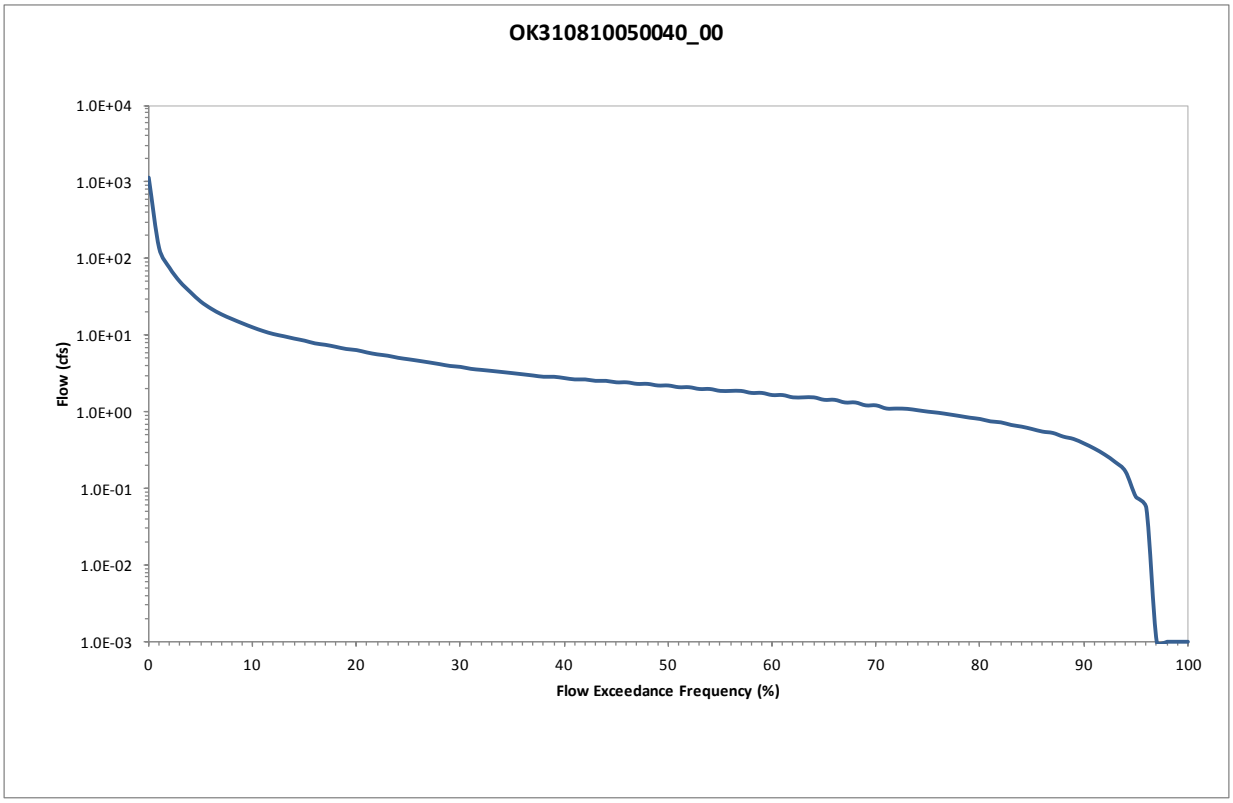
SECTION 5
TMDL CALCULATIONS

5.1 Flow Duration Curve

Following the same procedures described in Section 4.2, a flow duration curve for each waterbody requiring a TMDL in the Study Area was developed and is shown in Figures 5-1 through Figure 5-7.

No flow gage exists on Murray Creek (OK310810050040_00). Therefore, flows for this waterbody were estimated using the watershed area ration method based on measured flows at USGS gage station 07329000 located in an adjacent watershed (Rush Creek at Purdy, OK). The flow duration curve was based on measured flows from 1939 to 1994.

Figure 5-1 Flow Duration Curve for Murray Creek (OK310810050040_00)



No flow gage exists on Cox City Creek (OK310810050130_00), West Cox City Creek (OK310810050140_00), Rush Creek Tributary E (OK310810050120_00), or Rush Creek Tributary G (OK310810010270_00). Therefore, flows for these waterbodies were estimated using the watershed area ratio method based on measured flows at USGS gage station 07329500 located in Rush Creek near Maysville, OK. The flow duration curves were based on measured flows from 1954 to 1976.

Figure 5-2 Flow Duration Curve for Cox City Creek (OK310810050130_00)

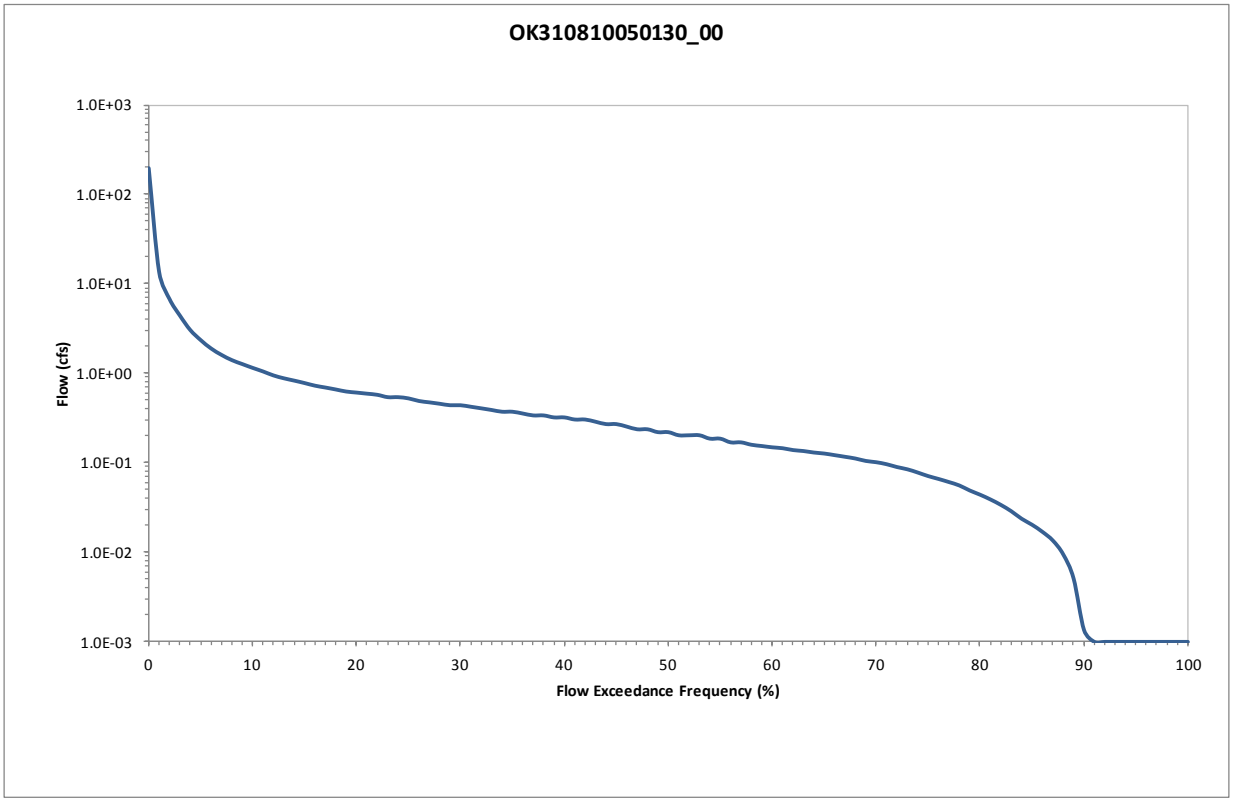


Figure 5-3 Flow Duration Curve for West Cox City Creek (OK310810050140_00)

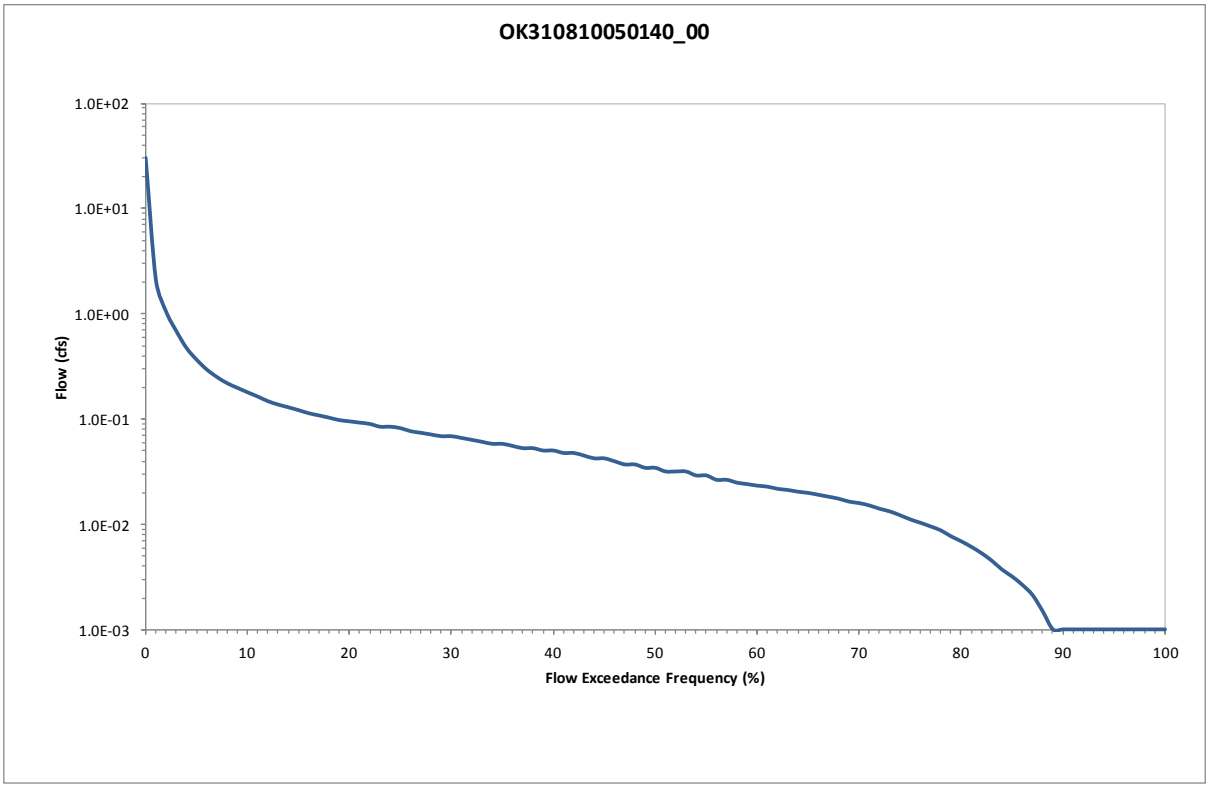


Figure 5-4 Flow Duration Curve for Rush Creek Tributary E (OK310810050120_00)

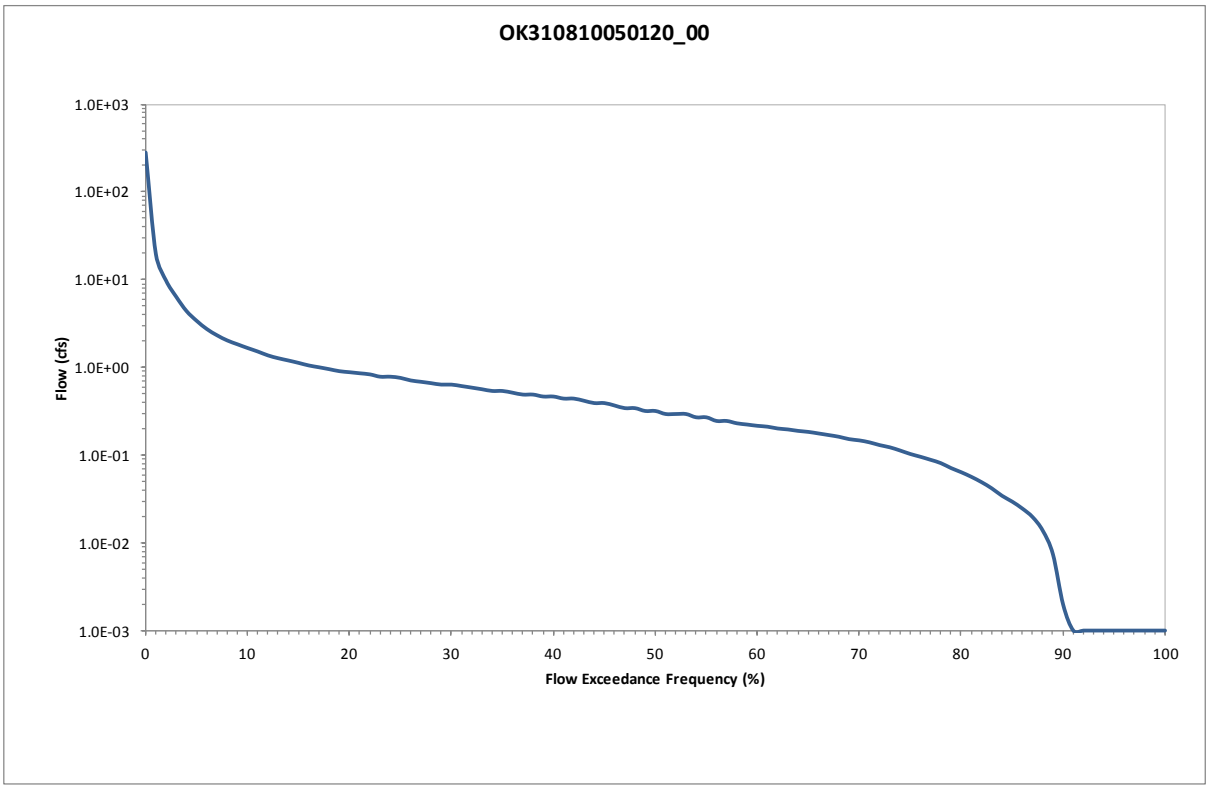
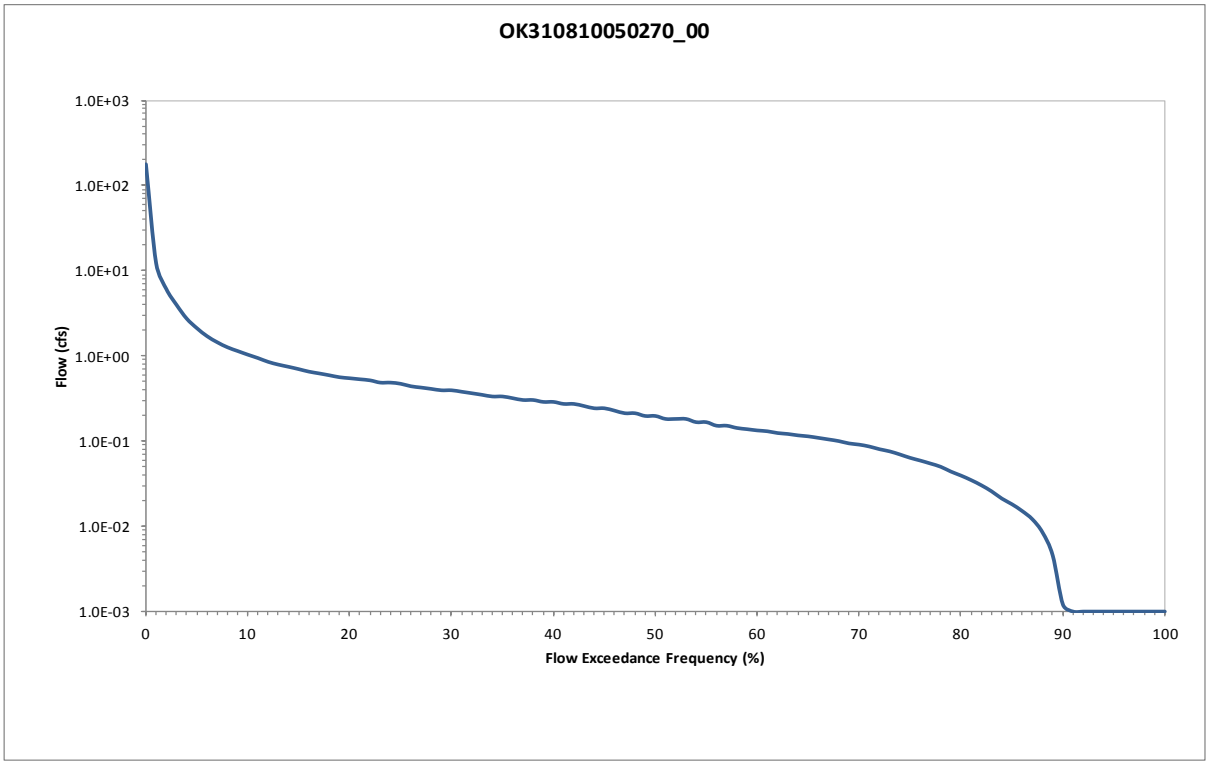
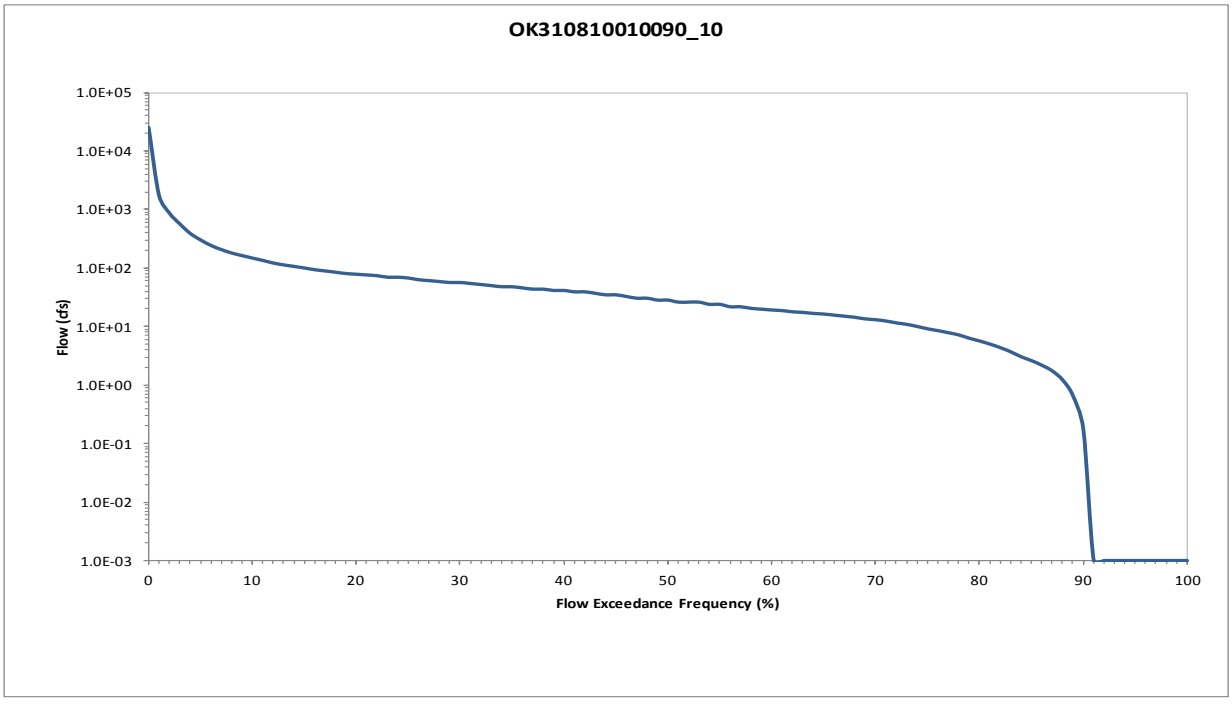


Figure 5-5 Flow Duration Curve for Rush Creek Tributary G (OK310810010270_00)



The flow duration curve for Rush Creek (OK310810010090_10) was developed using measured flows at USGS gage station 07329500 located in Rush Creek near Maysville, OK. The period of record for the gage is 1954 to 1976.

Figure 5-6 Flow Duration Curve for Rush Creek (OK310810010090_10)



5.2 Estimated Loading and Critical Conditions

EPA regulations [40 CFR 130.7(c)(1)] require TMDLs to take into account critical conditions for stream flow, loading, and all applicable WQS. To accomplish this, available in-stream WQM data were evaluated with respect to flows and magnitude of water quality criteria exceedance using LDCs.

To calculate the allowable chloride or sulfate load at the WQ standard, the flow rate at each flow exceedance percentile is multiplied by a unit conversion factor (*5.39377*) and the single sample WQ standard. This calculation produces the maximum chloride/sulfate load in the waterbody that will result in attainment of the standard. The allowable loads at the WQS establish the TMDL and are plotted versus flow exceedance percentile as a LDC. The x-axis indicates the flow exceedance percentile, while the y-axis is expressed in terms of a load in pounds per day.

To estimate existing loading, chloride or sulfate observations from 2002 to 2010 are paired with the flows measured or projected on the same date for the waterbody. Pollutant loads are then calculated by multiplying the chloride/sulfate concentration by the flow rate and the unit conversion factor. The associated flow exceedance percentile is then matched with the flow from the tables provided in Appendix B. The observed loads are then added to the LDC plot as points. These points represent individual ambient water quality samples. Points above the LDC indicate the single sample WQS was exceeded at the time of sampling. Conversely, points under the LDC indicate the sample did not exceed the WQS.

Figures 5-7 through Figure 5-11 show the chloride LDCs developed for the waterbodies addressed in this TMDL report. Given the lack of sampling data for most of the waterbodies in the Study Area, it is not possible to estimate the current level of impairment or the flow conditions at which impairments occur. For Rush Creek (OK310810010090_10), data in Figure 5-11 indicate that chloride levels exceed the water quality target during moderate and low flow conditions, indicating water quality impairments due to nonpoint sources. Wet weather influenced samples found during low flow conditions can be caused by an isolated rainfall event during dry weather conditions.

Figure 5-7 Load Duration Curve for Chloride in Cox City Creek (OK310810050130_00)

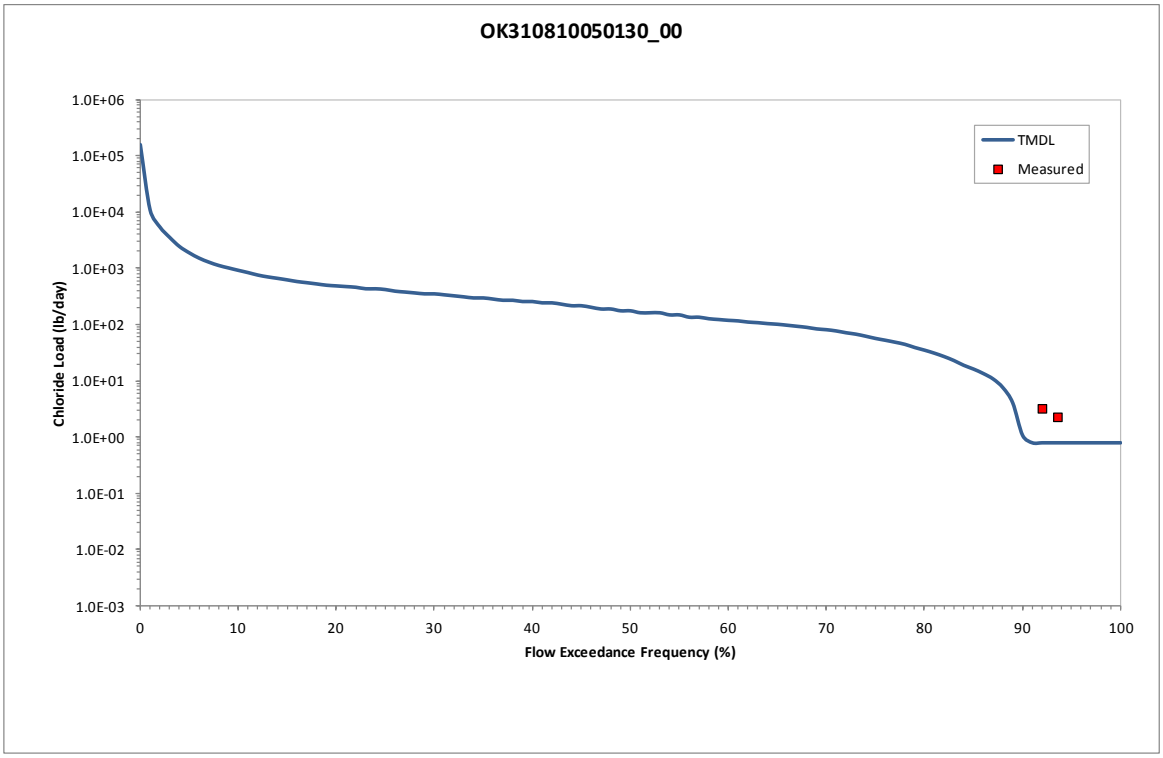


Figure 5-8 Load Duration Curve for Chloride in West Cox City Creek (OK310810050140_00)

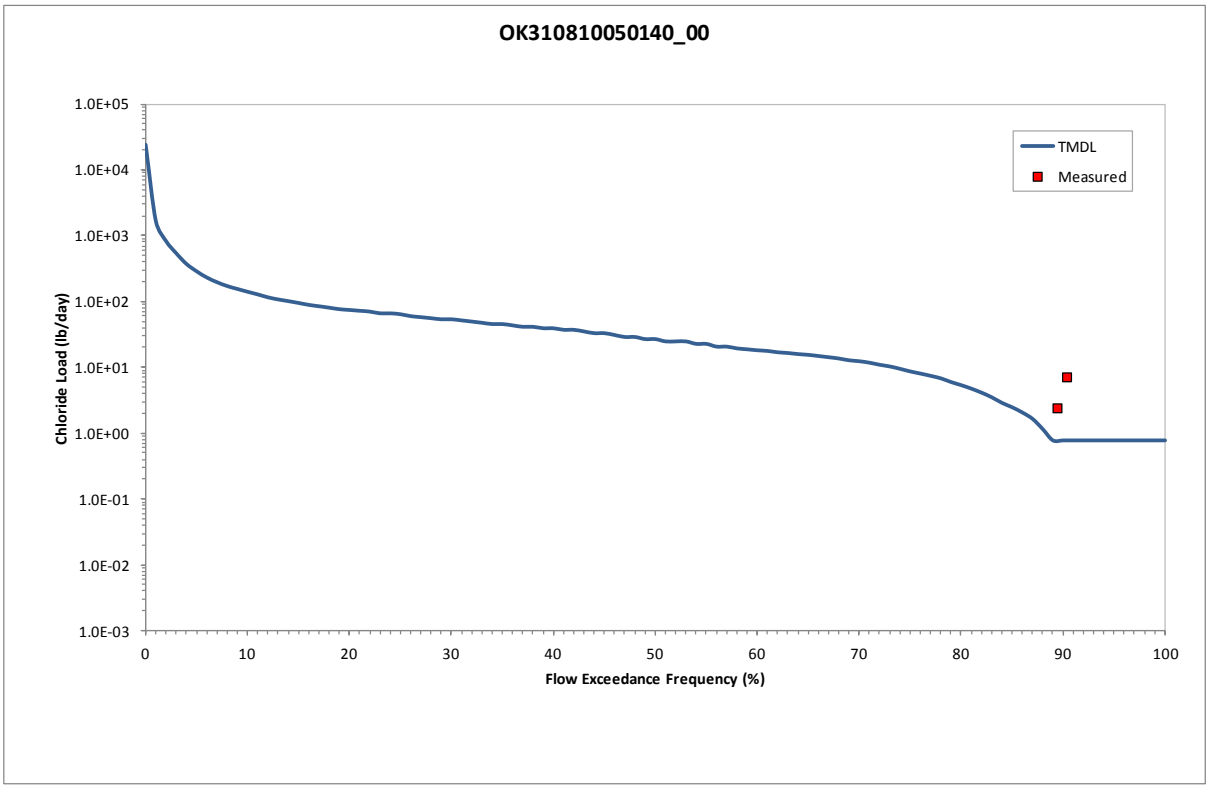


Figure 5-9 Load Duration Curve for Chloride in Rush Creek Tributary E (OK310810050120_00)

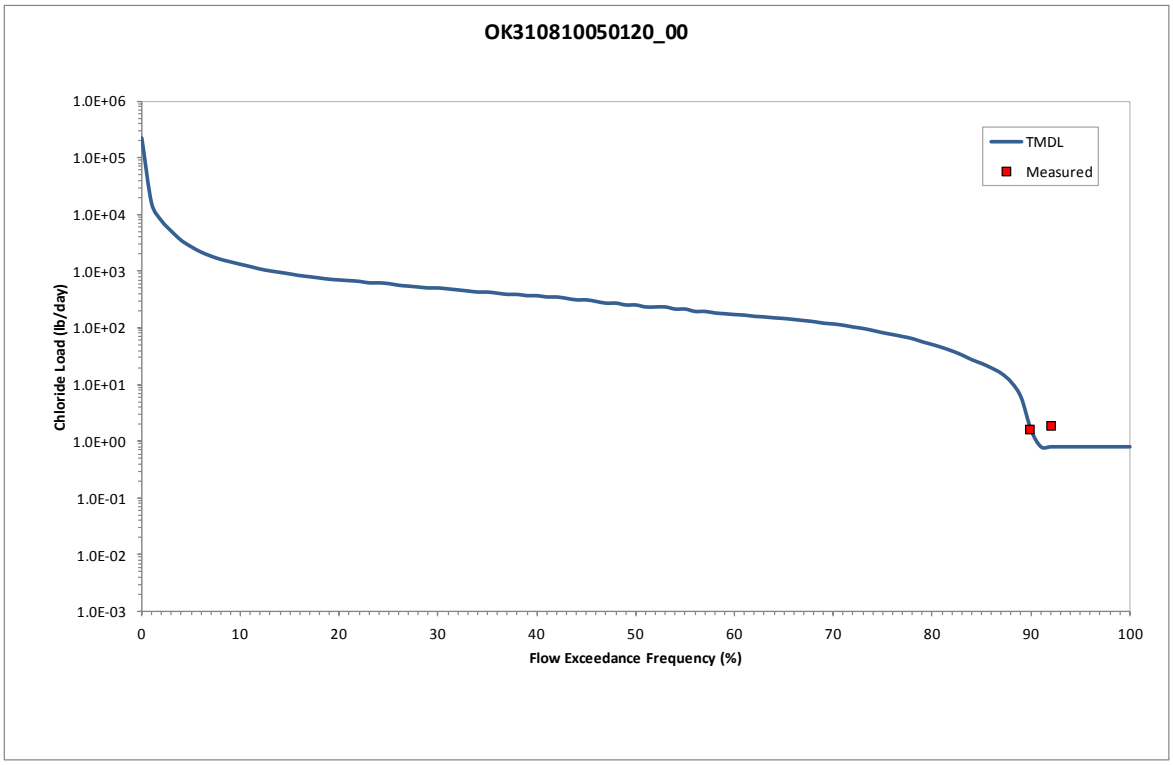


Figure 5-10 Load Duration Curve for Chloride in Rush Creek Tributary G (OK310810010270_00)

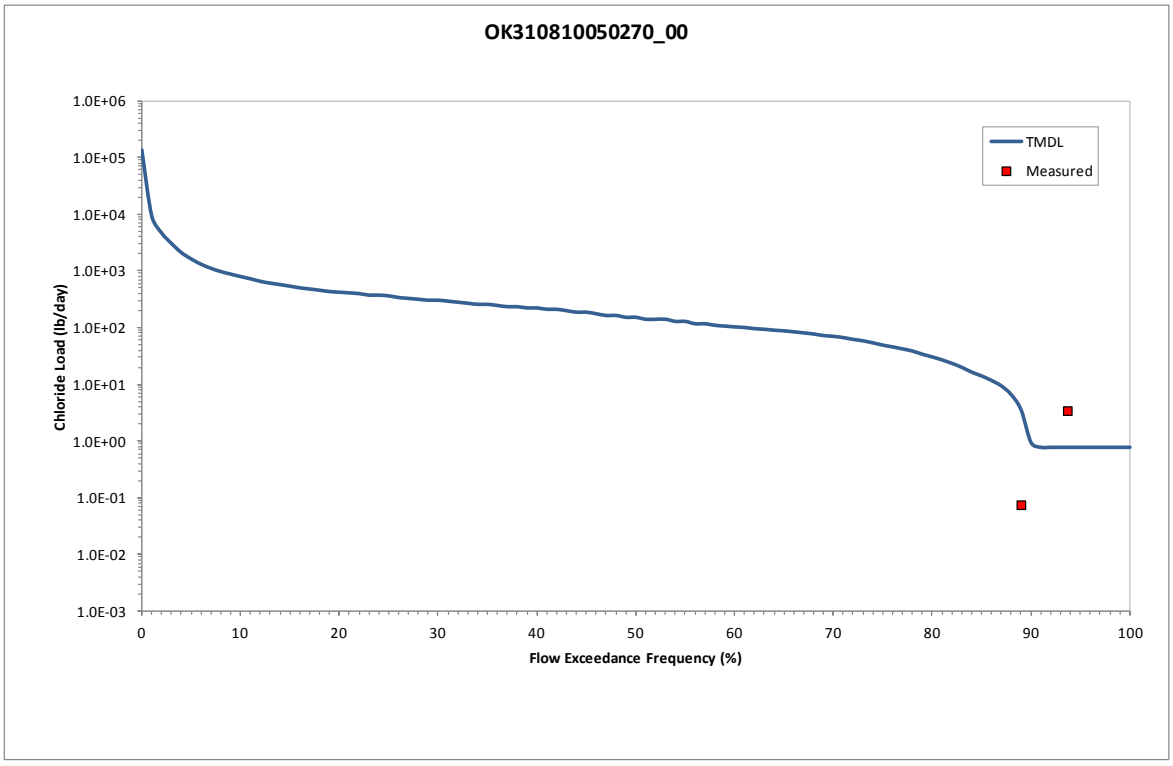
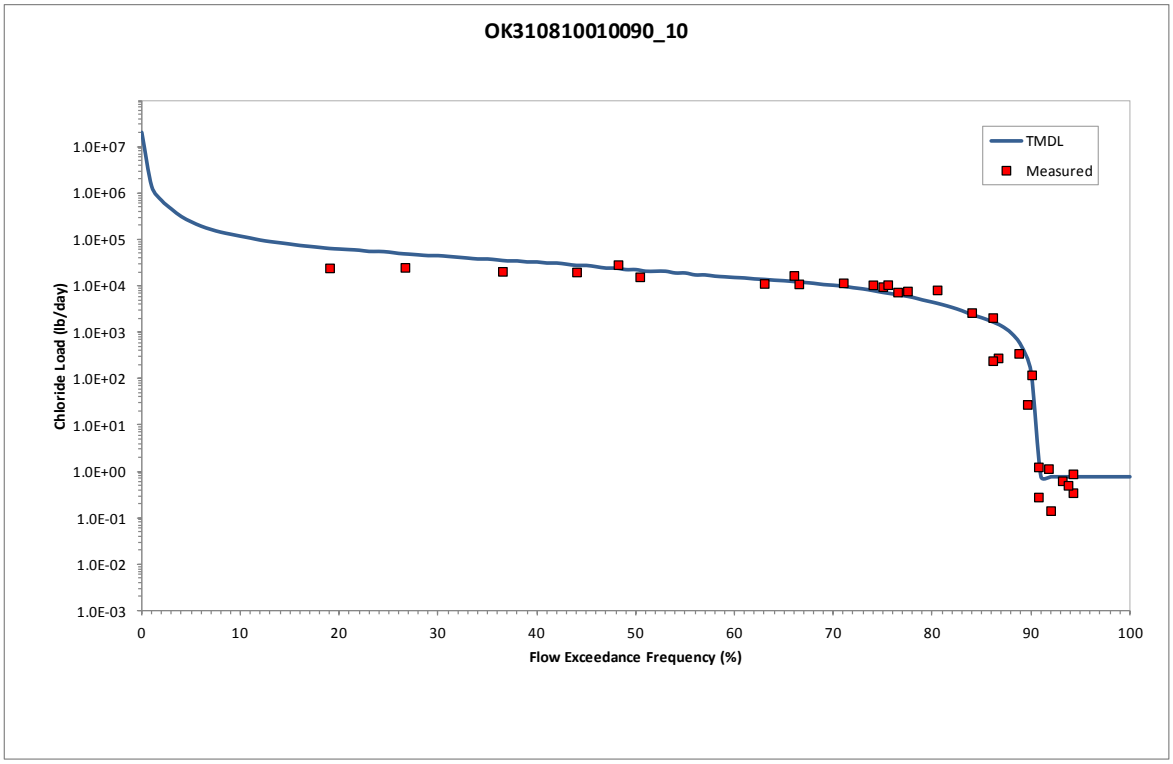


Figure 5-11 Load Duration Curve for Chloride in Rush Creek (OK310810010090_10)



Establishing Percent Reduction Goals: The LDC approach recognizes that the assimilative capacity of a waterbody varies with flow condition. Existing loading and load reductions required to meet the TMDL water quality target can be calculated under different flow conditions. The difference between estimated existing loading and the water quality target is used to calculate the loading reductions required. PRGs for minerals are calculated using two criteria: 1) through an iterative process of taking a series of percent reduction values, applying each value uniformly to the concentrations of samples and verifying than no more than 10% of the samples exceed the single sample WQS; and 2) calculating the required reduction for the average of all the data to be at or below the yearly mean WQS. The single sample WQS and the yearly mean WQS are defined in Table 2-4 which were derived from Appendix F of the OAC 785:45. The PRG is the greater of the two reductions. It was not possible to calculate a PRG for most of the waterbodies in the Study Area because of the very small number of samples available. Given the lack of monitoring data, the PRG could only be calculated for one of the waterbodies within the Study Area: Rush Creek (OK310810010090_10). For Rush Creek, a 30% reduction is required to meet the single sample WQS, while a 13% reduction is required to meet the yearly mean WQS. Thus, the PRG for Rush Creek is 30%.

5.3 Wasteload Allocation (WLA)

There are no NPDES-permitted facilities or areas designated as MS4 within the watersheds of the Study Area. Thus, the WLA is zero for each impaired waterbody.

5.4 Load Allocation (LA)

As discussed in Section 3, nonpoint source loading to each waterbody emanate from a number of different sources. The data analysis and the LDCs indicate that exceedances for each waterbody are the result of a variety of nonpoint source loading. The LAs for each waterbodies are calculated as the difference between the TMDL, MOS, and WLA, as follows:

$$\mathbf{LA = TMDL – WLA\_WWTF – WLA\_MS4 – MOS}$$

Since the WLA for the Study Area is zero, the equation is reduced to:

$$\mathbf{LA = TMDL – MOS}$$

5.5 Seasonal Variability

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs account for seasonal variation in watershed conditions and pollutant loading. Seasonal variation for the mineral TMDLs established in this report was accounted for by using more than five years of water quality data and by using the longest period of USGS flow records when estimating flows to develop flow exceedance percentiles.

5.6 Margin of Safety

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs include an MOS. The MOS is a conservative measure incorporated into the TMDL equation that accounts for the lack of knowledge associated with calculating the allowable pollutant loading to ensure WQSs are attained. EPA guidance allows for use of implicit or explicit expressions of the MOS, or both. When conservative assumptions are used in development of the TMDL, or conservative factors are used in the calculations, the MOS is implicit. When a specific percentage of the TMDL is set aside to account for the lack of knowledge, then the MOS is considered explicit. For chloride TMDLs, an explicit MOS was set at 10%.

5.7 TMDL Calculations

The TMDLs for the 303(d)-listed waterbodies covered in this report were derived using LDCs. A TMDL is expressed as the sum of all WLAs (point source loads), LAs (nonpoint source loads), and an appropriate MOS, which attempts to account for the lack of knowledge concerning the relationship between pollutant loading and water quality.

This definition can be expressed by the following equation:

$$\boldsymbol{TMDL = \Sigma\, WLA + LA + MOS}$$

The TMDL represents a continuum of desired load over all flow conditions, rather than fixed at a single value, because loading capacity varies as a function of the flow present in the stream. The higher the flow is, the more wasteload the stream can handle without violating water quality standards. Regardless of the magnitude of the WLA calculated in these TMDLs, future new discharges or increased load from existing discharges will be considered consistent with the TMDL provided the NPDES permit requires in-stream criteria to be met.

The TMDL, WLA, LA, and MOS will vary with flow condition, and are calculated at every 5th flow interval percentile. Tables 5-1 through 5-5 summarize the allocations for the five waterbodies in the Study Area that require chloride TMDLs.

