OKLAHOMA GEOLOGICAL SURVEY
G. Randy Keller, *Director*

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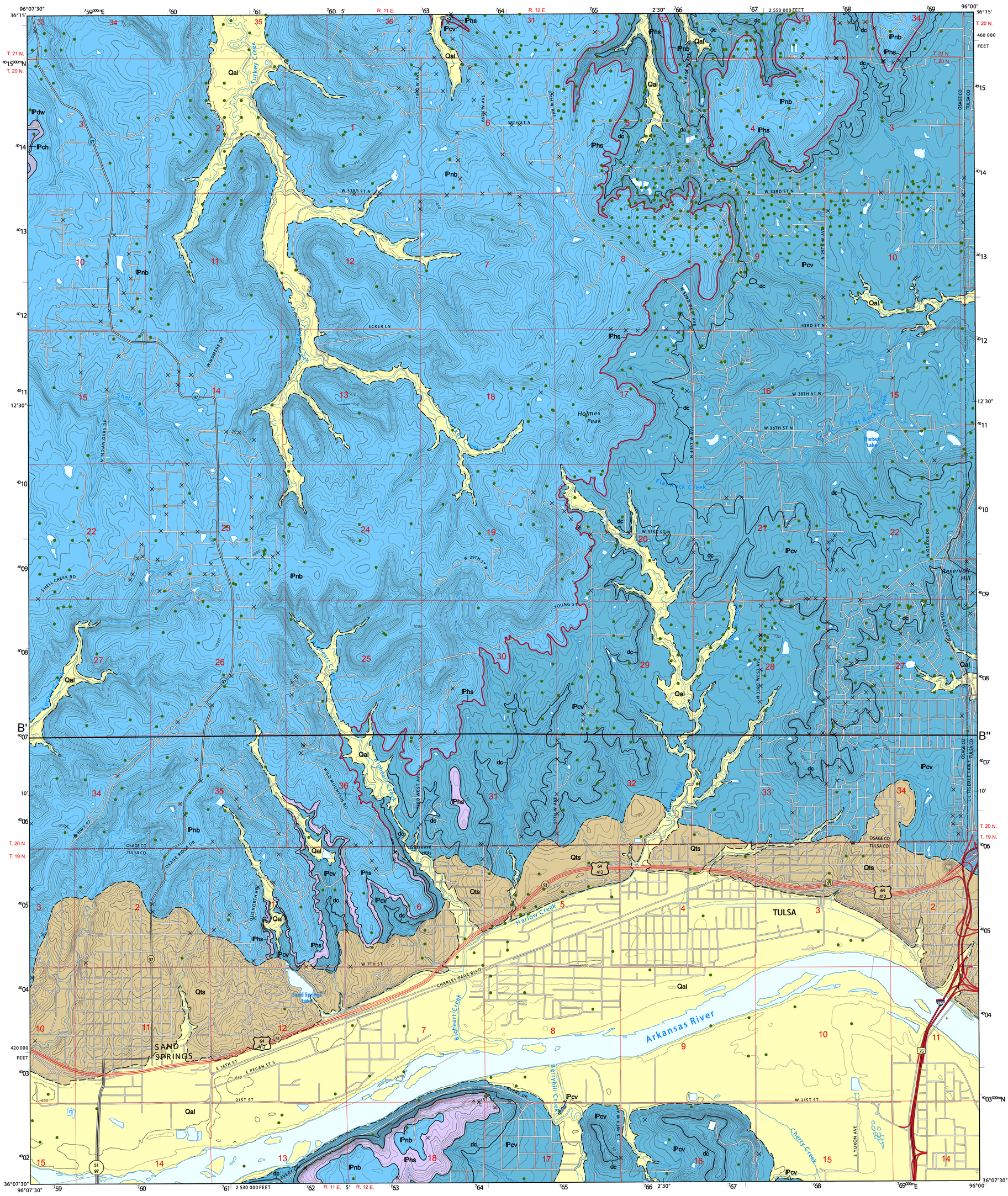
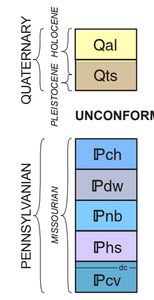


CORRELATION OF MAP UNITS



DESCRIPTION OF UNITS*

Qal — ALLUVIUM (Holocene)—Clay, silt, sand, and gravel in channels and on flood plains of modern streams. Includes terrace deposits of similar composition located directly above and adjacent to modern channels and flood plains. Thickness: 0 to about 30 ft.

