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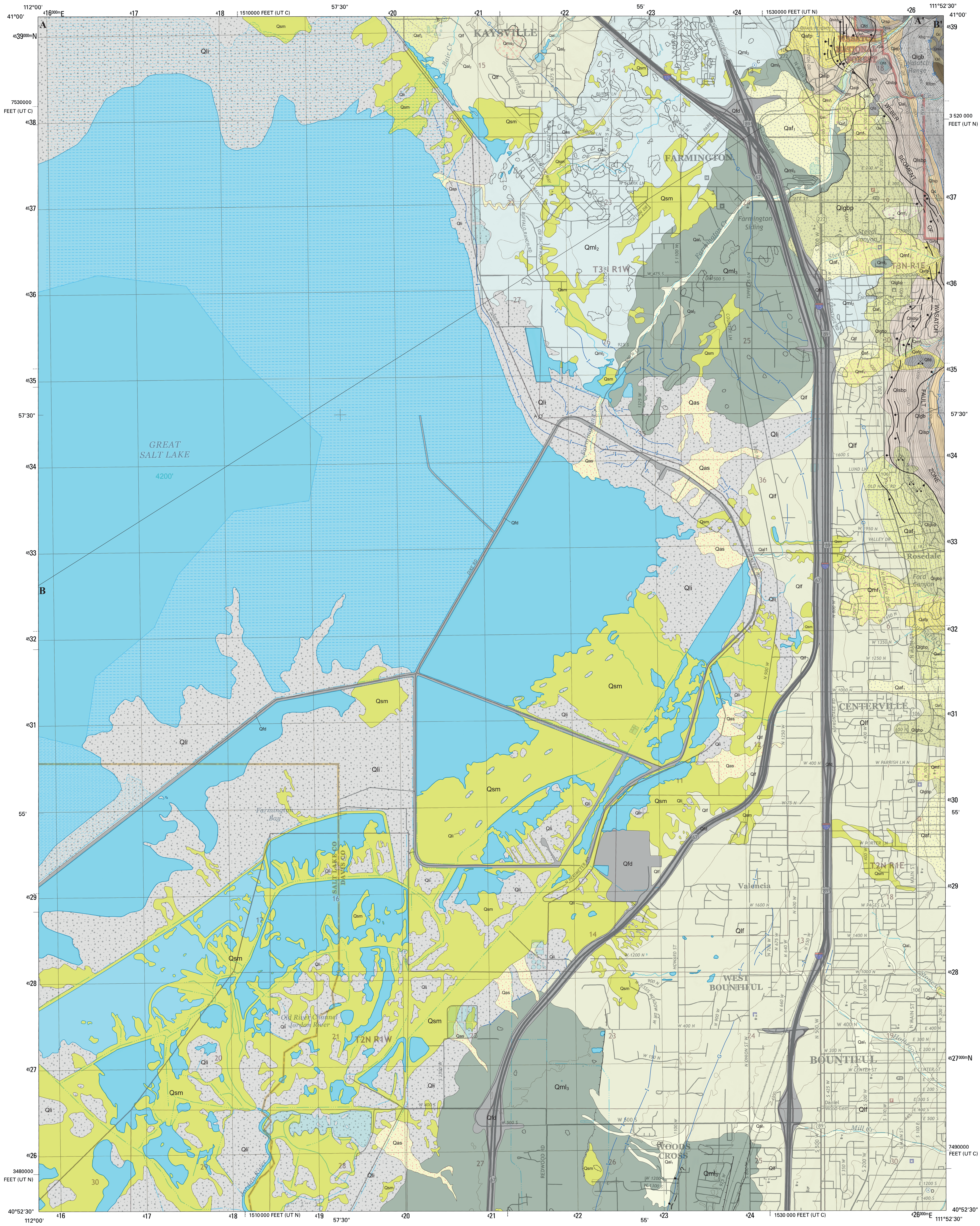

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SCALE 1:24,000
1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
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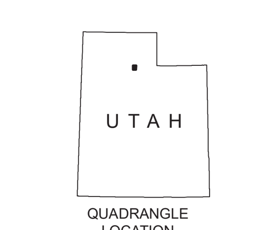
CONTOUR INTERVAL 20 FEET