Table 5-1 Chloride TMDL Calculations for Cox City Creek (OK310810050130_00)

Percentile	Flow (cfs)	TMDL (lb/day)	WLA_{WWTF} (lb/day)	WLA_{MS4} (lb/day)	LA (lb/day)	MOS (lb/day)
0	197	1.80E+05	0	0	1.62E+05	1.80E+04
5	2.4	2.16E+03	0	0	1.95E+03	2.16E+02
10	1.2	1.06E+03	0	0	9.52E+02	1.06E+02
15	0.8	7.16E+02	0	0	6.44E+02	7.16E+01
20	0.6	5.60E+02	0	0	5.04E+02	5.60E+01
25	0.5	4.82E+02	0	0	4.34E+02	4.82E+01
30	0.4	4.05E+02	0	0	3.64E+02	4.05E+01
35	0.37	3.42E+02	0	0	3.08E+02	3.42E+01
40	0.32	2.96E+02	0	0	2.66E+02	2.96E+01
45	0.27	2.49E+02	0	0	2.24E+02	2.49E+01
50	0.22	2.02E+02	0	0	1.82E+02	2.02E+01
55	0.19	1.71E+02	0	0	1.54E+02	1.71E+01
60	0.15	1.37E+02	0	0	1.23E+02	1.37E+01
65	0.13	1.17E+02	0	0	1.05E+02	1.17E+01
70	0.10	9.34E+01	0	0	8.40E+01	9.34E+00
75	0.07	6.53E+01	0	0	5.88E+01	6.53E+00
80	0.04	4.05E+01	0	0	3.64E+01	4.05E+00
85	0.02	1.87E+01	0	0	1.68E+01	1.87E+00
90	0.001	1.24E+00	0	0	1.12E+00	1.24E-01
95	0.001	9.17E-01	0	0	8.25E-01	9.17E-02
100	0.001	9.17E-01	0	0	8.25E-01	9.17E-02

Table 5-2 Chloride TMDL Calculations for West Cox City Creek (OK310810050140_00)

Percentile	Flow (cfs)	TMDL (lb/day)	WLA_{WWTF} (lb/day)	WLA_{MS4} (lb/day)	LA (lb/day)	MOS (lb/day)
0	31	2.82E+04	0	0	2.54E+04	2.82E+03
5	0.4	3.38E+02	0	0	3.04E+02	3.38E+01
10	0.2	1.65E+02	0	0	1.49E+02	1.65E+01
15	0.12	1.12E+02	0	0	1.01E+02	1.12E+01
20	0.10	8.75E+01	0	0	7.88E+01	8.75E+00
25	0.08	7.54E+01	0	0	6.78E+01	7.54E+00
30	0.07	6.32E+01	0	0	5.69E+01	6.32E+00
35	0.06	5.35E+01	0	0	4.81E+01	5.35E+00
40	0.05	4.62E+01	0	0	4.16E+01	4.62E+00
45	0.04	3.89E+01	0	0	3.50E+01	3.89E+00
50	0.034	3.16E+01	0	0	2.84E+01	3.16E+00
55	0.029	2.67E+01	0	0	2.41E+01	2.67E+00
60	0.023	2.14E+01	0	0	1.93E+01	2.14E+00
65	0.020	1.82E+01	0	0	1.64E+01	1.82E+00
70	0.016	1.46E+01	0	0	1.31E+01	1.46E+00
75	0.011	1.02E+01	0	0	9.19E+00	1.02E+00
80	0.007	6.32E+00	0	0	5.69E+00	6.32E-01
85	0.003	2.92E+00	0	0	2.63E+00	2.92E-01
90	0.001	9.17E-01	0	0	8.25E-01	9.17E-02
95	0.001	9.17E-01	0	0	8.25E-01	9.17E-02
100	0.001	9.17E-01	0	0	8.25E-01	9.17E-02

Table 5-3 Chloride TMDL Calculations for Rush Creek Tributary E (OK310810050120_00)

Percentile	Flow (cfs)	TMDL (lb/day)	WLA_{WWTF} (lb/day)	WLA_{MS4} (lb/day)	LA (lb/day)	MOS (lb/day)
0	286	2.63E+05	0	0	2.36E+05	2.63E+04
5	3.4	3.15E+03	0	0	2.83E+03	3.15E+02
10	1.7	1.54E+03	0	0	1.39E+03	1.54E+02
15	1.1	1.04E+03	0	0	9.37E+02	1.04E+02
20	0.9	8.15E+02	0	0	7.34E+02	8.15E+01
25	0.8	7.02E+02	0	0	6.32E+02	7.02E+01
30	0.6	5.89E+02	0	0	5.30E+02	5.89E+01
35	0.5	4.98E+02	0	0	4.48E+02	4.98E+01
40	0.5	4.30E+02	0	0	3.87E+02	4.30E+01
45	0.4	3.62E+02	0	0	3.26E+02	3.62E+01
50	0.32	2.94E+02	0	0	2.65E+02	2.94E+01
55	0.27	2.49E+02	0	0	2.24E+02	2.49E+01
60	0.22	1.99E+02	0	0	1.79E+02	1.99E+01
65	0.19	1.70E+02	0	0	1.53E+02	1.70E+01
70	0.15	1.36E+02	0	0	1.22E+02	1.36E+01
75	0.10	9.51E+01	0	0	8.56E+01	9.51E+00
80	0.06	5.89E+01	0	0	5.30E+01	5.89E+00
85	0.03	2.72E+01	0	0	2.45E+01	2.72E+00
90	0.002	1.81E+00	0	0	1.63E+00	1.81E-01
95	0.001	9.17E-01	0	0	8.25E-01	9.17E-02
100	0.001	9.17E-01	0	0	8.25E-01	9.17E-02

Table 5-4 Chloride TMDL Calculations for Rush Creek Tributary G (OK310810010270_00)

Percentile	Flow (cfs)	TMDL (lb/day)	WLA_{WWTF} (lb/day)	WLA_{MS4} (lb/day)	LA (lb/day)	MOS (lb/day)
0	175	1.60E+05	0	0	1.44E+05	1.60E+04
5	2.1	1.92E+03	0	0	1.73E+03	1.92E+02
10	1.0	9.40E+02	0	0	8.46E+02	9.40E+01
15	0.7	6.36E+02	0	0	5.72E+02	6.36E+01
20	0.5	4.98E+02	0	0	4.48E+02	4.98E+01
25	0.47	4.29E+02	0	0	3.86E+02	4.29E+01
30	0.39	3.59E+02	0	0	3.23E+02	3.59E+01
35	0.33	3.04E+02	0	0	2.74E+02	3.04E+01
40	0.29	2.63E+02	0	0	2.36E+02	2.63E+01
45	0.24	2.21E+02	0	0	1.99E+02	2.21E+01
50	0.20	1.80E+02	0	0	1.62E+02	1.80E+01
55	0.17	1.52E+02	0	0	1.37E+02	1.52E+01
60	0.13	1.22E+02	0	0	1.09E+02	1.22E+01
65	0.11	1.04E+02	0	0	9.33E+01	1.04E+01
70	0.09	8.29E+01	0	0	7.47E+01	8.29E+00
75	0.06	5.81E+01	0	0	5.23E+01	5.81E+00
80	0.04	3.59E+01	0	0	3.23E+01	3.59E+00
85	0.02	1.66E+01	0	0	1.49E+01	1.66E+00
90	0.001	1.11E+00	0	0	9.95E-01	1.11E-01
95	0.001	9.17E-01	0	0	8.25E-01	9.17E-02
100	0.001	9.17E-01	0	0	8.25E-01	9.17E-02

Table 5-5 Chloride TMDL Calculations for Rush Creek (OK310810010090_10)

Percentile	Flow (cfs)	TMDL (lb/day)	WLA_{WWTF} (lb/day)	WLA_{MS4} (lb/day)	LA (lb/day)	MOS (lb/day)
0	25,409	2.33E+07	0	0	2.10E+07	2.33E+06
5	304	2.79E+05	0	0	2.51E+05	2.79E+04
10	149	1.37E+05	0	0	1.23E+05	1.37E+04
15	101	9.24E+04	0	0	8.32E+04	9.24E+03
20	79	7.23E+04	0	0	6.51E+04	7.23E+03
25	68	6.23E+04	0	0	5.60E+04	6.23E+03
30	57	5.22E+04	0	0	4.70E+04	5.22E+03
35	48	4.42E+04	0	0	3.98E+04	4.42E+03
40	42	3.82E+04	0	0	3.43E+04	3.82E+03
45	35	3.21E+04	0	0	2.89E+04	3.21E+03
50	28	2.61E+04	0	0	2.35E+04	2.61E+03
55	24	2.21E+04	0	0	1.99E+04	2.21E+03
60	19	1.77E+04	0	0	1.59E+04	1.77E+03
65	16	1.51E+04	0	0	1.36E+04	1.51E+03
70	13	1.21E+04	0	0	1.08E+04	1.21E+03
75	9	8.44E+03	0	0	7.59E+03	8.44E+02
80	6	5.22E+03	0	0	4.70E+03	5.22E+02
85	3	2.41E+03	0	0	2.17E+03	2.41E+02
90	0.2	1.61E+02	0	0	1.45E+02	1.61E+01
95	0.001	9.17E-01	0	0	8.25E-01	9.17E-02
100	0.001	9.17E-01	0	0	8.25E-01	9.17E-02

5.8 TMDL Implementation

DEQ will collaborate with a host of other State agencies and local governments working within the boundaries of State and local regulations to target available funding and technical assistance to support implementation of pollution controls and management measures. Various water quality management programs and funding sources will be used so that the pollutant reductions as required by these TMDLs can be achieved and water quality can be restored to maintain designated uses. DEQ's Continuing Planning Process (CPP), required by the CWA §303(e)(3) and 40 CFR 130.5, summarizes Oklahoma's commitments and programs aimed at restoring and protecting water quality throughout the State (DEQ 2012). The CPP can be viewed from DEQ's website at: http://www.deq.state.ok.us/wqdnew/305b_303d/Final%20CPP.pdf.

Table 5-6 provides a partial list of the State partner agencies DEQ will collaborate with to address point and nonpoint source reduction goals established by TMDLs.

Table 5-6 Partial List of Oklahoma Water Quality Management Agencies

Agency	Web Link
Oklahoma Conservation Commission	http://www.ok.gov/conservation/Agency_Divisions/Water_Quality_Division
Oklahoma Department of Wildlife Conservation	http://www.wildlifedepartment.com/wildlifemgmt/endangeredspecies.htm
Oklahoma Department of Agriculture, Food, and Forestry	http://www.ok.gov/~okag/aems
Oklahoma Water Resources Board	http://www.owrb.state.ok.us/quality/index.php

5.8.1 Point Sources

As authorized by Section 402 of the CWA, DEQ has delegation of the NPDES Program in Oklahoma, except for certain jurisdictional areas related to agriculture (retained by State Department of Agriculture, Food, and Forestry), and the oil and gas industry (retained by the Corporation Commission), for which EPA has retained permitting authority. The NPDES Program in Oklahoma, in accordance with an agreement between DEQ and EPA relating to administration and enforcement of the delegated NPDES Program, is implemented via the Oklahoma Pollutant Discharge Elimination System (OPDES) Act [Title 252, Chapter 606 (http://www.deq.state.ok.us/rules/611.pdf)]. Point source WLAs are outlined in the Oklahoma Water Quality Management Plan (aka the 208 Plan) under the OPDES program.

Land application activities that are permitted by the Corporation Commission are managed to address potential contamination that may emanate from commercial soil farming sites or one-time land application sites used for disposal of oil and gas development spoils.

5.8.2 Nonpoint Sources

Nonpoint source pollution in Oklahoma is primarily managed by the Oklahoma Conservation Commission. The Oklahoma Conservation Commission (OCC) works with other agencies that collect water monitoring information and/or address water quality problems associated with nonpoint source pollution. These agencies are DEQ, OWRB, Corporation Commission, & ODAFF at the State level and EPA, USGS, U.S. Army Corps of Engineers (USACE) & the National Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) at the Federal level.

In Oklahoma, the Corporation Commission has the primary responsibility for efforts to mitigate the pollutant load contributions from oil and gas production including land application sites used for disposal production waters and drilling muds. For example, The Corporation Commission locates and caps 250-400 wells per year Statewide in its efforts to reduce the availability of nonpoint source pollution to surface waters.

The primary mechanisms used for management of nonpoint source pollution are incentive-based programs that support the installation of BMPs and public education and outreach. The pollutant load reduction rates called for in this TMDL report are as high as 30%. The DEQ recognizes that achieving reductions will be a challenge, especially since unregulated nonpoint sources are a major cause of mineral loadings.

5.9 Reasonable Assurances

Reasonable assurance is required by the EPA guidance for a TMDL to be approvable only when a waterbody is impaired by both point and nonpoint sources and where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. The impairments to the waterbodies in this report are not caused by point sources. Since there are no point source WLAs in this TMDL report, reasonable assurance does not apply.

SECTION 6
PUBLIC PARTICIPATION

This report has been preliminarily reviewed by EPA. After EPA reviewed this draft TMDL report, DEQ was given approval to submit this Report for Public Notice. A public notice will be sent to local newspapers, stakeholders in the Study Area affected by these draft TMDLs, and to stakeholders who have requested all copies of TMDL public notices. The public notice will also be posted at the DEQ website: http://www.deq.state.ok.us/wqdnew/index.htm.

The public comment period lasts 45 days. During that time, the public has the opportunity to review the TMDL report and make written comments. Depending on the interest and responses from the public, a public meeting may be held within the watershed affected by the TMDLs in this report. If a public meeting is held, the public will also have opportunities to ask questions and make formal oral comments at the meeting and/or to submit written comments at the public meeting.

All written comments received during the public notice period will become a part of the record of these TMDLs. All comments will be considered; and the TMDL report will be revised according to the comments, if necessary, prior to the ultimate completion of these TMDLs and submission to EPA for final action.

After EPA's final approval, each TMDL will be adopted into the Water Quality Management Plan (WQMP). These TMDLs provide a mathematical solution to meet ambient water quality criteria with a given set of facts. The adoption of these TMDLs into the WQMP provides a mechanism to recalculate acceptable loads when information changes in the future. Updates to the WQMP demonstrate compliance with the water quality criteria. The updates to the WQMP are also useful when the water quality criteria change and the loading scenario is reviewed to ensure that the in-stream criterion is predicted to be met.

SECTION 7
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APPENDIX A

AMBIENT WATER QUALITY DATA

1997 TO 2010

Waterbody Name	Waterbody ID	Waterbody Station	Date	Chloride (mg/l)	Sulfate (mg/l)	TDS (mg/l)	Comments
Murray Creek	OK310810050040_00	310810050040C	02/28/02	10	409		
Murray Creek	OK310810050040_00	310810050040C	05/22/02	9	306		
Murray Creek	OK310810050040_00	310810050040B	08/12/02	11	388		
			# Samples	**3**	**3**	**0**	No sulfate
			Arithmetic Mean	**10**	**368**	**0**	TMDL
			Mean Yrly Std	**127**	**755**	**3008**	required
			Single Sample Criterion	**170**	**958**	**4409**	
			# Over Single Sample Criterion	**0**	**0**	**0**	
			% Over Single Sample Criterion	**0**	**0**	**0**	
Cox City Creek	OK310810050130_00	310810050130A	12/14/05	602	17		
Cox City Creek	OK310810050130_00	310810050130A	02/08/06	425	12		
			# Samples	**2**	**2**	**0**	
			Arithmetic Mean	**513**	**14**	**0**	TMDL
			Mean Yrly Std	**127**	**755**	**3008**	required for
			Single Sample Criterion	**170**	**958**	**4409**	Chlorides
			# Over Single Sample Criterion	**2**	**0**	**0**	
			% Over Single Sample Criterion	**100**	**0**	**0**	
West Cox City Creek	OK310810050140_00		02/12/07	1333	29		
West Cox City Creek	OK310810050140_00		04/16/07	451	308		
			# Samples	**2**	**2**	**0**	
			Arithmetic Mean	**892**	**169**	**0**	
			Mean Yrly Std	**127**	**755**	**3008**	TMDL
			Single Sample Criterion	**170**	**958**	**4409**	required for
			# Over Single Sample Criterion	**2**	**0**	**0**	Chlorides
			% Over Single Sample Criterion	**100**	**0**	**0**	
Rush Creek Trib D	OK310810050110_00	310810050110A	02/18/97	329			
Rush Creek Trib D	OK310810050110_00	310810050110B	02/06/98	331	182		
			# Samples	**2**	**1**	**0**	No TMDL
			Arithmetic Mean	**330**	**182**	**0**	required for
			Mean Yrly Std	**127**	**755**	**3008**	Chlorides;
			Single Sample Criterion	**170**	**958**	**4409**	data from
			# Over Single Sample Criterion	**2**	**0**	**0**	wrong watershed
			% Over Single Sample Criterion	**100**	**0**	**0**	
Rush Creek Trib E	OK310810050120_00	310810050120B	10/11/05	306	55		
Rush Creek Trib E	OK310810050120_00	310810050120B	12/14/05	355	69		
Rush Creek Trib E	OK310810050120_00		08/29/06	5	8		
			# Samples	**3**	**3**	**0**	
			Arithmetic Mean	**222**	**44**	**0**	
			Mean Yrly Std	**127**	**755**	**3008**	TMDL
			Single Sample Criterion	**170**	**958**	**4409**	required for
			# Over Single Sample Criterion	**2**	**0**	**0**	Chlorides
			% Over Single Sample Criterion	**67**	**0**	**0**	
Rush Creek Trib G	OK310810010270_00	31081005.00C	08/29/05	14	14		
Rush Creek Trib G	OK310810010270_00	310810000000	02/07/06	640	24		
Rush Creek Trib G	OK310810010270_00	310810000000	06/13/06	549	18		
Rush Creek Trib G	OK310810010270_00		03/12/07	12	23		

Waterbody Name	Waterbody ID	Waterbody Station	Date	Chloride (mg/l)	Sulfate (mg/l)	TDS (mg/l)	Comments
			# Samples	**4**	**4**	**0**	
			Arithmetic Mean	**304**	**20**	**0**	TMDL
			Mean Yrly Std	**127**	**755**	**3008**	required for
			Single Sample Criterion	**170**	**958**	**4409**	Chlorides
			# Over Single Sample Criterion	**2**	**0**	**0**	
			% Over Single Sample Criterion	**50**	**0**	**0**	
Rush Creek	OK310810010090_10	OK310810-01-0090G	08/24/04	189.6	161.5	870	
Rush Creek	OK310810010090_10	OK310810-01-0090G	09/28/04	285.3	216.9	1141	
Rush Creek	OK310810010090_10	OK310810-01-0090G	11/02/04	26.6	23.5	192	
Rush Creek	OK310810010090_10	OK310810-01-0090G	12/07/04	29.7	42.0	305	
Rush Creek	OK310810010090_10	OK310810-01-0090G	02/22/05	83.8	134.8	669	
Rush Creek	OK310810010090_10	OK310810-01-0090G	03/21/05	105.1	159.9	636	
Rush Creek	OK310810010090_10	OK310810-01-0090G	04/25/05	132.1	178.7	816	
Rush Creek	OK310810010090_10	OK310810-01-0090G	05/31/05	120.0	171.6	840	
Rush Creek	OK310810010090_10	OK310810-01-0090G	07/05/05	29.5	29.3	270	
Rush Creek	OK310810010090_10	OK310810-01-0090G	08/08/05	55.8	42.5	833	
Rush Creek	OK310810010090_10	OK310810-01-0090G	09/12/05	224.2	194.1	1039	
Rush Creek	OK310810010090_00	310810010090E	10/10/05	128	120		
Rush Creek	OK310810010090_10	OK310810-01-0090G	10/17/05	164.4	166.2	832	
Rush Creek	OK310810010090_10	OK310810-01-0090G	11/29/05	205.5	208.6	1019	
Rush Creek	OK310810010090_00	310810010090E	12/13/05	214	221		
Rush Creek	OK310810010090_10	OK310810-01-0090G	01/09/06	177.5	190.8	940	
Rush Creek	OK310810010090_10	OK310810-01-0090G	02/13/06	188.8	201.0	960	
Rush Creek	OK310810010090_10	OK310810-01-0090G	03/20/06	64.7	75.9	22	
Rush Creek	OK310810010090_00	310810010090B	04/04/06	117	155		
Rush Creek	OK310810010090_10	OK310810-01-0090G	04/24/06	161.8	161.9	997	
Rush Creek	OK310810010090_10	OK310810-01-0090G	05/30/06	173.0	180.3	903	
Rush Creek	OK310810010090_10	OK310810-01-0090G	06/26/06	193.1	231.0	914	
Rush Creek	OK310810010090_10	OK310810-05-0010D	05/18/09	20.7	60.0	344	
Rush Creek	OK310810010090_10	OK310810-05-0010D	06/22/09	103.5	154.7	578	
Rush Creek	OK310810010090_10	OK310810-05-0010D	07/28/09	175.7	176.9	804	
Rush Creek	OK310810010090_10	OK310810-05-0010D	08/31/09	99.2	97.1	548	
Rush Creek	OK310810010090_10	OK310810-05-0010D	10/05/09	232.7	232.5	988	
Rush Creek	OK310810010090_10	OK310810-05-0010D	11/03/09	52.2	88.3	487	
Rush Creek	OK310810010090_10	OK310810-05-0010D	12/15/09	164.9	188.1	757	
Rush Creek	OK310810010090_10	OK310810-05-0010D	01/26/10	93.6	133.1	670	
Rush Creek	OK310810010090_10	OK310810-05-0010D	03/02/10	75.9	133.6	666	
			# Samples	**31**	**31**	**28**	
			Arithmetic Mean	**132**	**132**	**716**	TMDL
			Mean Yrly Std	**127**	**755**	**3008**	required for
			Single Sample Criterion	**170**	**958**	**4409**	Chlorides
			# Over Single Sample Criterion	**11**	**0**	**14**	
			% Over Single Sample Criterion	**35**	**0**	**45**	

APPENDIX B

GENERAL METHOD FOR ESTIMATING FLOW FOR UNGAGED STREAMS

AND

ESTIMATED FLOW EXCEEDANCE PERCENTILES

Appendix B
General Method for Estimating Flow for Ungaged Streams

Flows duration curve will be developed using existing USGS measured flow where the data exist from a gage on the stream segment of interest, or by estimating flow for stream segments with no corresponding flow record. Flow data to support flow duration curves and load duration curves will be derived for each Oklahoma stream in the following priority:

i) In cases where a USGS flow gage occurs on, or within one-half mile upstream or downstream of the Oklahoma stream segment.

   a. If simultaneously collected flow data matching the water quality sample collection date are available, these flow measurements will be used.

   b. If flow measurements at the coincident gage are missing for some dates on which water quality samples were collected, the gaps in the flow record will be filled, or the record will be extended, by estimating flow based on measured streamflows at a nearby gages. All gages within 150 km radius are identified. For each of the identified gage with a minimum of 99 flow measurements on matching dates, four different regressions are calculated including linear, log linear, logarithmic and exponential regressions. The regression with the lowest root mean square error (RMSE) is chosen for each gage. The potential filling gages are ranked by RMSE from lowest to highest. The record is filled from the first gage (lowest RMSE) for those dates that exist in both records. If dates remain unfilled in the desired timespan of the timeseries, the filling process is repeated with the next gage with the next lowest RMSE and proceeds in this fashion until all missing values in the desired timespan are filled.

   c. The flow frequency for the flow duration curves will be based on measured flows only. The filled timeseries described above is used to match flows to sampling dates to calculate loads.

   d. On a stream impounded by dams to form reservoirs of sufficient size to impact stream flow, only flows measured after the date of the most recent impoundment will be used to develop the flow duration curve. This also applies to reservoirs on major tributaries to the stream.

ii) In the case no coincident flow data are available for a stream segment, but flow gage(s) are present upstream and/or downstream without a major reservoir between, flows will be estimated for the stream segment from an upstream or downstream gage using a watershed area ratio method derived by delineating sub-watersheds, and relying on the NRCS runoff curve numbers and antecedent rainfall condition. Drainage sub-basins will first be delineated for all impaired 303(d)-listed WQM stations, along with all USGS flow stations located in the 8-digit HUCs with impaired streams. Parsons will then identify all the USGS gage stations upstream and downstream of the sub-watersheds with 303(d) listed WQM stations.

a. Watershed delineations are performed using ESRI Arc Hydro with a 30 m resolution National Elevation Dataset digital elevation model, and National Hydrography Dataset (NHD) streams. The area of each watershed will be calculated following watershed delineation.

b. The watershed average curve number is calculated from soil properties and land cover as described in the U.S. Department of Agriculture (USDA) Publication *TR-55: Urban Hydrology for Small Watersheds*. The soil hydrologic group is extracted from NRCS STATSGO soil data, and land use category from the 2001 National Land Cover Dataset (NLCD). Based on land use and the hydrologic soil group, SCS curve numbers are estimated at the 30-meter resolution of the NLCD grid as shown in Table 7. The average curve number is then calculated from all the grid cells within the delineated watershed.

c. The average rainfall is calculated for each watershed from gridded average annual precipitation datasets for the period 1971-2000 (Spatial Climate Analysis Service, Oregon State University, http://www.ocs.oregonstate.edu/prism/, created February 20, 2004).

d. The method used to project flow from a gaged location to an ungaged location was adapted by combining aspects of two other flow projection methodologies developed by Furness (Furness 1959) and Wurbs (Wurbs 1999).

Table B-1 Runoff Curve Numbers for Various Land Use Categories and Hydrologic Soil Groups

NLCD Land Use Category	Curve number for hydrologic soil group			
	A	B	C	D
0 in case of zero	100	100	100	100
11 Open Water	100	100	100	100
12 Perennial Ice/Snow	100	100	100	100
21 Developed, Open Space	39	61	74	80
22 Developed, Low Intensity	57	72	81	86
23 Developed, Medium Intensity	77	85	90	92
24 Developed, High Intensity	89	92	94	95
31 Barren Land (Rock/Sand/Clay)	77	86	91	94
32 Unconsolidated Shore	77	86	91	94
41 Deciduous Forest	37	48	57	63
42 Evergreen Forest	45	58	73	80
43 Mixed Forest	43	65	76	82
51 Dwarf Scrub	40	51	63	70
52 Shrub/Scrub	40	51	63	70
71 Grasslands/Herbaceous	40	51	63	70
72 Sedge/Herbaceous	40	51	63	70
73 Lichens	40	51	63	70
74 Moss	40	51	63	70
81 Pasture/Hay	35	56	70	77
82 Cultivated Crops	64	75	82	85
90-99 Wetlands	100	100	100	100

Furness Method

The Furness method has been employed in Kansas by both the USGS and Kansas Department of Health and Environment to estimate flow-duration curves. The method typically uses maps, graphs, and computations to identify six unique factors of flow duration for ungaged sites. These factors include:

- the mean streamflow and percentage duration of mean streamflow;
- the ratio of 1%-duration streamflow to mean streamflow;
- the ratio of 0.1%-duration streamflow to 1%-duration streamflow;
- the ratio of 50%-duration streamflow to mean streamflow;
- the percentage duration of appreciable (0.10 ft/s) streamflow; and
- the average slope of the flow-duration curve.

Furness defined appreciable flow as 0.10 ft/s. This value of streamflow was important because, for many years, this was the smallest non-zero streamflow value reported in most Kansas streamflow records. The average slope of the duration curve is a graphical approximation of the variability index, which is the standard deviation of the logarithms of the streamflows (Furness 1959, p. 202-204, figs. 147 and 148). On a duration curve that fits the log-normal distribution exactly, the variability index is equal to the ratio of the streamflow at the 15.87%-duration point to the streamflow at the 50%-duration point. Because duration curves usually do not exactly fit the log-normal distribution, the average-slope line is drawn through an arbitrary point, and the slope is transferred to a position approximately defined by the previously estimated points.

The method provides a means of both describing shape of the flow duration curve and scaling the magnitude of the curve to another location, basically generating a new flow duration curve with a very similar shape but different magnitude at the ungaged location.

Wurbs Modified NRCS Method

As a part of the Texas water availability modeling (WAM) system developed by Texas Natural Resources Conservation Commission, now known as the Texas Commission on Environmental Quality (TCEQ), and partner agencies, various contractors developed models of all Texas rivers. As a part of developing the model code to be used, Dr. Ralph Wurbs of Texas A&M University researched methods to distribute flows from gaged locations to ungaged locations. (Wurbs 2006) His results included the development of a modified NRCS curve-number (CN) method for distributing flows from gaged locations to ungaged locations.

This modified NRCS method is based on the following relationship between rainfall depth, P in inches, and runoff depth, Q in inches (NRCS 1985; McCuen 2005):

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad (1)$$

where:

Q = runoff depth (inches)

P = rainfall (inches)

S = potential maximum retention after runoff begins (inches)

I_a = initial abstraction (inches)

If P < 0.2, Q = 0. Initial abstraction has been found to be empirically related to S by the equation

$$I_a = 0.2*S \quad (2)$$

Thus, the runoff curve number equation can be rewritten:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \quad (3)$$

S is related to the curve number (CN) by:

$$S = \frac{1000}{CN} - 10 \quad (4)$$

P and Q in inches must be multiplied by the watershed area to obtain volumes. The potential maximum retention, S in inches, represents an upper limit on the amount of water that can be abstracted by the watershed through surface storage, infiltration, and other hydrologic abstractions. For convenience, S is expressed in terms of a curve number CN, which is a dimensionless watershed parameter ranging from 0 to 100. A CN of 100 represents a limiting condition of a perfectly impervious watershed with zero retention and thus all the rainfall becoming runoff. A CN of zero conceptually represents the other extreme with the watershed abstracting all rainfall with no runoff regardless of the rainfall amount.

First, S is calculated from the average curve number for the gaged watershed. Next, the daily historic flows at the gage are converted to depth basis (as used in equations 1 and 3) by dividing by its drainage area, then converted to inches. Equation 3 is then solved for daily precipitation depth of the gaged site, Pgaged. The daily precipitation depth for the ungaged site is then calculated as the precipitation depth of the gaged site multiplied by the ratio of the long-term average precipitation in the watersheds of the ungaged and gaged sites:

$$P_{ungaged} = P_{gaged}\left(\frac{M_{ungaged}}{M_{gaged}}\right) \quad (5)$$

where M is the mean annual precipitation of the watershed in inches. The daily precipitation depth for the ungaged watershed, along with the average curve number of

the ungaged watershed, are then used to calculate the depth equivalent daily flow Q of the ungaged site. Finally, the volumetric flow rate at the ungaged site is calculated by multiplying by the area of the watershed of the ungaged site and converted to cubic feet.

In a subsequent study (Wurbs 2006), Wurbs evaluated the predictive ability of various flow distribution methods including:

- Distribution of flows in proportion to drainage area;
- Flow distribution equation with ratios for various watershed parameters;
- Modified NRCS curve-number method;
- Regression equations relating flows to watershed characteristics;
- Use of recorded data at gaging stations to develop precipitation-runoff relationships; and
- Use of watershed (precipitation-runoff) computer models such as SWAT.

As a part of the analysis, the methods were used to predict flows at one gaged station to another gage station so that fit statistics could be calculated to evaluate the efficacy of each of the methods. Based upon similar analyses performed for many gaged sites which reinforced the tests performed as part of the study, Wurbs observed that temporal variations in flows are dramatic, ranging from zero flows to major floods. Mean flows are reproduced reasonably well with the all flow distribution methods and the NRCS CN method reproduces the mean closest. Accuracy in predicting mean flows is much better than the accuracy of predicting the flow-frequency relationship. Performance in reproducing flow-frequency relationships is better than for reproducing flows for individual flows.

Wurbs concluded that the NRCS CN method, the drainage area ratio method, and drainage area – CN – mean annual precipitation depth (MP) ratio methods all yield similar levels of accuracy. If the CN and MP are the same for the gaged and ungaged watersheds, the three alternative methods yield identical results. Drainage area is the most important watershed parameter. However, the NRCS method adaptation is preferable in those situations in which differences in CN (land use and soil type) and long-term MP are significantly different between the gaged and ungaged watersheds. The CN and MP are usually similar but not identical.

Generalized Flow Projection Methodology

In the first several versions of the Oklahoma TMDL toolbox, all flows at ungaged sites that required projection from a gaged site were performed with the Modified NRCS CN method. This led a number of problems with flow projections in the early versions. As described previously, the NRCS method, in common with all others, reproduces the mean or central tendency best but the accuracy of the fit degrades towards the extremes of the frequency spectrum. Part of the degradation in accuracy is due to the quite non-linear nature of the NRCS equations. On the low flow end of the frequency spectrum, Equation 2 above constitutes a low flow limit below which the NRCS equations are not applicable at all. Given the flashy nature of most streams in

locations for which the toolbox was developed, high and low flows are relatively more common and spurious results from the limits of the equations abounded.

In an effort to increase the flow prediction efficacy and remedy the failure of the NRCS CN method at the extremes of the flow spectrum, a hybrid of the NRCS CN method and the Furness method was developed. Noting the facts that all tested projection methods, and particularly the NRCS CN method, perform best near the central tendency or mean and that none of the methods predict the entire flow frequency spectrum well, an assumption that is implicit in the Furness method is applied. The Furness method implicitly assumes that the shape of the flow frequency curve at an upstream site is related to and similar to the shape of the flow frequency curve at a site downstream. As described previously, the Furness method employs several relationships derived between the mean flows and flows at differing frequencies to replicate the shape of the flow frequency curve at the projected site, while utilizing other regressed relationships to scale the magnitude of the curve. Since, as part of the toolbox calculations, the entire flow frequency curve at a 1% interval is calculated for every USGS gage utilizing very long periods of record, this vector in association with the mean flow was used to project the flow frequency curve.

In the ideal situation flows are projected from an ungaged location from a downstream gaged location. The toolbox also has the capability to project flows from an upstream gaged location if there is no useable downstream gage.

iii) In the rare case where no coincident flow data are available for a WQM station and no gages are present upstream or downstream, flows will be estimated for the WQM station from a gage on an adjacent watershed of similar size and properties, via the same procedure described above for upstream or downstream gages.

References

Furness, L.W., 1959, *Kansas Streamflow Characteristics- Part 1, Flow Duration*: Kansas Water Resources Board Technical Report No. 1.

Wurbs, R.A., and E.D. Sisson, *Evaluation of Methods for Distributing Naturalized Streamflows from Gaged Watersheds to Ungaged Sub-watersheds*, Technical Report 179, Texas Water Resources Institute and Texas Natural Resource Conservation Commission, August 1999.

Wurbs, R.A. 2006. *Methods for Developing Naturalized Monthly Flows at Gaged and Ungaged Sites*. Journal of Hydrologic Engineering, January/February 2006, ASCE

Table B-2 Estimated Flow Exceedance Percentiles

WBID	OK310810050040_00	OK310800501 40_00	OK310810050130_00	OK310810050120_00	OK310810010270_00	OK310810010090_10
USGS Gage Reference	07329000 (downstream)	07329500 (downstream)	07329500 (downstream)	07329500 (downstream)	07329500 (adjacent)	07329500 (upstream)
Projected Gage	2857	2858	2858	2858	2858	2858
Percentile	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)
0	1,157	30.8	196.8	286.5	174.9	25,409
1	139	2.1	13.6	19.8	12.1	1,759
2	76.8	1.1	6.8	9.9	6.0	876
3	50.5	0.7	4.4	6.4	3.9	572
4	37.0	0.5	3.1	4.4	2.7	394
5	27.8	0.4	2.4	3.4	2.1	304
6	22.5	0.3	1.9	2.8	1.7	245
7	18.9	0.3	1.6	2.3	1.4	208
8	16.5	0.2	1.4	2.0	1.3	182
9	14.5	0.2	1.3	1.9	1.1	164
10	12.8	0.2	1.2	1.7	1.0	149
11	11.5	0.2	1.1	1.5	0.9	136
12	10.5	0.1	1.0	1.4	0.8	123
13	9.8	0.1	0.9	1.3	0.8	114
14	9.1	0.1	0.8	1.2	0.7	107
15	8.6	0.1	0.8	1.1	0.7	101
16	7.9	0.1	0.7	1.1	0.6	94.2
17	7.6	0.1	0.7	1.0	0.6	89.8
18	7.1	0.1	0.7	1.0	0.6	85.4
19	6.7	0.1	0.6	0.9	0.6	81.0
20	6.5	0.1	0.6	0.9	0.5	78.9
21	6.0	0.1	0.6	0.9	0.5	76.7
22	5.7	0.1	0.6	0.8	0.5	74.5
23	5.5	0.1	0.5	0.8	0.5	70.1
24	5.1	0.1	0.5	0.8	0.5	70.1
25	4.9	0.1	0.5	0.8	0.5	67.9
26	4.7	0.1	0.5	0.7	0.4	63.5
27	4.5	0.1	0.5	0.7	0.4	61.3
28	4.2	0.1	0.5	0.7	0.4	59.1
29	4.0	0.1	0.4	0.6	0.4	57.0
30	3.9	0.1	0.4	0.6	0.4	57.0
31	3.7	0.1	0.4	0.6	0.4	54.8
32	3.6	0.1	0.4	0.6	0.4	52.6
33	3.4	0.1	0.4	0.6	0.3	50.4
34	3.3	0.1	0.4	0.5	0.3	48.2
35	3.2	0.1	0.4	0.5	0.3	48.2

WBID	OK310810050040_00	OK310800501 40_00	OK310810050130_00	OK310810050120_00	OK310810010270_00	OK310810010090_10
USGS Gage Reference	07329000 (downstream)	07329500 (downstream)	07329500 (downstream)	07329500 (downstream)	07329500 (adjacent)	07329500 (upstream)
Projected Gage	2857	2858	2858	2858	2858	2858
Percentile	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)	Q (cfs)
36	3.1	0.1	0.4	0.5	0.3	46.0
37	3.0	0.1	0.3	0.5	0.3	43.8
38	2.9	0.1	0.3	0.5	0.3	43.8
39	2.9	0.1	0.3	0.5	0.3	41.6
40	2.8	0.1	0.3	0.5	0.3	41.6
41	2.7	0.0	0.3	0.4	0.3	39.4
42	2.7	0.0	0.3	0.4	0.3	39.4
43	2.6	0.0	0.3	0.4	0.3	37.2
44	2.6	0.0	0.3	0.4	0.2	35.0
45	2.4	0.0	0.3	0.4	0.2	35.0
46	2.4	0.0	0.3	0.4	0.2	32.9
47	2.3	0.0	0.2	0.3	0.2	30.7
48	2.3	0.0	0.2	0.3	0.2	30.7
49	2.2	0.0	0.2	0.3	0.2	28.5
50	2.2	0.0	0.2	0.3	0.2	28.5
51	2.1	0.0	0.2	0.3	0.2	26.3
52	2.1	0.0	0.2	0.3	0.2	26.3
53	2.0	0.0	0.2	0.3	0.2	26.3
54	2.0	0.0	0.2	0.3	0.2	24.1
55	1.9	0.0	0.2	0.3	0.2	24.1
56	1.9	0.0	0.2	0.2	0.2	21.9
57	1.9	0.0	0.2	0.2	0.2	21.9
58	1.8	0.0	0.2	0.2	0.1	20.6
59	1.8	0.0	0.2	0.2	0.1	19.9
60	1.7	0.0	0.1	0.2	0.1	19.3
61	1.7	0.0	0.1	0.2	0.1	18.8
62	1.6	0.0	0.1	0.2	0.1	18.0
63	1.6	0.0	0.1	0.2	0.1	17.5
64	1.6	0.0	0.1	0.2	0.1	16.9
65	1.4	0.0	0.1	0.2	0.1	16.4
66	1.4	0.0	0.1	0.2	0.1	15.8
67	1.3	0.0	0.1	0.2	0.1	15.1
68	1.3	0.0	0.1	0.2	0.1	14.5
69	1.2	0.0	0.1	0.2	0.1	13.6
70	1.2	0.0	0.1	0.1	0.1	13.1
71	1.1	0.0	0.1	0.1	0.1	12.5
72	1.1	0.0	0.1	0.1	0.1	11.6

WBID	OK310810050040_00	OK310800501 40_00	OK310810050130_00	OK310810050120_00	OK310810010270_00	OK310810010090_10
USGS Gage Reference	**07329000 (downstream)**	**07329500 (downstream)**	**07329500 (downstream)**	**07329500 (downstream)**	**07329500 (adjacent)**	**07329500 (upstream)**
Projected Gage	**2857**	**2858**	**2858**	**2858**	**2858**	**2858**
Percentile	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**	**Q (cfs)**
73	1.1	0.0	0.1	0.1	0.1	11.0
74	1.1	0.0	0.1	0.1	0.1	10.1
75	1.0	0.0	0.1	0.1	0.1	9.2
76	1.0	0.0	0.1	0.1	0.1	8.5
77	0.9	0.0	0.1	0.1	0.1	7.9
78	0.9	0.0	0.1	0.1	0.0	7.2
79	0.8	0.0	0.0	0.1	0.0	6.4
80	0.8	0.0	0.0	0.1	0.0	5.7
81	0.8	0.0	0.0	0.1	0.0	5.0
82	0.7	0.0	0.0	0.0	0.0	4.4
83	0.7	0.0	0.0	0.0	0.0	3.7
84	0.6	0.0	0.0	0.0	0.0	3.1
85	0.6	0.0	0.0	0.0	0.0	2.6
86	0.6	0.0	0.0	0.0	0.0	2.2
87	0.5	0.0	0.0	0.0	0.0	1.8
88	0.5	0.0	0.0	0.0	0.0	1.2
89	0.4	0.0	0.0	0.0	0.0	0.7
90	0.4	0.0	0.0	0.0	0.0	0.2
91	0.3	0.0	0.0	0.0	0.0	0.0
92	0.3	0.0	0.0	0.0	0.0	0.0
93	0.2	0.0	0.0	0.0	0.0	0.0
94	0.2	0.0	0.0	0.0	0.0	0.0
95	0.1	0.0	0.0	0.0	0.0	0.0
96	0.1	0.0	0.0	0.0	0.0	0.0
97	0.0	0.0	0.0	0.0	0.0	0.0
98	0.0	0.0	0.0	0.0	0.0	0.0
99	0.0	0.0	0.0	0.0	0.0	0.0
100	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX C

STATE OF OKLAHOMA ANTIDEGRADATION POLICY

Appendix C
State of Oklahoma Antidegradation Policy

785:45-3-1. Purpose; Antidegradation policy statement

(a) Waters of the State constitute a valuable resource and shall be protected, maintained and improved for the benefit of all the citizens.