Qts — UPPER TERRACE SANDS (Holocene and Pleistocene)—Extensive deposits occur along the north bank of the Arkansas River, consisting mainly of unconsolidated fine- to very fine-grained quartz sand, silt, and wind-blown loess; little to no gravel-sized material observed. Thickness: 0 ft to as much as 100 ft.

IPch — CHANUTE FORMATION (Pennsylvanian, Missourian)—Mostly a grayish orange (10YR7/4), grayish orange pink (5YR7/2), pale yellowish brown (10YR6/2), to medium light gray (N6), laminated to blocky bedded, weakly calcareous, very silty clayshale to mudshale.
Only the basal 10-20 ft of formation exposed in quad.

IPdw — DEWEY FORMATION (Pennsylvanian, Missourian)—Consists of two, thin, slightly sandy limestone beds with an intervening shale and sandstone interval. Limestones are moderate red (5R4/6), moderate reddish brown (10R4/6), to dusky red (5R3/4), thin-bedded to locally laminated, sandy, fossiliferous packstone to rarely grainstone; grainstone texture more common in upper limestone bed; fossils dominated by small bivalves, high-spired gastropods, and crinoid debris. Thickness of both limestone beds average 2 ft, although upper limestone may achieve thicknesses in excess of 3 ft.
Intervening clastic interval mostly dark yellowish brown (10YR6/6) to moderate reddish brown (10R4/6), laminated, calcareous, fossiliferous clayshale, grading upward into very fine-grained, laminated sandstone and siltstone; large productid brachiopods common in shale interval.
Total thickness of formation about 40 ft.

IPnb — NELLIE BLY FORMATION (Pennsylvanian, Missourian)—Consists mostly of clayshale and mudstone, interbedded with some prominent sandstones, none of which can be easily separated into mappable units. Sandstones vary from yellowish gray (5Y7/2), dusky yellow (5Y6/4; when moist), pale yellowish orange (10YR8/6), grayish orange (10YR7/4), and pale greenish yellow (10Y8/2) when fresh; commonly dark yellowish orange (10YR6/6), although it may be moderate yellowish brown (10YR 54) or light brown (5Y5/6) weathered; all exhibit moderate induration, rarely friable, are quartz-rich, fine- to very fine-grained, and non-calcareous, although some bedding surfaces may be calcareous due to the precipitation of caliche. Fe-oxide spots, trace fossils, laminations and cross-laminations, ripple marks, and tool marks are common along bedding surfaces; mud clasts and pitting from weathering of mud clasts are sometimes observed, and soft-sediment deformation is rare. Some prominent sandstones do occur locally: an unnamed, 8-10 ft thick interval of thin- to medium-bedded (bedding 1-3 ft thick), homogenous sandstone occurs between 15 to 25 ft above the Hogshooter Formation. Another prominent sandstone, called the Shell Creek Sandstone occurs between 75 to 125 ft above the base. Good exposures of the Shell Creek Sandstone indicate a wide variety of lithologic textures, ranging from a thick bedded with thin clayshale, to a thin-bedded sandstone interval with appreciably more clayshale content. Other sandstones of even more local significance vary from laminated to medium-bedded, with planar to wavy bedding contacts.
Interbedded shales are a light olive gray (5Y5/2; 5Y6/1) to olive gray (5Y4/1), and consist predominantly of slightly silty claystones to mudstones, although clayshale textural bedding is not uncommon; paleosol development and curved slickenside fractures common in mudstone and claystone lithologies. Ironstone concretionary layers may be present within shales; concretions commonly moderate yellowish brown (10YR5/4) to moderate brown (5YR4/4) in color.
Thickness of formation about 365 ft.