11°46'
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 2018



QUADRANGLE LOCATION

GEOLOGIC MAP OF THE FARMINGTON QUADRANGLE, SALT LAKE AND DAVIS COUNTIES, UTAH

by

Mike Lowe[2], Stefan M. Kirby[1], and Kimm M. Harty[2]

2018

[1]Utah Geological Survey, P.O. Box 146100, Salt Lake City, UT 84114-6100
[2]Utah Geological Survey, retired

Base from USGS Farmington 7.5' Quadrangle (2017)
Projection: UTM Zone 12
Datum: NAD 1983
Geology mapped in 2006 and 2012

Project Manager: Adam P. McKean
GIS and Cartography: Martha L. Jensen and Jay C. Hill

Utah Geological Survey
1594 West North Temple, Suite 3110
P.O. Box 146100, Salt Lake City, UT 84114-6100
(801) 537-3300
geology.utah.gov

1	2	3
4		5
6	7	8

1. Clearfield
2. Kaysville
3. Peterson
4. Saltair NE
5. Bountiful Peak
6. Baileys Lake (formerly Saltair)
7. Salt Lake City North
8. Fort Douglas

ADJOINING 7.5' QUADRANGLE NAMES

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DESCRIPTION OF MAP UNITS

QUATERNARY

Alluvial deposits

Qal1 — **Younger stream alluvium** (upper Holocene) – Clast-supported, moderately to well-sorted pebble and cobble gravel, gravelly sand, and silty sand deposited in modern channels and floodplains; clasts subangular to rounded; deposited where fluvial processes are currently or episodically active; locally includes minor alluvial-fan, colluvial, and terrace deposits; thickness generally less than 6 meters (20 ft).

Qal2 — **Older stream alluvium** (middle Holocene to upper Pleistocene) – Clast-supported, moderately sorted pebble and cobble gravel, gravelly sand, and silty sand deposited along inactive floodplains 1 to 3 meters (3-10 ft) above modern stream level; clasts subangular to rounded; mapped along Haight Creek and adjacent drainages in the northern part of the quadrangle where fluvial processes are generally no longer active; thickness generally less than 6 meters (20 ft).

Qalp — **Stream alluvium related to the Provo shoreline and regressive phase of Lake Bonneville** (upper Pleistocene) – Clast-supported, moderately to well-sorted pebble and cobble gravel, gravelly sand, and silty sand; deposited along inactive floodplains more than 3 meters (10 ft) above modern stream level; mapped where fluvial processes are generally no longer active; exposed thickness less than 6 meters (20 ft).

Qaf1 — **Younger alluvial-fan deposits** (upper Holocene) – Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; forms fans, locally with distinct levees and channels, at mouths of mountain-front canyons; exposed thickness less than 6 meters (20 ft).

Qaf2 — **Older alluvial-fan deposits** (middle Holocene to upper Pleistocene) – Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; forms fans that are slightly incised by modern stream channels; exposed thickness less than 6 meters (20 ft).

Qafp — **Alluvial-fan deposits related to the Provo shoreline and regressive phase of Lake Bonneville** (upper Pleistocene) – Mixture of gravel and sand deposited by streams, and diamicton deposited by debris flows; forms fans graded approximately to the Provo level of Lake Bonneville that are incised by modern stream channels; exposed thickness less than 6 meters (20 ft).

Artificial deposits

Qfd — **Fill and disturbed land** (historical) – Land disturbed and excavated through aggregate (sand and gravel) operations and construction of Interstate highways, highway interchanges, and Farmington Bay dikes.

Colluvial deposits

Qc — **Colluvium** (Holocene to middle Pleistocene) – Weakly to non-layered, variably sorted, matrix- to clast-supported silt, sand, clay, and minor gravel of local origin; deposits formed mostly by creep and slope wash; includes hill-slope deposits of angular cobble to pebble-sized clasts of Farmington Canyon Complex float; thickness probably less than 3 meters (10 ft) in most areas.