(b) It is the policy of the State of Oklahoma to protect all waters of the State from degradation of water quality, as provided in OAC 785:45-3-2 and Subchapter 13 of OAC 785:46.

785:45-3-2. Applications of antidegradation policy

(a) Application to outstanding resource waters (ORW). Certain waters of the State constitute an outstanding resource or have exceptional recreational and/or ecological significance. These waters include streams designated "Scenic River" or "ORW" in Appendix A of this Chapter, and waters of the State located within watersheds of Scenic Rivers. Additionally, these may include waters located within National and State parks, forests, wilderness areas, wildlife management areas, and wildlife refuges, and waters which contain species listed pursuant to the federal Endangered Species Act as described in 785:45-5-25(c)(2)(A) and 785:46-13-6(c). No degradation of water quality shall be allowed in these waters.

(b) Application to high quality waters (HQW). It is recognized that certain waters of the State possess existing water quality which exceeds those levels necessary to support propagation of fishes, shellfishes, wildlife, and recreation in and on the water. These high quality waters shall be maintained and protected.

(c) Application to beneficial uses. No water quality degradation which will interfere with the attainment or maintenance of an existing or designated beneficial use shall be allowed.

(d) Application to improved waters. As the quality of any waters of the State improves, no degradation of such improved waters shall be allowed.

785:46-13-1. Applicability and scope

(a) The rules in this Subchapter provide a framework for implementing the antidegradation policy stated in OAC 785:45-3-2 for all waters of the State. This policy and framework includes three tiers, or levels, of protection.

(b) The three tiers of protection are as follows:

(1) Tier 1. Attainment or maintenance of an existing or designated beneficial use.

(2) Tier 2. Maintenance or protection of High Quality Waters and Sensitive Public and Private Water Supply waters.

(3) Tier 3. No degradation of water quality allowed in Outstanding Resource Waters.

(c) In addition to the three tiers of protection, this Subchapter provides rules to implement the protection of waters in areas listed in Appendix B of OAC 785:45. Although Appendix B areas are not mentioned in OAC 785:45-3-2, the framework for protection of Appendix B areas is similar to the implementation framework for the antidegradation policy.

(d) In circumstances where more than one beneficial use limitation exists for a waterbody, the most protective limitation shall apply. For example, all antidegradation policy implementation rules applicable to Tier 1 waterbodies shall be applicable also to Tier 2 and Tier 3 waterbodies or areas, and implementation rules applicable to Tier 2 waterbodies shall be applicable also to Tier 3 waterbodies.

(e) Publicly owned treatment works may use design flow, mass loadings or concentration, as appropriate, to calculate compliance with the increased loading requirements of this section if those flows, loadings or concentrations were approved by the Oklahoma Department of Environmental Quality as a portion of Oklahoma's Water Quality Management Plan prior to the application of the ORW, HQW or SWS limitation.

785:46-13-2. Definitions

The following words and terms, when used in this Subchapter, shall have the following meaning, unless the context clearly indicates otherwise:

"Specified pollutants" means

(A) Oxygen demanding substances, measured as Carbonaceous Biochemical Oxygen Demand (CBOD) and/or Biochemical Oxygen Demand (BOD);

(B) Ammonia Nitrogen and/or Total Organic Nitrogen;

(C) Phosphorus;

(D) Total Suspended Solids (TSS); and

(E) Such other substances as may be determined by the Oklahoma Water Resources Board or the permitting authority.

785:46-13-3. Tier 1 protection; attainment or maintenance of an existing or designated beneficial use

(a) General.

(1) Beneficial uses which are existing or designated shall be maintained and protected.

(2) The process of issuing permits for discharges to waters of the State is one of several means employed by governmental agencies and affected persons which are designed to attain or maintain beneficial uses which have been designated for those waters. For example, Subchapters 3, 5, 7, 9 and 11 of this Chapter are rules for the permitting process. As such, the latter Subchapters not only implement numerical and narrative criteria, but also implement Tier 1 of the antidegradation policy.

(b) Thermal pollution. Thermal pollution shall be prohibited in all waters of the State. Temperatures greater than 52 degrees Centigrade shall constitute thermal pollution and shall be prohibited in all waters of the State.

(c) Prohibition against degradation of improved waters. As the quality of any waters of the State improves, no degradation of such improved waters shall be allowed.

785:46-13-4. Tier 2 protection; maintenance and protection of High Quality Waters and Sensitive Water Supplies

(a) General rules for High Quality Waters. New point source discharges of any pollutant after June 11, 1989, and increased load or concentration of any specified pollutant from any point source discharge existing as of June 11, 1989, shall be prohibited in any waterbody or watershed designated in Appendix A of OAC 785:45 with the limitation "HQW". Any discharge of any pollutant to a waterbody designated "HQW" which would, if it occurred, lower existing water quality shall be prohibited. Provided however, new point source discharges or increased load or concentration of any specified pollutant from a discharge existing as of June 11, 1989, may be approved by the permitting authority in circumstances where the discharger demonstrates to the satisfaction of the permitting authority that such new discharge or increased load or concentration would result in maintaining or improving the level of water quality which exceeds that necessary to support recreation and propagation of fishes, shellfishes, and wildlife in the receiving water.

(b) General rules for Sensitive Public and Private Water Supplies. New point source discharges of any pollutant after June 11, 1989, and increased load of any specified pollutant from any point source discharge existing as of June 11, 1989, shall be prohibited in any waterbody or watershed designated in Appendix A of OAC 785:45 with the limitation "SWS". Any discharge of any pollutant to a waterbody designated "SWS" which would, if it occurred, lower existing water quality shall be prohibited. Provided however, new point source discharges or increased load of any specified pollutant from a discharge existing as of June 11, 1989, may be approved by the

permitting authority in circumstances where the discharger demonstrates to the satisfaction of the permitting authority that such new discharge or increased load will result in maintaining or improving the water quality in both the direct receiving water, if designated SWS, and any downstream waterbodies designated SWS.

(c) Stormwater discharges. Regardless of subsections (a) and (b) of this Section, point source discharges of stormwater to waterbodies and watersheds designated "HQW" and "SWS" may be approved by the permitting authority.

(d) Nonpoint source discharges or runoff. Best management practices for control of nonpoint source discharges or runoff should be implemented in watersheds of waterbodies designated "HQW" or "SWS" in Appendix A of OAC 785:45.

785:46-13-5. Tier 3 protection; prohibition against degradation of water quality in outstanding resource waters

(a) General. New point source discharges of any pollutant after June 11, 1989, and increased load of any pollutant from any point source discharge existing as of June 11, 1989, shall be prohibited in any waterbody or watershed designated in Appendix A of OAC 785:45 with the limitation "ORW" and/or "Scenic River", and in any waterbody located within the watershed of any waterbody designated with the limitation "Scenic River". Any discharge of any pollutant to a waterbody designated "ORW" or "Scenic River" which would, if it occurred, lower existing water quality shall be prohibited.

(b) Stormwater discharges. Regardless of 785:46-13-5(a), point source discharges of stormwater from temporary construction activities to waterbodies and watersheds designated "ORW" and/or "Scenic River" may be permitted by the permitting authority. Regardless of 785:46-13-5(a), discharges of stormwater to waterbodies and watersheds designated "ORW" and/or "Scenic River" from point sources existing as of June 25, 1992, whether or not such stormwater discharges were permitted as point sources prior to June 25, 1992, may be permitted by the permitting authority; provided, however, increased load of any pollutant from such stormwater discharge shall be prohibited.

(c) Nonpoint source discharges or runoff. Best management practices for control of nonpoint source discharges or runoff should be implemented in watersheds of waterbodies designated "ORW" in Appendix A of OAC 785:45, provided, however, that development of conservation plans shall be required in sub-watersheds where discharges or runoff from nonpoint sources are identified as causing or significantly contributing to degradation in a waterbody designated "ORW".

(d) LMFOs. No licensed managed feeding operation (LMFO) established after June 10, 1998 which applies for a new or expanding license from the State Department of Agriculture after March 9, 1998 shall be located...[w]ithin three (3) miles of any designated scenic river area as specified by the Scenic Rivers Act in 82 O.S. Section 1451 and following, or [w]ithin one (1) mile of a waterbody [2:9-210.3(D)] designated in Appendix A of OAC 785:45 as "ORW".

785:46-13-6. Protection for Appendix B areas

(a) General. Appendix B of OAC 785:45 identifies areas in Oklahoma with waters of recreational and/or ecological significance. These areas are divided into Table 1, which includes national and state parks, national forests, wildlife areas, wildlife management areas and wildlife refuges; and Table 2, which includes areas which contain threatened or endangered species listed as such by the federal government pursuant to the federal Endangered Species Act as amended.

(b) Protection for Table 1 areas. New discharges of pollutants after June 11, 1989, or increased loading of pollutants from discharges existing as of June 11, 1989, to waters within the boundaries of areas listed in Table 1 of Appendix B of OAC 785:45 may be approved by the permitting authority under such conditions as ensure that the recreational and ecological significance of these waters will be maintained.

(c) Protection for Table 2 areas. Discharges or other activities associated with those waters within the boundaries listed in Table 2 of Appendix B of OAC 785:45 may be restricted through agreements between appropriate regulatory agencies and the United States Fish and Wildlife Service. Discharges or other activities in such areas shall not substantially disrupt the threatened or endangered species inhabiting the receiving water.

(d) Nonpoint source discharges or runoff. Best management practices for control of nonpoint source discharges or runoff should be implemented in watersheds located within areas listed in Appendix B of OAC 785:45.

APPENDIX D

OIL AND GAS WELL HEADS

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050140_00	West Cox City Creek	Grady	64043	ZZ64043	C M WOLFORD	CARTER OIL CO	5/1/1927	6/25/1927			34.72773	-97.7357		NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64055	ZZ64055	GEORGE W HICKS	KNOX L GARVIN	2/12/1927	4/12/1927			34.72953	-97.7379		NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64074	5136155	WOLFORD	T H MCCASLAND ET AL	7/6/1948	8/6/1948	8/15/1948		34.72592	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	64075	5136152	WOLFORD	T H MCCASLAND ET AL	10/1/1948	10/10/1948	10/18/1948		34.726	-97.7357		OIL
OK310810050140_00	West Cox City Creek	Grady	64076	5136146	WOLFORD	T H MCCASLAND ET AL	1/31/1949	3/3/1949	3/16/1949		34.72696	-97.7385		OIL
OK310810050140_00	West Cox City Creek	Grady	64077	5136147	WOLFORD	T H MCCASLAND ET AL	3/6/1949	3/24/1949			34.72704	-97.7385		OIL
OK310810050140_00	West Cox City Creek	Grady	64082	5100339	SARAH BURKES	MARLAND OIL CO OF OK	10/29/1927	11/19/1927			34.73315	-97.7379	10/18/2001	OIL
OK310810050140_00	West Cox City Creek	Grady	64083	ZZ64083	SARAH P BURKES	MARLAND OIL CO OF OK	1/28/1927				34.73134	-97.7379		NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64085	5136146	WOLFORD	MACK OIL CO	1/11/1964	1/26/1964	2/7/1964		34.72696	-97.7385		OIL
OK310810050140_00	West Cox City Creek	Grady	64106	5135988	S P BURKS	GANT & GARVIN	8/25/1927				34.73325	-97.7401	11/9/2001	NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64108	5100294	BURKES	T H MCCASLAND ET AL	3/13/1939	3/31/1939			34.73325	-97.7401	1/7/2002	DRY
OK310810050140_00	West Cox City Creek	Grady	64111	5136001	S P BURKES	T H MCCASLAND	9/23/1947	10/21/1947	10/30/1947		34.73173	-97.7419	6/7/2001	OIL
OK310810050140_00	West Cox City Creek	Grady	64131	5135988	SARAH BURKES	MARLAND OIL CO	11/7/1926	12/17/1926			34.73325	-97.7401	11/9/2001	NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64142	5100460	S P BURKES	SHELL OIL CO INC	4/24/1948	5/23/1948	5/29/1948		34.72963	-97.7399		OIL
OK310810050140_00	West Cox City Creek	Grady	64143	5136018	S P BURKES B	SHELL OIL CO INC	10/25/1948	11/15/1948	11/25/1948		34.72782	-97.7401		OIL
OK310810050140_00	West Cox City Creek	Grady	64145	5136017	S P BURKES B	SHELL OIL CO	1/12/1949	1/21/1949	1/27/1950		34.72803	-97.7401		OIL
OK310810050140_00	West Cox City Creek	Grady	64163	5136041	W A REED	SKELLY OIL CO	6/2/1948	8/23/1948		9/9/1948	34.7239	-97.7401		DRY
OK310810050140_00	West Cox City Creek	Grady	64200	5136090	MILES KERNS	CARTER OIL CO	4/28/1927	10/23/1927			34.71677	-97.729		DRY
OK310810050140_00	West Cox City Creek	Grady	64201	5136078	MILES KERNS	CARTER OIL CO	3/28/1928	4/26/1928			34.71688	-97.7291		OIL
OK310810050140_00	West Cox City Creek	Grady	64203	5100340	R L RUSSELL	CARTER OIL CO	9/24/1926	12/30/1926			34.71677	-97.7313		OIL
OK310810050140_00	West Cox City Creek	Grady	64208	5136089	N B WALL	CARTER OIL CO	6/26/1927	9/15/1927			34.72219	-97.729	6/11/2001	NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64220	5136076	OLEN SLEDGE A	MARATHON OIL CO	9/13/1982	9/30/1982	10/7/1982		34.72274	-97.7372		OIL
OK310810050140_00	West Cox City Creek	Grady	64224	5136054	KITTY HOWARD	T H MCCASLAND ET AL	6/13/1948	7/5/1948			34.72011	-97.7335	8/10/2000	GAS
OK310810050140_00	West Cox City Creek	Grady	64225	5136053	KITTY HOWARD	T H MCCASLAND ET AL	7/15/1948	8/3/1948	8/13/1948		34.71863	-97.7328	4/18/2001	OIL
OK310810050140_00	West Cox City Creek	Grady	64226	5136052	KITTY HOWARD	T H MCCASLAND ET AL	3/15/1949	4/6/1949			34.71855	-97.7313		GAS
OK310810050140_00	West Cox City Creek	Grady	64228	5136059	KITTY HOWARD	T H MCCASLAND ET AL	7/29/1949	8/20/1949	9/1/1949		34.72093	-97.7308	9/18/2002	OIL
OK310810050140_00	West Cox City Creek	Grady	64229	5136058	KITTY HOWARD	T H MCCASLAND ET AL	8/22/1949	8/29/1949	9/15/1949		34.72115	-97.7308	2/10/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	64231	5136061	KITTY HOWARD	T H MCCASLAND ET AL	9/15/1949	9/20/1949	9/26/1949		34.72288	-97.7327	2/11/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	64243	5136063	WALL	T H MCCASLAND ET AL	2/24/1950	3/10/1950	4/15/1950		34.72174	-97.7295	9/27/2002	OIL
OK310810050140_00	West Cox City Creek	Grady	64244	5136062	WALL	T H MCCASLAND ET AL	1/25/1950	2/19/1950	2/25/1950		34.72337	-97.7294	8/6/2002	OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050140_00	West Cox City Creek	Grady	64247	5136064	HOWARD-MAC	MACK OIL CO	9/26/1964	10/1/1964	11/7/1964		34.71844	-97.7337		OIL
OK310810050140_00	West Cox City Creek	Grady	64248	5136106	KNOX PERMIAN SAND UNIT	MACK OIL CO	10/23/1964	10/24/1964	11/3/1964		34.724	-97.7313	3/1/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	64252	5100466	KNOX PERMIAN SAND UNIT	MACK OIL CO	1/6/1965	1/13/1965			34.71903	-97.7295		SERVICE WELL
OK310810050140_00	West Cox City Creek	Grady	64254	5136072	OLEN SLEDGE A	MARATHON OIL CO	8/8/1981	10/6/1981	8/26/1981		34.72408	-97.7381		OIL
OK310810050140_00	West Cox City Creek	Grady	64257	5121830	SLEDGE DEEP	MARATHON OIL CO	8/22/1986	1/16/1987	2/3/1987		34.72438	-97.7312		OIL
OK310810050140_00	West Cox City Creek	Grady	64258	5121933	SLEDGE DEEP	MARATHON OIL CO	10/1/1987	12/30/1987	4/21/1988		34.72353	-97.7305		GAS
OK310810050140_00	West Cox City Creek	Grady	64266	5136074	OLEN SLEDGE A	OHIO OIL CO	8/8/1948	8/20/1948	8/26/1948		34.72219	-97.7359		OIL
OK310810050140_00	West Cox City Creek	Grady	64267	5136075	OLEN SLEDGE A	OHIO OIL CO	8/28/1948	9/14/1948	9/20/1948		34.724	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	64268	5136071	OLEN SLEDGE A	OHIO OIL CO	9/23/1948	10/6/1948			34.72052	-97.7354		OIL
OK310810050140_00	West Cox City Creek	Grady	64269	5136076	OLEN SLEDGE A	OHIO OIL CO	10/14/1948	10/28/1948	11/2/1948		34.72274	-97.7372		OIL
OK310810050140_00	West Cox City Creek	Grady	64271	5136073	OLEN SLEDGE A	OHIO OIL CO	3/26/1949	4/11/1949	4/12/1949		34.72445	-97.7352		OIL
OK310810050140_00	West Cox City Creek	Grady	64272	5136072	OLEN SLEDGE A	OHIO OIL CO	3/3/1950	3/16/1950	3/22/1950		34.72408	-97.7381		OIL
OK310810050140_00	West Cox City Creek	Grady	64277	5100298	ROBERT L RUSSELL	PRAIRIE OIL & GAS CO	7/5/1927	8/26/1927			34.72222	-97.7313	2/18/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	64278	5136109	R L RUSSELL	PRAIRIE OIL & GAS CO	5/22/1927	9/17/1927			34.724	-97.7335	2/8/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	65196	5121762	WILLITS	MARATHON OIL CO	3/1/1986	7/1/1986	7/18/1986		34.73157	-97.7398		GAS
OK310810050140_00	West Cox City Creek	Grady	387208	5100712	S B BURKES	MACK ENERGY CO	11/28/1927	12/16/1927			34.73315	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	388704	5136156	S B BURKES	MACK ENERGY CO	8/25/1927	8/20/1927			34.72953	-97.738		OIL
OK310810050140_00	West Cox City Creek	Grady	389801	5136109	KNOX PERMIAN SAND UNIT	MACK ENERGY CO					34.724	-97.7335	2/8/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	474355	5122539	G MERCER	AVALON EXPL INC	4/16/1995	7/7/1995			34.71859	-97.7296		OIL
OK310810050140_00	West Cox City Creek	Grady	476178	5121830	SLEDGE DEEP	MACK ENERGY CO	8/22/1986	1/16/1987	2/3/1987		34.72438	-97.7312		OIL
OK310810050140_00	West Cox City Creek	Grady	476189	5136016	BURKES B	BEREXCO INC	4/2/1950	4/7/1950	4/12/1950		34.72602	-97.7401		OIL
OK310810050140_00	West Cox City Creek	Grady	519796	5100712	S B BURKES WF	MACK ENERGY CO	11/28/1927	12/16/1927			34.73315	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	528538	5136073	OLEN SLEDGE A	LE NORMAN ENERGY CORP	3/26/1949	4/11/1949	4/12/1949		34.72445	-97.7352		SERVICE WELL
OK310810050140_00	West Cox City Creek	Grady	537122	5122859	BOBBIE	MARATHON OIL CO	12/20/1999	2/3/2000	4/23/2000		34.7158	-97.7329		GAS
OK310810050140_00	West Cox City Creek	Grady	544972	5136054	KITTY HOWARD	MACK ENERGY CO	6/13/1948	7/5/1948			34.72011	-97.7335	8/10/2000	DRY
OK310810050140_00	West Cox City Creek	Grady	550740	5122914	BEATRICE	MACK ENERGY CO	10/1/2000	11/9/2000	12/7/2000		34.72048	-97.7341		GAS
OK310810050140_00	West Cox City Creek	Grady	573298	5122963	WILL	MACK ENERGY CO	5/2/2001	6/13/2001	8/15/2001		34.72279	-97.7362		GAS
OK310810050140_00	West Cox City Creek	Grady	578752	5123031	MICHAELIS	MACK ENERGY CO	10/3/2001	11/29/2001	12/20/2001		34.73019	-97.7408		OIL
OK310810050140_00	West Cox City Creek	Grady	581729	5123047	GARIS	MACK ENERGY CO	1/29/2002	3/5/2002	3/17/2002		34.73475	-97.7406		OIL
OK310810050140_00	West Cox City Creek	Grady	10001380	5100704	SARA BURKES B 1-A		11/3/1959	10/28/1959		3/11/1992	34.72953	-97.7395		DRY

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050140_00	West Cox City Creek	Grady	64046	5135975	C M WOLFORD	CARTER OIL CO	1/24/1928	2/29/1928			34.72773	-97.7379		DRY
OK310810050140_00	West Cox City Creek	Grady	64070	5100295	S P BURKES B	T H MCCASLAND ET AL	5/27/1949	6/23/1949	7/8/1949		34.72953	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	64073	5136154	WOLFORD	T H MCCASLAND ET AL	4/25/1948	5/24/1948			34.72592	-97.7357		NOT REPORTED
OK310810050140_00	West Cox City Creek	Grady	64110	5121762	WILLITS	MARATHON OIL CO	3/1/1986		7/18/1986		34.73157	-97.7398		OIL
OK310810050140_00	West Cox City Creek	Grady	64115	5136003	S P BURKES A	T H MCCASLAND ET AL	7/25/1949	8/23/1949	9/7/1949		34.73073	-97.7408	6/7/2001	OIL
OK310810050140_00	West Cox City Creek	Grady	64130	5121762	WILLITS	MARATHON OIL CO	3/1/1986	7/1/1986	7/18/1986		34.73157	-97.7398		GAS
OK310810050140_00	West Cox City Creek	Grady	64144	5136866	S P BURKES B	SHELL OIL CO INC	4/18/1949	5/11/1949	5/22/1949		34.72602	-97.7398		OIL
OK310810050140_00	West Cox City Creek	Grady	64156	5100312	BUELAH HOGUE	GYPSY OIL CO	1/2/1927	6/3/1927			34.72404	-97.7401		GAS
OK310810050140_00	West Cox City Creek	Grady	64192	5136064	KITTY HOWARD	CARTER OIL CO	4/24/1948	5/18/1948	5/26/1948		34.71844	-97.7337		OIL
OK310810050140_00	West Cox City Creek	Grady	64219	5136071	OLEN SLEDGE A	MARATHON OIL CO	10/15/1982	12/17/1982	12/10/1982		34.72052	-97.7354		OIL
OK310810050140_00	West Cox City Creek	Grady	64227	5136057	KITTY HOWARD	T H MCCASLAND ET AL	5/5/1949	5/22/1949	6/7/1949		34.72038	-97.7335		OIL
OK310810050140_00	West Cox City Creek	Grady	64230	5136060	KITTY HOWARD	T H MCCASLAND ET AL	8/26/1949	9/13/1949	9/30/1949		34.72282	-97.7327	2/11/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	64256	5136075	OLEN SLEDGE A	MARATHON OIL CO	6/12/1963	6/20/1963			34.724	-97.7379		DRY
OK310810050140_00	West Cox City Creek	Grady	64262	5136070	OLEN SLEDGE	OHIO OIL CO	5/26/1948	6/15/1948			34.71677	-97.7315		DRY
OK310810050140_00	West Cox City Creek	Grady	64270	5136077	OLEN SLEDGE A	OHIO OIL CO	11/5/1948	12/7/1948			34.71934	-97.7353		DRY
OK310810050140_00	West Cox City Creek	Grady	64273	5100336	ROBERT L RUSSELL	PRAIRIE OIL & GAS CO	11/2/1926	2/2/1927			34.71858	-97.7313		OIL
OK310810050140_00	West Cox City Creek	Grady	64275	5136105	ROBERT L RUSSELL	PRAIRIE OIL & GAS CO	4/29/1927	6/17/1927			34.72038	-97.729		OIL
OK310810050140_00	West Cox City Creek	Grady	64276	5136106	ROBERT L RUSSELL	PRAIRIE OIL & GAS CO	5/3/1927	6/22/1927			34.724	-97.7313	3/1/2000	OIL
OK310810050140_00	West Cox City Creek	Grady	389800	5100298	KNOX PERMIAN SAND UNIT	MACK ENERGY CO					34.72222	-97.7313	2/18/2000	SERVICE WELL
OK310810050140_00	West Cox City Creek	Grady	550398	5122886	CAROLINE	MACK ENERGY CO	4/30/2000	7/16/2000	9/29/2000		34.71989	-97.7343		GAS
OK310810050140_00	West Cox City Creek	Grady	589358	5100712	BPU	MACK ENERGY CO	11/28/1927	12/16/1927			34.73315	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	616056	5100712	BPU	MACK ENERGY CO	11/28/1927	12/16/1927			34.73315	-97.7379		OIL
OK310810050140_00	West Cox City Creek	Grady	621246	5123047	GARIS	MACK ENERGY CO	1/29/2002	3/5/2002	3/17/2002		34.73475	-97.7406		OIL
OK310810050130_00	Cox City Creek	Grady	63936	5135986	B A HORTON	CARTER OIL CO	1/12/1927	4/4/1927			34.74217	-97.7421		OIL
OK310810050130_00	Cox City Creek	Grady	63937	5135983	B A HORTON	CARTER OIL CO	2/26/1927	8/23/1927			34.74037	-97.7399		DRY
OK310810050130_00	Cox City Creek	Grady	63939	ZZ63939	MAR HORTON	CARTER OIL CO	2/15/1926	4/22/1926			34.74217	-97.7443		OIL
OK310810050130_00	Cox City Creek	Grady	63954	5136122	BRYAN	CHARLES B COOKE ET AL	9/10/1938	9/26/1938			34.74398	-97.7421	12/19/2000	DRY
OK310810050130_00	Cox City Creek	Grady	63956	5121562	SHIR-LEA	MACK OIL CO	3/8/1984	7/20/1984	7/27/1984		34.74308	-97.741		OIL
OK310810050130_00	Cox City Creek	Grady	63960	5136127	B A HORTON B	T H MCCASLAND ET AL	9/2/1940	9/11/1940			34.7398	-97.7428		OIL
OK310810050130_00	Cox City Creek	Grady	63965	ZZ63965	H J HORTON A	T H MCCASLAND ET AL	11/19/1939	12/2/1939	12/8/1939		34.74075	-97.7438		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050130_00	Cox City Creek	Grady	64016	5121584	GARRETSON	DONALD C SLAWSON	5/16/1984	7/26/1984		7/26/1984	34.74122	-97.7277		DRY
OK310810050130_00	Cox City Creek	Grady	64017	5121607	CARNES A	PHILLIPS PETROLEUM CO	8/18/1984	10/23/1985		10/23/1985	34.74844	-97.7368		DRY
OK310810050130_00	Cox City Creek	Grady	64019	5100329	HUGO KAPP	MARLAND OIL CO OF OKLAHOMA	12/8/1926	2/20/1927			34.74023	-97.738		OIL
OK310810050130_00	Cox City Creek	Grady	64020	5136296	KAPPS	T H MCCASLAND ET AL	5/18/1947	5/30/1947			34.74212	-97.7379	1/4/2002	DRY
OK310810050130_00	Cox City Creek	Grady	64029	5135960	LEE DOWLAND	CARTER OIL CO	12/15/1926	3/15/1927			34.73383	-97.7335	11/6/2001	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64031	5135971	W GARDEN	CARTER OIL CO	12/15/1926	3/15/1927			34.73857	-97.7379		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64032	5135973	W GARDEN	CARTER OIL CO	11/26/1926	2/14/1927			34.73676	-97.7357		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64034	5136587	W GARDEN 4	CARTER OIL CO	7/15/1948	12/22/1948			34.7385	-97.7357		DRY
OK310810050130_00	Cox City Creek	Grady	64036	5135968	C M WOLFORD	CARTER OIL CO	11/28/1926	2/27/1927			34.72773	-97.7313		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64037	ZZ64037	C M WOLFORD	CARTER OIL CO	12/19/1926	3/8/1927			34.72953	-97.7357		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64039	5135979	C M WOLFORD	CARTER OIL CO	2/14/1927	4/19/1927			34.72592	-97.729	9/27/2002	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64040	5135979	C M WOLFORD	CARTER OIL CO	5/29/1927	8/20/1927			34.72592	-97.729	9/27/2002	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64042	5135977	C M WOLFORD	CARTER OIL CO	5/1/1927	6/18/1927			34.72592	-97.7335		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64045	5135974	C M WOLFORD	CARTER OIL CO	1/24/1928	2/13/1928			34.72953	-97.7357	1/25/2002	DRY
OK310810050130_00	Cox City Creek	Grady	64048	5100333	MASHBURN	EDWIN B COX & JAKE L HAMON	12/8/1926	12/24/1926			34.73676	-97.7379		OIL
OK310810050130_00	Cox City Creek	Grady	64051	5100333	MASHBURN	COX & HAMON					34.73676	-97.7379		DRY
OK310810050130_00	Cox City Creek	Grady	64052	5136163	MASHBURN	EDWIN B COX & JAKE L HAMON	11/22/1927	12/22/1927			34.73496	-97.7381	9/28/2001	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64054	5121606	HOWELL	MACK OIL CO	8/9/1984	2/5/1985	3/7/1985		34.72849	-97.7259		OIL
OK310810050130_00	Cox City Creek	Grady	64056	5100326	GEORGE W HICKS	KNOX L GARVIN	2/15/1927	2/26/1927			34.72592	-97.7268		OIL
OK310810050130_00	Cox City Creek	Grady	64057	5100458	THENTON GIBSON	GULF OIL CORP	5/30/1937	7/15/1937			34.73128	-97.7357		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64059	5100458	T GIBSON	GYPSY OIL CO	12/19/1926	2/4/1927			34.73128	-97.7357		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64060	5136167	T GIBSON	GYPSY OIL CO	2/25/1927	3/27/1927			34.73134	-97.7335		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64062	5136169	T GIBSON	GYPSY OIL CO	4/26/1927	5/23/1927			34.72954	-97.7335		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64063	5136170	T GIBSON	GYPSY OIL CO	1/31/1928	4/11/1928			34.73315	-97.7357		DRY
OK310810050130_00	Cox City Creek	Grady	64065	5121714	NICHOLSON	DONALD C SLAWSON OIL PRODUCER	7/14/1985	9/13/1985		9/13/1985	34.73315	-97.7286		DRY
OK310810050130_00	Cox City Creek	Grady	64068	5136151	SARAH BURKES	T H MCCASLAND ET AL	12/18/1947	12/23/1947	1/18/1948		34.73179	-97.7374		OIL
OK310810050130_00	Cox City Creek	Grady	64071	ZZ64071	WOLFORD	T H MCCASLAND ET AL	9/16/1939	10/7/1939			34.72978	-97.7354		DRY
OK310810050130_00	Cox City Creek	Grady	64078	5100707	WOLFORD	T H MCCASLAND ET AL	4/11/1950	5/1/1950	5/23/1950		34.72944	-97.7357	11/26/2001	OIL
OK310810050130_00	Cox City Creek	Grady	64079	5121523	DARNELL	MACK OIL CO	11/29/1983	2/28/1984	3/7/1984		34.7375	-97.7362		OIL
OK310810050130_00	Cox City Creek	Grady	64080	ZZ64080	KNOX PERMIAN SAND UNIT	MACK OIL CO	9/30/1964	10/5/1964	10/23/1964		34.72592	-97.7313		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050130_00	Cox City Creek	Grady	64086	ZZ64086	GIBSON	SUN DRLG CO	4/19/1950	5/31/1950		5/31/1950	34.73134	-97.7359		DRY
OK310810050130_00	Cox City Creek	Grady	64088	5136172	NOTHAF	TWIN STATE OIL CO	1/7/1927	7/29/1927			34.72953	-97.7268	11/10/2001	DRY
OK310810050130_00	Cox City Creek	Grady	64097	5100311	W E WOODS	CARTER OIL CO	12/13/1926	2/3/1927			34.73686	-97.7401	5/1/2001	OIL
OK310810050130_00	Cox City Creek	Grady	64098	5100311	W E WOODS	CARTER OIL CO	5/31/1927	8/22/1927			34.73686	-97.7401	5/1/2001	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64099	5100306	W E WOODS	CARTER OIL CO	12/10/1926	2/28/1927			34.73686	-97.7423		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64120	5100303	WOODS	T H MCCASLAND ET AL	12/20/1938	1/5/1939			34.73505	-97.7401	10/15/2001	OIL
OK310810050130_00	Cox City Creek	Grady	64122	5135990	W E WOODS	T H MCCASLAND ET AL	12/27/1947	1/4/1948	2/25/1948		34.7355	-97.7406		OIL
OK310810050130_00	Cox City Creek	Grady	64126	5136024	W E WOODS A	MACK OIL CO	7/10/1962	7/17/1962		7/17/1962	34.73535	-97.7402	1/21/2002	DRY
OK310810050130_00	Cox City Creek	Grady	64171	5121946	BARTER	MACK OIL CO	10/16/1987	1/16/1988	2/5/1988		34.72367	-97.7245		OIL
OK310810050130_00	Cox City Creek	Grady	64205	5136067	R H SPALDING	CARTER OIL CO	4/26/1927	6/16/1927			34.72038	-97.7246		OIL
OK310810050130_00	Cox City Creek	Grady	64245	5100464	KNOX PERMIAN SAND UNIT	MACK OIL CO	9/8/1964	9/22/1964			34.72476	-97.728		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	64246	5100465	KNOX PERMIAN SAND UNIT	MACK OIL CO	9/1/1964	9/5/1964			34.72296	-97.7258		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	64297	5136227	W C NOTHAF	CARTER OIL CO	12/11/1927	12/27/1927		12/27/1927	34.72038	-97.7203		DRY
OK310810050130_00	Cox City Creek	Grady	64447	ZZ64447	RUBY E WHITE	JOE RAY	11/1/1950	11/7/1950	11/26/1950		34.75115	-97.7244		OIL
OK310810050130_00	Cox City Creek	Grady	118870	5122041	WHEELER	MACK OIL CO	2/16/1989	5/9/1989	9/16/1989		34.73571	-97.7341		OIL
OK310810050130_00	Cox City Creek	Grady	388705	5135997	CARTER WOODS	MACK ENERGY CO	5/15/1943	6/1/1943	8/25/1943		34.73664	-97.7401		OIL
OK310810050130_00	Cox City Creek	Grady	509113	5122597	CHARLIE	CHESAPEAKE OPERATING INC	3/23/1996	7/8/1996	7/28/1996		34.72912	-97.7333		GAS
OK310810050130_00	Cox City Creek	Grady	524304	5122764	BOB ROY	MACK ENERGY CO	5/7/1998	6/28/1998	8/14/1998		34.74588	-97.7434		OIL
OK310810050130_00	Cox City Creek	Grady	535729	5121971	HARRIS	MACK ENERGY CO	2/27/1988	5/23/1988	6/7/1988		34.73627	-97.7394		OIL
OK310810050130_00	Cox City Creek	Grady	562651	5122936	GRANT	MACK ENERGY CO	11/19/2000	1/28/2001	4/14/2001		34.74894	-97.7444		OIL
OK310810050130_00	Cox City Creek	Grady	583334	5135983	BPU	MACK ENERGY CO					34.74037	-97.7399		OIL
OK310810050130_00	Cox City Creek	Grady	583337	5136587	BPU	MACK ENERGY CO	7/15/1948	12/22/1948			34.7385	-97.7357		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	583338	5136002	BPU	MACK ENERGY CO	7/14/1940				34.73867	-97.7424		OIL
OK310810050130_00	Cox City Creek	Grady	583340	5135994	BPU	MACK ENERGY CO	9/28/1940	10/4/1940		4/18/2002	34.73691	-97.7414		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	584763	5135986	BPU	MACK ENERGY CO	4/4/1927				34.74217	-97.7421		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	584765	5136151	BPU	MACK ENERGY CO	12/18/1947	12/23/1947	1/18/1948		34.73179	-97.7374		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	589359	5136167	BPU	MACK ENERGY CO					34.73134	-97.7335		OIL
OK310810050130_00	Cox City Creek	Grady	590837	5136166	BPU	MACK ENERGY CO	2/8/1927	3/1/1927	3/5/1927		34.73134	-97.7313	12/9/1981	SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	592005	5135976	DOLAND	OTC/CORP. COMM NOT ASSIGNED					34.73675	-97.7334	10/8/2001	OIL
OK310810050130_00	Cox City Creek	Grady	593212	5136157	BPU	MACK ENERGY CO	1/1/1927				34.73301	-97.7335		SERVICE WELL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050130_00	Cox City Creek	Grady	602232	5123144	HUGON	MACK ENERGY CO	10/3/2003	11/30/2003	1/23/2004		34.73804	-97.7401		OIL
OK310810050130_00	Cox City Creek	Grady	602504	5100344	BPU	MACK ENERGY CO	10/17/1926	11/30/1926			34.73315	-97.7357		OIL
OK310810050130_00	Cox City Creek	Grady	602613	5100333	BPU	MACK ENERGY CO		10/6/1943			34.73676	-97.7379		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	602614	5100759	BPU	MACK ENERGY CO				8/1/1957	34.73496	-97.7357		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	602615	5136169	BPU	MACK ENERGY CO	4/26/1927	5/23/1927			34.72953	-97.7335		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	602616	5135967	BPU	MACK ENERGY CO				4/18/1986	34.73134	-97.7357		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	603609	5135977	BPU	MACK ENERGY CO	5/1/1927	6/18/1927			34.72592	-97.7335		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	63938	5135969	B A HORTON	CARTER OIL CO	7/27/1928	8/22/1928			34.74037	-97.7421		OIL
OK310810050130_00	Cox City Creek	Grady	63995	5100709	H J HORTON	MACK OIL CO	3/25/1963	3/30/1963			34.74398	-97.7443		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	64018	5121479	CRABB	MACK OIL CO	7/26/1983	10/22/1983	5/10/1984		34.74122	-97.7368		OIL
OK310810050130_00	Cox City Creek	Grady	64030	ZZ64030	LEE DOWLAND	CARTER OIL CO	2/25/1927	6/7/1927			34.73676	-97.7335		DRY
OK310810050130_00	Cox City Creek	Grady	64033	5135965	W GARDEN	CARTER OIL CO	11/29/1947	12/15/1947			34.7394	-97.7357		DRY
OK310810050130_00	Cox City Creek	Grady	64038	5135980	C M WOLFORD	CARTER OIL CO	1/13/1927	3/18/1927			34.72953	-97.7313		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64041	5135978	C M WOLFORD	CARTER OIL CO	3/13/1927	5/27/1927			34.72592	-97.7313	8/6/2002	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64044	5135982	C M WOLFORD	CARTER OIL CO	7/24/1927	11/19/1927			34.72592	-97.7335	8/9/2002	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64047	5136171	MASHBURN	EDWIN B COX & JAKE L HAMON	10/13/1926	10/23/1926			34.73496	-97.7379		OIL
OK310810050130_00	Cox City Creek	Grady	64049	5100333	MASHBURN	EDWIN B COX & JAKE L HAMON JR					34.73676	-97.7379		DRY
OK310810050130_00	Cox City Creek	Grady	64053	5100334	GEORGE W HICKS	KNOX L GARVIN	10/25/1926	11/12/1926			34.72592	-97.729		OIL
OK310810050130_00	Cox City Creek	Grady	64058	5100344	T GIBSON	GYPSY OIL CO	10/17/1926	11/30/1926			34.73315	-97.7357		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64061	5136168	T GIBSON	GYPSY OIL CO	3/5/1927	4/10/1927			34.72772	-97.7335		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64064	5121945	CHARLIE	MACK OIL CO	10/17/1987	1/26/1988	2/10/1988		34.72904	-97.7343		OIL
OK310810050130_00	Cox City Creek	Grady	64067	ZZ64067	DEAN	HALL & BRISCOE INC	1/3/1927	1/16/1927			34.73676	-97.729		DRY
OK310810050130_00	Cox City Creek	Grady	64069	5136164	S P BURKES	T H MCCASLAND	4/25/1943	5/12/1943			34.73333	-97.7379	9/9/1999	OIL
OK310810050130_00	Cox City Creek	Grady	64081	5136166	STACY	MACK OIL CO	2/8/1927	3/1/1927	3/5/1927		34.73134	-97.7313	12/9/1981	OIL
OK310810050130_00	Cox City Creek	Grady	64087	5100375	C M WOLFORD	JOE RAY	3/14/1925	6/12/1925			34.72592	-97.7313		GAS
OK310810050130_00	Cox City Creek	Grady	64089	5136157	GIBSON	WINKLER & MCQUEEN INC	12/22/1926	1/2/1927			34.73301	-97.7335		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64090	5121587	ARCHER	MACK OIL CO	5/25/1984	12/2/1984	12/20/1984		34.73776	-97.7412		OIL
OK310810050130_00	Cox City Creek	Grady	64092	5135981	B A HORTON	CARTER OIL CO	1/16/1927	7/27/1927			34.73867	-97.7401		OIL
OK310810050130_00	Cox City Creek	Grady	64093	5136012	B A HORTON	CARTER OIL CO	10/7/1927	4/2/1928			34.73867	-97.7423	1/28/1999	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64096	5100311	W E WOODS	CARTER OIL CO	10/12/1926	11/18/1926			34.73686	-97.7401	5/1/2001	NOT REPORTED