IPhs — HOGSHOOTER FORMATION (Pennsylvanian, Missourian)—North of the north line of T. 19 N., the Hogshooter Formation is composed solely of the Winterset Limestone Member, a thin (< 2' thick) interval of whole fossil packstone, with lesser amounts of wackestone and carbonate mudstone textures. Fossils include abundant crinoid stems and ossicles, brachiopods, clams, bryozoans, corals, and algae. Packstone colors include light olive gray (5Y6/1), olive gray (5Y4/1), medium light gray (N6) and medium gray (N5). Weathered surfaces include dusky yellow (5Y6/4), moderate yellowish brown (10YR 5/4), and dark yellowish orange (10YR6/6). Ironstone nodules are sometimes observed. Carbonate mudstone is light olive gray (5Y6/1) and weathers grayish orange (10YR7/4), dark yellowish orange (10YR6/6), and light brown (5YR5/6), is well indurated, and contains few, if any, fossils; locally, carbonate mudstones may be slightly sandy or contain carbonaceous matter.
South of the north line of T. 19 N., the Hogshooter consists of the thin, Winterset Limestone Member, and an underlying member having variable thickness, called the Lost City Limestone. The Lost City is a medium light gray (N6) to medium gray (N5) fresh, locally weathered to a light brown (5YR5/6) or moderate yellowish brown (10YR5/4) color along fractures and bedding planes, whole-fossil to locally skeletal wackestone or carbonate mudstone; bedding medium to thick, varying from 3' to as much as 15' thick. Enclosed fossil assemblages similar to that of the Winterset Member. Member thickness varies from 3 thick near the north line of T. 19 N., to as much as 50 ft thick along the southernmost part of the quad.
Total thickness of the formation varies between 1' to 52' thick.

IPcv — COFFEYVILLE FORMATION (Pennsylvanian, Missourian)—Formation composed of a number of sandstone and shale intervals, the most prominent being the Dodds Creek Sandstone (base of which marked as 'dc' on map). Exposed thickness of the Coffeyville Formation ranges from 290-320 ft, base not exposed.
In ascending order the individual units include:
First, a basal, 15 ft thick interval of moderate yellowish brown (10YR5/4), slightly silty, non-calcareous clayshale; interval poorly exposed.
Second is a 65 ft thick interval of mostly ripple-bedded sandstone with local interbeds of siltstone, shale and limestone. Sandstones are weakly indurated due to a weak calcite or clay cement; fine- to very fine-grained; color a very pale orange (10YR8/2), grayish orange (10YR7/4), dusky yellow (5Y6/4), and light olive gray (5Y5/2) when fresh, and a moderate yellowish brown (10YR5/4) to dark yellowish brown (10YR4/2) weathered; bedding varies from cross-laminated, to thin- and medium-bedded (~ ½ -3 inches thick), with ripple-bedded upper and lower contacts; thinner bedded sandstones commonly show lenticular bedding and mud drapes; impressions of weathered mud clasts, horizontal trace fossils, and crinoid stems may occur locally; thickness of most sandstone-dominated intervals range from 8 to 10 ft, and are separated by 3 to 5 ft thick intervals of very silty clayshale and claystone interlaminated with siltstone. Thin (~ 1 to 1 ½ ft thick) limestone beds occurring within clayshale intervals in the northern part of quad; limestone texturally a packstone with abundant crinoid stems and ossicles of variable size.
Next, is a 25 to 100 ft thick interval of light olive gray (5Y6/1) to yellowish gray (5Y7/2); bedding well-laminated to fissile, rarely blocky, slightly silty clayshale. Local interbeds of fine-grained sandstone also occur and are more common where this interval crops out south of the Arkansas River. Texturally, these sandstone interbeds are similar to those of previous interval.
Dodds Creek Sandstone (dc): A 40 ft thick interval of distinctive very thin-bedded, cross-laminated, very fine-grained, silty sandstone and siltstone, with flaser bedded shale interlaminations. Sandstone and siltstone usually a yellowish gray (5Y7/2), very pale orange (10YR8/2), and grayish orange (10YR7/4), whereas the shale is light olive gray (5Y5/2). Commonly, the wavy- and cross-laminated siltstone sequence is overlain by thin- to very thinly-planar bedded (0.5"-3.0" thick) sandstone, which may thicken upwards. The wavy- and cross-laminated siltstone sequence, or the uniformly-bedded sequence may be overlain by thin- to thick-bedded, planar to slightly wavy and cross-bedded sandstones; this sandstone has irregular bedding thicknesses and appears to be interbedded with shale or siltstone that is sometimes not observable due to erosion.
The uppermost interval of the Coffeyville consists of about 25 ft of a dark yellowish brown (10YR4/2), moderate brown (5YR4/4), dark reddish brown (10R3/4), light olive gray (5Y6/1) to olive gray (5Y4/1), wavy laminated to fissile, silty clayshale, with interlaminae of siltstone, very fine-grained sandstone, and 3 coal interbeds; coal layers are thin, being 1" thick or less. Pieces of petrified Lepidodendron are observed within the shale intervals.