Wetland and marsh deposits

Qsm — **Wetland and marsh deposits** (Holocene) – Wet, fine-grained, organic-rich sediment associated with springs, wetlands, ponds and seeps; thickness probably less than 1 meter (3 ft) in most areas.

Mass-movement deposits

Qmf1 — **Debris-flow deposits** (upper Holocene) – Matrix- to clast-supported cobble and boulder gravel, with variable amounts of sand, silt, and clay matrix; surfaces variably rubbly and commonly have levees and channels; thickness probably less than 9 meters (30 ft).

Qmf2 — **Older debris-flow deposits** (middle to lower Holocene) – Matrix- to clast-supported cobble and boulder gravel, with variable amounts of sand, silt, and clay matrix; surfaces variably rubbly and commonly have levees and channels; includes multiple events graded to various levels above modern channels; unit grades into alluvial fans at mouths of canyons; thickness probably less than 9 meters (30 ft).

Qml2 — **Liquefaction-induced landslide deposits** (Holocene) – Mixture of silt, fine sand, and minor gravel redeposited in flow slides and lateral spreads (the northern part of the Farmington Siding landslide complex) as a result of liquefaction during large earthquakes; deposits display landslide-related lineaments, scarps, and hummocky topography; disrupted bedding and sand-filled cracks (injection features) are present in the deposits in the subsurface (Hylland and Lowe, 1998; Harty and Lowe, 2003); thickness generally less than 22 meters (70 ft). Most recent movement between 2700 and 4500 cal yr B.P.

Qml3 — **Older liquefaction-induced landslide deposits** (lower Holocene to upper Pleistocene) – Mixture of silt, fine sand, and minor gravel redeposited in flow slides and lateral spreads (the southern part of the Farmington Siding landslide complex) as a result of liquefaction during large earthquakes; deposits display landslide-related lineaments, scarps, and hummocky topography that are more subdued than similar features found in the northern part of the landslide complex (Hylland and Lowe, 1998; Harty and Lowe, 2003); thickness less than 22 meters (70 ft). Most recent movement between 11,500 and 13,000 cal yr B.P.

Qms1 — **Landslide deposits** (upper Holocene) – Unsorted, unstratified mixtures of gravel, sand, silt, and clay redeposited by slides, slumps, and flows; deposits display distinctly hummocky topography and fresh scarps, and are currently or have been recently active; thickness generally less than 15 meters (50 ft).

Qms2 — **Older landslide deposits** (middle to lower Holocene) – Unsorted, unstratified mixtures of mostly sand, silt, and clay redeposited by single to multiple slides, slumps, and flows; deposits display hummocky topography but lack fresh scarps and are mostly inactive; thickness generally less than 15 meters (50 ft).

Lacustrine deposits

Qli — **Lacustrine silt and clay deposits** (Holocene) – Silt and clay with minor sand deposited in mud flats and exposed by fluctuating Great Salt Lake levels; may contain gypsum, halite, and other salts; thickness typically less than 3 meters (10 ft).

Qlf — **Lacustrine fine-grained deposits** (upper Pleistocene) – Intervals of mixed fine-grained sediment, clay to silt, and intervals of rhythmically interbedded fine to medium sand deposited in low-energy, generally offshore environments at elevations below the Provo shoreline; thickness typically less than 6 meters (20 ft).

Qlsp — **Lacustrine sand-bearing deposits related to the Provo shoreline and regressive phase of Lake Bonneville** (upper Pleistocene) – Moderately to well-sorted gravelly sand, interlayered with some silt and sand; deposited and reworked in higher energy environments along the Provo and regressive shorelines near the mountain front; mapped at elevations below Provo shoreline; thickness typically less than 6 meters (20 ft).

Qlsbp — **Lacustrine sand-bearing deposits related to transgressive and regressive phases of Lake Bonneville** (upper Pleistocene) – Moderately to well-sorted gravelly sand, interlayered with some silt and sand; deposited and reworked in higher energy environments near the mountain front; mapped at elevations below Provo shoreline; thickness typically less than 6 meters (20 ft).