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050130_00	Cox City Creek	Grady	64104	5136011	W E WOODS	WIRT FRANKLIN PET CORP	1/9/1928	2/22/1928			34.73505	-97.7404	9/19/2001	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64107	5121971	HARRIS	MACK OIL CO	2/27/1988	5/23/1988	6/7/1988		34.73627	-97.7394		OIL
OK310810050130_00	Cox City Creek	Grady	64112	5135994	CARTER-WOODS	T H MCCASLAND ET AL	9/28/1940	10/4/1940			34.73691	-97.7414		OIL
OK310810050130_00	Cox City Creek	Grady	64113	5135995	CARTER-WOODS	T H MCCASLAND ET AL	10/17/1940	10/20/1940			34.73698	-97.7414		OIL
OK310810050130_00	Cox City Creek	Grady	64118	5136002	B A HORTON B	T H MCCASLAND	7/14/1940	7/24/1940	7/29/1940		34.73867	-97.7424		OIL
OK310810050130_00	Cox City Creek	Grady	64132	5100303	W E WOODS	MARLAND OIL CO OF OK	8/11/1926	9/15/1926			34.73505	-97.7401	10/15/2001	NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64175	ZZ64175	L M CALLAHAN	CARTER OIL CO	5/31/1927	7/18/1927			34.72219	-97.7268		OIL
OK310810050130_00	Cox City Creek	Grady	64176	5121686	BATES	MACK OIL CO	2/20/1985	7/12/1985	9/6/1985		34.72088	-97.7257		OIL
OK310810050130_00	Cox City Creek	Grady	64195	5136087	C M KARNES	CARTER OIL CO	6/23/1927	8/21/1927			34.72038	-97.7224		NOT REPORTED
OK310810050130_00	Cox City Creek	Grady	64207	5136066	N B WALL	CARTER OIL CO	4/28/1927	5/11/1927			34.724	-97.729		OIL
OK310810050130_00	Cox City Creek	Grady	64215	5100462	GEORGE W HICKS	WALTER H GANT	5/2/1927				34.724	-97.7268		OIL
OK310810050130_00	Cox City Creek	Grady	64216	5100463	GEORGE W HICKS	WALTER H GANT	5/26/1927	6/9/1927			34.72219	-97.7246		OIL
OK310810050130_00	Cox City Creek	Grady	64238	5136049	FINCH	T H MCCASLAND ET AL	8/8/1938	8/16/1938			34.72192	-97.7273	5/24/2001	OIL
OK310810050130_00	Cox City Creek	Grady	64253	5100467	KNOX PERMIAN SAND UNIT	MACK OIL CO	8/26/1964	8/29/1964			34.72115	-97.7229		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	509110	5122611	BALL	CHESAPEAKE OPERATING INC	5/27/1996	9/5/1996	10/7/1996		34.74393	-97.7313		GAS
OK310810050130_00	Cox City Creek	Grady	510057	5122660	GOFF	CHESAPEAKE OPERATING INC	3/6/1997	6/25/1997	7/24/1997		34.73767	-97.7235		GAS
OK310810050130_00	Cox City Creek	Grady	535103	5122833	ORCA	MACK ENERGY CO	8/15/1999	10/12/1999	12/3/1999		34.73131	-97.7338		OIL
OK310810050130_00	Cox City Creek	Grady	583333	5136127	BPU	MACK ENERGY CO	9/2/1940	9/11/1940			34.7398	-97.7428		OIL
OK310810050130_00	Cox City Creek	Grady	583335	5100329	BPU	MACK ENERGY CO	12/8/1926	2/20/1927			34.74023	-97.738		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	583336	5135971	BPU	MACK ENERGY CO	12/15/1926	1/4/1927	3/15/1927		34.73857	-97.7379		OIL
OK310810050130_00	Cox City Creek	Grady	583339	5135997	BPU	MACK ENERGY CO	5/15/1943	6/1/1943	8/25/1943		34.73664	-97.7401		OIL
OK310810050130_00	Cox City Creek	Grady	583341	5135995	BPU	MACK ENERGY CO	10/17/1940	10/20/1940			34.73698	-97.7414		OIL
OK310810050130_00	Cox City Creek	Grady	583342	5100306	BPU	MACK ENERGY CO	12/10/1926	2/28/1927			34.73686	-97.7423		OIL
OK310810050130_00	Cox City Creek	Grady	584764	5136171	BPU	MACK ENERGY CO	10/13/1926	10/23/1926			34.73496	-97.7379		OIL
OK310810050130_00	Cox City Creek	Grady	585021	5135968	BPU	MACK ENERGY CO	11/28/1926	2/27/1927			34.72773	-97.7313		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	589361	5135990	BPU	MACK ENERGY CO	12/27/1947	1/4/1948	2/25/1948		34.7355	-97.7406		SERVICE WELL
OK310810050130_00	Cox City Creek	Grady	589891	5121595	PHIPPS	MACK ENERGY CO	10/7/1984	1/31/1985	3/18/1985		34.7304	-97.7335		OIL
OK310810050130_00	Cox City Creek	Grady	592330	5122041	WHEELER	MACK ENERGY CO	2/16/1989	5/9/1989	9/16/1989		34.73571	-97.7341		OIL
OK310810050130_00	Cox City Creek	Grady	593601	5136008	W F WOODS	OTC/CORP. COMM NOT ASSIGNED					34.73504	-97.7399	4/13/2001	OIL
OK310810050130_00	Cox City Creek	Grady	593769	5123059	MARK 1-8	MACK ENERGY CO	7/12/2002	9/6/2002	11/9/2002		34.7425	-97.7431		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050130_00	Cox City Creek	Grady	593895	5121479	CRABB	MACK ENERGY CO	7/26/1983	10/22/1983	5/10/1984		34.74122	-97.7368		OIL
OK310810050130_00	Cox City Creek	Grady	602505	5136168	BPU	MACK ENERGY CO	3/5/1927	4/10/1927		4/18/1986	34.72772	-97.7335		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69029	13710164	GARVIN-SIMMS	CARTER OIL CO	11/10/1926	1/9/1927			34.67667	-97.6959	2/15/1936	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69030	13710163	GOZA	CARTER OIL CO ET AL	3/20/1925	6/20/1925			34.67577	-97.6914	2/9/1937	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69038	13710160	J A GREEN	CARTER OIL CO	3/4/1926	7/20/1926			34.67342	-97.691	7/21/9999	DRY
OK310810050120_00	Rush Creek, Trib E	Stephens	69044	13710155	GOZA	CLARK & COWDEN	7/16/1925	8/17/1925			34.67577	-97.6892		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69046	13710154	GOZA	CLARK & COWDEN & PAULINE OIL & GAS CO	11/14/1925	12/9/1925			34.67667	-97.6892		DRY
OK310810050120_00	Rush Creek, Trib E	Stephens	69052	13710151	JIM GRAHAM	MACK OIL CO	8/12/1956	8/22/1956		8/22/1956	34.67811	-97.6919	9/8/1956	DRY
OK310810050120_00	Rush Creek, Trib E	Stephens	69061	13710146	HITCHCOCK A	WILLARD L MILLER	12/21/1949	1/16/1950	2/8/1950		34.67306	-97.6981	1/4/2001	OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69063	13710145	HITCHCOCK A	WILLARD L MILLER	1/17/1950	1/28/1950	2/14/1950		34.67311	-97.6981		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69071	13710141	HITCHCOCK B	WILLARD L MILLER	6/23/1949	7/2/1949			34.67487	-97.6981		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69072	13710140	WORRELL	WILLARD L MILLER	8/31/1949	9/18/1949			34.67848	-97.7003	3/29/1950	DRY
OK310810050120_00	Rush Creek, Trib E	Stephens	69077	13700324	W E HITCHCOCK	GULF OIL CORP	11/4/1947	1/14/1948			34.67495	-97.7046	3/22/1950	DRY
OK310810050120_00	Rush Creek, Trib E	Stephens	69080	13721181	HUSSEY	SHAWNEE OIL & GAS CORP	8/24/1975	9/10/1975			34.67856	-97.7046	6/14/1984	GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	69023	ZZ069023	GARVIN-SIMMS	CARTER OIL CO	1/15/1926	2/10/1926			34.67703	-97.6985	1/7/1927	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69024	ZZ069023	GARVIN SIMMS	CARTER OIL CO	11/26/1924	1/9/1927			34.67703	-97.6985	1/7/1927	GAS AND OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69026	13710166	GARVIN-SIMMS	CARTER OIL CO	3/8/1926	4/21/1926			34.68064	-97.6964	3/7/1935	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69031	13709038	J A GOZA	CARTER OIL CO	2/14/1926	3/18/1926			34.67451	-97.691		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69032	13710162	J A GOZA	CARTER OIL CO	10/23/1926	3/9/1927			34.67667	-97.6936	12/5/1935	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69033	13709036	JIM GRAHAM	CARTER OIL CO	8/25/1926	10/3/1926			34.67848	-97.6936		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69034	13709037	JIM GRAHAM	CARTER OIL CO	1/3/1927	2/10/1927			34.68029	-97.6936		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69040	13710159	KNOX-SIMMS	CARTER OIL CO	3/1/1926	4/8/1926			34.68064	-97.6999	10/5/1935	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69049	13708366	FRANK WORRELL	GULF OIL CORP	2/3/1948	2/26/1948	3/25/1948		34.67487	-97.7003		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69051	13700296	SIMMS	KNOX PETROLEUM CO	11/26/1924	2/13/1925			34.67713	-97.6987		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69057	13720524	SE KNOX TRACT 22	MACK OIL CO	4/14/1970	4/17/1970			34.67128	-97.6936		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Stephens	69058	13720523	SE KNOX TRACT 20	MACK OIL CO	4/10/1970	4/12/1970			34.67487	-97.6936		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Stephens	69067	13708973	HITCHCOCK A	WILLARD L MILLER	4/12/1950	5/5/1950	6/14/1950		34.67053	-97.6965		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69074	13721139	HITCHCOCK	SHAWNEE OIL & GAS CORP	5/15/1975	6/8/1975	6/20/1975		34.67487	-97.7019		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	504746	13709038	J A GOZA	NORTHBROOK OIL CO	2/14/1926	4/7/1926			34.67451	-97.691		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Stephens	533185	13725481	FOX ALLIANCE	CHEVRON U S A INC	5/25/1999	6/23/1999	7/9/1999		34.67836	-97.7052		GAS

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Stephens	535932	13725497	LYDIA MAY	MARATHON OIL CO	10/25/1999	11/30/1999	2/2/2000		34.67593	-97.7029		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	594659	13708974	HITCHCOCK A	WILLARD L MILLER	5/9/1950	5/16/1950	5/23/1950		34.67053	-97.6966		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	596833	13709037	S E KNOX	G & S PRODUCTION	1/3/1927				34.68029	-97.6936		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10003978	13713557	HITCHCOCK "A" 5		3/3/1950	3/23/1950	5/5/1950		34.67176	-97.6972		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10004154	13709037	JIM GRAHAM 2		1/3/1927	2/10/1927	3/1/1927		34.6804	-97.6934		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10004595	13726083	FOX ALLIANCE	CHEVRON USA INC	12/2/2004	2/14/2005		2/14/2005	34.67682	-97.7198		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Stephens	69022	ZZ069022	GARVIN SIMMS	CARTER OIL CO	10/26/1925	1/12/1926			34.68064	-97.6985	12/9/1935	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69027	13710165	GARVIN-SIMMS	CARTER OIL CO	4/20/1926	5/23/1926			34.68078	-97.7019	7/3/1936	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69028	13709050	GARVIN-SIMMS	CARTER OIL CO	10/16/1926	6/17/1927			34.67848	-97.6958		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69036	13710161	J A GREEN	CARTER OIL CO		1/4/1926			34.67355	-97.6924	10/2/1935	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69045	13710156	GOZA	CLARK & COWDEN & PAULINE OIL & GAS CO	8/19/1925	9/30/1926			34.67487	-97.6892		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69070	13710142	GOZA	PAULINE OIL & GAS CO ET AL	12/15/1925	1/9/1926			34.67487	-97.6898		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69079	13700284	SIMMS	OKLACUBA OIL CORP	6/1/1919	9/1/1920			34.68082	-97.7063		DRY
OK310810050120_00	Rush Creek, Trib E	Stephens	432143	13709050	GARVIN SIMS	G & S PRODUCTION	10/16/1926	6/17/1927			34.67848	-97.6958		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	479417	13709037	JIM GRAHAM	G & S PRODUCTION	1/3/1927				34.68029	-97.6936		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Stephens	497709	13725298	FOX ALLIANCE	CHEVRON U S A INC	1/28/1996	5/19/1996	8/1/1996		34.68037	-97.7046		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	510291	13725370	SHARON JEAN	AVALON EXPL INC	4/8/1997	6/16/1997	7/30/1997		34.67832	-97.701		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	522962	13709037	S E KNOX	G & S PRODUCTION	1/3/1927				34.68029	-97.6936		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Stephens	534858	13725283	SHARON JEAN	MARATHON OIL CO	8/16/1995	10/21/1995	12/7/1995		34.67572	-97.6973		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	585057	13725643	CALEB	ROX EXPL INC	9/7/2001	10/2/2001	11/26/2001		34.67547	-97.7022		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	595668	13770235	SOUTHEAST KNOX	G & S PRODUCTION	7/1/1926				34.67848	-97.6959		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10004184	13713559	HITCHCOCK "A" 7		4/3/1950	4/10/1950	4/25/1950		34.67187	-97.6972		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10004279	13726635	TURNER	MARATHON OIL COMPANY	6/16/2008	7/1/2008	7/28/2008		34.6713	-97.6952		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Stephens	10004279	13726637	TURNER	MARATHON OIL COMPANY	5/22/2008	6/11/2008	6/28/2008		34.67689	-97.7003		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Stephens	10004566	13708974	SEKU TR 21 (HITCHCOCK"A"9) 9						34.67058	-97.6962		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10004594	13725550	ALEX	MARATHON OIL CO	10/14/2000	11/23/2000	1/3/2001		34.67289	-97.6973		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Stephens	69025	ZZ069025	GARVIN SIMMS	CARTER OIL CO	10/26/1925	1/3/1926			34.67451	-97.6955	7/5/1936	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69048	13710152	SIMMS	COLINE OIL CO	9/19/1916	2/15/1918			34.68074	-97.6887		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	69050	13770235	GARVIN SIMS	KNOX PETROLEUM CO		5/1/1924			34.67848	-97.6959		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	69065	13710144	HITCHCOCK A	WILLARD L MILLER	1/29/1950	2/6/1950	2/18/1950		34.67317	-97.6981		OIL

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OK310810050120_00	Rush Creek, Trib E	Stephens	69068	13708975	HITCHCOCK A	WILLARD L MILLER	7/1/1950	7/16/1950	8/7/1950		34.67261	-97.6966		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	311328	13720524	SE KNOX UNIT	FAHRENHEIT PETROLEUM CO	1/26/1992	1/28/1992	1/28/1992		34.67128	-97.6936		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	455854	13709038	J A GOZA	G & S PRODUCTION	2/14/1926	3/18/1926	3/18/1926		34.67451	-97.691		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	535808	13725283	SHARON JEAN	MARATHON OIL CO	8/16/1995	10/21/1995	12/7/1995		34.67572	-97.6973		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	551852	13725550	ALEX	MARATHON OIL CO	10/14/2000	11/23/2000	1/3/2001		34.67283	-97.6977		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	573930	13725645	JOSHUA	MARATHON OIL CO	8/29/2001	9/15/2001	10/10/2001		34.67439	-97.6989		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	594660	13708974	SOUTHEAST KNOX	G & S PRODUCTION	6/27/1950	7/1/1950			34.67053	-97.6966		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Stephens	595587	13709038	SOUTHEAST KNOX	G & S PRODUCTION	2/14/1926	3/18/1926	3/18/1926		34.67451	-97.691		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	326096	13720523	SE KNOX UNIT	FAHRENHEIT PETROLEUM CO	12/20/1991	12/23/1991			34.67487	-97.6936		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	458224	13725283	SHARON JEAN	AVALON EXPL INC	8/16/1995	10/21/1995	12/7/1995		34.67572	-97.6973		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	497708	13725291	HODGE	CHESAPEAKE OPERATING INC	10/7/1995	3/11/1996	3/26/1996		34.67213	-97.6965		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	497717	13720524	S E KNOX UNIT	NORTHBROOK OIL & GAS CO	1/26/1992	1/28/1992	1/28/1992		34.67128	-97.6936		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	509439	13725354	FOX ALLIANCE	CHEVRON U S A INC	12/27/1996	2/16/1997	3/25/1997		34.67998	-97.7136		GAS
OK310810050120_00	Rush Creek, Trib E	Stephens	526287	13720524	S E KNOX	G & S PRODUCTION	4/14/1970	4/17/1970	8/20/1970		34.67128	-97.6936		OIL
OK310810050120_00	Rush Creek, Trib E	Stephens	10004278	13726338	JOSHUA	ROX EXPLORATION INC	2/13/2006	3/5/2006	7/10/2006		34.67697	-97.7022		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Grady	64309	5136186	POUNDS	GEORGE D BLAYLOCK	10/18/1948	10/26/1948		10/26/1948	34.69868	-97.7068		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64312	5136191	I POLSON	CARTER OIL CO	6/27/1926	9/5/1926			34.69868	-97.7136		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64314	5136215	IRVIN POLSON	CARTER OIL CO	8/3/1926	11/11/1926			34.69687	-97.7158		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64315	5136188	IRVIN POLSON	CARTER OIL CO	8/14/1926	10/23/1926			34.69868	-97.7158		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64317	5100335	WHITE EAGLE	CARTER OIL CO	12/28/1927	2/16/1928			34.70265	-97.7166		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64323	5136193	WHITE EAGLE	CARTER OIL CO	11/30/1926	2/7/1927			34.7023	-97.7175		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64326	ZZ64326	POUNDS	CARTER & RAY	10/12/1925	11/24/1925		11/24/1925	34.70049	-97.7112		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64332	5136183	POLSON	GARVIN DRLG CO	4/29/1926	5/29/1926			34.70049	-97.7112		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64340	5136216	POLSON	T H MCCASLAND	6/10/1943	6/18/1943	10/14/1943		34.69868	-97.7136		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64343	ZZ64343	WHITE EAGLE B	T H MCCASLAND ET AL	5/4/1937	5/19/1937			34.7023	-97.718		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64346	5100380	GROVER COCHRAN	MAGNOLIA PETROLEUM CO	3/15/1927	4/30/1927			34.69868	-97.709		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64347	5100357	GROVER COCHRAN	MAGNOLIA PETROLEUM CO	5/28/1927	9/29/1927			34.69854	-97.709		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64349	ZZ64349	I POLSON	MAGNOLIA PETROLEUM CO	4/14/1926	6/6/1926			34.69868	-97.718		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64351	5100304	IRVIN POLSON	MAGNOLIA PETROLEUM CO	4/10/1927	8/3/1927			34.69819	-97.7208		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64352	5136185	R H RAMSEY	MAGNOLIA PETROLEUM CO	10/23/1926	1/16/1927			34.70049	-97.7202		NOT REPORTED

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	64355	5136200	G COCHRAN	SCHEIDENHELM CLAPP & GRAHAM	7/4/1941	5/6/1942			34.69687	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64463	5136508	JOHN W BAKER	BRITISH-AMERICAN OIL PROD CO	3/18/1957	11/16/1957	11/13/1957		34.6888	-97.7298		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64469	5136503	EASON	CHRISTIE-STEWART DRLG CO	12/2/1956	12/7/1956		12/7/1956	34.68415	-97.7222		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64470	5136514	MILLER A	CHRISTIE-STEWART DRLG CO	3/31/1959	4/7/1959		4/7/1959	34.69319	-97.7222		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64474	5136509	KEENEY	DICK WEGENER DRLG CONTRACTOR	5/28/1954	6/13/1954	6/24/1954		34.68957	-97.7288		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64475	5136500	KEENEY	DICK WEGENER DRLG CONTRACTOR	4/12/1955	4/20/1955		4/20/1955	34.68776	-97.7288		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64477	5136487	MITCHELL	R L BAUMAN & MAX PRAY	9/2/1948	11/15/1948			34.695	-97.7157		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64478	ZZ64478	J C NATION	BAY PETROLEUM CO	10/16/1926	11/3/1926			34.68597	-97.7112		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64480	ZZ64480	EVA NATIONS	CARTER OIL CO	12/20/1926	6/3/1927			34.68777	-97.7068		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64481	5100314	EVA NATIONS	CARTER OIL CO	1/18/1927	5/30/1927			34.68597	-97.7068		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64483	5136442	L F WHAM	CARTER OIL CO	5/3/1926	7/31/1926			34.69536	-97.7116		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64486	5136440	L F WHAM	CARTER OIL CO	9/25/1926	10/6/1926			34.68958	-97.7112		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64489	ZZ64489	L F WHAM	CARTER OIL CO	12/2/1926	7/15/1927			34.68958	-97.7068		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64492	ZZ64492	L F WHAM	CARTER OIL CO	4/27/1927	10/24/1927			34.69139	-97.7112		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64494	5136478	MIDWEST	CHRISTIE-STEWART DRLG CO	12/18/1956	12/23/1956		12/23/1956	34.69139	-97.7201		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64495	5136479	STEWART	CHRISTIE-STEWART	10/18/1956	10/27/1956	10/27/1956		34.695	-97.7135		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64496	5136480	STEWART	CHRISTIE-STEWART DRLG CO	10/28/1956	11/3/1956		11/3/1956	34.68958	-97.7135		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64497	5136494	STEWART	CHRISTIE-STEWART DRLG CO	3/9/1959	3/18/1959		3/18/1959	34.69139	-97.7135		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64498	ZZ64498	STEWART	CHRISTIE-STEWART DRLG CO	3/24/1959	3/27/1959	4/1/1959		34.68972	-97.7135		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64500	5100350	NATION	HALL & BRISCOE INC	8/4/1926	8/27/1926			34.68597	-97.709		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64501	ZZ64501	J C NATION	HALL & BRISCOE INC	8/10/1926	9/9/1926			34.68777	-97.709		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64503	ZZ64503	J C NATION	HALL & BRISCOE INC	12/6/1927	1/16/1928			34.68777	-97.709		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64504	5136472	LYLE WHAM DEVELOPMENT CO 1	LYLE WHAM ET AL	12/20/1947	1/22/1948	2/9/1948		34.69274	-97.7073		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64506	5136444	BETTIE MITCHELL	MAGNOLIA PETROLEUM CO	7/14/1926	8/12/1926			34.68944	-97.7135		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64507	5136461	BETTIE MITCHELL	MAGNOLIA PETROLEUM CO	12/27/1926	3/21/1927			34.69139	-97.7135		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64509	5100353	E H MITCHELL	MAGNOLIA PETROLEUM CO	5/29/1926	7/4/1926			34.695	-97.7135		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64512	5136452	E H MITCHELL	MAGNOLIA PETROLEUM CO	3/28/1927	10/2/1927			34.6932	-97.7157		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64514	5136454	S D WHAM	MAGNOLIA PETROLEUM CO	1/6/1927	10/17/1927			34.6932	-97.7046		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64515	ZZ64515	L F WHAM	T H MCCASLAND	7/11/1941	7/24/1941			34.6909	-97.7096		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64517	5136474	WHAM	T H MCCASLAND	8/22/1947	10/4/1947	10/4/1947		34.69455	-97.7095		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	64518	5136474	WHAM	T H MCCASLAND	8/22/1947	9/2/1947	10/4/1947		34.69455	-97.7095		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64520	5136492	WHAM	T H MCCASLAND	9/3/1947	9/8/1947	10/5/1947		34.69274	-97.7095		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64521	5136473	WHAM	T H MCCASLAND	9/9/1947	9/15/1947			34.69094	-97.7073		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64523	ZZ64523	WHAM	T H MCCASLAND ET AL	7/12/1948	7/17/1948	7/31/1948		34.69184	-97.7084		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64526	5136470	WHAM	T H MCCASLAND ET AL	8/3/1948	8/8/1948	8/28/1948		34.69062	-97.7055		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64527	5136465	WHAM	T H MCCASLAND ET AL	8/12/1948	8/19/1948	9/14/1948		34.68966	-97.7053		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64529	5136489	WHAM	T H MCCASLAND ET AL	10/19/1948	10/26/1948	11/22/1948		34.69365	-97.7106		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64530	5136486	NATIONS A	WILLARD L MILLER	7/7/1949	7/14/1949			34.68642	-97.704		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64532	5136482	LYLE WHAM	LYLE WHAM ET AL	9/29/1949	10/16/1949	10/24/1949		34.69365	-97.7073		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64534	5136468	WHAM	W H RIDDLE	2/8/1948	2/18/1948			34.69455	-97.7073		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64535	5136467	WHAM	W H RIDDLE	2/22/1948	3/7/1948			34.69455	-97.7062		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64537	5120013	NATIONS 1	W T ROBINSON & SON INC	9/6/1966	9/16/1966	10/24/1966		34.68597	-97.709		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64538	ZZ64538	NATIONS	W T ROBINSON & SON TRUCKING	3/11/1968	3/13/1968	3/18/1968		34.68498	-97.7084		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64540	5120814	NATIONS	W T ROBINSON & SON TRUCKING CONTRACTORS INC	4/24/1979	5/7/1979			34.68777	-97.709		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64541	5120914	NATIONS	W T ROBINSON & SON TRUCKING CONTRACTORS INC	9/20/1979	9/23/1979	10/20/1979		34.68823	-97.7106		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64543	5120923	NATIONS	W T ROBINSON & SON TRUCKING CONTRACTORS INC	10/5/1979	10/8/1979	10/20/1979		34.68823	-97.7117		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64544	5120954	NATIONS	W T ROBINSON & SON TRUCKING CONTRACTORS INC	12/16/1979	12/19/1979			34.68732	-97.7117		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64546	5120418	STEWART	SHAWNEE OIL & GAS CORP	1/11/1975	1/26/1975		1/29/1975	34.69139	-97.7179		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64549	ZZ064549	EVA NATIONS	SWAN OIL CO	10/15/1948	10/19/1948			34.68823	-97.7084		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64550	ZZ064549	NATIONS	LYLE WHAM	3/30/1959	4/17/1959	4/21/1959		34.68823	-97.7084		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64552	5136448	JOE NATIONS	WIRT FRANKLIN PET CORP	1/2/1938	6/2/1938			34.68777	-97.7068		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64553	ZZ64553	J L ABERNATHY	CARTER OIL CO	2/8/1926	3/24/1926			34.68631	-97.6976		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64555	5136431	J L ABERNATHY	CARTER OIL CO	4/8/1926	5/12/1926			34.68686	-97.6976		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64557	5136457	L COCHRAN	CARTER OIL CO	12/7/1926	10/29/1927			34.69318	-97.7024		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64558	5136421	T F CROSS	CARTER OIL CO	9/25/1926	11/10/1926			34.68776	-97.7002	2/10/2000	NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64560	5100351	G W HILDERBRANT	CARTER OIL CO	6/12/1926	8/19/1926			34.68957	-97.7002		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64561	5136428	G W HILDERBRANDT	CARTER OIL CO	1/11/1927	3/18/1927			34.68957	-97.698		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64563	ZZ64563	C H LINDSEY	CARTER OIL CO	1/17/1926	2/24/1926			34.68379	-97.6984		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64564	ZZ64564	C H LINDSEY	CARTER OIL CO	3/28/1926	5/1/1926			34.68198	-97.6984		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64566	5100439	C H LINDSEY	CARTER OIL CO	12/5/1926	1/25/1927			34.68595	-97.7002		NOT REPORTED

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	64569	5100447	C A SCHRAMECK	CARTER OIL CO	11/27/1925	1/9/1926			34.68198	-97.7002		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64570	5100479	C A SCHRAMECK	CARTER OIL CO	1/14/1926	2/8/1926			34.68234	-97.7002	8/23/2001	GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64572	ZZ064571	C A SCHRAMECK	CARTER OIL CO	3/23/1927	5/21/1927			34.68415	-97.7024		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64575	ZZ64575	T L WADE	CLARK & COWDEN	11/8/1925	1/10/1926			34.6856	-97.6963		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64577	ZZ64577	LINDSAY	COLINE OIL CORP	4/1/1918	10/1/1920			34.68234	-97.6936		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64578	5136433	ABERNATHY	AL FOLMER	9/6/1946	9/20/1946			34.68595	-97.698		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64580	ZZ64580	LINDSEY	GARVIN DRLG CO	1/13/1926	2/1/1926			34.68415	-97.6958		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64581	5120115	SE KNOX WSW	MACK OIL CO	4/4/1970	4/11/1970			34.68171	-97.6973		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	410379	5136508	JOHN W BAKER	CHEVRON U S A INC	3/18/1957	11/16/1957	11/13/1957		34.6888	-97.7298		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	455855	5136191	I POLSON	G & S PRODUCTION	6/27/1926	9/5/1926			34.69868	-97.7136		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455857	5136436	JOE NATION	G & S PRODUCTION	4/26/1938	6/12/1938			34.68777	-97.7046		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455858	5136209	G COCHRAN	G & S PRODUCTION	8/1/1941	9/22/1941			34.69778	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455860	5136421	T F CROSS	G & S PRODUCTION	9/25/1926	11/10/1926			34.68776	-97.7002	2/10/2000	OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455861	5136418	T F CROSS	G & S PRODUCTION	11/7/1926	12/17/1926			34.68776	-97.7024		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455863	5100439	C H LINDSAY	G & S PRODUCTION	12/25/1927	1/25/1928			34.68595	-97.7002		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	476187	5122557	CHANDLER	CHESAPEAKE OPERATING INC	7/21/1995	11/17/1995	12/7/1995		34.69289	-97.7096		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	479464	5136465	WHAM	G & S PRODUCTION	8/12/1948	8/19/1948			34.68966	-97.7053		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	479465	5136464	WHAM 11	G & S PRODUCTION	8/21/1948	8/30/1948			34.69003	-97.7063		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	502465	5122618	RAMSEY	MACK ENERGY CO	10/6/1996	12/5/1996	2/12/1997		34.70139	-97.7186		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	505157	5120954	NATIONS	G & S PRODUCTION	4/16/1979	4/19/1979			34.68732	-97.7117		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	505178	5121783	ABERNATHY A	CHESAPEAKE OPERATING INC	10/5/1996	11/26/1996	12/17/1996		34.6856	-97.6984		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	509120	5122606	JENNA NICOLE	MARATHON OIL CO	6/17/1997	3/7/1997	4/26/1997		34.69703	-97.7004		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	509123	5122641	MERCER FOR PRESIDENT	AVALON EXPL INC	11/27/1996	2/21/1997	6/26/1997		34.68302	-97.7019		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	510073	5122667	ROBINSON FAMILY	CHESAPEAKE OPERATING INC	3/16/1997	5/12/1997	6/8/1997		34.68326	-97.7046		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	521783	5122618	RAMSEY	MACK ENERGY CO	10/6/1996	12/5/1996	2/12/1997		34.70139	-97.7186		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	522496	5122676	RAMSEY	MACK ENERGY CO	6/30/1997	8/16/1997	9/25/1997		34.69848	-97.7168		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	522771	5122741	BLOCH	MARATHON OIL CO	1/31/1998	3/24/1998	6/21/1998		34.69458	-97.7146		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	526059	5122701	AULD	CHESAPEAKE OPERATING INC	8/11/1997	11/15/1997	1/9/1998		34.69274	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	526060	5122673	CHANDLER	CHESAPEAKE OPERATING INC	5/28/1997	9/1/1997	9/25/1997		34.68708	-97.705		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	526217	5136472	S E KNOX	G & S PRODUCTION	12/20/1947	1/22/1948	2/15/1948		34.69274	-97.7073		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	526218	5136470	S E KNOX	G & S PRODUCTION	8/3/1948	8/6/1948	8/8/1948		34.69062	-97.7055		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	526219	5136465	S E KNOX	G & S PRODUCTION	8/12/1948	8/19/1948	9/4/1948		34.68966	-97.7053		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	526220	5136464	S E KNOX	G & S PRODUCTION	8/21/1948	8/30/1948	9/26/1948		34.69003	-97.7063		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	528007	5122766	KEARLEY	CHESAPEAKE OPERATING INC	5/3/1998	5/27/1998	7/12/1998		34.695	-97.713		GAS AND OIL
OK310810050120_00	Rush Creek, Trib E	Grady	531767	5122800	J KAYE	CHEVRON U S A INC	12/3/1998	2/10/1999	2/25/1999		34.68212	-97.7273		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	531988	5122771	J KAYE	MARATHON OIL CO	5/23/1998	10/31/1998	3/27/1999		34.6928	-97.7252		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	532093	5122814	BLOCH	MARATHON OIL CO	2/20/1999	4/5/1999	5/12/1999		34.69198	-97.7142		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	532399	5122827	EDNA	MARATHON OIL CO	5/7/1999	5/25/1999			34.6931	-97.725	5/28/1999	DRY
OK310810050120_00	Rush Creek, Trib E	Grady	533381	5122819	MEREDITH	MACK ENERGY CO	4/7/1999	6/11/1999	7/27/1999		34.69909	-97.7189		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	533566	5122820	BLOCH	MARATHON OIL CO	4/12/1999	4/28/1999	5/22/1999		34.6941	-97.719		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	536021	5122840	NATIONS	CHESAPEAKE OPERATING INC	9/12/1999	11/3/1999	12/13/1999		34.68369	-97.7089		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	536022	5122634	AULD	CHESAPEAKE OPERATING INC	8/21/1996	9/6/1996	10/3/1996		34.69289	-97.7101		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	536244	5122848	GEORGE	MACK ENERGY CO	11/4/1999	1/10/2000	2/26/2000		34.70138	-97.7153		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	536399	5122843	CAROLYN	CHESAPEAKE OPERATING INC	11/10/1999	12/16/1999	2/14/2000		34.68901	-97.7079		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	537644	5122873	BLOCH	MARATHON OIL CO	2/20/2000	4/4/2000	6/8/2000		34.69391	-97.7161		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	562713	5122892	OPAL	CHESAPEAKE OPERATING INC	7/24/2000	9/1/2000	9/30/2000		34.68597	-97.7115		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	574712	5122798	GLEN EAGLES	MACK ENERGY CO	1/7/1999	1/27/1999	3/23/1999		34.69734	-97.7196		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	582009	5122701	AULD	CHESAPEAKE OPERATING INC	8/11/1997	11/15/1997	1/9/1998		34.69274	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	590447	5122667	ROBINSON FAMILY	CHESAPEAKE OPERATING INC	3/16/1997	5/12/1997	6/8/1997		34.68326	-97.7046		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	591064	5122766	KEARLEY	CHESAPEAKE OPERATING INC	5/3/1998	5/27/1998	7/12/1998		34.695	-97.713		GAS AND OIL
OK310810050120_00	Rush Creek, Trib E	Grady	594563	5120915	NATIONS	GERALD ELAM	9/26/1979	9/30/1979			34.68732	-97.7106		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	595074	5120115	SE KNOX WSW	G & S PRODUCTION	4/4/1970	4/11/1970			34.68171	-97.6973		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	597638	ZZ597638	COCHRAN						34.7023	-97.7134		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	615849	5122741	BLOCH	MARATHON OIL CO	1/31/1998	3/24/1998	6/21/1998		34.69458	-97.7146		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	10001383	5120056	NATIONS 3		3/30/1968	4/2/1968	4/10/1968		34.68399	-97.7084		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	10001976	5123318	DUSTIN	MACK ENERGY CO	3/4/2006	3/16/2006	4/9/2006		34.69526	-97.718		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Grady	10001976	5123344	DANIELA	MACK ENERGY CO	4/20/2006	5/9/2006	7/3/2006		34.68898	-97.7135		GAS AND OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64313	ZZ64313	IRWIN POLSON	CARTER OIL CO	7/19/1926	9/10/1926			34.69687	-97.7134		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64316	ZZ64316	G H POUNDS	CARTER OIL CO	11/29/1926	1/28/1927			34.70043	-97.709		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64318	5136173	WHITE EAGLE	CARTER OIL CO	7/28/1926	9/17/1926			34.70021	-97.718		NOT REPORTED

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	64319	5136173	WHITE EAGLE	CARTER OIL CO	9/13/1936	12/29/1936			34.70021	-97.718		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64321	5136197	WHITE EAGLE	CARTER OIL CO	10/31/1926	12/10/1926			34.70049	-97.7136		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64322	5136197	WHITE EAGLE	CARTER OIL CO	5/15/1927	6/8/1927			34.70049	-97.7136		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64324	5136199	WHITE EAGLE	CARTER OIL CO	1/17/1927	3/16/1927			34.7023	-97.7158		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64325	5136187	WHITE EAGLE	CARTER OIL CO	1/16/1927	3/17/1927			34.70049	-97.7158		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64339	5136212	POLSON	T H MCCASLAND ET AL	9/12/1941	9/19/1941			34.6962	-97.7126		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64341	5136189	POLSON	T H MCCASLAND ET AL	3/17/1949	4/12/1949			34.69687	-97.7158		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64342	5136219	WHITE EAGLE	T H MCCASLAND ET AL	3/8/1935	3/26/1935			34.70279	-97.7208		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64344	5100360	GROVER COCHRAN	MAGNOLIA PETROLEUM CO	1/24/1926	3/17/1926			34.69687	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64345	5136423	GROVER COCHRAN	MAGNOLIA PETROLEUM CO	8/4/1926	9/28/1926			34.69868	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64350	5100328	IRVIN POLSON	MAGNOLIA PETROLEUM CO	10/13/1926	3/5/1927			34.69687	-97.718		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64353	ZZ64353	COCHRAN	W H RIDDLE	1/21/1948	2/5/1948			34.69642	-97.7117		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64356	5136209	G COCHRAN	SCHEIDENHELM CLAPP & GRAHAM	8/1/1941	9/22/1941			34.69778	-97.7112		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64464	5136502	MILLER A	CHRISTIE-STEWART DRLG CO	10/10/1956	10/18/1956	10/24/1956		34.69499	-97.7222		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64468	5120057	MILLER A	CHRISTIE-STEWART DRLG CO	4/9/1968	4/11/1968			34.69346	-97.7222		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	64471	5136510	WILD	CHRISTIE-STEWART DRLG CO	12/8/1956	12/17/1956		12/17/1956	34.69138	-97.7222		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64476	ZZ64476	NATION	JOE S ANDERSON	5/1/1926	6/16/1926			34.68152	-97.7116		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64479	5136447	EVA NATIONS	CARTER OIL CO	8/10/1926	12/19/1926			34.68416	-97.7068		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64482	5100314	EVA NATIONS	CARTER OIL CO	6/4/1927	7/8/1927			34.68597	-97.7068		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64484	5136198	L F WHAM	CARTER OIL CO	8/8/1926	9/20/1926			34.6932	-97.7112		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64485	5136198	L F WHAM	CARTER OIL CO	1/20/1928	2/15/1928			34.6932	-97.7112		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64487	5136449	L F WHAM	CARTER OIL CO	10/24/1926	7/20/1927			34.68958	-97.7046		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64490	5136435	L F WHAM	CARTER OIL CO	12/24/1926	7/9/1927			34.68958	-97.709		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64491	5136462	L F WHAM	CARTER OIL CO	12/15/1926	2/18/1927			34.69139	-97.7046		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64493	5136476	MIDWEST	CHRISTIE-STEWART DRLG CO	12/1/1956	12/10/1956		12/10/1956	34.695	-97.7201		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64499	5136496	STEWART A	CHRISTIE-STEWART	6/29/1957	7/3/1957	7/15/1957		34.6932	-97.7201		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64502	ZZ64502	J C NATION	HALL & BRISCOE INC	9/14/1926	9/24/1926			34.68777	-97.7112		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64505	5136481	NATIONS C	MACK OIL CO	9/1/1951	9/12/1951			34.68572	-97.7062		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64508	5136451	BETTIE MITCHELL	MAGNOLIA PETROLEUM CO	5/10/1927	8/29/1927		8/29/1927	34.695	-97.7179		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64510	5100331	E H MITCHELL	MAGNOLIA PETROLEUM CO	8/4/1926	2/22/1927			34.695	-97.7157		NOT REPORTED