CHECKERBOARD LIMESTONE (Pennsylvanian, Missourian)—A dense skeletal to whole-fossil carbonate mudstone to wackestone; found only in the subsurface.

SEMINOLE FORMATION (Pennsylvanian, Missourian)—Formation consists of a lower sandstone interval, called the Tulsa Sandstone, and a basal and upper suite of interbedded with laminated, concretionary, silty clayshales, mudshales and siltstones. The Tulsa coal also occurs within the uppermost shale interval, just above the top of the Tulsa Sandstone; found only in the subsurface.

LOST BRANCH FORMATION (Pennsylvanian, Desmoinesian)—Overall, a laminated, slightly calcareous, micaceous, silty clayshale, phosphatic clayshale, and thin limestone beds; found only in the subsurface.

MEMORIAL FORMATION (Pennsylvanian, Desmoinesian)—Interbedded sandstones and shales with prominant coal bed at top; found only in the subsurface.

LENAPAH LIMESTONE (Pennsylvanian, Desmoinesian)—A thin, skeletal to whole fossil wackestone to packstone textured limestone; found only in the subsurface.

NOWATA FORMATION (Pennsylvanian, Desmoinesian)—A blocky bedded to weakly laminated, slightly silty, concretionary clayshale; found only in the subsurface.

OOLOGAH FORMATION (Pennsylvanian, Desmoinesian)—A thin- to medium-bedded, skeletal carbonate mudstone to wackestone; found only in the subsurface.

LABETTE FORMATION (Pennsylvanian, Desmoinesian)—A laminated, very silty to sandy, micaceous, concretionary clayshales, interbedded with fine-grained sandstones near top; found only in the subsurface.

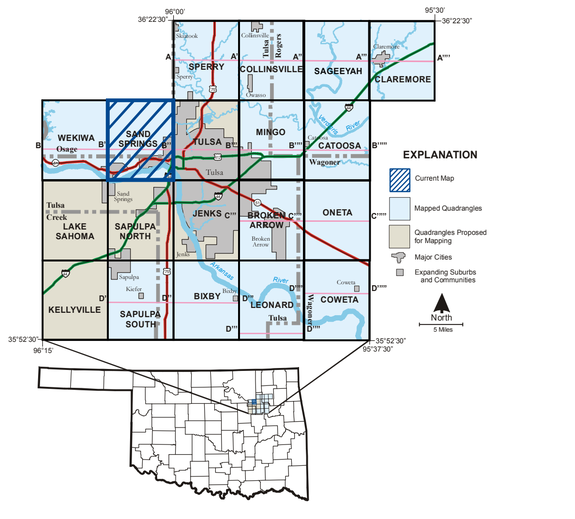
FORT SCOTT FORMATION (Pennsylvanian, Desmoinesian)—Thin to medium, wavy bedded whole-fossil wackestones and mudstones, interbedded with fissile, phosphatic clayshale; found only in the subsurface.