Qlgbp — **Lacustrine gravel-bearing deposits related to transgressive and regressive phases of Lake Bonneville** (upper Pleistocene) – Sand and clast-supported, moderately sorted pebble to cobble gravel, mapped below the Provo shoreline; gravels contain rounded to subrounded clasts, and some subangular clasts derived from reworking of mass-movement and alluvial-fan deposits; deposited in higher energy environments along shorelines; thickness generally less than 9 meters (30 ft).

Qlgb — **Lacustrine gravel-bearing deposits related to the Bonneville shoreline and transgressive phase of Lake Bonneville** (upper Pleistocene) – Clast-supported, moderately to well-sorted pebble to cobble gravel, with some silt to sand in interfluve areas and away from mountain front; gravels contain rounded to subrounded clasts, and some subangular clasts derived from reworking of mass-movement and alluvial-fan deposits; deposited in higher energy environments along shorelines during Lake Bonneville transgression; thickness generally less than 9 meters (30 ft).

Mixed-environment deposits

Qas — **Mixed alluvial and marsh deposits** (Holocene) – Predominantly fine-grained sediment (sand, silt, and clay) deposited by low-gradient streams and in marshes; total thickness typically less than 6 meters (20 ft).

Q — **Quaternary unconsolidated basin fill** (Holocene to Pleistocene) – Unconsolidated mixture of lacustrine and alluvial clay, silt, sand, gravel, marl, and tuffaceous layers; shown only on cross sections; up to 150 meters (500 ft) thick.

Qb — **Quaternary basin fill** (Pleistocene) – Weakly consolidated mixture of lacustrine and alluvial clay, silt, sand, gravel, marl, and tuffaceous layers; shown only on cross sections; up to 400 meters (1300 ft) thick.

Tb — **Tertiary basin fill** (Tertiary) – Weakly to strongly consolidated mixture of conglomerate, sandstone, mudstone, tuffaceous sandstone, tuff, and lacustrine limestone; shown only on cross sections; up to 2400 meters (8000 ft) thick.

PALEOPROTEROZOIC

Xfcg — **Farmington Canyon Complex quartz-rich gneiss** (Paleoproterozoic) – Medium- to light-gray, moderately foliated and layered, quartzo-feldspathic gneiss. Unit is characterized by quartz, feldspar, hornblende, and biotite gneiss, with garnet porphyroblasts; unit also contains zones of migmatite, pegmatitic dikes, amphibolite layers, biotite-rich schist, and mylonite. Unit forms rubble-strewn cliffs and steep slopes along Farmington Canyon and to the south along the mountain front. Age of metamorphism is ~1700 Ma (Nelson and others, 2002; Mueller and others, 2011; Nelson and others, 2011).

Xfcm — **Farmington Canyon Complex pegmatitic gneiss** (Paleoproterozoic) – Light-gray, weakly to moderately foliated, pegmatitic gneiss. Unit consists of quartzo-feldspathic pegmatite gneiss with minor biotite mica and secondary chloritic alteration. Unit may contain relatively unfoliated pegmatite bands and pods, and zones of moderately foliated interlayered pegmatite and quartz-rich gneiss. Unit is inset in quartz-rich gneiss (Xfcg) exposures south of Farmington Canyon. Age of metamorphism is ~1700 Ma (Nelson and others, 2002; Mueller and others, 2011; Nelson and others, 2011).

Xfc — **Farmington Canyon Complex, undifferentiated** (Paleoproterozoic) – Medium- to light-gray, moderately foliated and layered, quartzo-feldspathic gneiss and quartzo-feldspathic pegmatite gneiss; shown only on cross sections.