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	64511	5136445	E H MITCHELL	MAGNOLIA PETROLEUM CO	8/28/1926	10/16/1926			34.6932	-97.7135		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64513	5136454	S D WHAM	MAGNOLIA PETROLEUM CO	1/6/1927	10/17/1927		10/17/1927	34.6932	-97.7046		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64516	5136463	L F WHAM	T H MCCASLAND	8/31/1941	9/8/1941			34.69567	-97.7121	3/13/2000	OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64519	5136492	WHAM	T H MCCASLAND	9/3/1947	9/8/1947			34.69274	-97.7095		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64522	5136473	WHAM	T H MCCASLAND	9/9/1947	9/15/1947	10/7/1947		34.69094	-97.7073		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64524	5136475	WHAM	T H MCCASLAND ET AL	7/19/1948	7/24/1948	8/4/1948		34.69274	-97.7084		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64525	5136469	WHAM	T H MCCASLAND ET AL	7/26/1948	7/30/1948	8/9/1948		34.69184	-97.7073		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64528	5136464	WHAM	T H MCCASLAND ET AL	8/21/1948	8/25/1948	8/8/1948		34.69003	-97.7063		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64531	5136484	NATIONS B	WILLARD L MILLER	7/16/1949	7/26/1949			34.68395	-97.7046		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64533	ZZ64533	MITCHELL UNIT	PAN AMERICAN PETROLEUM CORP	3/2/1957	12/29/1957		12/31/1957	34.6876	-97.7143		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64536	5120522	NATIONS DEEP	W T ROBINSON & SON TRUCKING CONTRACTORS INC	2/15/1976	3/19/1976		3/19/1976	34.68235	-97.709		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64539	5150030	NATIONS	W T ROBINSON & SON TRUCKING	3/30/1968	4/2/1968	4/10/1968		34.68404	-97.7087		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64542	5120915	NATIONS	W T ROBINSON & SON TRUCKING CONTRACTORS INC	9/26/1979	9/30/1979	10/20/1979		34.68732	-97.7106		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64545	5120376	ROBINSON	SHAWNEE OIL & GAS CORP	1/22/1974	2/15/1974		2/15/1974	34.68534	-97.7093		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64547	5136477	E H MITCHELL	STANOLIND OIL & GAS CO	9/25/1956	12/3/1956	12/13/1956		34.68787	-97.7134		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	64551	5136436	JOE NATION	WIRT FRANKLIN PET CORP					34.68777	-97.7046		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64554	5121783	WRIGHT	F HOWARD WALSH JR	1/2/1986	8/15/1986		8/15/1986	34.6856	-97.6984		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64556	5136427	J L ABERNATHY	CARTER OIL CO	1/20/1927	3/22/1927			34.68776	-97.698		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64559	5136418	T F CROSS	CARTER OIL CO	11/7/1926	12/17/1926			34.68776	-97.7024		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64562	ZZ64562	C H LINDSEY	CARTER OIL CO					34.68185	-97.6988		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	64565	5136417	C H LINDSEY	CARTER OIL CO	11/26/1926	2/21/1927			34.68595	-97.7024		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64567	ZZ64567	B C SAHM	CARTER OIL CO	8/31/1926	9/29/1926			34.68957	-97.7024		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64568	5136419	B C SAHM	CARTER OIL CO	11/2/1926	11/30/1926			34.69138	-97.7002		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64571	ZZ064571	C A SCHRAMECK	CARTER OIL CO	3/23/1927	5/21/1927			34.68415	-97.7024		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64573	5100440	C A SCHRAMECK	CARTER OIL CO	11/16/1927	12/20/1927			34.68415	-97.7002		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64574	5136420	A J ZACHARY	CARTER OIL CO	10/15/1926	11/15/1926			34.69138	-97.7024		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64576	5100372	WINTERS	CLARK & COWDEN	10/1/1925	11/12/1925			34.68957	-97.6936		DRY
OK310810050120_00	Rush Creek, Trib E	Grady	64579	ZZ64579	LINDSEY	GARVIN DRLG CO	12/5/1925	1/2/1926			34.68234	-97.6958		NOT REPORTED
OK310810050120_00	Rush Creek, Trib E	Grady	64582	5120116	SE KNOX TRACT 14	MACK OIL CO	4/19/1970	4/21/1970			34.68291	-97.6986		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	440794	5136497	MITCHELL A	CHESAPEAKE OPERATING INC	2/11/1995	2/22/1995	3/29/1995		34.6876	-97.7139		GAS

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	455856	5136197	WHITE EAGLE	G & S PRODUCTION	10/31/1926	12/10/1926			34.70049	-97.7136		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455859	5136188	IRWIN POLSON	G & S PRODUCTION	8/14/1926	10/23/1926			34.69868	-97.7158		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	455862	5136417	C H LINDSAY	G & S PRODUCTION	11/26/1926	2/21/1927			34.68595	-97.7024		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	479463	5136472	L WHAM	G & S PRODUCTION	12/20/1947	1/22/1948			34.69274	-97.7073		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	489877	5122601	SUMNER	CHESAPEAKE OPERATING INC	4/15/1996	8/15/1996	9/2/1996		34.70041	-97.7165		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	502471	5122634	AULD	CHESAPEAKE OPERATING INC	8/21/1996	9/6/1996	10/3/1996		34.69289	-97.7101		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	505154	5120814	NATIONS	G & S PRODUCTION	4/24/1979	5/7/1979			34.68777	-97.709		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	505173	5122615	CALEB	CHESAPEAKE OPERATING INC	6/11/1996	9/19/1996	10/10/1996		34.69685	-97.7108		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	505177	5120522	NATIONS	G & S PRODUCTION	4/25/1997	4/25/1997	4/27/1997		34.68235	-97.709		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	510066	5122618	RAMSEY	MACK ENERGY CO	10/6/1996	12/5/1996	2/12/1997		34.70139	-97.7186		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	513305	5122606	JENNA NICOLE	MARATHON OIL CO	6/17/1996	2/22/1997	4/26/1997		34.69703	-97.7004		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	519454	5122714	JULES	CHESAPEAKE OPERATING INC	9/23/1997	12/27/1997	1/11/1998		34.69388	-97.7162		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	519800	5122618	RAMSEY	MACK ENERGY CO	10/6/1996	12/5/1996	2/12/1997		34.70139	-97.7186		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	521784	5122715	RAMSEY	MACK ENERGY CO	10/19/1997	12/31/1997	2/11/1998		34.69887	-97.7147		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	522497	5122694	MITCHELL	MARATHON OIL CO	8/8/1997	4/19/1998	6/21/1998		34.68326	-97.719		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	522769	5136173	HUMBLE WHITE EAGLE	MACK ENERGY CO	9/13/1936	12/29/1936			34.70021	-97.718		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	522772	5120116	S E KNOX	G & S PRODUCTION	4/4/1970	4/17/1970	7/17/1970		34.68291	-97.6986		SERVICE WELL
OK310810050120_00	Rush Creek, Trib E	Grady	526221	5122748	ROBINSON BROTHERS	CHESAPEAKE OPERATING INC	2/18/1998	3/22/1998	5/7/1998		34.68687	-97.7061		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	530710	5122796	BLOCH	MARATHON OIL CO	11/18/1998	11/30/1998	12/11/1998		34.69335	-97.7176		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	530766	5122694	MITCHELL	MARATHON OIL CO	8/8/1997	4/19/1998	6/21/1998		34.68326	-97.719		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	531766	5122798	GLEN EAGLES	MACK ENERGY CO	1/7/1999	1/27/1999	3/23/1999		34.69734	-97.7196		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	531989	5122796	BLOCH	MARATHON OIL CO	11/18/1998	11/30/1998	12/11/1998		34.69335	-97.7176		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	534949	5122615	CALEB	CHESAPEAKE OPERATING INC	6/11/1996	9/19/1996	10/10/1996		34.69685	-97.7108		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	536183	5122694	MITCHELL	MARATHON OIL CO	8/8/1997	4/19/1998	6/21/1998		34.68326	-97.719		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	558916	5122892	OPAL	CHESAPEAKE OPERATING INC	7/24/2000	9/1/2000	9/30/2000		34.68597	-97.7115		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	576738	5122798	GLEN EAGLES	MACK ENERGY CO	1/7/1999	1/27/1999	3/23/1999		34.69734	-97.7196		GAS
OK310810050120_00	Rush Creek, Trib E	Grady	622565	5122741	BLOCH	MARATHON OIL CO	1/31/1998	3/24/1998	6/21/1998		34.69458	-97.7146		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	624197	5123279	BRIDGER	MACK ENERGY CO	9/9/2005	9/23/2005	10/27/2005		34.69733	-97.7196		OIL
OK310810050120_00	Rush Creek, Trib E	Grady	10000943	5123344	DANIELLA	MACK ENERGY CO	4/20/2006	5/9/2006	7/3/2006		34.68898	-97.7135		GAS AND OIL
OK310810050120_00	Rush Creek, Trib E	Grady	10000947	5136471	SEKU TR5 (L F WHAM # 6) 6		7/12/1948	7/17/1948	7/31/1948		34.69123	-97.708		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810050120_00	Rush Creek, Trib E	Grady	10001752	5123318	DUSTIN	MACK ENERGY COMPANY	3/4/2006	3/16/2006	4/9/2006		34.69526	-97.718		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Grady	10001976	5123318	DUSTIN	MACK ENERGY CO	3/4/2006	3/16/2006	4/9/2006		34.69526	-97.718		UNKNOWN
OK310810050120_00	Rush Creek, Trib E	Grady	10001990	5136192	SEKU TR 2 (POLSON, I 2) 2H		7/19/1926	9/10/1926			34.69671	-97.7127		OIL
OK310810050040_00	Murray Creek	Stephens	65832	13701284	ALICE R BURKES	PIERCE & BROWN	4/21/1928	5/14/1928			34.67328	-97.8518	5/18/9999	DRY
OK310810050040_00	Murray Creek	Stephens	473144	13725263	GINGER	ARBUCKLE ENTERPRISES	4/30/1995	5/25/1995			34.65477	-97.7886	5/25/1995	DRY
OK310810050040_00	Murray Creek	Stephens	65833	13721280	OQUIN	ARKLA EXPL CO	12/12/1975	8/26/1976		9/4/1976	34.65612	-97.7869	9/4/1976	DRY
OK310810050040_00	Murray Creek	Stephens	141127	13724864	WYATT B	TXO PRODUCTION CORP	2/8/1990	2/26/1990		2/28/1990	34.65639	-97.7869	2/28/1990	DRY
OK310810050040_00	Murray Creek	Grady	64609	5120292	MCKINNEY	HARPER OIL CO	2/15/1972	3/20/1972		3/20/1972	34.70918	-97.7887		DRY
OK310810050040_00	Murray Creek	Grady	64612	5100230	MILLWE	LANGSTON OIL & GAS CO	11/25/1916	10/10/1920			34.68649	-97.8447		DRY
OK310810050040_00	Murray Creek	Grady	64608	5121165	MAHAFFEY	INEXCO OIL CO	6/17/1981	12/12/1982		12/12/1982	34.70683	-97.7869		DRY
OK310810050040_00	Murray Creek	Grady	64613	5100389	JONES HRS	A B HENLEY	12/26/1963	5/6/1964		5/6/1964	34.68447	-97.8436		DRY
OK310810050040_00	Murray Creek	Grady	64614	5100014	J THOMPSON	TEXAS CO	3/10/1956	5/2/1956		5/2/1956	34.6914	-97.8099		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	69106	4921055	ROES	CHRISTIE-STEWART DRLG CO	12/24/1977	1/17/1978		1/17/1978	34.675	-97.2805		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	69113	4920511	STATE OF OKLAHOMA	CRESLENN OIL CO	8/6/1970	8/18/1970	9/5/1970		34.67554	-97.2849		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119183	4900895	OHIO	NELSON & SPAIN OIL CO	3/27/1961	4/5/1961	4/23/1961		34.72643	-97.2807		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119191	4921132	BEATY	FARMERS ENERGY CORP	8/26/1978	9/4/1978	9/16/1978		34.72779	-97.2839		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119207	4950164	BEATY	NELSON & SPAIN	7/1/1962	7/12/1962	9/1/1962		34.72567	-97.2841		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119208	4950134	FARMER	NELSON & SPAIN OIL CO	9/12/1963	9/25/1963	10/25/1963		34.72915	-97.2839		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119425	4930266	DANNY	NELSON & SPAIN OIL CO	5/22/1966	6/8/1966		6/8/1966	34.72007	-97.2838		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119432	4939399	POYNER	NELSON & SPAIN OIL CO	6/12/1960	6/22/1960		6/22/1960	34.72187	-97.2882		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119434	4950132	VIOLA	NELSON & SPAIN	6/19/1962	6/27/1962	7/1/1962		34.71555	-97.2849		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119435	4939400	WILEY	NELSON & SPAIN OIL CO	7/2/1960	7/17/1960	9/1/1962		34.71645	-97.2882		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119443	4921182	ISAAC-SAVAGE	GRACE PETROLEUM CORP	3/17/1979	3/29/1979	4/16/1979		34.71102	-97.2774		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119444	4950577	BURKS	ROBERT C JONES	3/9/1962	3/22/1962	5/5/1963		34.71554	-97.2807		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119449	4939390	KIRBY	NELSON & SPAIN OIL CO		12/7/1960	12/15/1960		34.72186	-97.2817		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119469	4939433	VAN DYKE	CLEARY PETROLEUM & NATOL	11/13/1963	11/18/1963		11/18/1963	34.70916	-97.2816		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119476	4939432	EWERT	KIRKPATRICK OIL CO	3/23/1962	3/31/1962	4/7/1962		34.70194	-97.2805		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119477	4939433	LEONARD VAN DYKE	SAMEDAN OIL CORP	12/24/1961	1/5/1962	1/17/1962		34.70916	-97.2816		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119482	4900040	HOLLAND C	CITIES SERVICE OIL CO	1/22/1957	2/13/1957		2/13/1957	34.70465	-97.2938		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119483	4900044	HESTER	COMPADRE OIL CORP	3/15/1962	3/25/1962		3/26/1962	34.70478	-97.2935		DRY

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OK310810010270_00	Rush Creek, Trib G	Garvin	119485	4922225	BEATY	GLACIER PETROLEUM CO INC	10/15/1983	10/27/1983		10/27/1983	34.70103	-97.2927		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119525	4921300	COCHRAN	QUINTIN LITTLE CO	3/20/1980	4/8/1980		4/18/1980	34.69014	-97.2893		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119526	4900136	COCHRAN	NELSON & SPAIN	10/23/1959	11/7/1959		11/7/1959	34.68291	-97.2849		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119527	4939428	TOLBERT	NELSON & SPAIN OIL CO	4/9/1958	4/26/1958		7/8/1958	34.69375	-97.2849		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119532	4923299	MAXINE	MUSTANG PRODUCTION CO	3/15/1988	3/31/1988		4/2/1988	34.69104	-97.2794		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119420	4921131	LELA	FARMERS ENERGY CORP	9/7/1978	9/17/1978	10/1/1978		34.72142	-97.2849		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119421	4921131	LELA	FARMERS ENERGY CORP	9/7/1978	9/17/1978	10/1/1978		34.72142	-97.2849		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119423	4920661	ISAAC	LARIO OIL & GAS CO	4/4/1973	4/18/1973		4/19/1973	34.71875	-97.2888		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119428	4900934	ISAAC	NELSON & SPAIN OIL CO	10/1/1959	10/13/1959	9/29/1960		34.71916	-97.2893		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119429	4939397	ISAAC	NELSON & SPAIN OIL CO	9/11/1960	9/26/1960	10/27/1960		34.72007	-97.2882		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119430	ZZ119430	LELA	NELSON & SPAIN OIL CO	5/4/1960	5/22/1960	5/28/1960		34.72278	-97.2849	5/24/1973	OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119431	4922985	NANCY	CHEYENNE PETROLEUM CO	11/8/1985	11/20/1985		11/20/1985	34.71277	-97.2904		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119437	4900510	R B BEATY	STANOLIND OIL & GAS CO	2/3/1944	3/6/1944		3/31/1944	34.72368	-97.2882		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119445	4950577	BURKS	NELSON & SPAIN OIL CO	3/9/1962	3/22/1962		3/22/1962	34.71554	-97.2807		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119471	4939430	MEL PEEL	COMPADRE OIL CORP	11/16/1961	11/26/1961	12/30/1961		34.6966	-97.2814		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119472	4922072	EWERT	T F HODGE	10/6/1982	10/16/1982		10/16/1982	34.70013	-97.2794		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119478	4939432	EWERT	KIRKPATRICK OIL CO	3/23/1962	3/31/1962	4/7/1962		34.70194	-97.2805		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119486	4939426	BEATY	KIRKPATRICK OIL CO	3/9/1962	3/18/1962	3/25/1962		34.70555	-97.2838		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119488	4939429	BEATY	SAMEDAN OIL CORP	8/13/1961	8/24/1961		8/24/1961	34.70374	-97.286		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119528	4920845	TOLBERT	WOODS PETROLEUM CORP	11/21/1975	12/5/1975	12/14/1975		34.69285	-97.2838		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	576737	4924298	BELITA CASEY	AVEN GAS & OIL	8/24/2001	9/5/2001	10/15/2001		34.71826	-97.2882		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	579219	4920845	TOLBERT	NORMAN BROTHERS TANK TRUCKS	11/21/1975	12/5/1975	12/14/1975		34.69285	-97.2838		SERVICE WELL
OK310810010270_00	Rush Creek, Trib G	Garvin	620006	4900934	ISAAC	AVEN GAS & OIL	10/3/1959	10/13/1959			34.71916	-97.2893	10/30/1993	SERVICE WELL
OK310810010270_00	Rush Creek, Trib G	Garvin	618214	4923977	BEATY	RANKEN ENERGY CORP	4/15/1996	4/27/1996			34.70555	-97.2893	9/11/1996	DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119424	4939395	DANNY	NELSON & SPAIN OIL CO	4/11/1960	4/25/1960	4/27/1960		34.72007	-97.286		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119427	4900934	ISAAC	NELSON & SPAIN OIL CO	10/3/1959	10/13/1959	11/16/1959		34.71916	-97.2893		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119484	4900896	TOMKINS	COMPADRE OIL CORP	3/13/1961	4/2/1961	4/28/1961		34.70194	-97.2838		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	119524	4920348	TOLBERT	CAYMAN CORP	12/9/1968	12/26/1968		12/26/1968	34.69389	-97.285		DRY
OK310810010270_00	Rush Creek, Trib G	Garvin	119487	4950126	VAN DYKE	PERKINS PRODUCTION CO	12/21/1962	1/3/1963	1/19/1963		34.70708	-97.2839		OIL
OK310810010270_00	Rush Creek, Trib G	Garvin	10000884	4924632	TOMPKINS	RANKEN ENERGY CORPORATION	9/20/2007	9/30/2007	2/1/2008		34.70123	-97.2855		UNKNOWN

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	69111	4921596	TEMPLE	R J WALKER OIL CO INC	3/21/1981	3/31/1981	4/30/1981		34.67923	-97.3069		OIL
OK310810010090_10	Rush Creek	Garvin	69114	4900274	J N EVANS	CARTER OIL CO	2/5/1951	2/28/1951		3/1/1951	34.67471	-97.3146		DRY
OK310810010090_10	Rush Creek	Garvin	69110	4923273	TEETER	PETROLEUM ENGINEERING INC	11/19/1987	12/6/1987		12/7/1987	34.67916	-97.2981		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	69117	4936216	RANDOLPH	DAUBES OIL DEPT	10/10/1955	11/1/1955		11/1/1955	34.67833	-97.3212		DRY
OK310810010090_10	Rush Creek	Garvin	111902	4921939	PHARAOH	PAPAL ENTERPRISES INC	6/28/1989	6/29/1989		6/28/1989	34.74397	-97.391		DRY
OK310810010090_10	Rush Creek	Garvin	118189	4900230	QUINILL	J TOM GRIMMETT	3/2/1952	3/27/1952		3/27/1952	34.72542	-97.2401		DRY
OK310810010090_10	Rush Creek	Garvin	118195	4938481	LIDDLE A	HEFNER PRODUCTION CO	9/6/1957	9/19/1957			34.71276	-97.2315		DRY
OK310810010090_10	Rush Creek	Garvin	118198	4900232	HECTOR DERDEYN	PURE OIL CO	2/28/1939	3/21/1939		3/22/1939	34.71637	-97.2359		DRY
OK310810010090_10	Rush Creek	Garvin	118206	4900905	CITY OF PAULS VALLEY	HEFNER PRODUCTION CO	9/26/1956	10/18/1956	11/8/1956		34.71442	-97.2294		OIL
OK310810010090_10	Rush Creek	Garvin	118207	4938479	CITY OF PAULS VALLEY	HEFNER PRODUCTION CO	3/1/1957	3/12/1957		3/12/1957	34.71262	-97.2271		DRY
OK310810010090_10	Rush Creek	Garvin	118191	4920080	DERDEYN	CAMERON OIL CO	9/16/1966	10/15/1966		10/15/1966	34.71456	-97.2359	10/24/1966	DRY
OK310810010090_10	Rush Creek	Garvin	118192	4938480	HOFFMAN	HEFNER PRODUCTION CO	8/9/1958	8/20/1958		8/20/1958	34.71637	-97.2401		DRY
OK310810010090_10	Rush Creek	Garvin	118193	4900232	HECTOR DERDEYN	HEFNER PRODUCTION CO	9/28/1957	9/30/1957	10/2/1957		34.71637	-97.2359		OIL
OK310810010090_10	Rush Creek	Garvin	118194	4939412	LIDDLE A	HEFNER PRODUCTION CO	2/12/1957	2/28/1957	3/29/1957		34.71637	-97.2315		OIL
OK310810010090_10	Rush Creek	Garvin	118199	4900232	M H DERDEYN	TIDE WATER ASSOCIATED OIL CO	8/30/1952	9/28/1952		9/28/1952	34.71637	-97.2359		DRY
OK310810010090_10	Rush Creek	Garvin	118200	4921932	PAULS VALLEY	BURKHART PETROLEUM CORP	3/8/1982	3/16/1982			34.71522	-97.2276		GAS
OK310810010090_10	Rush Creek	Garvin	118203	4938478	AIRLINE ACRES	HEFNER PRODUCTION CO	9/5/1958	9/16/1958		9/16/1958	34.71204	-97.2293		DRY
OK310810010090_10	Rush Creek	Garvin	118208	ZZ118208	BLYTHE	R BENTON ROSS	1/27/1953	2/3/1953		2/3/1953	34.7212	-97.2222		DRY
OK310810010090_10	Rush Creek	Garvin	119017	4922804	CHARLIE SPENCER	LASER RESOURCES INC	8/1/1985	8/17/1985	12/1/1985	10/1/1985	34.75827	-97.3626		DRY
OK310810010090_10	Rush Creek	Garvin	119031	4922348	RAY	CHEYENNE PETROLEUM CO	12/13/1983	1/5/1984	2/24/1984		34.75645	-97.317		OIL
OK310810010090_10	Rush Creek	Garvin	119032	4920480	FRANKLIN UNIT	PETROLEUM INC	2/21/1970	3/16/1970	3/26/1970		34.75555	-97.3156		GAS
OK310810010090_10	Rush Creek	Garvin	119033	4920454	BRINLEY	PETROLEUM INC	10/19/1969	11/10/1969	11/14/1969		34.75555	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119034	4920754	BRINLEY A	RHOADES OIL CO	11/16/1974	12/2/1974	1/14/1975		34.75483	-97.3076		OIL
OK310810010090_10	Rush Creek	Garvin	119039	4939423	RICKERT	TRICE PRODUCTION CO	10/2/1958	10/17/1958		10/17/1958	34.75464	-97.3056		DRY
OK310810010090_10	Rush Creek	Garvin	119050	4921532	KELLEY	CHEYENNE PETROLEUM CO	12/31/1980	1/13/1981			34.75583	-97.3195		GAS
OK310810010090_10	Rush Creek	Garvin	119073	4921439	DIXIE	JIMMY W GRAY	9/17/1980	9/29/1980	10/9/1980		34.74366	-97.345		OIL
OK310810010090_10	Rush Creek	Garvin	119074	4921465	JUDY	JIMMY W GRAY	9/2/1980	9/18/1980	9/27/1980		34.74728	-97.3433		OIL
OK310810010090_10	Rush Creek	Garvin	119076	4921642	KIMBERLY	JIMMY W GRAY	4/25/1981	5/14/1981	9/4/1981		34.74818	-97.3505		OIL
OK310810010090_10	Rush Creek	Garvin	119081	4921464	LITTLE BIT	JIMMY W GRAY	9/12/1980	9/25/1980	10/11/1980		34.74547	-97.3494		OIL
OK310810010090_10	Rush Creek	Garvin	119082	4921445	LITTLE BIT	JIMMY W GRAY	8/20/1980	9/10/1980	9/17/1980		34.74185	-97.3494		OIL

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OK310810010090_10	Rush Creek	Garvin	119083	4921377	PAULINE	JIMMY W GRAY	5/27/1980	6/9/1980	6/12/1980		34.74185	-97.3367		OIL
OK310810010090_10	Rush Creek	Garvin	119084	4921378	PHYLISS	JIMMY W GRAY	5/24/1980	6/11/1980	6/12/1980		34.74185	-97.3411		OIL
OK310810010090_10	Rush Creek	Garvin	119089	4920868	R L SHAMLEY	LARIO OIL & GAS CO	1/8/1976	1/20/1976		1/23/1976	34.74908	-97.3461		DRY
OK310810010090_10	Rush Creek	Garvin	119090	4922227	KIMBERLY	OKLAHOMA OIL & GAS ROYALTIES INC	6/29/1983	7/14/1983		7/14/1983	34.75179	-97.3461		DRY
OK310810010090_10	Rush Creek	Garvin	119091	4900590	SANDERS	PERKINS PRODUCTION CO	6/19/1961	7/4/1961		7/4/1961	34.74005	-97.3433		DRY
OK310810010090_10	Rush Creek	Garvin	119093	4920613	SHAMLEY	JIM GRAY OIL CO	5/17/1972		11/12/1981		34.74003	-97.3236		OIL
OK310810010090_10	Rush Creek	Garvin	119098	4920579	SHAMLEY B PLUMMER	CHRISTIE-STEWART INC	9/4/1971	9/22/1971	10/7/1971		34.74003	-97.3203		OIL
OK310810010090_10	Rush Creek	Garvin	119099	4921069	SISSY	CHEYENNE PETROLEUM CO	1/28/1978	2/13/1978		2/13/1978	34.75178	-97.3291		DRY
OK310810010090_10	Rush Creek	Garvin	119100	4922490	PAUL BALL	GRAY EXPL INC	8/10/1984	8/26/1984	9/11/1984		34.74726	-97.3302		OIL
OK310810010090_10	Rush Creek	Garvin	119101	4920640	1 BEATRICE-CLARK	E W COOK	10/7/1972	10/20/1972		10/20/1972	34.74365	-97.3192		DRY
OK310810010090_10	Rush Creek	Garvin	119107	4900223	THOMSON	R CARL LARKINS	10/10/1947	11/11/1947			34.74726	-97.3302		DRY
OK310810010090_10	Rush Creek	Garvin	119108	4900409	CLARK	OKLAND OIL CO	8/9/1984	8/15/1984	9/20/1984		34.75268	-97.3192	1/3/1987	OIL
OK310810010090_10	Rush Creek	Garvin	119114	4920597	GOLDFEDER	CHRISTIE-STEWART	1/7/1972	1/20/1972	2/1/1972		34.74002	-97.317		OIL
OK310810010090_10	Rush Creek	Garvin	119116	4921387	DEZ	JIMMY W GRAY	6/17/1980	7/2/1980			34.74002	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	119117	4921440	JESSIE	JIM GRAY	2/25/1981	3/9/1981			34.74364	-97.3036		OIL
OK310810010090_10	Rush Creek	Garvin	119123	ZZ119123	MORRIS	JIM GRAY OIL CO	4/29/1982	5/1/1982	5/28/1982		34.74093	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119124	4921344	SHIPLEY	JIM W GRAY	3/7/1980	3/27/1980			34.74002	-97.3014		OIL
OK310810010090_10	Rush Creek	Garvin	119125	4950039	GIBSON	J M HUBER CORP	9/3/1964	9/19/1964	11/1/1964		34.74725	-97.3036		OIL
OK310810010090_10	Rush Creek	Garvin	119131	4921153	MCKEE	RHOADES OIL CO	10/25/1978	11/13/1978		11/13/1978	34.74865	-97.3058		DRY
OK310810010090_10	Rush Creek	Garvin	119133	4921572	MURPH	JIM GRAY OIL	2/11/1981	2/23/1981	3/30/1981		34.74364	-97.308		OIL
OK310810010090_10	Rush Creek	Garvin	119134	4920927	NALLEY	RHOADES OIL CO	10/30/1976	11/21/1976	1/7/1977		34.75267	-97.3126		OIL
OK310810010090_10	Rush Creek	Garvin	119139	4950035	BURCH	FAIN-PORTER DRLG CO	5/3/1963	5/12/1963		5/12/1963	34.74906	-97.2994		DRY
OK310810010090_10	Rush Creek	Garvin	119140	4921792	PIXLEY	JIM GRAY OIL CO	10/29/1981	11/20/1981	4/2/1982		34.75177	-97.2939	5/24/1989	OIL
OK310810010090_10	Rush Creek	Garvin	119141	4921330	SHIPLEY	JIMMY W GRAY	4/10/1980	4/30/1980		4/30/1980	34.74093	-97.2983		DRY
OK310810010090_10	Rush Creek	Garvin	119142	4950034	BURCH	J M HUBER CORP	1/14/1964	1/25/1964	2/1/1964		34.74544	-97.285		OIL
OK310810010090_10	Rush Creek	Garvin	119143	4950038	BRINLEY	KIRKPATRICK OIL CO	8/11/1963	8/20/1963	9/3/1963		34.74906	-97.2839		OIL
OK310810010090_10	Rush Creek	Garvin	119150	4921837	CHRISTIE	JIMMY W GRAY OIL CO	9/17/1981	10/8/1981		10/8/1981	34.75185	-97.3856	10/10/1981	DRY
OK310810010090_10	Rush Creek	Garvin	119156	4900406	GRAHAM-BAKER	NORTHEREN PUREP CO	12/6/1952	1/27/1953		1/27/1953	34.74548	-97.2799		DRY
OK310810010090_10	Rush Creek	Garvin	119158	4922995	BUTLER	FINA OIL & CHEMICAL CO	11/8/1985	11/17/1985		11/17/1985	34.74683	-97.2821		DRY
OK310810010090_10	Rush Creek	Garvin	119159	4920699	GRAHAM	FEE DEVELOPMENT CORP	12/5/1973	12/17/1973		12/18/1973	34.74186	-97.2671		DRY

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OK310810010090_10	Rush Creek	Garvin	119165	4921480	LONGMIRE	J M HUBER CORP	10/12/1980	10/27/1980	10/6/1980		34.74552	-97.2554		OIL
OK310810010090_10	Rush Creek	Garvin	119166	4921584	LONGMIRE	J M HUBER CORP	4/15/1981	4/28/1981		4/28/1981	34.74552	-97.251		DRY
OK310810010090_10	Rush Creek	Garvin	119173	4921961	AMERICAN FIDELITY	ROLLYSON CORP	6/8/1982	6/13/1982		6/13/1982	34.73093	-97.2499		DRY
OK310810010090_10	Rush Creek	Garvin	119174	4923094	RENNIE	TREPCO PRODUCTION CO INC	4/23/1987	5/2/1987		6/30/1987	34.73635	-97.2626		DRY
OK310810010090_10	Rush Creek	Garvin	119175	4939418	WALTERS	JIM GRAY OIL	8/8/1981	8/13/1981	4/20/1982		34.73637	-97.2818		OIL
OK310810010090_10	Rush Creek	Garvin	119176	4900069	GRAHAM	GORDON & ROGOVY	8/31/1956	9/5/1956	9/11/1956		34.73637	-97.2774		OIL
OK310810010090_10	Rush Creek	Garvin	119182	4950033	JO	NELSON & SPAIN OIL CO	4/24/1963	5/5/1963	5/6/1963		34.72649	-97.2718		GAS
OK310810010090_10	Rush Creek	Garvin	119184	4950031	A L POYNER A	NELSON & SPAIN OIL CO	2/12/1964	2/21/1964		2/21/1964	34.72643	-97.2674		DRY
OK310810010090_10	Rush Creek	Garvin	119190	4921135	KENNEDY	EDWIN L COX	9/8/1978	9/16/1978		9/17/1978	34.73095	-97.2982		DRY
OK310810010090_10	Rush Creek	Garvin	119193	ZZ119193	HUTCHINS 1-15	JIM GRAY OIL	11/25/1981	12/1/1981	1/6/1982		34.72553	-97.2949		OIL
OK310810010090_10	Rush Creek	Garvin	119198	4921393	SHIRLEY	JIMMY W GRAY	8/1/1980	8/19/1980	9/25/1980		34.73637	-97.2905		OIL
OK310810010090_10	Rush Creek	Garvin	119199	4921100	SMITH	JIMMY W GRAY	10/19/1979	10/23/1979	11/15/1979		34.73728	-97.2982		OIL
OK310810010090_10	Rush Creek	Garvin	119200	4921328	ROSE	JIMMY W GRAY	2/1/1980	2/24/1980	3/10/1980		34.73276	-97.2905	8/26/1998	OIL
OK310810010090_10	Rush Creek	Garvin	119206	4921620	FLOYD	LARIO OIL & GAS CO	4/4/1981	4/12/1981	5/5/1981		34.73366	-97.2982		OIL
OK310810010090_10	Rush Creek	Garvin	119210	4921135	KENNEDY	SAMEDAN OIL CORP	7/2/1980	7/8/1980	10/1/1980		34.73095	-97.2982		OIL
OK310810010090_10	Rush Creek	Garvin	119216	ZZ119216	T BURR	JIM GRAY OIL CO	4/10/1982	4/15/1982	4/30/1982		34.73088	-97.3015		OIL
OK310810010090_10	Rush Creek	Garvin	119217	4921921	C BURR	JIM GRAY OIL CO	3/21/1982	4/1/1982	4/23/1982		34.73729	-97.3159		OIL
OK310810010090_10	Rush Creek	Garvin	119223	ZZ119223	C BURR	JIM GRAY OIL CO	3/12/1982	3/14/1982	4/21/1982		34.73819	-97.302		OIL
OK310810010090_10	Rush Creek	Garvin	119224	4921940	C BURR	JIM GRAY OIL CO	4/18/1982	4/24/1982	5/3/1982		34.73729	-97.3069		OIL
OK310810010090_10	Rush Creek	Garvin	119225	4921936	C BURR	JIM GRAY OIL CO	4/8/1982	4/15/1982	4/25/1982		34.73367	-97.3025		OIL
OK310810010090_10	Rush Creek	Garvin	119226	4921937	C BURR	JIM GRAY OIL CO	2/18/1982	2/21/1982	3/5/1982		34.73367	-97.3159		GAS
OK310810010090_10	Rush Creek	Garvin	119231	4921855	THOMPSON	JIMMY W GRAY	1/3/1982	1/19/1982	1/25/1982		34.73006	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119233	4921695	THOMPSON	JIM GRAY	8/5/1981	8/21/1981			34.7282	-97.3025		OIL
OK310810010090_10	Rush Creek	Garvin	119234	4920760	FEATHERSTON	LARIO OIL & GAS CO	9/16/1974	10/3/1974	10/11/1974		34.73638	-97.308		OIL
OK310810010090_10	Rush Creek	Garvin	119240	4920769	FEATHERSTON	LARIO OIL & GAS CO	12/22/1974	1/17/1975		1/23/1975	34.73819	-97.3117		DRY
OK310810010090_10	Rush Creek	Garvin	119242	4920738	THOMPSON	LARIO OIL & GAS CO	8/7/1974	8/29/1974	4/4/1975		34.73096	-97.3104		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119243	4920774	THOMPSON	LARIO OIL & GAS CO	11/12/1974	12/13/1974	1/31/1975		34.72554	-97.3062		OIL
OK310810010090_10	Rush Creek	Garvin	119248	4920528	SHAMLEY	CHRISTIE-STEWART DRLG CO	12/10/1970	1/1/1971	1/14/1971		34.73458	-97.328		OIL
OK310810010090_10	Rush Creek	Garvin	119249	4920568	SHAMLEY	CHRISTIE-STEWART DRLG CO	7/14/1971	7/30/1971		7/30/1971	34.73729	-97.3291		DRY
OK310810010090_10	Rush Creek	Garvin	119250	4921452	SPEARMAN	JIM GRAY OIL	1/14/1981	1/28/1981	2/20/1981		34.72644	-97.3291		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	119251	4920688	VIRGINIA	JIM W GRAY	4/26/1980	4/28/1980			34.72554	-97.3335		OIL
OK310810010090_10	Rush Creek	Garvin	119256	4920643	SHAMLEY	LARIO OIL & GAS CO	10/26/1972	11/13/1972			34.73096	-97.328		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119257	4921938	SHAMLEY	RAMBLER OIL CO	2/20/1982	3/9/1982		3/9/1982	34.73819	-97.3346		DRY
OK310810010090_10	Rush Creek	Garvin	119258	4922275	SHAMLEY	RICKS EXPL CO	10/10/1983	10/21/1983	11/21/1983		34.73277	-97.3324		OIL
OK310810010090_10	Rush Creek	Garvin	119259	4923310	SHAMLEY	RAN RICKS INC	3/16/1988	3/28/1988		3/29/1988	34.73096	-97.3324		DRY
OK310810010090_10	Rush Creek	Garvin	119260	4939415	WALLACE B	CITIES SERVICE OIL CO	5/10/1946	6/9/1946	6/15/1946		34.73099	-97.3516		OIL
OK310810010090_10	Rush Creek	Garvin	119265	4920655	GOODSON	R J FIELD	12/28/1972	1/11/1973		1/12/1973	34.73778	-97.346		DRY
OK310810010090_10	Rush Creek	Garvin	119266	4921403	SHAMLEY	JIMMY W GRAY	7/15/1980	8/5/1980	8/14/1980		34.7337	-97.3378		OIL
OK310810010090_10	Rush Creek	Garvin	119268	4921047	GOODSON	JONES & PELLOW OIL CO	11/18/1977	12/8/1977		12/8/1977	34.7337	-97.3455		DRY
OK310810010090_10	Rush Creek	Garvin	119274	4921985	SCOTT-MORTON	RAMBLER OIL CO	4/28/1982	5/11/1982			34.73731	-97.3508		OIL
OK310810010090_10	Rush Creek	Garvin	119276	4923238	BERGEN	T X O PRODUCTION CORP	6/15/1987	7/10/1987		7/10/1987	34.72973	-97.3374		DRY
OK310810010090_10	Rush Creek	Garvin	119282	4900446	MCCURLEY	CITIES SERVICE OIL CO	9/30/1952	11/2/1952	11/10/1952		34.71917	-97.3422		OIL
OK310810010090_10	Rush Creek	Garvin	119283	4939407	MCCURLEY A	CITIES SERVICE OIL CO	3/4/1971	3/26/1971	3/20/1971		34.71646	-97.341		OIL
OK310810010090_10	Rush Creek	Garvin	119284	4939406	MCCURLEY	CITIES SERVICE PETROLEUM CO	4/3/1962	5/23/1962			34.71465	-97.3367		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119285	4939407	MCCURLEY	CITIES SERVICE OIL CO	2/6/1958	2/27/1958	3/4/1958		34.71646	-97.341		OIL
OK310810010090_10	Rush Creek	Garvin	119290	4939409	MURRAY	MILES JACKSON DRLG CO			10/16/1957		34.71646	-97.3433		OIL
OK310810010090_10	Rush Creek	Garvin	119291	4939409	MURRAY	MILES JACKSON DRLG CO	9/26/1957	10/14/1957	10/16/1957		34.71646	-97.3433		OIL
OK310810010090_10	Rush Creek	Garvin	119292	4939411	MURRAY	MILES JACKSON DRLG CO	1/19/1958	2/6/1958		2/6/1958	34.71646	-97.3472		DRY
OK310810010090_10	Rush Creek	Garvin	119293	4939410	MURRAY B	MILES JACKSON DRLG CO	12/4/1957	12/23/1957	12/28/1957		34.71827	-97.345		OIL
OK310810010090_10	Rush Creek	Garvin	119299	4921022	BRADY	WOODS PETROLEUM CORP	9/23/1977	10/5/1977		10/7/1977	34.71194	-97.3378		DRY
OK310810010090_10	Rush Creek	Garvin	119350	4923363	EDNA THOMPSON	TERRA RESOURCES INC	12/3/1988	12/12/1988		2/2/1989	34.75644	-97.2939		DRY
OK310810010090_10	Rush Creek	Garvin	119351	4920807	RLT	ROBERT F MOWDY	4/26/1989	4/29/1989			34.7524	-97.3058	9/3/1998	GAS
OK310810010090_10	Rush Creek	Garvin	119352	4939437	HYRE	RAJAC INC	3/20/1958	3/29/1958	4/1/1958		34.71463	-97.2663		OIL
OK310810010090_10	Rush Creek	Garvin	119360	4922159	MCCASKILL	MUSTANG FUEL CORP	1/4/1989	1/17/1989	1/17/1989		34.70737	-97.4152		OIL
OK310810010090_10	Rush Creek	Garvin	119383	4921605	BRENT	SINGLETERRY OIL & GAS INC	3/30/1981	4/15/1981	4/26/1981		34.71197	-97.329		OIL
OK310810010090_10	Rush Creek	Garvin	119384	4921842	JOY	BECK PRODUCTION CO INC	10/20/1981	11/1/1981	1/29/1982		34.71829	-97.3213		OIL
OK310810010090_10	Rush Creek	Garvin	119385	4921799	SHAYLA	BECK PRODUCTION CO INC	9/19/1981	10/1/1981	11/15/1981		34.72371	-97.3235		OIL
OK310810010090_10	Rush Creek	Garvin	119390	4921267	BAGWELL	JIMMY W GRAY	7/3/1979	7/8/1979			34.71784	-97.3334		OIL
OK310810010090_10	Rush Creek	Garvin	119391	4900535	MICHELLE	JIM W GRAY	3/30/1980	4/2/1980			34.71468	-97.3257		OIL
OK310810010090_10	Rush Creek	Garvin	119392	4900535	SPARKS	HEFNER CO	2/1/1960	2/15/1960		2/15/1960	34.71468	-97.3257		DRY