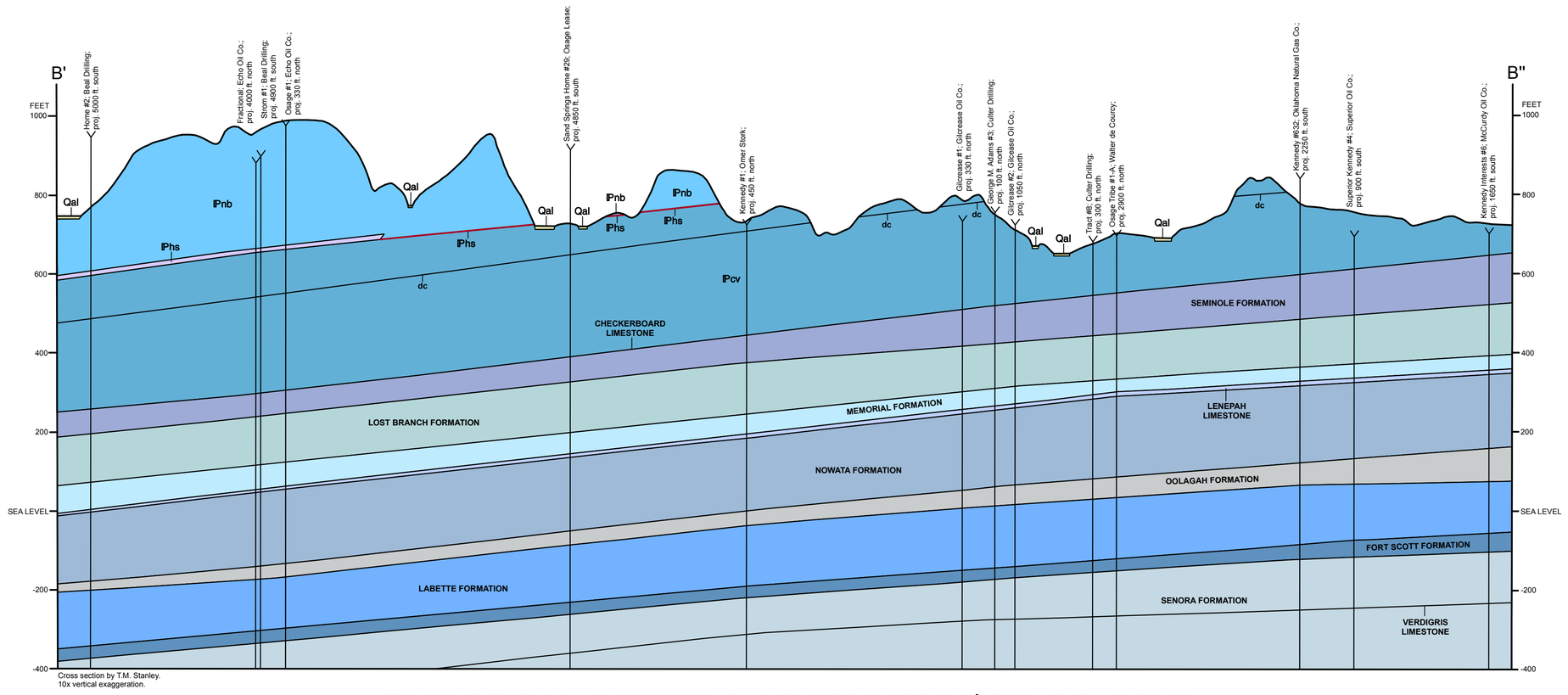
SENORA FORMATION (Pennsylvanian, Desmoinesian)—Complex sequence of silty and concretionary clayshale, interbedded with very fine-grained sandstones and siltstones; includes the Verdigris Limestone; found only in the subsurface.

*Detailed descriptions only include mappable units observed in the field. Formal member and bed names are indicated by capitalization (i.e., Glenpool Limestone), while informal names are given in lowercase (i.e., Nowata flagstone). Color of units based on fresh surfaces, unless stated otherwise.

SYMBOLS

- Unit contact; dashed where approximate
- Outcrop, geologic observation
- Petroleum well. Includes oil, gas, oil and gas, dry service (water supply or injection), junked and abandoned, unknown. Modified from Natural Resources Information System database
- Drill hole with well number, lessee, and projection (cross section only)





Cross section by T.M. Stanley.
10x vertical exaggeration.

GEOLOGIC MAP OF THE SAND SPRINGS 7.5′ QUADRANGLE, OSAGE AND TULSA COUNTIES, OKLAHOMA

Julie M. Chang and Thomas M. Stanley

2010

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Base map modified from the United States Geological Survey US Topo map of the Sand Springs quadrangle, dated 2010. North American Datum of 1983 (NAD83). World Geodetic System of 1984 (WGS84). Projection and 1,000-meter grid: Universal Transverse Mercator, Zone 14S. 10,000-foot ticks: Oklahoma Coordinate System of 1983 (north zone). Roads from the National Transportation Dataset, 2004-2007. Geographic names from Geographic Names Information System, 2008. Hydrography from National Hydrography Dataset, 2008. Elevation contours from National Elevation Dataset, 2008.