Table 2. *Ages of major shoreline occupations of Lake Bonneville, Gilbert episode, and Great Salt Lake with shoreline elevations in the Farmington quadrangle.*

Lake Cycle and Phase	Shoreline (map symbol)		Age: radiocarbon years (^{14}C yr B.P.)	Age: calibrated years (cal yr B.P.)[1]	Shoreline Elevation feet (meters)
Lake Bonneville					
Transgressive phase	Stansbury shorelines		22,000–20,000[2]	26,000–24,000	Not recognized[3]
	Bonneville (B)	flood	~15,200–15,000[4]	~18,500–18,000	5180–5200 (1580–1585)
Overflowing phase	Provo (P)		~15,000–12,600[5]	18,000–15,000	4820–4860 (1470–1482)
Regressive phase	Regressive shorelines (r, I)		~12,600–11,500[5]	15,000–13,000	4380–4820 (1335–1470)
Gilbert episode	Gilbert (G)		10,000[6]	11,500	~4250 (1295)
Great Salt Lake					
	early Holocene highstand		9700–9400[7]	11,000–10,500	Not recognized
	late Holocene highstand		4200–2100[8]	5000–2000	4217–4221 (1285–1287)
	Historical highstand			late 1860s to early 1870s and 1986–87[9]	4212 (1284)

[1]All calibrations made using OxCal ^{14}C calibration and analysis software (version 4.3.2; Bronk Ramsey, 2009; using the IntCal13 calibration curve of Reimer and others, 2013), rounded to the nearest 500 years.
[2] Oviatt and others (1990)
[3]The Stansbury shoreline formed at elevations of about 4440 to 4450 feet (1350–1360 m), which are present in the quadrangle, but the shoreline was either weakly developed or poorly preserved and cannot be identified.
[4]Oviatt (2015), Miller (2016), and references therein
[5]Godsey and others (2005, 2011), Oviatt (2015), Miller (2016) for the timing of the occupation of the Provo shoreline and subsequent regression of Lake Bonneville to near Great Salt Lake level. Alternatively, data in Godsey and others (2005) may suggest that regression began earlier, shortly after 16.5 cal ka (see sample Beta-153158, with an age of 13,660 ± 50 ^{14}C yr B.P. [16.5 cal ka] from 1.5 m below the Provo shoreline). Also, lacustrine carbonate deposits in caves reported by McGee and others (2012) seem to support an earlier Lake Bonneville regression beginning around 16.4 cal ka.
[6]Gilbert-episode highstand may have been very short lived; age represents lake culmination (Oviatt and others, 2005; Oviatt, 2014).
[7]Murchison (1989), Currey and James (1982)
[8]Miller and others (2005)
[9]Arnow and Stephens (1990)

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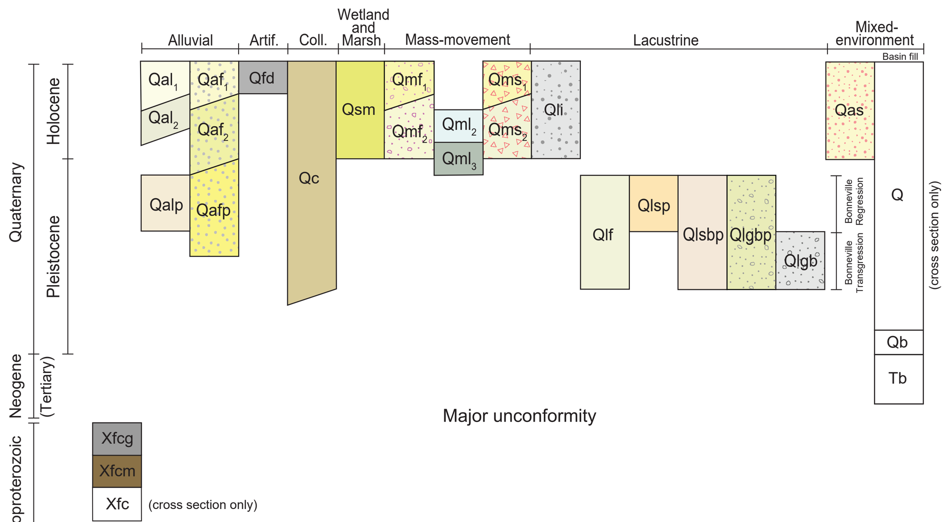
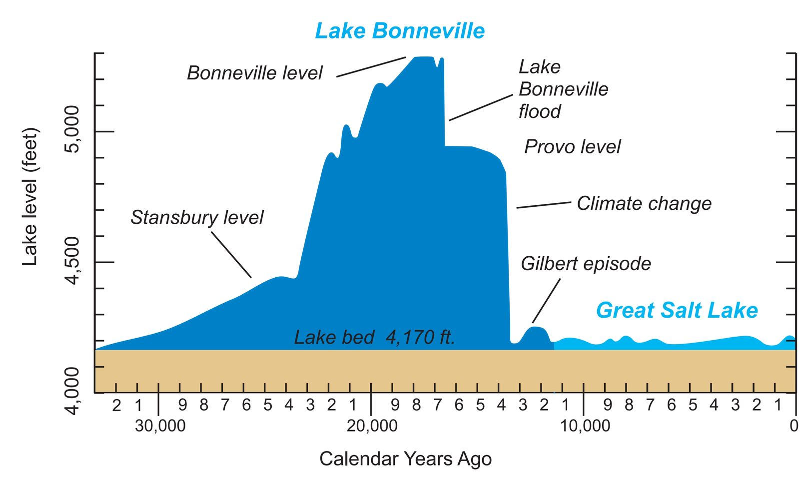
CORRELATION OF MAP UNITS