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OK310810010090_10	Rush Creek	Garvin	119393	4939404	BAGWELL	MILES JACKSON DRLG CO	6/10/1958	6/26/1958		6/26/1958	34.71648	-97.3235		DRY
OK310810010090_10	Rush Creek	Garvin	119399	4921284	JAMES M THOMPSON	COMBINED ENERGY GROUP	5/14/1981	5/23/1981		5/23/1981	34.7222	-97.3123		DRY
OK310810010090_10	Rush Creek	Garvin	119400	4922019	GLENNA RUSSELL	RAMBLER OIL CO	7/24/1982	8/2/1982	8/12/1982		34.71289	-97.3037		OIL
OK310810010090_10	Rush Creek	Garvin	119402	4921773	GRACE	BECK PRODUCTION CO INC	9/4/1981	9/18/1981	10/2/1981		34.72373	-97.3158		OIL
OK310810010090_10	Rush Creek	Garvin	119408	4921284	JAMES M THOMPSON	GRACE PETROLEUM CORP	1/2/1980	1/23/1980		1/23/1980	34.7222	-97.3123		DRY
OK310810010090_10	Rush Creek	Garvin	119415	4939401	GORDEN	HUFFMAN & MALLOY	11/18/1960	12/3/1960			34.7165	-97.3081		OIL
OK310810010090_10	Rush Creek	Garvin	119416	4921061	HINES	RAN RICKS JR	12/27/1977	1/3/1978		1/3/1978	34.71108	-97.3114		DRY
OK310810010090_10	Rush Creek	Garvin	119417	4900588	OHARRO J B	PURE OIL CO	8/16/1960	8/30/1960	9/18/1960		34.7147	-97.3103		OIL
OK310810010090_10	Rush Creek	Garvin	119426	4939396	HARREL	NELSON & SPAIN OIL CO	11/30/1961	12/12/1961		12/12/1961	34.71916	-97.2938		DRY
OK310810010090_10	Rush Creek	Garvin	119036	4920823	BRINLEY C	RHOADES OIL CO	8/15/1975	8/29/1975			34.755	-97.3033		DRY
OK310810010090_10	Rush Creek	Garvin	119037	4920882	BRINLEY D	RHOADES OIL CO	4/7/1976	4/20/1976	1/7/1977		34.75511	-97.3104		OIL
OK310810010090_10	Rush Creek	Garvin	119038	4920970	FRANKLIN B	RHOADES OIL CO	3/3/1977	3/17/1977		3/17/1977	34.75483	-97.3151		DRY
OK310810010090_10	Rush Creek	Garvin	119052	4922204	THOMPSON	CHEYENNE PETROLEUM CO	8/4/1983	8/13/1983	9/4/1983		34.75646	-97.3236		OIL
OK310810010090_10	Rush Creek	Garvin	119440	4900970	C M HYRE	MCELIEATH & SUGGETT	1/12/1936	3/20/1936			34.71644	-97.2663		DRY
OK310810010090_10	Rush Creek	Garvin	119442	4921278	SEVEDGE	FARMERS ENERGY CORP	10/4/1979	10/15/1979		5/14/1980	34.72005	-97.2707		DRY
OK310810010090_10	Rush Creek	Garvin	119450	4950129	SEVEDGE	NELSON & SPAIN OIL CO	12/7/1962	12/20/1962	2/10/1963		34.72304	-97.2714		OIL
OK310810010090_10	Rush Creek	Garvin	119451	4950128	THELMA	NELSON & SPAIN OIL CO	5/23/1962	6/1/1962	7/14/1962		34.72318	-97.2774		OIL
OK310810010090_10	Rush Creek	Garvin	119452	4900509	NORA BURKS	SINCLAIR PRAIRIE OIL CO	3/10/1944	4/6/1944			34.71644	-97.2796		DRY
OK310810010090_10	Rush Creek	Garvin	119054	4920563	THOMPSON	E W COOK	6/25/1971	7/7/1971		7/8/1971	34.75465	-97.3258		DRY
OK310810010090_10	Rush Creek	Garvin	119457	4939436	T G MAYS	JAKE L HAMON	8/25/1957	9/17/1957	9/26/1957		34.71463	-97.2619		OIL
OK310810010090_10	Rush Creek	Garvin	119458	4939436	T G MAYS	JAKE L HAMON	5/9/1960	5/9/1960	6/14/1960		34.71463	-97.2619		OIL
OK310810010090_10	Rush Creek	Garvin	119459	4900288	BARNETTE	L W JONES & CONTINENTAL PRODUCTION CO	1/1/1949	1/1/1949			34.71102	-97.2641		DRY
OK310810010090_10	Rush Creek	Garvin	119460	4900195	BARNETT	MCELREATH & HARVEY	3/6/1947	3/22/1947			34.71644	-97.2597		DRY
OK310810010090_10	Rush Creek	Garvin	119465	4921636	GOLF COURSE	ROLLYSON CORP	5/15/1981	5/26/1981		5/26/1981	34.72186	-97.2543		DRY
OK310810010090_10	Rush Creek	Garvin	119466	4920589	MAYS	EDWIN L COX	11/6/1971	11/21/1971		11/26/1971	34.70736	-97.2504		DRY
OK310810010090_10	Rush Creek	Garvin	119077	4921376	BETTY	JIMMY W GRAY	6/6/1980	6/14/1980	6/19/1980		34.74366	-97.3411		OIL
OK310810010090_10	Rush Creek	Garvin	119078	4921465	JUDY	JIMMY W GRAY	9/1/1980	9/14/1980	9/20/1980		34.74728	-97.3433		OIL
OK310810010090_10	Rush Creek	Garvin	119079	4921479	KIMBERLY	JIMMY W GRAY	10/7/1980	10/21/1980	11/19/1980		34.74728	-97.3461		OIL
OK310810010090_10	Rush Creek	Garvin	119080	4921428	LITTLE BIT	JIMMY W GRAY	8/17/1980	8/31/1980	9/4/1980		34.74185	-97.345		OIL
OK310810010090_10	Rush Creek	Garvin	119085	4921293	TURNEY	JIMMY W GRAY	11/18/1979	12/3/1979	1/18/1980		34.74366	-97.3389		OIL

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OK310810010090_10	Rush Creek	Garvin	119087	4922802	BARNEY SANDERS	OKLAHOMA OIL & GAS ROYALTIES INC	8/26/1985	9/5/1985	10/17/1985		34.74818	-97.3389		OIL
OK310810010090_10	Rush Creek	Garvin	119095	4921414	FERGUSON	WHITMAR EXPL CO	9/15/1980	9/28/1980	10/7/1980		34.74365	-97.3214		OIL
OK310810010090_10	Rush Creek	Garvin	119096	4921392	FERGUSON	WHITMAR EXPL CO	7/3/1980	7/21/1980	8/19/1980		34.75268	-97.3236		OIL
OK310810010090_10	Rush Creek	Garvin	119491	4921610	RUSSELL	RAMBLER OIL CO	4/3/1981	4/14/1981			34.70826	-97.3069		OIL
OK310810010090_10	Rush Creek	Garvin	119492	4922066	RUSSELL	RAMBLER OIL CO	9/27/1982	10/7/1982	10/16/1982		34.70464	-97.3069		OIL
OK310810010090_10	Rush Creek	Garvin	119494	4920544	THOMAS UNIT	DEVON CORP	12/13/1980	1/2/1981			34.70193	-97.3323		OIL
OK310810010090_10	Rush Creek	Garvin	119499	4922341	MABEL BAGWELL	C W HARRISON DBA HARRISON OIL	11/13/1983	11/27/1983	2/14/1984		34.70916	-97.3323		OIL
OK310810010090_10	Rush Creek	Garvin	119097	4920836	B J LANDRUM	E W COOK	8/22/1975	9/5/1975		9/6/1975	34.74765	-97.3341		DRY
OK310810010090_10	Rush Creek	Garvin	119102	4920669	GRANOFF	E W COOK	5/21/1973	6/2/1973		6/2/1973	34.74365	-97.3258		DRY
OK310810010090_10	Rush Creek	Garvin	119103	4920613	SHAMLEY	R J FIELD	5/17/1972	5/28/1972	6/6/1972		34.74003	-97.3236		OIL
OK310810010090_10	Rush Creek	Garvin	119104	4921882	DENNIS	JIM GRAY OIL CO	2/2/1982	2/11/1982	3/23/1982		34.74003	-97.3346		OIL
OK310810010090_10	Rush Creek	Garvin	119105	4921429	KATHY	JIM GRAY	8/2/1980	8/15/1980	8/26/1980		34.74362	-97.3324		OIL
OK310810010090_10	Rush Creek	Garvin	119110	4920613	SHAMLEY	CARLIS PIXLEY	5/17/1972	5/28/1972	6/6/1972		34.74003	-97.3236		OIL
OK310810010090_10	Rush Creek	Garvin	119111	4922541	SHAMLEY	CARLIS PIXLEY	9/22/1984	9/26/1984			34.74184	-97.3236		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119112	4920391	MCKEE UNIT	DON DENNIS	4/1/1969	4/15/1969	4/25/1969		34.74906	-97.3058		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	119113	4920916	MARY GIBSON	E W COOK	8/19/1976	9/2/1976			34.75267	-97.3036		GAS
OK310810010090_10	Rush Creek	Garvin	119500	4920619	CHRISTINE	RAMSEY ENGINEERING INC	6/27/1972	7/6/1972		7/6/1972	34.70374	-97.3301		DRY
OK310810010090_10	Rush Creek	Garvin	119502	4921170	RICHARDSON	W E WARE INC		12/31/1978			34.70012	-97.3256		OIL
OK310810010090_10	Rush Creek	Garvin	119509	4920525	EVANS	CRESLENN OIL CO	11/20/1970	12/3/1970		12/3/1970	34.6937	-97.3201		DRY
OK310810010090_10	Rush Creek	Garvin	119516	4920627	ZWEIGEL-EVANS	CRESLENN OIL CO	7/23/1972	8/4/1972			34.69039	-97.3029		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119518	4920627	ZWIEGEL-EVANS	CRESLENN OIL CO	7/23/1972	8/4/1972		8/4/1972	34.69039	-97.3029		DRY
OK310810010090_10	Rush Creek	Garvin	119519	4920609	R A EVANS	DEMINEX U S OIL CO	4/23/1972	5/7/1972	5/25/1972		34.6892	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	119119	4920807	R L T	FERGUSON OIL CO INC	4/17/1975	5/5/1975		5/5/1975	34.7524	-97.3058	9/3/1998	DRY
OK310810010090_10	Rush Creek	Garvin	119120	4921387	DEZ	JIMMY W GRAY	6/12/1980	7/3/1980	7/9/1980		34.74002	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	119122	4921966	MORRIS	JIM GRAY OIL CO	4/26/1982	5/2/1982	5/28/1982		34.74093	-97.3159		OIL
OK310810010090_10	Rush Creek	Garvin	119127	4920648	GOLDFEDER	LARIO OIL & GAS CO	11/17/1972	12/4/1972	12/17/1972		34.74002	-97.3126		OIL
OK310810010090_10	Rush Creek	Garvin	119128	4920857	GOLDFEDER	LARIO OIL & GAS CO	12/7/1975	12/20/1975		1/2/1976	34.74364	-97.3159		DRY
OK310810010090_10	Rush Creek	Garvin	119129	4920941	W WHITEBEAD	LARIO OIL & GAS CO	12/21/1976	1/15/1977		1/27/1977	34.74002	-97.3104		DRY
OK310810010090_10	Rush Creek	Garvin	119130	4939421	BURCH	B R POLK INC					34.75267	-97.3058		JUNKED AND ABANDONED
OK310810010090_10	Rush Creek	Garvin	119135	4939421	BURCH	TRICE PRODUCTION CO	11/20/1958	12/5/1958		12/5/1958	34.75267	-97.3058		DRY

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OK310810010090_10	Rush Creek	Garvin	119136	4900301	GOLDFEDER	SOHIO PETROLEUM CO	12/21/1946	1/15/1947			34.74544	-97.3104		DRY
OK310810010090_10	Rush Creek	Garvin	119549	4922776	FULLER	OKLAHOMA OIL & GAS ROYALTIES INC	6/27/1985	7/10/1985	11/1/1985		34.75539	-97.3604		OIL
OK310810010090_10	Rush Creek	Garvin	119550	4922752	FULLER	OKLAHOMA OIL & GAS ROYALTIES INC	6/3/1985	6/12/1985	6/30/1985		34.75827	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	119137	4900167	R L TOLBERT	SOHIO PETROLEUM CO	11/1/1945	11/27/1945	3/16/1946		34.75267	-97.3058		GAS
OK310810010090_10	Rush Creek	Garvin	119145	4950036	GIBSON A	KIRKPATRICK OIL CO	6/22/1964	6/28/1964		6/28/1964	34.74544	-97.2883		DRY
OK310810010090_10	Rush Creek	Garvin	119152	4900031	BLANTON	KEWANEE OIL CO	5/1/1950	5/20/1950		5/20/1950	34.74367	-97.2752		DRY
OK310810010090_10	Rush Creek	Garvin	119551	4921591	SETH FREEMAN	EASON OIL CO	3/29/1981	4/17/1981			34.76007	-97.367		OIL
OK310810010090_10	Rush Creek	Garvin	119552	4922505	SPENCER	LASER RESOURCES INC	8/2/1984	8/15/1984	11/18/1984		34.75646	-97.3626		GAS
OK310810010090_10	Rush Creek	Garvin	119558	4921617	ENGLISH	3 C INC	4/11/1981	4/23/1981	10/13/1981		34.75554	-97.3812		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119559	4921730	CANNON	EASON OIL CO	7/24/1981	8/10/1981		8/10/1981	34.76638	-97.3724		DRY
OK310810010090_10	Rush Creek	Garvin	119566	4923002	ENGLISH	FINA OIL & CHEMICAL CO	11/27/1985	12/23/1985		12/23/1985	34.75915	-97.3808		DRY
OK310810010090_10	Rush Creek	Garvin	119567	4920151	L NISLER	SUN OIL CO	1/31/1967	2/11/1967	2/13/1967		34.75915	-97.3812		GAS
OK310810010090_10	Rush Creek	Garvin	119568	4930006	L C PHAROAH	SUN OIL CO	5/25/1966	6/12/1966		6/12/1966	34.76547	-97.3801		DRY
OK310810010090_10	Rush Creek	Garvin	119569	4921849	PHAROAH	JOE B CLIFTON EXPL INC	11/19/1981	12/11/1981	10/7/1985		34.76277	-97.3943		OIL
OK310810010090_10	Rush Creek	Garvin	119171	4922049	GRAHAM	TIM WELCH	1/26/1983	2/7/1983	3/1/1983		34.74191	-97.2575		OIL
OK310810010090_10	Rush Creek	Garvin	119172	4920765	HASKELL PAUL	E W COOK	10/5/1974	10/20/1974		10/20/1974	34.73816	-97.251		DRY
OK310810010090_10	Rush Creek	Garvin	119177	ZZ119177	RENNIE-GRAHAM	GORDON & ROGOVY	10/24/1956	11/8/1956		11/8/1956	34.73637	-97.2818		DRY
OK310810010090_10	Rush Creek	Garvin	119179	4921083	FLOYD	LARIO OIL & GAS CO	8/7/1978	8/21/1978		8/30/1978	34.73728	-97.2718		DRY
OK310810010090_10	Rush Creek	Garvin	119180	4900202	KENNEDY	MCELREATH & SUGGETT	11/22/1946	12/20/1946			34.73276	-97.2796		OIL
OK310810010090_10	Rush Creek	Garvin	119185	4950030	REID	NELSON & SPAIN OIL CO	6/1/1962	6/15/1962	8/21/1962		34.72627	-97.2765		OIL
OK310810010090_10	Rush Creek	Garvin	119574	4921618	LAURA	JIMMY W GRAY	3/22/1981	4/7/1981	7/7/1981		34.76638	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119575	4921371	WALLY	JIMMY W GRAY	5/1/1980	5/16/1980	6/1/1980		34.75464	-97.3932		OIL
OK310810010090_10	Rush Creek	Garvin	119582	4921762	MATT	JIMMY W GRAY	3/11/1981	3/25/1981	5/5/1981		34.76277	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119186	4950029	ROBBIE	NELSON & SPAIN OIL CO	7/30/1963	8/16/1963	8/20/1963		34.73005	-97.2807		OIL
OK310810010090_10	Rush Creek	Garvin	119187	4950135	RONNIE	NELSON-SPAIN OIL CO	6/12/1963	6/22/1963	6/28/1963		34.73005	-97.2763		OIL
OK310810010090_10	Rush Creek	Garvin	119188	4950032	JO	W A WILLOUGHBY FORMERLY NELSON-SPAIN	1/24/1964	2/3/1964		2/3/1964	34.72643	-97.2713		DRY
OK310810010090_10	Rush Creek	Garvin	119189	4921380	HUTCHINS	BUTKIN OIL CO	12/18/1980	1/9/1981	1/30/1981		34.73095	-97.2905		OIL
OK310810010090_10	Rush Creek	Garvin	119196	ZZ119196	ROSE	JIMMY W GRAY OIL	4/20/1979	4/22/1979	5/1/1979		34.73276	-97.2949		OIL
OK310810010090_10	Rush Creek	Garvin	119197	4921388	SHIRLEY	JIMMY W GRAY	7/6/1980	7/27/1980	9/25/1980		34.73276	-97.2861		OIL
OK310810010090_10	Rush Creek	Garvin	119202	4920757	GRAHAM	LARIO OIL & GAS CO	12/27/1974	1/14/1975		1/20/1975	34.73276	-97.2949		DRY

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	119203	4921375	GRAHAM	LARIO OIL & GAS CO	6/27/1980	7/13/1980	9/11/1980		34.73637	-97.2949		OIL
OK310810010090_10	Rush Creek	Garvin	119204	4920758	GRAHAM	LARIO OIL & GAS CO	10/10/1975	10/25/1975	11/13/1975		34.73276	-97.2993		OIL
OK310810010090_10	Rush Creek	Garvin	119205	4920756	HUTCHINS	LARIO OIL & GAS CO	11/29/1974	12/21/1974		12/21/1974	34.72608	-97.2949		DRY
OK310810010090_10	Rush Creek	Garvin	119211	4921337	KENNEDY	WESSELY ENERGY CORP	3/27/1980	5/27/1980	5/17/1980		34.73095	-97.2949		OIL
OK310810010090_10	Rush Creek	Garvin	119213	4921385	KENNEDY	WESSELY ENERGY CORP	6/15/1980	6/29/1980	7/11/1980		34.72734	-97.2971		GAS
OK310810010090_10	Rush Creek	Garvin	119214	4921241	FERGUSON	BONRAY ENERGY CORP	8/16/1979	9/1/1979	9/20/1979		34.73096	-97.3148		OIL
OK310810010090_10	Rush Creek	Garvin	119220	ZZ119220	C BURR	JIM GRAY OIL CO	2/21/1982	2/24/1982	3/23/1982		34.73729	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119221	4921912	C BURR	JIM GRAY OIL CO	3/21/1982	4/3/1982	4/24/1982		34.73367	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119222	4921935	C BURR	JIM GRAY OIL CO	2/25/1982	3/9/1982	4/8/1982		34.73367	-97.3069		OIL
OK310810010090_10	Rush Creek	Garvin	119227	4920663	BURR	LARIO OIL & GAS CO	5/3/1973	5/17/1973		5/18/1973	34.73819	-97.3017		DRY
OK310810010090_10	Rush Creek	Garvin	119228	4920753	T BURR	LARIO OIL & GAS CO	9/8/1974	9/30/1974	1/4/1975		34.73076	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	119229	4921241	FERGUSON	G E C PRODUCTION CO INC	8/16/1979	9/1/1979	9/20/1979		34.73096	-97.3148		OIL
OK310810010090_10	Rush Creek	Garvin	119230	4921835	THOMPSON	JIM GRAY	11/25/1981	12/3/1981	12/22/1981		34.72644	-97.3069		OIL
OK310810010090_10	Rush Creek	Garvin	119236	4920683	FEATHERSTON	LARIO OIL & GAS CO	9/3/1973	9/22/1973	10/4/1973		34.7343	-97.3104		OIL
OK310810010090_10	Rush Creek	Garvin	119237	4920755	CARLTON	LARIO OIL & GAS CO	10/16/1974	11/8/1974	1/6/1975		34.73277	-97.3036		OIL
OK310810010090_10	Rush Creek	Garvin	119239	4920801	T BURR	LARIO OIL & GAS CO	4/5/1975	4/23/1975		4/25/1975	34.73071	-97.3015		DRY
OK310810010090_10	Rush Creek	Garvin	119244	4920522	RENAKER-GIBSON	CHRISTIE-STEWART DRLG CO	10/12/1970	10/28/1970	12/7/1970		34.73322	-97.3229		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119245	4920554	RENAKER-GIBSON	CHRISTIE-STEWART DRLG CO	4/27/1971	5/17/1971	5/24/1971		34.73638	-97.3235		OIL
OK310810010090_10	Rush Creek	Garvin	119246	4920557	RENAKER-GIBSON	CHRISTIE-STEWART DRLG CO	5/21/1971	6/8/1971	6/16/1971		34.73729	-97.3202		OIL
OK310810010090_10	Rush Creek	Garvin	119247	4920557	RENAKER-GIBSON	CHRISTIE-STEWART DRLG CO	5/21/1971	6/8/1971	2/24/1972		34.73729	-97.3202		OIL
OK310810010090_10	Rush Creek	Garvin	119252	4920688	VIRGINIA	JOHNSON-BATES DRLG CO	9/28/1973	10/14/1973		10/14/1973	34.72554	-97.3335		DRY
OK310810010090_10	Rush Creek	Garvin	119253	4922574	WEST WHITEBEAD UNIT	LARIO OIL & GAS CO	10/30/1984	11/15/1984		11/28/1984	34.73521	-97.3302		DRY
OK310810010090_10	Rush Creek	Garvin	119254	4920554	RENAKER-GIBSON	LARIO OIL & GAS CO	4/27/1971	5/17/1971	5/24/1971		34.73638	-97.3235		GAS
OK310810010090_10	Rush Creek	Garvin	119261	4930229	GOODSON	CONRAD L COOK	7/10/1966	7/26/1966		7/26/1966	34.73641	-97.3461		DRY
OK310810010090_10	Rush Creek	Garvin	119262	4920720	J C MURRAY	E W COOK	3/1/1974	3/14/1974		7/28/1974	34.73099	-97.3516		DRY
OK310810010090_10	Rush Creek	Garvin	119263	4939416	ARNETT	JAMES N CROFTON & E P BAKER	11/26/1946	12/26/1946			34.73279	-97.3494		DRY
OK310810010090_10	Rush Creek	Garvin	119269	4920456	MURRAY	KING RESOURCES CO-I-AMC	10/22/1969	11/14/1969	12/9/1969		34.73008	-97.3505		GAS
OK310810010090_10	Rush Creek	Garvin	119270	4900298	NANCY MANESS	MID-CONTINENT PETROLEUM CORP	10/12/1946	11/12/1946			34.72706	-97.3433		DRY
OK310810010090_10	Rush Creek	Garvin	119271	4920427	SHAMLEY	MORGAN PETROLEUM CO	7/18/1969	8/3/1969		8/4/1969	34.73731	-97.3392		DRY
OK310810010090_10	Rush Creek	Garvin	119277	4921047	GOODSON	WHITMAR EXPL CO	10/7/1981	10/10/1981	1/6/1982		34.7337	-97.3455		OIL

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OK310810010090_10	Rush Creek	Garvin	119279	4921585	GOODSON	ZETA ENGINEERING CO	4/27/1981	5/7/1981	5/30/1981		34.73822	-97.3461		OIL
OK310810010090_10	Rush Creek	Garvin	119280	4900281	POLK	NED RIFFLE DRLG CO	2/5/1950	3/6/1950			34.71104	-97.345		DRY
OK310810010090_10	Rush Creek	Garvin	119281	4920771	MCCURLEY A	CITIES SERVICE OIL CO	11/7/1974	11/25/1974	1/7/1975		34.71827	-97.3367		OIL
OK310810010090_10	Rush Creek	Garvin	119286	4939408	MCCURLEY	CITIES SERVICE OIL CO	4/4/1958	4/22/1958	5/4/1958		34.7181	-97.3407		OIL
OK310810010090_10	Rush Creek	Garvin	119287	4939414	MANESS 1-19	JIMMY W GRAY	12/11/1981	12/16/1981	1/6/1982		34.7218	-97.3422		OIL
OK310810010090_10	Rush Creek	Garvin	119288	4921903	BRADY	MAHAN-ROWSEY INC	1/6/1982	1/16/1982	4/6/1982		34.71104	-97.3433		OIL
OK310810010090_10	Rush Creek	Garvin	119294	4939413	BRADY	HOXSEY OIL CO	8/15/1958	8/27/1958		8/27/1958	34.71285	-97.3411		DRY
OK310810010090_10	Rush Creek	Garvin	119296	4920250	HURST	PAUL E KLOBERDANZ	1/10/1968	1/25/1968	3/1/1968		34.71962	-97.3445		OIL
OK310810010090_10	Rush Creek	Garvin	119297	4922399	MCCURLEY	OKLAND OIL CO	1/30/1984	2/13/1984	3/21/1984		34.71646	-97.3411		OIL
OK310810010090_10	Rush Creek	Garvin	119386	4921798	MITZI	BECK PRODUCTION CO INC	10/2/1981	10/13/1981	11/1/1981		34.71197	-97.3213		OIL
OK310810010090_10	Rush Creek	Garvin	119388	4921781	BECKY	BECK PRODUCTION CO INC	6/27/1981	7/11/1981	8/14/1981		34.71468	-97.3213		OIL
OK310810010090_10	Rush Creek	Garvin	119389	4900535	SPARKS	E W COOK	2/21/1975	3/3/1975		3/3/1975	34.71468	-97.3257		DRY
OK310810010090_10	Rush Creek	Garvin	119394	4920889	WARD	LARIO OIL & GAS CO	5/10/1976	5/28/1976		6/4/1976	34.71829	-97.3331		DRY
OK310810010090_10	Rush Creek	Garvin	119395	4921587	BRENT	SINGLETERRY OIL & GAS INC	3/13/1981	3/24/1981	4/13/1981		34.71106	-97.3257		OIL
OK310810010090_10	Rush Creek	Garvin	119744	4922059	PHARAOH	DON J LEEMAN	11/17/1983	11/17/1983	11/18/1983		34.7437	-97.3932		OIL
OK310810010090_10	Rush Creek	Garvin	119750	ZZ119750	ALLEN	JIMMY W GRAY OIL	11/15/1978	11/20/1978			34.74821	-97.3943		OIL
OK310810010090_10	Rush Creek	Garvin	119758	4920258	JOHNSON F	PETROLEUM INC	2/25/1968	3/15/1968		3/15/1968	34.74821	-97.3943		DRY
OK310810010090_10	Rush Creek	Garvin	119396	4922006	ROY HOFFMAN	BOSWELL ENERGY CORP	6/6/1982	6/16/1982	6/24/1982		34.71831	-97.3015		OIL
OK310810010090_10	Rush Creek	Garvin	119397	4900353	HOFFMAN B	CITIES SERVICE OIL CO	1/31/1946	3/1/1946			34.71831	-97.3125		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119403	4921843	MARCUS	BECK PRODUCTION CO INC	11/3/1981	11/14/1981	1/2/1982		34.71289	-97.3114		OIL
OK310810010090_10	Rush Creek	Garvin	119405	4930454	FREEMAN UNIT	CONRAD L COOK INC	6/15/1967	8/13/1967		8/13/1967	34.7165	-97.3125		DRY
OK310810010090_10	Rush Creek	Garvin	119406	4920512	GORDEN	FEE DEVELOPMENT CORP	8/7/1970	8/19/1970		8/20/1970	34.71596	-97.3081		DRY
OK310810010090_10	Rush Creek	Garvin	119411	4939402	GORDEN	HUFFMAN & MALLOY	3/23/1964	3/24/1964			34.7147	-97.3059		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119412	4939402	GORDEN	HUFFMAN & MALLOY	2/1/1961	2/14/1961		2/14/1961	34.7147	-97.3059		DRY
OK310810010090_10	Rush Creek	Garvin	119413	4939403	HOFFMAN	HUFFMAN & MALLOY	3/5/1961	3/14/1961		3/14/1961	34.71804	-97.3059		DRY
OK310810010090_10	Rush Creek	Garvin	119414	4921685	RUTH	BECK PRODUCTION CO INC	5/15/1981	5/30/1981	8/17/1981		34.71831	-97.3169		OIL
OK310810010090_10	Rush Creek	Garvin	119761	4920955	JOHNSON	NATIONAL OIL CO	1/26/1977	2/11/1977		2/11/1977	34.74742	-97.3911		DRY
OK310810010090_10	Rush Creek	Garvin	119767	4921536	MCDANIEL	WOODS PETROLEUM CORP	1/26/1981	2/21/1981			34.73103	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119775	4920926	FREEMAN-SCRIVNER	DON J LEEMAN	11/3/1979	11/9/1979	12/8/1979		34.74462	-97.3768		OIL
OK310810010090_10	Rush Creek	Garvin	119776	4920666	MINERVA-FREEMAN	LEEMAN ENERGY CORP	11/25/1980	12/9/1980	12/22/1980		34.75185	-97.3757		OIL

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OK310810010090_10	Rush Creek	Garvin	119419	4900240	RADDEN	CITIES SERVICE OIL CO	6/18/1953	7/12/1953		7/12/1953	34.71464	-97.2971		DRY
OK310810010090_10	Rush Creek	Garvin	119422	4921748	ISAAC	RAIZEN OIL CO	8/17/1981	8/27/1981			34.71464	-97.2973		OIL
OK310810010090_10	Rush Creek	Garvin	119777	4922276	SETH FREEMAN	LEEMAN ENERGY CORP	9/5/1983	9/24/1983	10/28/1983		34.7486	-97.376		OIL
OK310810010090_10	Rush Creek	Garvin	119778	4920875	SCRIVNER	DON J LEEMAN	10/25/1979	10/30/1979	12/5/1979		34.74011	-97.3801		OIL
OK310810010090_10	Rush Creek	Garvin	119784	4921826	KRAMER	LEEMAN ENERGY CORP	12/1/1981	12/9/1981	3/19/1982		34.74011	-97.3757		GAS
OK310810010090_10	Rush Creek	Garvin	119786	4921825	FOGELSON	LEEMAN ENERGY CORP	12/26/1981	1/15/1982	3/2/1982		34.74462	-97.3812		OIL
OK310810010090_10	Rush Creek	Garvin	119791	4939509	CARNELL	LARSON & THOMAS	5/5/1969	5/20/1969	6/9/1969		34.74046	-97.3674		OIL
OK310810010090_10	Rush Creek	Garvin	119792	4939508	E J ONEAL	LARSON & THOMAS	5/26/1969	6/4/1969		6/4/1969	34.74008	-97.3648		DRY
OK310810010090_10	Rush Creek	Garvin	119794	4901273	C E CARNELL	OLSON OIL CO	4/25/1961	5/2/1961			34.7409	-97.367		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119801	4921534	SMITH-IMAN	EASON OIL CO	12/27/1980	1/16/1981	2/24/1981		34.74824	-97.3646		OIL
OK310810010090_10	Rush Creek	Garvin	119803	4921369	WILLIE B SMITH	WHITMAR EXPL CO	6/7/1980	6/25/1980	7/16/1980		34.74099	-97.3593		OIL
OK310810010090_10	Rush Creek	Garvin	119436	4950131	PHILLIP	PERKINS PRODUCTION CO	5/1/1963	5/24/1963	6/3/1963		34.71645	-97.2927		OIL
OK310810010090_10	Rush Creek	Garvin	119438	4923198	HYRE	CHEROKEE OPERATING CO	3/19/1987	3/29/1987		4/29/1987	34.71192	-97.2729		DRY
OK310810010090_10	Rush Creek	Garvin	119439	4923062	CLAIRE	CHEROKEE OPERATING CO	1/26/1986	2/7/1986	4/1/1986		34.7122	-97.2759		OIL
OK310810010090_10	Rush Creek	Garvin	119446	4950127	CORA	NELSON & SPAIN OIL CO	11/3/1962	11/14/1962	1/11/1963		34.72005	-97.2752		OIL
OK310810010090_10	Rush Creek	Garvin	119448	4950130	A L POYNER	NELSON & SPAIN OIL CO	5/9/1963	5/21/1963	6/2/1963		34.72367	-97.2685		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	119453	4900218	BARNETT	GEO W DECK ET AL	11/30/1947	12/16/1947			34.71644	-97.2575		DRY
OK310810010090_10	Rush Creek	Garvin	119454	4921179	EDSON-TROUSDALE	GRACE PETROLEUM CORP	10/9/1979	10/19/1979		10/18/1979	34.71644	-97.2489		DRY
OK310810010090_10	Rush Creek	Garvin	119808	4921257	DOBSON	WOODS PETROLEUM CORP	9/13/1979	10/13/1979	12/1/1979		34.74404	-97.3641		OIL
OK310810010090_10	Rush Creek	Garvin	119809	4921466	DOBSON	WOODS PETROLEUM CORP	12/4/1980	12/26/1980			34.74189	-97.3648		OIL
OK310810010090_10	Rush Creek	Garvin	119810	4900162	ABERNATHY	CITIES SERVICE OIL CO	4/28/1945	5/30/1945			34.72557	-97.3582		OIL
OK310810010090_10	Rush Creek	Garvin	119811	4900162	ABERNATHY	CITIES SERVICE OIL CO	7/21/1945	8/12/1945			34.72557	-97.3582		OIL
OK310810010090_10	Rush Creek	Garvin	119817	4939501	ABERNATHY	CITIES SERVICE OIL CO	3/22/1948	5/1/1948	5/9/1948		34.72737	-97.3692		GAS
OK310810010090_10	Rush Creek	Garvin	119818	4939502	WALLACE C	CITIES SERVICE OIL CO	6/27/1946	7/27/1946			34.72918	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	119819	4939503	JOHNSTON	JAMES N CROFTON & E P BAKER	10/28/1946	12/5/1946			34.73279	-97.3538		DRY
OK310810010090_10	Rush Creek	Garvin	119820	4920606	RALPH E MAULDIN	E W COOK	3/31/1972	4/15/1972		4/15/1972	34.72918	-97.3637		DRY
OK310810010090_10	Rush Creek	Garvin	119825	4939504	R C KENNEDY B	GENERAL AMERICAN OIL CO OF TX	4/13/1966	4/18/1966			34.73731	-97.3681	1/25/2002	OIL
OK310810010090_10	Rush Creek	Garvin	119455	4939435	MARY LONGMIRE UNIT	JAKE L HAMON & SEABOARD OIL	11/30/1957	12/15/1957		12/15/1957	34.71825	-97.2619		DRY
OK310810010090_10	Rush Creek	Garvin	119456	4900092	T G MAYS	JAKE L HAMON	5/29/1957	6/28/1957	7/10/1957		34.71644	-97.2641		OIL
OK310810010090_10	Rush Creek	Garvin	119462	4900917	ALLISON & WELD	PURE OIL CO	5/31/1943	7/26/1943			34.72005	-97.2532		DRY

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OK310810010090_10	Rush Creek	Garvin	119464	4923008	THREE TEE	FINA OIL & CHEMICAL CO	11/20/1985	11/28/1985		11/28/1985	34.71825	-97.2597		DRY
OK310810010090_10	Rush Creek	Garvin	119479	4921518	PEEL	WHITMAR EXPL CO	1/12/1981	1/25/1981	2/3/1981		34.70465	-97.2761		OIL
OK310810010090_10	Rush Creek	Garvin	119826	4921060	MURRAY	JONES & PELLOW OIL CO	3/10/1978	3/28/1978	5/4/1978		34.73008	-97.3549		OIL
OK310810010090_10	Rush Creek	Garvin	119827	4920398	KENNEDY	LARSON & THOMAS	4/13/1969	4/29/1969	5/22/1969		34.73822	-97.367		OIL
OK310810010090_10	Rush Creek	Garvin	119828	4920526	MURRAY	MORGAN PETROLEUM (E W COOK)	11/25/1970	12/13/1970		12/21/1970	34.7346	-97.3681		DRY
OK310810010090_10	Rush Creek	Garvin	119833	4921619	MURRAY	WHITMAR EXPL CO	4/8/1981	4/22/1981	6/24/1981		34.72647	-97.3692		OIL
OK310810010090_10	Rush Creek	Garvin	119834	4939503	JOHNSTON	WOODS PETROLEUM CORP	3/25/1981	3/31/1981	11/17/1981		34.73279	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	119835	4921619	MURRAY	WHITMAR EXPL CO	4/8/1981	4/22/1981	6/24/1981		34.72647	-97.3692		OIL
OK310810010090_10	Rush Creek	Garvin	119841	4921012	MCDADE	E W COOK	7/27/1977	8/14/1977		8/15/1977	34.73827	-97.3845		DRY
OK310810010090_10	Rush Creek	Garvin	119842	4920370	MCDANIEL	DON DENNIS	2/7/1969	2/21/1969		2/21/1969	34.73859	-97.3845		DRY
OK310810010090_10	Rush Creek	Garvin	119843	4939496	KENNEDY A	GENERAL AMERICAN OIL CO OF TX	1/7/1982	1/26/1982	1/27/1982		34.73646	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	119844	4939497	CRAWFORD	HOME-STAKE PRODUCTION CO	12/20/1957	1/15/1958	2/3/1958		34.72923	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	119850	4920858	G K GRAHAM	PERRY E LARSON	11/16/1975	12/3/1975	12/27/1975		34.73465	-97.3725		OIL
OK310810010090_10	Rush Creek	Garvin	119851	4939499	R C KENNEDY A	THOMAS P SHAW	11/24/1947	12/27/1947	1/5/1948		34.73827	-97.3823		OIL
OK310810010090_10	Rush Creek	Garvin	119852	4921925	GINGER	MAHAN-ROWSEY INC	2/9/1982	2/21/1982	4/24/1982		34.73827	-97.3801		GAS
OK310810010090_10	Rush Creek	Garvin	119853	4921968	MCKAY	WHITMAR EXPL CO	8/13/1982	9/1/1982	10/30/1982		34.73736	-97.3736		OIL
OK310810010090_10	Rush Creek	Garvin	119858	4921492	MCDANIEL	WHITMAR EXPL CO	1/22/1981	2/11/1981	2/25/1981		34.73736	-97.3769		OIL
OK310810010090_10	Rush Creek	Garvin	119860	4921410	MCDANIEL	WOODS PETROLEUM CORP	7/22/1980	8/21/1980			34.72923	-97.3867		OIL
OK310810010090_10	Rush Creek	Garvin	119861	4920976	MULDROW	WOODS PETROLEUM CORP	2/19/1981	2/22/1981			34.73375	-97.3867		OIL
OK310810010090_10	Rush Creek	Garvin	119480	4921474	GUNTER	WHITMAR EXPL CO	10/23/1980	11/4/1980		11/4/1980	34.70826	-97.2674		DRY
OK310810010090_10	Rush Creek	Garvin	119481	4920725	WRIGHT	CHRISTIE-STEWART DRLG	3/28/1974	4/13/1974		4/13/1974	34.70555	-97.2949		DRY
OK310810010090_10	Rush Creek	Garvin	119489	4921812	WARD	MABEE PETROLEUM CORP	11/14/1981	11/27/1981	3/6/1982		34.70012	-97.308		OIL
OK310810010090_10	Rush Creek	Garvin	119495	4920544	CURTIS-BLANTON	CHRISTIE-STEWART INC	8/19/1971	9/5/1971	10/1/1971		34.70193	-97.3323		OIL
OK310810010090_10	Rush Creek	Garvin	119496	4920580	CURTIS-BLANTON	CHRISTIE-STEWART	9/8/1971	9/25/1971		9/25/1971	34.69832	-97.3279		DRY
OK310810010090_10	Rush Creek	Garvin	119497	4920508	THOMAS	CHRISTIE-STEWART DRLG CO	7/11/1970	7/31/1970	8/13/1970		34.70012	-97.3301		OIL
OK310810010090_10	Rush Creek	Garvin	119498	4920584	THOMAS	CHRISTIE-STEWART	9/30/1971	10/16/1971		10/16/1971	34.70374	-97.3279		DRY
OK310810010090_10	Rush Creek	Garvin	119869	4939493	F WHITTINGTON	MAGNOLIA PETROLEUM CO	6/20/1948	7/29/1948	10/2/1948		34.73451	-97.3999		OIL
OK310810010090_10	Rush Creek	Garvin	119870	4939495	FREEMAN	MID-AMERICA MINERALS INC	12/1/1958	12/26/1958		12/26/1958	34.73465	-97.3954		DRY
OK310810010090_10	Rush Creek	Garvin	119877	4930464	FLORENCE P SUTTON	COASTAL STATES GAS PRODUCTION CO	10/2/1967	10/20/1967		10/20/1967	34.73284	-97.3999		DRY
OK310810010090_10	Rush Creek	Garvin	119878	4921699	FREEMAN	RAMBLER OIL CO	6/14/1981	7/2/1981		7/2/1981	34.73013	-97.3988		DRY

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	119884	4921574	MCDANIEL	WOODS PETROLEUM CORP	2/24/1981	3/14/1981			34.72652	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119886	4921683	FREEMAN	B R POLK INC	5/30/1981	6/15/1981	8/15/1981		34.73339	-97.3999		OIL
OK310810010090_10	Rush Creek	Garvin	119503	4921140	BRADY	SHEBESTER INC	9/22/1978	10/11/1978		10/11/1978	34.70831	-97.3377		DRY
OK310810010090_10	Rush Creek	Garvin	119504	4921666	LOVE BAPTIST CHURCH	GEC PRODUCTION CO INC	5/14/1981	6/7/1981	7/17/1981		34.70108	-97.3512		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119505	4921140	BRADY	MAHAN-ROWSEY INC	9/24/1981	10/5/1981	12/8/1981		34.70831	-97.3377		OIL
OK310810010090_10	Rush Creek	Garvin	119506	4900720	DUNN	GRIMES BROS	1/1/1923	3/14/1923			34.69656	-97.3472		DRY
OK310810010090_10	Rush Creek	Garvin	119511	4921068	JO	CHEYENNE PETROLEUM CO	1/28/1978	2/11/1978		2/11/1978	34.69101	-97.3102		DRY
OK310810010090_10	Rush Creek	Garvin	119512	4920609	R A EVANS	CRESLENN OIL CO	4/23/1972	5/7/1972	5/11/1972		34.6892	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	119513	4920621	ZWEIGEL ESTATE	CRESLENN OIL CO	7/6/1972	7/18/1972		7/18/1972	34.69281	-97.3058		DRY
OK310810010090_10	Rush Creek	Garvin	119514	4923194	EVANS	SOUTHERN RESOURCES INC	2/13/1987	2/22/1987		2/22/1987	34.68739	-97.3036		DRY
OK310810010090_10	Rush Creek	Garvin	119515	4920819	EVANS	ALLIED MATERIALS CORP	6/3/1975	6/16/1975		6/17/1975	34.68739	-97.3058		DRY
OK310810010090_10	Rush Creek	Garvin	119520	4921706	JO SUE EVANS	KEITH F WALKER	7/4/1981	7/14/1981	8/20/1981		34.68288	-97.3113		OIL
OK310810010090_10	Rush Creek	Garvin	119522	4920627	ZWEIGEL EVANS	DEMINEX U S OIL CO	7/23/1972	8/4/1972			34.69039	-97.3029		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119523	4921104	ZWEIGEL	RATLIFF EXPL CO	8/17/1978	8/31/1978		8/31/1978	34.69372	-97.308		DRY
OK310810010090_10	Rush Creek	Garvin	119545	4900436	PLUMMER	JAMES N CROFTON & E P BAKER	11/7/1946	12/13/1946			34.75465	-97.3538		DRY
OK310810010090_10	Rush Creek	Garvin	119546	4921591	SETH FREEMAN	EASON OIL CO	9/15/1981		10/8/1981		34.76007	-97.367		GAS
OK310810010090_10	Rush Creek	Garvin	119548	4922719	KOON	LASER RESOURCES INC	4/7/1985	4/28/1985		6/24/1985	34.75646	-97.367		DRY
OK310810010090_10	Rush Creek	Garvin	119554	4921709	FULLER	WOODS PETROLEUM CORP	7/7/1981	7/25/1981	11/27/1981		34.75917	-97.3593		OIL
OK310810010090_10	Rush Creek	Garvin	119556	4921621	ENGLISH	3 C INC	3/2/1981	3/7/1981	4/13/1981		34.7555	-97.3845		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119561	4921617	ENGLISH	JIM GRAY OIL	4/11/1981	4/23/1981	10/31/1981		34.75554	-97.3812		OIL
OK310810010090_10	Rush Creek	Garvin	119562	4920133	MAJOR BOYER	SUN OIL CO	12/6/1966	12/16/1966	12/19/1966		34.76679	-97.3768		OIL
OK310810010090_10	Rush Creek	Garvin	119983	4930435	HART	MORGAN PETROLEUM CO	4/18/1967	5/11/1967		5/12/1967	34.71187	-97.4175		DRY
OK310810010090_10	Rush Creek	Garvin	119984	4939439	RICHARDSON	PETROLEUM INC	12/30/1958	1/2/1959	1/15/1959		34.71077	-97.413		OIL
OK310810010090_10	Rush Creek	Garvin	119986	4900724	J A WORLEY	PRAIRIE OIL & GAS CO	9/23/1916	8/2/1918			34.71051	-97.4191		DRY
OK310810010090_10	Rush Creek	Garvin	119987	4921657	HOLT	SOUTHERN OK PRODUCTION CO	7/2/1981	7/21/1981			34.71909	-97.4075		OIL
OK310810010090_10	Rush Creek	Garvin	119992	4921593	RICHARDSON	WOODS PETROLEUM CORP	4/2/1981	4/7/1981	9/12/1981		34.71187	-97.4175		OIL
OK310810010090_10	Rush Creek	Garvin	119993	4921593	RICHARDSON	WOODS PETROLEUM CORP	4/2/1981	4/7/1981	9/12/1981		34.71187	-97.4175		OIL
OK310810010090_10	Rush Creek	Garvin	119563	4920141	M BOYER A	SUN OIL CO	12/27/1966	1/11/1967		3/1/1967	34.76277	-97.3768		DRY
OK310810010090_10	Rush Creek	Garvin	119564	4920141	M BOYER A	SUN OIL CO	12/27/1966	1/11/1967	6/13/1967		34.76277	-97.3768		OIL
OK310810010090_10	Rush Creek	Garvin	119565	4922586	GAYLE	GRAY EXPL INC	11/26/1984	12/11/1984	1/2/1985		34.75464	-97.3757		OIL

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OK310810010090_10	Rush Creek	Garvin	119573	4950124	BABE	JIMMY W GRAY	5/19/1980	5/20/1980	6/15/1980		34.75915	-97.3943		OIL
OK310810010090_10	Rush Creek	Garvin	119579	4921430	WILSON	JIM GRAY INC	10/4/1980	10/31/1980	11/5/1980		34.75554	-97.3977		OIL
OK310810010090_10	Rush Creek	Garvin	119580	4921493	WILSON	JIM GRAY INC	11/2/1980	11/21/1980	12/6/1980		34.75915	-97.3988	10/17/1995	OIL
OK310810010090_10	Rush Creek	Garvin	119994	4921951	KING	OXLEY PETROLEUM	2/27/1982	4/6/1982	5/15/1982		34.71189	-97.3943		OIL
OK310810010090_10	Rush Creek	Garvin	119995	4921660	POPE	OXLEY PETROLEUM CO	5/10/1981	6/10/1981	7/16/1981		34.71189	-97.3988		OIL
OK310810010090_10	Rush Creek	Garvin	120000	4939438	STATE OF OK	TRANS-TEX DRLG CO	6/22/1952	7/29/1952		7/29/1952	34.72273	-97.3899		DRY
OK310810010090_10	Rush Creek	Garvin	120001	4939391	TETER	EARL E BARNES	6/3/1961	6/20/1961	6/25/1961		34.72368	-97.3866		OIL
OK310810010090_10	Rush Creek	Garvin	120002	ZZ120002	BIFFLE	N E BIFFLE	10/21/1948	11/17/1948			34.72007	-97.3736		DRY
OK310810010090_10	Rush Creek	Garvin	120003	4900169	BIFFLE	CITIES SERVICE OIL CO	8/17/1947	9/21/1947	9/28/1947		34.72007	-97.378		OIL
OK310810010090_10	Rush Creek	Garvin	120009	4921869	SEARCY	SHEBESTER INC	12/3/1981	12/30/1981	12/16/1984		34.71194	-97.3758		GAS
OK310810010090_10	Rush Creek	Garvin	120010	4939385	BIFFLE	CONRAD L COOK	9/19/1959	9/28/1959	9/30/1959		34.71625	-97.378		OIL
OK310810010090_10	Rush Creek	Garvin	120011	4939384	BIFFLE	CONRAD L COOK INC	5/3/1951	5/18/1961	5/22/1961		34.71284	-97.378		OIL
OK310810010090_10	Rush Creek	Garvin	119589	4950124	ALLEN B	PETROLEUM INC	9/15/1969	9/20/1969		9/20/1969	34.75915	-97.3943		DRY
OK310810010090_10	Rush Creek	Garvin	119590	4950124	ALLEN	PETROLEUM INC	6/28/1964	7/15/1964		7/15/1964	34.75915	-97.3943		DRY
OK310810010090_10	Rush Creek	Garvin	119595	4939550	GRAND LODGE	ROY J TURNER & DECEM DRLG CO INC	2/2/1958	2/19/1958		2/19/1958	34.75915	-97.39	11/13/1995	DRY
OK310810010090_10	Rush Creek	Garvin	119596	4939545	PHAROAH	BRITISH-AMERICAN OIL PROD CO	7/7/1959	7/31/1959		7/31/1959	34.76729	-97.391		DRY
OK310810010090_10	Rush Creek	Garvin	120012	4939385	RUBY MAE BIFFLE	DEEP ROCK OIL CORP	2/19/1948	3/25/1948		6/5/1948	34.71625	-97.378		DRY
OK310810010090_10	Rush Creek	Garvin	120017	4921788	SEARCY	MAHAN-ROWSEY INC	9/22/1981	10/17/1981	1/10/1982		34.7146	-97.3754		OIL
OK310810010090_10	Rush Creek	Garvin	120018	4939387	KING	HOME-STAKE PRODUCTION CO	4/22/1958	5/11/1958	5/21/1958		34.72368	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	120019	4939393	JASON	JACK RICHARDS	1/10/1980	1/19/1980	4/25/1980		34.71646	-97.3823		GAS
OK310810010090_10	Rush Creek	Garvin	120020	4922115	PECAN TREE	SETTLERS ENERGY CORP	12/21/1982	1/13/1983	4/13/1983		34.71826	-97.3758		OIL
OK310810010090_10	Rush Creek	Garvin	120026	ZZ120026	BIFFLE	VICKERS PETROLEUM CO INC	2/10/1948	4/11/1948			34.71646	-97.3823		DRY
OK310810010090_10	Rush Creek	Garvin	120027	4900327	KING	RAYMOND R LACKEY 04299	4/4/1969	4/21/1969	4/24/1969		34.72007	-97.3648		OIL
OK310810010090_10	Rush Creek	Garvin	120034	4922011	KING	WM H LAMBDIN	8/4/1982	8/20/1982	9/21/1982		34.72007	-97.3681		OIL
OK310810010090_10	Rush Creek	Garvin	120036	4900327	KING	CONRAD L COOK	4/7/1969	4/21/1969	4/24/1969		34.72007	-97.3648		OIL
OK310810010090_10	Rush Creek	Garvin	120037	4923030	NED	EDWIN L COX & BERRY R COX	1/2/1986	1/13/1986	3/7/1986		34.72369	-97.3626		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	120042	4922263	BULL MANNING MEMORIAL	WARD ENERGY INC	10/11/1983	11/13/1983		11/13/1983	34.71646	-97.3538		DRY
OK310810010090_10	Rush Creek	Garvin	120043	4922201	BATTLER	WARD ENERGY	5/27/1983	6/13/1983	10/25/1983		34.71194	-97.3593		OIL
OK310810010090_10	Rush Creek	Garvin	120044	4920583	CORNELL	WOODS PETROLEUM CORP	1/30/1981	2/3/1981	9/14/1988		34.72287	-97.3589		OIL
OK310810010090_10	Rush Creek	Garvin	120050	ZZ120050	BAKER	JIMMY W GRAY	3/10/1979	3/20/1979		3/23/1979	34.70921	-97.3542		DRY

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OK310810010090_10	Rush Creek	Garvin	120052	4939378	RUSSELL	JOSALINE PRODUCTION CO	4/24/1950	5/22/1950	7/11/1950		34.70198	-97.3692		OIL
OK310810010090_10	Rush Creek	Garvin	120053	4939379	THORNTON	PERKINS PRODUCTION CO	9/30/1960	10/15/1960	10/21/1960		34.70198	-97.3649		OIL
OK310810010090_10	Rush Creek	Garvin	120059	ZZ120059	FREEMAN	R R GOLDSMITH & CONRAD COOK	6/21/1960	7/6/1960	7/13/1960		34.70105	-97.3725		OIL
OK310810010090_10	Rush Creek	Garvin	120067	4939370	BIFFLE-KING	AMERICAN STATES OIL	11/11/1955	12/28/1955	1/10/1956		34.70196	-97.3998		OIL
OK310810010090_10	Rush Creek	Garvin	120069	4923013	TIFFANY	JOE B CLIFTON EXPL INC	12/20/1985	1/8/1986		1/8/1986	34.70112	-97.3994		DRY
OK310810010090_10	Rush Creek	Garvin	120070	4900855	BIFFLE	PERKINS PRODUCTION CO	8/29/1962	10/16/1962		10/16/1962	34.70196	-97.3976		DRY
OK310810010090_10	Rush Creek	Garvin	120075	4922216	ALEETA	FORTUNA ENERGY CORP	6/25/1983	7/22/1983			34.70556	-97.4152		OIL
OK310810010090_10	Rush Creek	Garvin	120078	4930124	MCCASKILL	LEEMAN ENERGY CORP	2/26/1986	2/28/1986	3/27/1986		34.70556	-97.4163	3/6/1991	OIL
OK310810010090_10	Rush Creek	Garvin	120079	4922402	GUTHRIE	FORTUNA ENERGY CORP	2/10/1984	2/27/1984	8/1/1984		34.70236	-97.4111		OIL
OK310810010090_10	Rush Creek	Garvin	120084	4920204	PARKS	MORGAN PETROLEUM CO	1/30/1967	2/26/1967	3/12/1967		34.70918	-97.4174		OIL
OK310810010090_10	Rush Creek	Garvin	120086	4922330	SHERRELL	MUSTANG PRODUCTION CO	10/31/1983	11/25/1983	1/25/1984		34.70737	-97.413		OIL
OK310810010090_10	Rush Creek	Garvin	120087	4939369	MCCASKILL	PETROLEUM INC	11/22/1958	12/20/1958	1/8/1959		34.70556	-97.4086		OIL
OK310810010090_10	Rush Creek	Garvin	120092	4921467	RICHARDSON	WOODS PETROLEUM CORP	10/22/1980	12/1/1980			34.70827	-97.4196		OIL
OK310810010090_10	Rush Creek	Garvin	120101	4939359	PRIM	GLOBE OIL & REFINING CO	10/28/1946	12/9/1946			34.69833	-97.4305		OIL
OK310810010090_10	Rush Creek	Garvin	120109	4939365	MORPHEW	SUNRAY OIL CORP	7/8/1947	8/18/1947			34.69778	-97.4261		OIL
OK310810010090_10	Rush Creek	Garvin	119689	ZZ119689	ALLEN	JIMMY W GRAY	11/15/1978	11/20/1978	12/8/1978		34.74742	-97.3911		OIL
OK310810010090_10	Rush Creek	Garvin	119737	4921164	ALLEN	H T S OILFIELD SERVICE	11/15/1978	11/20/1978	11/22/1978		34.74742	-97.3911		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119749	4921164	ALLEN	JIMMY W GRAY	11/15/1978	11/20/1978	12/8/1978	11/22/1978	34.74742	-97.3911		DRY
OK310810010090_10	Rush Creek	Garvin	119754	4922059	PHARAOH	DON J LEEMAN	11/16/1982	12/4/1982	12/21/1982		34.7437	-97.3932		OIL
OK310810010090_10	Rush Creek	Garvin	119757	4921939	PHARAOH	DON J LEEMAN	3/5/1982	3/29/1982	4/11/1982		34.74397	-97.391		OIL
OK310810010090_10	Rush Creek	Garvin	120178	4939297	FRED ELLIS	GLOBE OIL & REFINING CO	5/21/1948	6/23/1948	7/3/1948		34.69462	-97.4173		OIL
OK310810010090_10	Rush Creek	Garvin	120179	4939301	RICHARDSON B	GLOBE OIL & REFINING CO	10/5/1947	11/8/1947	11/13/1947		34.691	-97.4217		OIL
OK310810010090_10	Rush Creek	Garvin	120185	4901289	TULSA UNIVERSITY C	SINCLAIR PRAIRIE OIL CO	1/10/1948	3/8/1948	3/8/1948		34.68739	-97.413		OIL
OK310810010090_10	Rush Creek	Garvin	120187	4939305	TULSA UNIVERSITY A	SINCLAIR PRAIRIE OIL CO	12/9/1947	1/6/1948	1/12/1948		34.691	-97.4173		OIL
OK310810010090_10	Rush Creek	Garvin	120193	4939295	M E EVANS	FRED M MANNING	3/1/1950	3/26/1950		3/26/1950	34.68742	-97.4042		DRY
OK310810010090_10	Rush Creek	Garvin	120194	4922138	RUSSELL	HOLD OIL CORP	4/8/1983	4/21/1983			34.69389	-97.3723		OIL
OK310810010090_10	Rush Creek	Garvin	119763	4922174	PETERMAN	RICO	4/29/1983	5/22/1983	12/19/1983		34.75183	-97.3943	9/11/1998	OIL
OK310810010090_10	Rush Creek	Garvin	119771	4921838	CLINT	3 C INC	9/1/1981	9/7/1981	9/20/1981		34.75185	-97.3812		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119772	ZZ119772	BUDOWSKY	JIMMY W GRAY OIL	3/4/1979	3/7/1979	4/9/1979		34.74191	-97.3867		OIL
OK310810010090_10	Rush Creek	Garvin	119774	4900482	H M HAMILTON	GULF OIL CORP	10/7/1958	10/23/1958			34.74191	-97.3823		GAS

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	119780	4900482	HAMILTON	WESTERN OIL CO	9/9/1947	10/25/1947	11/1/1947		34.74191	-97.3823		OIL
OK310810010090_10	Rush Creek	Garvin	119781	4900331	KAHN-HAMILTON	DEEP ROCK OIL CORP	9/29/1950	10/29/1950	11/3/1950		34.74011	-97.3713	10/28/1989	OIL
OK310810010090_10	Rush Creek	Garvin	119782	4921837	CHRISTY	JIMMY W GRAY	9/19/1981	10/10/1981		10/10/1981	34.75185	-97.3856	10/10/1981	DRY
OK310810010090_10	Rush Creek	Garvin	119787	4921947	SETH FREEMAN	LEEMAN ENERGY CORP	4/1/1982	4/30/1982		11/8/1982	34.75185	-97.3724		DRY
OK310810010090_10	Rush Creek	Garvin	119788	4920875	SCRIVNER	PERRY E LARSON	3/4/1976	3/20/1976		3/20/1976	34.74011	-97.3801		DRY
OK310810010090_10	Rush Creek	Garvin	119789	4920926	FREEMAN-SCRIVNER	DON J LEEMAN	10/19/1976	10/30/1976		10/30/1976	34.74462	-97.3768		DRY
OK310810010090_10	Rush Creek	Garvin	119790	4939508	ONEAL	HOME-STAKE PRODUCTION CO	10/11/1958	10/31/1958		11/3/1958	34.74008	-97.3648		DRY
OK310810010090_10	Rush Creek	Garvin	119795	4922717	ROACH	OKLAHOMA OIL & GAS ROYALTIES INC	4/10/1985	4/20/1985	5/10/1985		34.7525	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	119797	4950122	ELOISE JOHNSTON	OLSON OIL CO	2/17/1962	3/9/1962	8/1/1962		34.74731	-97.367		OIL
OK310810010090_10	Rush Creek	Garvin	119798	4921356	WILLIE B SMITH	WHITMAR EXPL CO	4/6/1980	5/5/1980	5/22/1980		34.7446	-97.3604		OIL
OK310810010090_10	Rush Creek	Garvin	119799	4921475	MATTINGLY	WHITMAR EXPL CO	10/4/1980	10/19/1980	10/29/1980		34.74731	-97.3604		OIL
OK310810010090_10	Rush Creek	Garvin	119804	4921522	WILLIE B SMITH	WHITMAR EXPL CO	12/4/1980	12/23/1980	1/6/1981		34.74099	-97.3549		OIL
OK310810010090_10	Rush Creek	Garvin	119805	4921594	MATTINGLY	WHITMAR EXPL CO	3/18/1981	4/5/1981	4/29/1981		34.75093	-97.3593		OIL
OK310810010090_10	Rush Creek	Garvin	119806	4921579	MATTINGLY	WHITMAR EXPL CO	2/23/1981	3/14/1981	3/26/1981		34.74731	-97.356		OIL
OK310810010090_10	Rush Creek	Garvin	119807	4921564	WILLIE B SMITH	WHITMAR EXPL CO	2/1/1981	2/20/1981	2/27/1981		34.7437	-97.356		OIL
OK310810010090_10	Rush Creek	Garvin	119812	4900162	ABERNATHY	CITIES SERVICE OIL CO	8/16/1945	8/19/1945			34.72557	-97.3582		OIL
OK310810010090_10	Rush Creek	Garvin	119814	4923146	CHAULK	COX OIL & GAS INC	9/28/1986	10/11/1986	12/3/1986		34.72511	-97.3609		OIL
OK310810010090_10	Rush Creek	Garvin	119821	4920687	WILLIE SMITH	E W COOK	9/13/1973	9/26/1973		9/27/1973	34.73641	-97.3604		DRY
OK310810010090_10	Rush Creek	Garvin	119823	4939504	R C KENNEDY B	DEEP ROCK OIL CORP	5/30/1952	7/9/1952	7/10/1952		34.73731	-97.3681	1/25/2002	OIL
OK310810010090_10	Rush Creek	Garvin	119824	4939505	HELEN MURRAY	DEEP ROCK OIL CORP	4/3/1953	5/26/1953	5/29/1953		34.7337	-97.3681		GAS
OK310810010090_10	Rush Creek	Garvin	119829	4939504	KENNEDY B	PHILLIPS PETROLEUM CO	6/3/1988	6/5/1988	7/1/1988		34.73731	-97.3681	1/25/2002	OIL
OK310810010090_10	Rush Creek	Garvin	119830	4900856	GREEN	B R POLK INC	4/20/1962	5/22/1962		5/22/1962	34.72647	-97.3596		DRY
OK310810010090_10	Rush Creek	Garvin	119831	4921412	MURRAY	WHITMAR EXPL CO	7/24/1980	8/14/1980	8/21/1980		34.72647	-97.3637		OIL
OK310810010090_10	Rush Creek	Garvin	119832	4921563	SMITH	WHITMAR EXPL CO	2/14/1981	3/4/1981	3/25/1981		34.73731	-97.3549		OIL
OK310810010090_10	Rush Creek	Garvin	119837	4920575	MURRAY	J LEE YOUNGBLOOD	8/14/1971	9/3/1971			34.72658	-97.3678		OIL
OK310810010090_10	Rush Creek	Garvin	119838	4939506	GREEN	HOME-STAKE PRODUCTION CO	3/5/1958	3/29/1958	4/14/1958		34.72557	-97.3692		OIL
OK310810010090_10	Rush Creek	Garvin	119840	4920976	MULDROW	E W COOK	4/1/1977	4/13/1977		4/15/1977	34.73375	-97.3867		DRY
OK310810010090_10	Rush Creek	Garvin	119846	4939496	R C KENNEDY	DEEP ROCK OIL CORP	2/11/1951	3/15/1951	4/12/1951		34.73646	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	119847	4939497	CRAWFORD	HOME-STAKE PRODUCTION CO	5/6/1959	5/9/1959			34.72923	-97.3714		GAS
OK310810010090_10	Rush Creek	Garvin	119848	4920036	MCDANIEL	WILLIAM H LAMBDIN	7/20/1970	7/21/1970	7/21/1970		34.73827	-97.3845		OIL

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OK310810010090_10	Rush Creek	Garvin	119849	4920834	A C BARNES	PERRY E LARSON	8/17/1975	9/6/1975		9/6/1975	34.73465	-97.3758		DRY
OK310810010090_10	Rush Creek	Garvin	119854	4920834	BARNES	WOODS PETROLEUM CORP	2/5/1981	2/10/1981	12/16/1981		34.73465	-97.3758		OIL
OK310810010090_10	Rush Creek	Garvin	119855	4920036	MCDANIEL	SAMEDAN OIL CORP	6/16/1966	7/8/1966	7/19/1966		34.73827	-97.3845		OIL
OK310810010090_10	Rush Creek	Garvin	119856	4939499	R C KENNEDY	SINCLAIR PRAIRIE OIL CO	11/24/1947	12/27/1947	1/11/1948		34.73827	-97.3823		OIL
OK310810010090_10	Rush Creek	Garvin	119857	4939499	R C KENNEDY	SINCLAIR OIL & GAS CO	7/5/1957	7/30/1957			34.73827	-97.3823		OIL
OK310810010090_10	Rush Creek	Garvin	119864	4920217	FLORENCE P SUTTON	COASTAL STATES GAS PRODUCTION CO	10/2/1967	10/20/1967		10/20/1967	34.73284	-97.3999		DRY
OK310810010090_10	Rush Creek	Garvin	119865	4922073	GERTIE HOLT	HUNTON OIL & GAS CORP	11/19/1982	11/19/1982	1/31/1983		34.72742	-97.3932		OIL
OK310810010090_10	Rush Creek	Garvin	119871	ZZ119871	O W PHAROAH	MIDSTATES OIL CORP	10/5/1949	11/22/1949		3/4/1950	34.73383	-97.4043		DRY
OK310810010090_10	Rush Creek	Garvin	119872	ZZ119872	JOHNSTON	PAWNEE PRODUCTION CO	10/18/1964	11/16/1964		11/16/1964	34.73826	-97.3888	4/1/1965	DRY
OK310810010090_10	Rush Creek	Garvin	119873	4939495	FREEMAN	B R POLK INC	9/28/1960	10/19/1960	11/5/1960		34.73465	-97.3954		GAS
OK310810010090_10	Rush Creek	Garvin	119879	4930015	MCDANIEL	WOODS PETROLEUM CORP	3/18/1981	3/23/1981	12/1/1986		34.73826	-97.3888		OIL
OK310810010090_10	Rush Creek	Garvin	119880	4921574	MCDANIEL	3555 NW 58TH ST SUITE 500	2/24/1981	3/14/1981			34.72652	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119881	4921536	MCDANIEL	WOODS PETROLEUM CORP	1/26/1981	2/21/1981	3/8/1982		34.73103	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119887	4921789	MCDANIEL	WOODS PETROLEUM CORP	8/30/1981	9/16/1981	11/20/1981		34.73374	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119888	4930015	MCDANIELS	WOODS PETROLEUM CORP	3/18/1981	3/23/1981			34.73826	-97.3888		OIL
OK310810010090_10	Rush Creek	Garvin	119979	4921477	HOLT	G E C PRODUCTION CO INC	10/14/1980	11/5/1980			34.71819	-97.413		OIL
OK310810010090_10	Rush Creek	Garvin	119980	4922498	ELLIS	JET OIL CO	8/19/1984	9/7/1984	10/19/1984		34.71187	-97.4086		OIL
OK310810010090_10	Rush Creek	Garvin	119981	4922498	ELLIS	JET OIL CO	8/19/1984	9/7/1984	9/25/1985		34.71187	-97.4086		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	119989	4921658	MCCASKILL	SOUTHERN OK PRODUCTION CO	6/8/1981	7/2/1981			34.72301	-97.407		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119996	4920406	KING STATE	COASTAL STATES GAS PRODUCTION CO	5/12/1969	6/2/1969		6/2/1969	34.72364	-97.3888		DRY
OK310810010090_10	Rush Creek	Garvin	119998	4920406	KING	JIMMY W GRAY	3/15/1980	3/18/1980			34.72364	-97.3888		OIL
OK310810010090_10	Rush Creek	Garvin	119999	4921951	KING 1	JOE B CLIFTON EXPL INC	7/26/1986	7/29/1986	7/31/1986		34.71189	-97.3943		OIL
OK310810010090_10	Rush Creek	Garvin	120004	4920343	A J SEARCY	COASTAL STATES GAS PRODUCTION CO	12/6/1968	12/25/1968		12/25/1968	34.71646	-97.3801		DRY
OK310810010090_10	Rush Creek	Garvin	120005	4921338	TETER	JIM GRAY OIL CO	5/9/1980	5/23/1980		5/25/1980	34.72368	-97.3845		DRY
OK310810010090_10	Rush Creek	Garvin	120006	4921844	SEARCY	MAHAN-ROWSEY INC	10/23/1981	11/14/1981	4/22/1982		34.71194	-97.3725		OIL
OK310810010090_10	Rush Creek	Garvin	120007	4921869	SEARCY	MAHAN-ROWSEY INC	12/3/1981	12/30/1981	3/12/1982		34.71194	-97.3758		OIL
OK310810010090_10	Rush Creek	Garvin	120013	4939386	CROSBY	GOLDSMITH DRLG CO	3/31/1959	4/20/1959	4/29/1959		34.72188	-97.3801		OIL
OK310810010090_10	Rush Creek	Garvin	120015	4921788	SEARCY	SHEBESTER INC	6/5/1985	6/8/1985	6/11/1985		34.7146	-97.3754		GAS
OK310810010090_10	Rush Creek	Garvin	120016	4922595	RIDLEY	AVANTI ENERGY CORP	6/19/1985	7/3/1985	8/18/1985		34.72314	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	120021	4939392	PHEBE TODD	SINCLAIR PRAIRIE OIL CO	11/19/1947	1/8/1948	1/27/1948		34.72007	-97.3823		OIL

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OK310810010090_10	Rush Creek	Garvin	120023	4921144	KING	NATIONAL OIL CO	10/3/1978	10/13/1978		10/13/1978	34.71917	-97.3725		DRY
OK310810010090_10	Rush Creek	Garvin	120024	4920343	JASON	JACK RICHARDS	6/27/1979	7/8/1979	7/15/1979		34.71646	-97.3801		OIL
OK310810010090_10	Rush Creek	Garvin	120029	4921955	GEHRKE	K W B OIL PROPERTY MGMT INC	3/19/1982	3/29/1982	6/11/1982		34.71104	-97.367		OIL
OK310810010090_10	Rush Creek	Garvin	120030	4921805	GEHRKE	MABEE PETROLEUM CORP	10/1/1981	10/16/1981	1/19/1982		34.71465	-97.3626		OIL
OK310810010090_10	Rush Creek	Garvin	120032	4920556	KING	WILLIAM H LAMBDIN	11/17/1980	12/30/1980	2/8/1981		34.72381	-97.3681		OIL
OK310810010090_10	Rush Creek	Garvin	120033	4921578	KING	WM H LAMBDIN	6/7/1981	7/17/1981	11/19/1981		34.72279	-97.3637		OIL
OK310810010090_10	Rush Creek	Garvin	120039	4920583	CORNELL	J LEE YOUNGBLOOD	9/23/1971	10/12/1971		10/12/1971	34.72287	-97.3589		DRY
OK310810010090_10	Rush Creek	Garvin	120040	4920556	KING	J LEE YOUNGBLOOD	5/25/1971	6/15/1971		6/15/1971	34.72381	-97.3681		DRY
OK310810010090_10	Rush Creek	Garvin	120046	4939376	PYLE	AN-SON PETROLEUM CORP	8/5/1960	8/15/1960		8/15/1960	34.7047	-97.3681		DRY
OK310810010090_10	Rush Creek	Garvin	120047	4939377	LINDSEY	AN-SON PETROLEUM CORP	12/8/1955	12/24/1955		12/24/1955	34.70198	-97.3649		DRY
OK310810010090_10	Rush Creek	Garvin	120049	4921189	MANSEL-BAKER	GRACE PETROLEUM CORP	3/5/1979	3/24/1979		3/26/1979	34.70831	-97.3549		DRY
OK310810010090_10	Rush Creek	Garvin	120055	4921746	LONG	MURCHISON OIL & GAS INC	8/14/1981	8/30/1981	9/30/1981		34.70379	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	120056	4901257	DOCKHORN	PHILLIPS PETROLEUM CO	11/24/1948	1/15/1949	1/26/1949		34.69656	-97.3626		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	120057	4922675	COFFEY	FORTUNA ENERGY CORP	1/19/1985	2/6/1985	5/16/1985		34.70015	-97.3823		OIL
OK310810010090_10	Rush Creek	Garvin	120058	4900484	FREEMAN	ANDERSON-PRICHARD OIL CORP	3/28/1948	8/4/1948	4/28/1948		34.70196	-97.3736		OIL
OK310810010090_10	Rush Creek	Garvin	120063	4901258	FREEMAN	UNION TEXAS PETROLEUM CORP	9/4/1962	9/5/1962			34.70114	-97.3719		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	120064	4939374	V K FREEMAN	DEARING INC	1/1/1949	2/27/1949		3/1/1949	34.70557	-97.378		DRY
OK310810010090_10	Rush Creek	Garvin	120065	4962727	VERA	JIM GRAY OIL CO	3/20/1980	3/25/1980	4/1/1980		34.70738	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	120066	4939375	FREEMAN	G E HALL	8/26/1949	9/18/1949		9/18/1949	34.69654	-97.3736		DRY
OK310810010090_10	Rush Creek	Garvin	120072	4939367	GLEN ROSIER	CARTER OIL CO	4/29/1948	5/24/1948	5/31/1948		34.69833	-97.4218		OIL
OK310810010090_10	Rush Creek	Garvin	120073	4939368	OCIE GUTHRIE	GLOBE OIL & REFINING CO	12/9/1948	2/12/1949			34.70556	-97.4218		DRY
OK310810010090_10	Rush Creek	Garvin	120074	4922256	TONYA	FORTUNA ENERGY CORP	7/30/1983	8/20/1983	9/3/1983		34.70556	-97.413		OIL
OK310810010090_10	Rush Creek	Garvin	120080	4920204	PARKS	MORGAN PETROLEUM CO	1/30/1967	2/26/1967	3/12/1967		34.70918	-97.4174		OIL
OK310810010090_10	Rush Creek	Garvin	120081	4922330	SHERRELL	MUSTANG PRODUCTION CO	10/31/1983	11/25/1983	1/18/1984	1/15/1984	34.70737	-97.413		DRY
OK310810010090_10	Rush Creek	Garvin	120088	4920814	RICHARDSON	BASIN PETROLEUM CORP	5/18/1975	6/14/1975		6/15/1975	34.70918	-97.4152		DRY
OK310810010090_10	Rush Creek	Garvin	120089	4920033	MCCASKILL	SAMEDAN OIL CORP	5/14/1966	6/7/1966		6/7/1966	34.70556	-97.4163	8/2/1966	DRY
OK310810010090_10	Rush Creek	Garvin	120090	4939368	OCIE GUTHRIE	WOODS PETROLEUM CORP	4/10/1981				34.70556	-97.4218		OIL
OK310810010090_10	Rush Creek	Garvin	120091	4922739	ELLIS A	JET OIL CO	6/26/1985	7/17/1985	12/11/1986		34.7076	-97.4085		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	120180	4939298	EVANS-ELLIS COMMUNITY	GLOBE OIL & REFINING CO	4/2/1948	5/3/1948	5/12/1948		34.691	-97.413		OIL
OK310810010090_10	Rush Creek	Garvin	120182	4939302	TULSA UNIVERSITY A	SINCLAIR PRAIRIE OIL CO	10/20/1947	11/19/1947	11/26/1947		34.68739	-97.4173		OIL

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OK310810010090_10	Rush Creek	Garvin	120188	4939307	TULSA UNIVERSITY TRACT C	SINCLAIR OIL & GAS CO	8/28/1949	9/26/1949	10/24/1949		34.68739	-97.4086		OIL
OK310810010090_10	Rush Creek	Garvin	120198	ZZ120198	LOVE SCHOOL	COMBINED ENERGY GROUP INC	3/17/1982	4/27/1982	6/24/1982		34.69471	-97.3692		OIL
OK310810010090_10	Rush Creek	Garvin	120199	4921671	TURNER	MURCHISON OIL & GAS INC	7/1/1981	7/22/1981	8/5/1981		34.69381	-97.3549		OIL
OK310810010090_10	Rush Creek	Garvin	120660	4900855	BIFFLE	PERKINS PROD CO	8/29/1962	10/16/1962		10/16/1962	34.70196	-97.3976		DRY
OK310810010090_10	Rush Creek	Garvin	122402	4920182	BOYER B	SUN OIL CO	5/16/1967	5/24/1967	5/31/1967		34.77036	-97.3731		OIL
OK310810010090_10	Rush Creek	Garvin	122408	4900194	CLINE	JAMES N CROFTON	12/16/1947	2/4/1948			34.7701	-97.3681		DRY
OK310810010090_10	Rush Creek	Garvin	122404	4930312	POLLOCK A	SUN OIL CO	11/7/1966	11/29/1966	12/1/1966		34.77009	-97.3774		OIL
OK310810010090_10	Rush Creek	Garvin	122405	4920167	POLLOCK B	SUN OIL CO	3/17/1967	3/27/1967	5/6/1967		34.77009	-97.3808		OIL
OK310810010090_10	Rush Creek	Garvin	122406	4920167	POLLOCK B	SUN OIL CO					34.77009	-97.3808		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	135309	4901289	TULSA UNIVERSITY	DEEP ROCK LAND & EXPL CO	2/15/1990	3/6/1990		3/6/1990	34.68739	-97.413		DRY
OK310810010090_10	Rush Creek	Garvin	200965	4923537	MCNEILL	LASMO ENERGY CORP	10/16/1990	10/31/1990		10/31/1990	34.70555	-97.2982		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	221523	4920925	PHAROAH	QUINTIN LITTLE CO INC	10/24/1976	11/12/1976			34.74098	-97.3932		GAS
OK310810010090_10	Rush Creek	Garvin	230731	4922497	KIMBERLY	OKLAHOMA OIL & GAS ROYALTIES INC	7/17/1984	7/29/1984	8/18/1984		34.75089	-97.3505		OIL
OK310810010090_10	Rush Creek	Garvin	234791	4923573	BRINLEY	DIXIE OIL CO INC	4/9/1991	4/16/1991	5/16/1991		34.76007	-97.3495		OIL
OK310810010090_10	Rush Creek	Garvin	284576	4923623	JIM GORDEN	JASMINE INC	7/27/1991	8/1/1991	8/15/1991		34.71424	-97.3087		OIL
OK310810010090_10	Rush Creek	Garvin	284670	4923657	WILLIAMS-DONOHO	AMBRIT ENERGY CORP	11/24/1991	12/2/1991		12/2/1991	34.68354	-97.2992		DRY
OK310810010090_10	Rush Creek	Garvin	285022	4920554	RENAKER-GIBSON	LARIO OIL & GAS CO	4/27/1971	5/17/1971	5/24/1971		34.73638	-97.3235		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	286283	4923634	WILSON	BIG HORN OIL CO INC	9/15/1991	10/4/1991	10/25/1991		34.75599	-97.4021	10/26/1995	OIL
OK310810010090_10	Rush Creek	Garvin	314777	4923567	EVANS	AMBRIT ENERGY CORP	6/16/1992	6/17/1992	6/17/1992		34.69098	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	378292	4920609	R A EVANS	AMBRIT ENERGY CORP	10/1/1992	10/2/1992	10/15/1992		34.6892	-97.3058		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	403705	4923748	WILSON	LEEMAN ENERGY CORP	3/14/1993	3/23/1993		3/23/1993	34.72186	-97.2619		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	404021	4920718	WEST WHITEBEAD UNIT	LARIO OIL & GAS CO	2/28/1974	3/17/1974	3/22/1974		34.73458	-97.3191		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	409562	4923732	DAVIS	JASMINE INC	12/2/1992	12/11/1992	2/26/1993		34.74139	-97.3247		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	217716	4922159	MCCASKILL	MUSTANG FUEL CORP	4/19/1990	5/25/1990			34.70737	-97.4152		OIL
OK310810010090_10	Rush Creek	Garvin	221578	4923518	MURRAY	KEITH F WALKER	10/9/1990	10/24/1990		10/27/1990	34.73008	-97.3681	8/30/2001	DRY
OK310810010090_10	Rush Creek	Garvin	225923	4923557	GREEN	LASMO ENERGY CORP	11/14/1990	11/29/1990		11/30/1990	34.70058	-97.3163		DRY
OK310810010090_10	Rush Creek	Garvin	433101	ZZ433101	ROBERT A HEFNER JR LIDDLE A		9/6/1957				34.71324	-97.2315		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	433108	4920080	DERDEYN	CAMERON OIL CO	9/20/1966				34.71456	-97.2359	10/24/1966	NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	433110	4939412	LIDDLE-A	ROBERT A HEFNER JR	2/13/1957	6/13/1957			34.71637	-97.2315		OIL
OK310810010090_10	Rush Creek	Garvin	230443	4921534	SMITH-IMAN	SONAT EXPL CO	12/27/1980	1/16/1981	2/24/1981		34.74824	-97.3646		SERVICE WELL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	439903	4921385	KENNEDY	PERKINS ENERGY CO	6/15/1980	6/29/1980	7/11/1980		34.72734	-97.2971		OIL
OK310810010090_10	Rush Creek	Garvin	440163	4923898	WEST WHITEBEAD UNIT	LARIO OIL & GAS CO	3/10/1995	3/22/1995		3/22/1995	34.74029	-97.3187		DRY
OK310810010090_10	Rush Creek	Garvin	440164	4923870	WARD	MORRIS E STEWART OIL CO	3/7/1995	3/22/1995		3/22/1995	34.70114	-97.3027		DRY
OK310810010090_10	Rush Creek	Garvin	456072	4923198	HYRE	RANKEN ENERGY CORP	7/28/1995	8/7/1995	8/16/1995		34.71192	-97.2729		OIL
OK310810010090_10	Rush Creek	Garvin	285418	4923496	RLT	ROBERT T MOWDY	6/30/1990	7/22/1990			34.75087	-97.3075	9/9/1998	DRY
OK310810010090_10	Rush Creek	Garvin	472687	4923984	MILLIGAN	AMOCO PRODUCTION CO	5/31/1996	6/15/1996			34.73315	-97.3765		DRY
OK310810010090_10	Rush Creek	Garvin	472693	4923951	HYRE	RANKEN ENERGY CORP	1/12/1996	1/22/1996	3/24/1996		34.71478	-97.2726	8/28/2001	OIL
OK310810010090_10	Rush Creek	Garvin	480391	4920666	MINERVA-FREEMAN	LEEMAN ENERGY CORP	11/25/1980	12/9/1980	12/22/1980		34.75185	-97.3757		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	347379	4923675	SUZY	JASMINE INC	4/27/1992	5/6/1992	7/9/1992		34.74094	-97.3291		OIL
OK310810010090_10	Rush Creek	Garvin	520117	4924090	POPE	HAZELWOOD PROD & EXPL CO L L C	12/18/1997	12/30/1997			34.72183	-97.3999		DRY
OK310810010090_10	Rush Creek	Garvin	404200	4923567	EVANS	AMBRIT ENERGY CORP	6/17/1992	6/17/1992	2/7/1993		34.69098	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	522490	4924113	BROOKS	KIRKPATRICK OIL CO INC	5/8/1998	5/19/1998	6/22/1998		34.67471	-97.3036		OIL
OK310810010090_10	Rush Creek	Garvin	409799	4923815	MURRAY	DOUGLASS DIETZ & DALEY INC	2/16/1994	2/24/1994	4/8/1994		34.73536	-97.3758		OIL
OK310810010090_10	Rush Creek	Garvin	414958	4923858	WHITE	FRONTIER INC	8/23/1994	9/3/1994		9/5/1994	34.71959	-97.2796		DRY
OK310810010090_10	Rush Creek	Garvin	426321	4923851	WEST WHITEBEAD UNIT	LARIO OIL & GAS CO	9/10/1994	9/26/1994	10/22/1994		34.73807	-97.322		OIL
OK310810010090_10	Rush Creek	Garvin	433104	ZZ433106	ROBERT A HEFNER JR DERDEYN						34.71637	-97.2359		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	433105	ZZ433106	DERDEYN	TIDE WATER ASSOC OIL CO					34.71637	-97.2359		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	440642	4921337	KENNEDY	PERKINS ENERGY CO	3/27/1980	5/27/1980	5/28/1980		34.73095	-97.2949		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	441061	4923896	SHAMLEY A E	JASMINE INC	2/19/1995	2/26/1995	5/2/1995		34.73766	-97.3324		OIL
OK310810010090_10	Rush Creek	Garvin	441606	4923744	DOUBLE K	JASMINE INC	8/1/1993	8/14/1993	9/21/1993		34.75313	-97.3061	8/31/1998	GAS
OK310810010090_10	Rush Creek	Garvin	443851	4923915	FEATHERSTON	LARIO OIL & GAS CO	6/9/1995	6/23/1995	8/2/1995		34.73545	-97.3059		OIL
OK310810010090_10	Rush Creek	Garvin	456110	4923898	WEST WHITEBEAD UNIT	LARIO OIL & GAS CO	3/10/1995	4/5/1995	4/25/1995		34.74029	-97.3187		OIL
OK310810010090_10	Rush Creek	Garvin	456217	4921393	SHIRLEY	JASMINE INC	1/9/1995	1/9/1995	1/12/1995		34.73637	-97.2905		OIL
OK310810010090_10	Rush Creek	Garvin	456396	4920522	WEST WHITEBEAD UNIT	LARIO OIL & GAS CO	10/12/1970	10/28/1970	12/7/1970		34.73322	-97.3229		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	456505	4920556	KING	WAYNE SNELGROOES	11/17/1980	12/30/1980	2/8/1981		34.72381	-97.3681		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	473994	4923885	THOMPSON	LEEMAN ENERGY CORP	12/21/1994	12/31/1994	1/16/1995		34.7477	-97.302		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	483234	4923976	ARTHUR D	SPECIAL ENERGY CORP	4/5/1996	4/25/1996	5/21/1996		34.70805	-97.4174		OIL
OK310810010090_10	Rush Creek	Garvin	494801	4923984	MILLIGAN	SPECIAL ENERGY CORP	5/31/1996	6/15/1996			34.73315	-97.3765		OIL
OK310810010090_10	Rush Creek	Garvin	497539	4923997	SMART	HOLLRAH EXPL CO	8/2/1996	8/22/1996	11/7/1996		34.71508	-97.2629		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	555320	4924184	BRINLEY	JASMINE INC	1/10/2001	1/23/2001			34.75487	-97.3088		OIL

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OK310810010090_10	Rush Creek	Garvin	497566	4924011	BAGWELL	AMOCO PRODUCTION CO	10/28/1996	11/12/1996			34.72051	-97.3335		DRY
OK310810010090_10	Rush Creek	Garvin	503230	4924051	BARNEY	G L B EXPL INC	6/6/1997	6/16/1997			34.73366	-97.2774		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	505044	4923661	TRACY	GENESIS ENERGY CORP	2/6/1992	2/19/1992	5/25/1992		34.7578	-97.396		OIL
OK310810010090_10	Rush Creek	Garvin	556876	4924045	SHAMLEY	JASMINE INC	5/29/1997	6/16/1997	6/28/1997		34.73458	-97.3324		GAS
OK310810010090_10	Rush Creek	Garvin	559992	4900409	I L CLARK	SUN OIL CO	3/31/1953	4/17/1953			34.75268	-97.3192	1/3/1987	DRY
OK310810010090_10	Rush Creek	Garvin	565897	4922275	SHAMLEY	ARROW OPERATING	10/10/1983	10/21/1983	11/21/1983		34.73277	-97.3324		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	571959	4924186	SHAMLEY	JASMINE INC	4/6/2000	11/8/2000			34.73318	-97.3324		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	573295	4924184	BRINLEY	JASMINE INC	1/10/2001	1/23/2001			34.75487	-97.3088		OIL
OK310810010090_10	Rush Creek	Garvin	519476	4924114	JUSTICE	RAMSEY PROPERTY MANAGEMENT INC	3/31/1998	4/18/1998			34.7346	-97.3692		DRY
OK310810010090_10	Rush Creek	Garvin	581727	4924308	EVANS	RANKEN ENERGY CORP	11/1/2001	11/8/2001			34.69046	-97.3058	3/29/2002	DRY
OK310810010090_10	Rush Creek	Garvin	526050	4920556	KING SWD	B & B TOOL CO INC	11/17/1980	12/30/1980			34.72381	-97.3681		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	528533	4922275	SHAMLEY	JASMINE INC	10/10/1983	10/21/1983	11/21/1983		34.73277	-97.3324		OIL
OK310810010090_10	Rush Creek	Garvin	589889	4939509	CARNELL	CHESAPEAKE OPERATING INC	5/5/1969	5/20/1969	6/9/1969		34.74046	-97.3674		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	535627	4921532	KELLEY	PLUMMER ENERGY INC	12/31/1980	1/13/1981			34.75583	-97.3195		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	601957	4924395	DOBSON	COMBINED RESOURCES CORP	8/30/2003	9/21/2003	10/1/2003		34.7422	-97.3637		OIL
OK310810010090_10	Rush Creek	Garvin	602072	4922348	RAY	PLUMMER ENERGY INC	12/13/1983	1/5/1984	2/24/1984		34.75645	-97.317		OIL
OK310810010090_10	Rush Creek	Garvin	603141	4924077	ARTHUR D	ELLITHORP PRODUCTION CO L L C	10/17/1997	11/3/1997	11/25/1997		34.70672	-97.4145		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	604262	4924395	DOBSON	COMBINED RESOURCES CORP	8/30/2003	9/21/2003	10/1/2003		34.7422	-97.3637		OIL
OK310810010090_10	Rush Creek	Garvin	556136	4924186	SHAMLEY	JASMINE INC	4/6/2000	11/8/2000			34.73318	-97.3324		DRY
OK310810010090_10	Rush Creek	Garvin	559995	4939507	E J ONEAL	DEEP ROCK OIL CORP	1/29/1952	3/4/1952			34.74008	-97.3626	4/17/1952	DRY
OK310810010090_10	Rush Creek	Garvin	562127	4924108	SHAMLEY	JASMINE INC	4/11/1998	4/17/1998	5/20/1998		34.73277	-97.3326		OIL
OK310810010090_10	Rush Creek	Garvin	565811	4924282	JACK JUSTICE	JASMINE INC	5/12/2001	5/21/2001	5/29/2001		34.75392	-97.3114		OIL
OK310810010090_10	Rush Creek	Garvin	566037	4923518	MURRAY	RAMSEY PROPERTY MANAGEMENT INC	10/9/2000	10/18/2000			34.73008	-97.3681	8/30/2001	DRY
OK310810010090_10	Rush Creek	Garvin	578847	4920823	BRINLEY C	JASMINE INC	8/15/1975	8/29/1975			34.755	-97.3033		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	615878	4924436	MOWDY	RANKEN ENERGY CORP	5/7/2004	7/9/2004	9/15/2004		34.75087	-97.3058	9/14/2005	OIL
OK310810010090_10	Rush Creek	Garvin	618216	4920735	TOLBERT	MORGAN PETROLEUM	6/30/1974	7/19/1974			34.75267	-97.308	7/21/1974	DRY
OK310810010090_10	Rush Creek	Garvin	618217	4900430	ELLIE BURCH	O E DEMPSEY	8/12/1952	9/3/1952			34.74725	-97.2928	10/21/1952	DRY
OK310810010090_10	Rush Creek	Garvin	618219	4921763	BAGWELL	JIM W GRAY					34.7192	-97.329	1/3/1991	OIL
OK310810010090_10	Rush Creek	Garvin	618526	4939366	ROSIER-PARK	AURCRA GASOLINE CO	7/7/1949	8/10/1949			34.69833	-97.4174	8/31/1949	DRY
OK310810010090_10	Rush Creek	Garvin	618527	4939510	CARNELL	A O OLSON					34.74371	-97.367	8/13/1975	NOT REPORTED

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OK310810010090_10	Rush Creek	Garvin	618528	4900291	J J LEE	EDWARD PACE ETA					34.69105	-97.3824	3/9/1949	NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	618533	4921786	FREEMAN	OXLEY PETROLEUM CO	11/14/1981	12/17/1981	3/16/1982		34.72273	-97.4043	4/4/1986	OIL
OK310810010090_10	Rush Creek	Garvin	618534	4939440	H G HUCKABY	TRIGG DRLG CO INC	5/3/1952	6/11/1952	7/1/1952		34.71638	-97.413	10/6/1952	OIL
OK310810010090_10	Rush Creek	Garvin	618535	4921792	PIXLEY	JIM GRAY OIL CO					34.75177	-97.2939	5/24/1989	OIL
OK310810010090_10	Rush Creek	Garvin	590446	4924323	SUSAN COATES	JASMINE INC	6/18/2002	6/23/2002			34.75313	-97.3151		OIL
OK310810010090_10	Rush Creek	Garvin	594555	4924184	BRINLEY	JASMINE INC	1/10/2001	1/23/2001			34.75487	-97.3088		OIL
OK310810010090_10	Rush Creek	Garvin	594742	4924348	JACK JUSTICE	JASMINE INC	12/23/2002	1/3/2003			34.75419	-97.3126		OIL
OK310810010090_10	Rush Creek	Garvin	598390	4924347	TANNER BOB	CHEROKEE ROYALTIES & MINERALS INC	1/8/2003	1/18/2003	3/25/2003		34.75646	-97.3517		OIL
OK310810010090_10	Rush Creek	Garvin	601592	4924405	SHAMLEY	RANKEN ENERGY CORP	11/1/2003	11/10/2003	1/17/2004		34.72915	-97.3324		OIL
OK310810010090_10	Rush Creek	Garvin	602196	4921257	DOBSON	COMBINED RESOURCES CORP	9/13/1979	10/13/1979			34.74404	-97.3641		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	10000883	4924354	MORRIS 2		4/29/1982	5/1/1982	5/28/1982		34.74082	-97.3109		OIL
OK310810010090_10	Rush Creek	Garvin	10000884	4924577	WINNIE MAE	JASMINE INC	10/22/2006	11/3/2006	1/1/2007		34.73949	-97.3681		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10000884	4924603	DEBI	JASMINE, INC.	5/17/2007	5/30/2007	7/27/2007		34.75655	-97.3137		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10000884	4924634	SWAGSU	CHAPARRAL ENERGY, L.L.C.	11/10/2007	11/24/2007	12/18/2007		34.69319	-97.4158		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	618213	4900280	THOMAS ADAMS	NORRIS & FLEET DRLG & PRODUCING CO	12/23/1949	1/18/1950			34.7093	-97.3014	2/20/1950	DRY
OK310810010090_10	Rush Creek	Garvin	618221	4922279	MCDOLE	CHEYENNE PETROLEUM CO					34.75916	-97.3159	9/25/1985	NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	618531	4923158	PYLE	BRAND OIL & GAS INC	10/29/1986	11/15/1986			34.7047	-97.3638	9/29/1988	OIL
OK310810010090_10	Rush Creek	Garvin	618532	4939383	BIFFLE FEE	N E BIFFLE	10/21/1948	11/17/1948			34.72007	-97.3867	3/8/1950	DRY
OK310810010090_10	Rush Creek	Garvin	10001280	4924585	GIBSON	RANKEN ENERGY CORPORATION	11/24/2006	12/27/2006		12/27/2006	34.7459	-97.2933		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001280	4924653	OLTA	JASMINE, INC.	12/6/2007	12/27/2007	2/25/2008		34.72957	-97.3335		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001281	4924685	SWAGSU	CHAPARRAL ENERGY LLC	10/19/2008	11/7/2008	11/20/2008		34.69945	-97.4296		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001281	4924697	CHICKASAW	RANKEN ENERGY CORPORATION	6/28/2008	7/19/2008	12/1/2008		34.74372	-97.3728		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001626	4924445	3D BUG	JASMINE INC	7/17/2004	7/30/2004	9/20/2004		34.72545	-97.3377		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	10001626	4924536	MCNEIL 1		6/19/2006	6/30/2006	7/20/2006		34.70397	-97.2987		OIL
OK310810010090_10	Rush Creek	Garvin	10001626	4924567	CHRISTY	RANKEN ENERGY CORPORATION	8/11/2006	8/21/2006		8/21/2006	34.73816	-97.2843		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001627	4924754	JAMES	RANKEN ENERGY CORPORATION	9/1/2009	9/20/2009			34.73423	-97.3443		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001865	4924649	BAKER	RANKEN ENERGY CORPORATION	11/17/2007	12/9/2007	3/24/2008	10/20/2008	34.729	-97.3918		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10000883	4924392	RENAKER GIBSON	LARIO OIL & GAS COMPANY	3/18/2004	3/28/2004		3/28/2004	34.73812	-97.3229		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10000883	4924536	MCNEIL	HOCO INC	6/20/2006	7/2/2006	7/15/2006		34.70397	-97.2987		OIL
OK310810010090_10	Rush Creek	Garvin	10000884	4924602	JAMIE	JASMINE, INC.	11/23/2007	12/6/2007	3/19/2008		34.71575	-97.3091		UNKNOWN

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	10000884	4924658	POLLACK	RANKEN ENERGY CORPORATION	1/8/2008	1/19/2008		1/19/2008	34.77348	-97.3719		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10000884	4924742	JC	RANKEN ENERGY CORPORATION	5/31/2009	7/1/2009	7/22/2009		34.72359	-97.3513		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001280	4924513	BERGEN 2-18		12/16/2005	1/12/2006		6/21/2006	34.7306	-97.3366		DRY
OK310810010090_10	Rush Creek	Garvin	10001280	4924516	JUSTICE	RANKEN ENERGY CORPORATION	1/19/2006	2/7/2006	5/18/2006		34.73386	-97.3675		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001280	4924536	MCNEIL	HOCO INC	6/19/2006	6/30/2006	7/20/2006		34.70397	-97.2987		OIL
OK310810010090_10	Rush Creek	Garvin	10001626	4924409	JACK JUSTICE	JASMINE, INC.	12/4/2003	12/15/2003	2/5/2004	5/30/2006	34.75434	-97.3102		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001626	4924424	LITTLE BITS	JASMINE, INC.		4/7/2004	4/18/2004	6/24/2008	34.73991	-97.3467		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	10001626	4924480	SARAH	HOCO INC	7/20/2005	8/1/2005	8/8/2005		34.73997	-97.2834		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001626	4924538	CLARK	JASMINE, INC	7/5/2006	7/16/2006	8/1/2006		34.7566	-97.3126		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001627	4924711	J.C. "CHOC" MURRAY (LE FLORE)	RANKEN ENERGY CORPORATION	9/3/2008	9/24/2008	12/19/2008		34.72491	-97.3516		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001627	4924714	JOHNSTON	RANKEN ENERGY CORPORATION	9/30/2008	10/14/2008	12/25/2008		34.73332	-97.3573		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001627	4929583	CORNELL 24-1		1/30/1981	2/3/1981	9/14/1988		34.72312	-97.3582		OIL
OK310810010090_10	Rush Creek	Garvin	118196	ZZ118196	HAMILTON	GEORGE NORTHRUP ET AL	7/14/1921	8/20/1921			34.71818	-97.2401	7/25/1921	NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119026	4939424	BARCH	NELS BURTON DRLG CO	7/1/1937	7/23/1937			34.75463	-97.2928		DRY
OK310810010090_10	Rush Creek	Garvin	119115	4920708	SHIPLEY	BEARD & LEEMAN	1/2/1974	1/15/1974		1/18/1974	34.74503	-97.3014		DRY
OK310810010090_10	Rush Creek	Garvin	119118	4921440	JESSIE	JIMMY W GRAY	2/20/1981	3/9/1981	5/2/1981		34.74364	-97.3036		OIL
OK310810010090_10	Rush Creek	Garvin	119126	4930068	THOMPSON	J M HUBER CORP	7/27/1966	8/15/1966		8/15/1966	34.75087	-97.3036		DRY
OK310810010090_10	Rush Creek	Garvin	119132	4921510	NALLEY	RHOADES OIL CO	7/24/1981	8/7/1981		8/7/1981	34.75267	-97.3104		DRY
OK310810010090_10	Rush Creek	Garvin	119181	4900202	R C KENNEDY	MCELREATH & SUGGETT & HARVEY	11/22/1946	12/20/1946			34.73276	-97.2796		OIL
OK310810010090_10	Rush Creek	Garvin	119192	4921282	RUTH FARMER	FARMERS ENERGY CORP	10/21/1979	10/28/1979	12/1/1979		34.73095	-97.2839		OIL
OK310810010090_10	Rush Creek	Garvin	119201	4930234	KENNEDY UNIT	KIRKPATRICK OIL CO	1/27/1965	2/3/1965		2/3/1965	34.73637	-97.285		DRY
OK310810010090_10	Rush Creek	Garvin	119209	4921380	HUTCHINS	RAIZEN OIL CO	12/18/1980	1/9/1981	1/30/1981		34.73095	-97.2905		OIL
OK310810010090_10	Rush Creek	Garvin	119215	4920574	HIBDON	CHRISTIE-STEWART	8/6/1971	8/23/1971	9/13/1971		34.73729	-97.3159		OIL
OK310810010090_10	Rush Creek	Garvin	119218	4921922	C BURR	JIM GRAY OIL CO	1/30/1982	2/13/1982	3/19/1982		34.73367	-97.3159		OIL
OK310810010090_10	Rush Creek	Garvin	119232	4921836	THOMPSON	JIMMY W GRAY	12/18/1981	1/2/1982	1/20/1982		34.72644	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119235	4920719	FEATHERSTON	LARIO OIL & GAS CO	3/23/1974	4/8/1974	5/8/1974		34.73458	-97.3075		OIL
OK310810010090_10	Rush Creek	Garvin	119241	4920690	HIBDON	LARIO OIL & GAS CO	10/17/1973	10/31/1973	11/14/1973		34.73458	-97.3148		OIL
OK310810010090_10	Rush Creek	Garvin	119298	4922053	MURRAY	RAMBLER OIL CO	10/22/1982	11/2/1982	11/13/1982		34.72279	-97.3461		GAS
OK310810010090_10	Rush Creek	Garvin	119401	4921521	FREEMAN	SINGLETERRY OIL & GAS INC	12/23/1980	6/6/1981	1/30/1981		34.7156	-97.3158		OIL
OK310810010090_10	Rush Creek	Garvin	119410	4939401	GORDEN	HUFFMAN & MALLOY	11/18/1960	12/3/1960	12/18/1960		34.7165	-97.3081		OIL

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	119441	4939437	HYRE	MID-AMERICA MINERALS INC	3/20/1958	3/29/1958	4/1/1958		34.71463	-97.2663		OIL
OK310810010090_10	Rush Creek	Garvin	119490	4921904	RUSSELL	MABEE PETROLEUM CORP	1/7/1982	1/15/1982	3/10/1982		34.70374	-97.308		OIL
OK310810010090_10	Rush Creek	Garvin	119493	4922457	SPIVEY	SHEBESTER INC	5/23/1984	6/6/1984		6/6/1984	34.69832	-97.3234		DRY
OK310810010090_10	Rush Creek	Garvin	119501	4920618	ANDREAS	SHAWNEE OIL & GAS CORP	7/9/1972	7/19/1972	9/12/1972		34.70374	-97.3345		OIL
OK310810010090_10	Rush Creek	Garvin	119507	4923252	WARD	SHEBESTER INC	7/24/1987	8/5/1987	9/23/1987		34.70379	-97.3516		OIL
OK310810010090_10	Rush Creek	Garvin	119510	4921180	JOHN WARD	GRACE PETROLEUM CORP	2/12/1979	3/2/1979		3/2/1979	34.69099	-97.3278		DRY
OK310810010090_10	Rush Creek	Garvin	119576	4921568	WALLY	JIMMY W GRAY	1/30/1981	2/17/1981	2/25/1981		34.75554	-97.39		OIL
OK310810010090_10	Rush Creek	Garvin	119584	4921849	PHAROAH	MAHAN-ROWSEY INC	11/19/1981	12/11/1981	2/23/1982		34.76277	-97.3943		OIL
OK310810010090_10	Rush Creek	Garvin	119753	4920925	PHAROAH	DON J LEEMAN	10/24/1976	11/12/1976			34.74098	-97.3932		GAS
OK310810010090_10	Rush Creek	Garvin	119785	4900331	KAHN	LEEMAN ENERGY CORP	11/11/1980	11/20/1980			34.74011	-97.3713	10/28/1989	OIL
OK310810010090_10	Rush Creek	Garvin	119793	4939510	C E CARNELL	OLSON OIL CO	4/7/1961	4/10/1961			34.74371	-97.367	8/13/1975	OIL
OK310810010090_10	Rush Creek	Garvin	119802	4922432	CARNELL	LADD PETROLEUM CORP	5/29/1984	6/20/1984	7/1/1984		34.74008	-97.3681		OIL
OK310810010090_10	Rush Creek	Garvin	119816	4923090	MCKAY	FRENCH PETROLEUM CORP	3/25/1986	4/10/1986		4/10/1986	34.73451	-97.3654		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119836	4920606	MAULDIN	WOODS PETROLEUM CORP	2/12/1981	2/15/1981		5/31/1983	34.72918	-97.3637		DRY
OK310810010090_10	Rush Creek	Garvin	119845	4939498	MURRAY	HOME-STAKE PRODUCTION CO	6/25/1957	8/1/1957	8/17/1957		34.72742	-97.3736		OIL
OK310810010090_10	Rush Creek	Garvin	119859	4921463	MURRAY	WHITMAR EXPL CO	11/7/1980	12/1/1980	12/9/1980		34.72652	-97.3725		OIL
OK310810010090_10	Rush Creek	Garvin	119876	4920217	FREEMAN	B R POLK INC	5/21/1981	5/25/1981			34.73284	-97.3999		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119885	4921536	MCDANIEL	WOODS PETROLEUM CORP	1/26/1981	2/21/1981			34.73103	-97.3899		OIL
OK310810010090_10	Rush Creek	Garvin	119985	4939439	RICHARDSON	HOME-STAKE PRODUCTION CO	10/17/1958	11/12/1958		11/13/1958	34.71077	-97.413		DRY
OK310810010090_10	Rush Creek	Garvin	120025	4921844	SEARCY	SHEBESTER INC	10/24/1981	11/14/1981	9/14/1984		34.71194	-97.3725		GAS
OK310810010090_10	Rush Creek	Garvin	120028	4901256	LOW	N E BIFFLE	7/30/1948	8/10/1948			34.71777	-97.3532		DRY
OK310810010090_10	Rush Creek	Garvin	120045	4920583	CORNELL	WOODS PETROLEUM CORP	1/30/1981	2/3/1981			34.72287	-97.3589		OIL
OK310810010090_10	Rush Creek	Garvin	120051	4922207	TURNER	HOLD OIL CORP	6/18/1983	6/30/1983	6/9/1984		34.69656	-97.3692		OIL
OK310810010090_10	Rush Creek	Garvin	120054	4921953	BAKER	MURCHISON OIL & GAS INC	6/17/1982	7/8/1982	9/6/1982		34.70108	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	120062	4900328	ALLEN	DAVE MORGAN OIL CO	5/13/1948	6/19/1948			34.70738	-97.3725		DRY
OK310810010090_10	Rush Creek	Garvin	120068	4922245	L B BARNES	JOE B CLIFTON EXPL	12/15/1984	1/22/1985	2/15/1985		34.70828	-97.4042		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	120077	4922739	ELLIS A	JET OIL CO	6/26/1985	7/17/1985	8/8/1985		34.7076	-97.4085		OIL
OK310810010090_10	Rush Creek	Garvin	120085	4922159	MCCASKILL	MUSTANG PRODUCTION CO	5/6/1983	5/28/1983			34.70737	-97.4152		OIL
OK310810010090_10	Rush Creek	Garvin	120177	4939296	THORNTON-RICHARDSON	CARTER OIL CO	3/10/1948	4/6/1948	4/12/1948		34.69462	-97.4217		OIL
OK310810010090_10	Rush Creek	Garvin	122407	4900194	CLINE	CAPITOL WELL SERVICING CO	5/4/1982	5/17/1982	6/22/1982		34.7701	-97.3681		OIL

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OK310810010090_10	Rush Creek	Garvin	241645	4923608	FREEMAN A	OXY U S A INC	6/16/1991	6/25/1991		6/25/1991	34.72191	-97.3345		DRY
OK310810010090_10	Rush Creek	Garvin	119043	4922347	BRINLEY	KAISER-FRANCIS OIL CO	12/27/1983	1/10/1984	7/7/1984		34.75826	-97.3115		OIL
OK310810010090_10	Rush Creek	Garvin	119063	4922731	BROMIDE	OKLAHOMA OIL & GAS ROYALTIES INC	4/27/1985	5/9/1985	5/17/1985		34.75465	-97.3501		OIL
OK310810010090_10	Rush Creek	Garvin	119072	4901274	LORETTA	JAMES N CROFTON	4/4/1947	5/9/1947			34.74005	-97.3367		OIL
OK310810010090_10	Rush Creek	Garvin	119138	4921092	GIBSON	COPELAND ENERGY CORP	9/18/1978	10/5/1978		10/5/1978	34.74364	-97.285		DRY
OK310810010090_10	Rush Creek	Garvin	119146	4920826	GIBSON	MORGAN PETROLEUM CO	6/21/1975	7/5/1975		7/8/1975	34.74544	-97.2983		DRY
OK310810010090_10	Rush Creek	Garvin	119155	4921545	RENNIE	GEC PRODUCTION CO INC	1/30/1981	2/9/1981		2/11/1981	34.74096	-97.2807		DRY
OK310810010090_10	Rush Creek	Garvin	119161	4921527	GARLAND	JIMMY W GRAY	1/15/1981	1/30/1981	2/6/1981		34.74552	-97.2575		OIL
OK310810010090_10	Rush Creek	Garvin	119178	4950031	POYNER	L E JONES PRODUCTION CO	7/27/1971	8/5/1971		8/5/1971	34.72643	-97.2674		DRY
OK310810010090_10	Rush Creek	Garvin	119195	4921550	ROSE	JIMMY W GRAY	4/19/1980	4/29/1980			34.73276	-97.2993		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	119212	4921100	GRAHAM	WESSELY ENERGY CORP	7/15/1978	7/30/1978		7/30/1978	34.73728	-97.2982		DRY
OK310810010090_10	Rush Creek	Garvin	119238	4920800	C BURR	LARIO OIL & GAS CO	3/7/1975	4/1/1975	6/4/1975		34.73638	-97.3036		OIL
OK310810010090_10	Rush Creek	Garvin	119255	4920718	RENAKER-GIBSON	LARIO OIL & GAS CO	2/28/1974	3/17/1974	3/22/1974		34.73458	-97.3191		OIL
OK310810010090_10	Rush Creek	Garvin	119264	4950165	LEFLORE	DAUBE CO	3/17/1963	4/5/1963		4/5/1963	34.7255	-97.3513	5/27/1964	DRY
OK310810010090_10	Rush Creek	Garvin	119272	4900537	CURTIS	PETROLEUM INC	8/5/1960	8/18/1960		8/18/1960	34.73731	-97.3494		DRY
OK310810010090_10	Rush Creek	Garvin	119278	4921567	GOODSON	ZETA ENGINEERING CO	12/29/1980	1/10/1981	1/18/1981		34.73731	-97.3422		OIL
OK310810010090_10	Rush Creek	Garvin	119295	ZZ119295	MANESS	MIDLAND OIL CORP	7/5/1956	7/25/1956		7/31/1956	34.72188	-97.3422	9/11/1956	DRY
OK310810010090_10	Rush Creek	Garvin	119361	4930124	MCCASKILL	PAPAL ENTERPRISES INC	7/11/1989	7/18/1989	7/29/1989		34.70556	-97.4163	3/6/1991	GAS
OK310810010090_10	Rush Creek	Garvin	119387	4921647	MANDY	BECK PRODUCTION CO INC	5/18/1981	6/3/1981	8/15/1981		34.72317	-97.3191		OIL
OK310810010090_10	Rush Creek	Garvin	119404	4921975	GORDEN	RAMBLER OIL CO	3/4/1982	3/13/1982	3/29/1982		34.71108	-97.3059		OIL
OK310810010090_10	Rush Creek	Garvin	119447	4939389	FLEMING	NELSON & SPAIN OIL CO	7/21/1961	8/4/1961	8/10/1961		34.71915	-97.2806		OIL
OK310810010090_10	Rush Creek	Garvin	119461	4900192	JACK LONGMIRE	A R MCELREATH & W W HARVEY	2/9/1948	2/29/1948			34.72367	-97.2641		DRY
OK310810010090_10	Rush Creek	Garvin	399987	4923771	BOB	JASMINE INC	7/22/1993	8/1/1993	9/21/1993		34.7446	-97.3943		GAS AND OIL
OK310810010090_10	Rush Creek	Garvin	409614	4923708	WILSON	GENESIS ENERGY CORP	9/22/1992	10/7/1992	11/6/1992		34.75628	-97.4021		OIL
OK310810010090_10	Rush Creek	Garvin	119521	4920672	ZWEIGEL-EVANS	CRESLENN OIL CO	6/18/1973	7/2/1973		7/2/1973	34.6863	-97.3028		DRY
OK310810010090_10	Rush Creek	Garvin	119553	4900436	PLUMMER	OKLAHOMA OIL & GAS ROYALTIES INC	9/22/1984	10/4/1984	10/12/1984		34.75465	-97.3538		OIL
OK310810010090_10	Rush Creek	Garvin	119570	4939550	WALLY	JIM GRAY	12/17/1980	12/23/1980	1/22/1981		34.75915	-97.39	11/13/1995	OIL
OK310810010090_10	Rush Creek	Garvin	433109	ZZ433109	ROBERT A HEFNER JR HOFFMAN		8/9/1958				34.71637	-97.2401		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	119756	4921939	PHARAOH	DON J LEEMAN	3/5/1982	3/29/1982	4/11/1982		34.74397	-97.391		OIL
OK310810010090_10	Rush Creek	Garvin	119765	4921164	ALLEN	SINDLEE OIL SERVICE INC	11/15/1978	11/20/1978	12/8/1978		34.74742	-97.3911		SERVICE WELL

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OK310810010090_10	Rush Creek	Garvin	443846	4923905	CRULL	WILLIAM W LONDON	5/30/1995	6/8/1995		6/8/1995	34.68201	-97.2992		DRY
OK310810010090_10	Rush Creek	Garvin	119773	4939511	EDWARD BYNUM	GULF OIL CORP	9/11/1948	10/31/1948			34.74191	-97.3867		DRY
OK310810010090_10	Rush Creek	Garvin	119779	4920666	MINERVA	MAGNESS PETROLEUM CO	6/9/1973	6/27/1973		6/27/1973	34.75185	-97.3757		DRY
OK310810010090_10	Rush Creek	Garvin	119822	4920687	WILLIE SMITH	CORE OIL & GAS CORP	1/20/1980	2/1/1980	3/3/1980		34.73641	-97.3604		OIL
OK310810010090_10	Rush Creek	Garvin	119839	4920847	MURRAY A	RHOADES OIL CO	11/16/1975	12/2/1975		12/6/1975	34.72737	-97.367		DRY
OK310810010090_10	Rush Creek	Garvin	119988	4921658	MCCASKILL	SOUTHERN OK PRODUCTION CO	6/8/1981	7/2/1981			34.72301	-97.407		OIL
OK310810010090_10	Rush Creek	Garvin	119991	4921593	RICHARDSON	WOODS PETROLEUM CORP	4/2/1981	4/7/1981	9/12/1981		34.71187	-97.4175		OIL
OK310810010090_10	Rush Creek	Garvin	120008	4921913	SEARCY	MAHAN-ROWSEY INC	1/21/1982	2/3/1982	3/9/1982		34.71646	-97.3725		OIL
OK310810010090_10	Rush Creek	Garvin	120014	4921869	SEARCY	SHEBESTER INC	3/15/1985	3/22/1985	3/29/1985		34.71194	-97.3758		GAS
OK310810010090_10	Rush Creek	Garvin	120022	4939391	MINNIE A TETER	SINCLAIR PRAIRIE OIL CO	5/26/1948	6/27/1948			34.72368	-97.3866		DRY
OK310810010090_10	Rush Creek	Garvin	120031	4900327	BIFFLE B	CITIES SERVICE OIL CO	9/2/1948	10/8/1948			34.72007	-97.3648		DRY
OK310810010090_10	Rush Creek	Garvin	503210	4924018	FREEMAN	LEEMAN ENERGY CORP	12/11/1996	12/20/1996	1/3/1997		34.74914	-97.3735		OIL
OK310810010090_10	Rush Creek	Garvin	505122	4921467	RICHARDSON	SPECIAL ENERGY CORP	10/22/1980	12/1/1980			34.70827	-97.4196		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	120048	4923345	GORDEN	T L COX INVESTMENTS INC	6/2/1988	6/16/1988		6/16/1988	34.70198	-97.3692		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	120071	ZZ120071	BIG-MAC	JACK RICHARDS	3/8/1980	3/13/1980		3/13/1980	34.70196	-97.3976	9/10/1980	DRY
OK310810010090_10	Rush Creek	Garvin	120157	4939312	WEBER-MORPHEW	DEVONIAN OIL CO	8/26/1947	9/21/1947	9/26/1947		34.69459	-97.4261		OIL
OK310810010090_10	Rush Creek	Garvin	120197	4921285	D J CASSELL	GRACE PETROLEUM CORP	11/11/1979	12/29/1979		12/29/1979	34.69471	-97.3692		DRY
OK310810010090_10	Rush Creek	Garvin	583966	4921060	MURRAY	PANTHER OPERATING L L C	3/10/1978	3/28/1978	5/4/1978		34.73008	-97.3549		OIL
OK310810010090_10	Rush Creek	Garvin	618218	4900007	TOOMAN	KIRKPATRICK OIL CO	7/28/1955	8/16/1955			34.74003	-97.3324	12/7/1955	DRY
OK310810010090_10	Rush Creek	Garvin	10001740	4920411	CARNELL #1 SWD		5/5/1969	5/20/1969	6/9/1969		34.74031	-97.3668		SERVICE WELL
OK310810010090_10	Rush Creek	Garvin	10001865	4924574	HOLMES	RANKEN ENERGY CORPORATION	10/6/2006	10/26/2006		10/30/2006	34.74907	-97.3855		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	241622	4923567	EVANS	LASMO ENERGY CORP	12/12/1990	12/30/1990	2/7/1991		34.69098	-97.3058		OIL
OK310810010090_10	Rush Creek	Garvin	433106	ZZ433106	DORDEYN						34.71637	-97.2359		NOT REPORTED
OK310810010090_10	Rush Creek	Garvin	439297	4900945	BARNEY	KEITH F WALKER OIL & GAS CO L L C	1/3/1995	1/19/1995		1/19/1995	34.73276	-97.2839		DRY
OK310810010090_10	Rush Creek	Garvin	512038	4924077	ARTHUR D	SPECIAL ENERGY CORP	10/17/1997	11/3/1997	11/25/1997		34.70672	-97.4145		OIL
OK310810010090_10	Rush Creek	Garvin	602363	4924404	SHAMLEY	RANKEN ENERGY CORP	11/15/2003	11/17/2003	3/27/2004		34.73703	-97.3335		OIL
OK310810010090_10	Rush Creek	Garvin	618215	4939405	HURST	CITIES SERVICE OIL CO	3/30/1953	4/21/1953			34.72188	-97.345	6/2/1953	DRY
OK310810010090_10	Rush Creek	Garvin	622534	4924484	WILEY POST	JASMINE INC	7/12/2005	8/1/2005	9/3/2005		34.73423	-97.3714		OIL
OK310810010090_10	Rush Creek	Garvin	10000884	4924644	SWAGSU	CHAPARRAL ENERGY, L.L.C.	12/2/2007	12/14/2007	2/8/2008		34.69636	-97.4254		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10000884	4924734	BAGWELL (WARD)	RANKEN ENERGY CORPORATION	3/5/2009	3/29/2009	5/18/2009		34.71876	-97.3325		UNKNOWN

WBIDSEGID	Reach Name	County Name	GIS ID	API Well Number	Well Name	Well Operator	Drill Start Date	Drill End Date	Date of First Production	Plug Date	Latitude	Longitude	Plug End Date	Well Characterization
OK310810010090_10	Rush Creek	Garvin	10001280	4924571	MCDANIEL	RANKEN ENERGY CORPORATION	9/4/2006	9/28/2006		3/6/2007	34.73713	-97.381		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001280	4924581	RUSH CREEK	COMBINED RESOURCES CORPORATION	11/5/2006	11/16/2005	6/6/2007		34.73935	-97.3676		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001865	4924597	SWAGSU 247		5/27/2007	6/10/2007	7/2/2007		34.69437	-97.4208		GAS
OK310810010090_10	Rush Creek	Garvin	10001865	4924602	JAMIE	JASMINE, INC.	11/23/2007	12/6/2007	3/19/2008		34.71575	-97.3091		UNKNOWN
OK310810010090_10	Rush Creek	Garvin	10001865	4924610	HAMILTON	RANKEN ENERGY CORPORATION	5/25/2007	6/18/2007	8/12/2007		34.7403	-97.3823		UNKNOWN