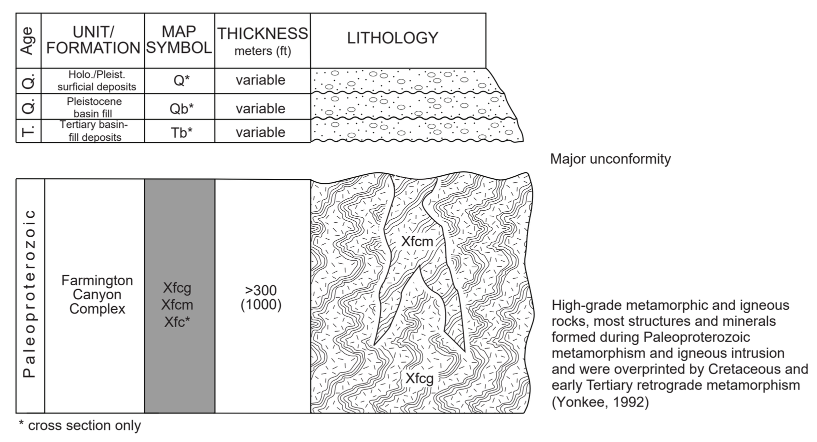
Rise and fall of Lake Bonneville between about 28 and 13.5 ka, and of Great Salt Lake (modified from Oviatt, 1997; Murchison and Mulvey, 2000; and Godsey and others, 2005). Elevations have been adjusted to remove effects of isostatic rebound. Holocene portion of hydrograph is largely schematic.

Table 1. *Well location is shown on geologic map. Depth is the total depth of well in feet. WR location corresponds to the water right location in the Utah Division of Water Rights database available at http://www.waterrights.utah.gov/wellinfo/default.asp. API number corresponds to petroleum well logs available at http://www.ogm.utah.gov/. Location data projection: UTM 12 N NAD 1927.*

WELL DATA

Well ID	Depth (ft)	Location	API or WR Location	Bottom Lithology
A	3525	111°55'47.711" W 40°57'29.605" N	4301110041	Tertiary basin fill
B	985	111°56'35.31" W 40°59'59.341" N	S840 E1334 NW 15 T3N R1W	unconsolidated deposits
C	910	111°54'1.207" W 40°59'41.708" N	N100 W2579 E4 13 T3N R1W	unconsolidated deposits
D	520	111°52'36.133" W 40°52'37.861" N	S2485 W1525 NE 30 T2N R1E	unconsolidated deposits

LITHOLOGIC COLUMN



MAP SYMBOLS

Contact, dashed were approximately located, dotted where concealed

Normal fault, dashed where approximately located, dotted where concealed; queried where uncertain; bar and ball on down-dropped side where known; arrows on cross section indicate direction of relative movement

Landslide scarp, dotted where visible on 1952 aerial photographs but concealed by later urban development

Topographic depression, some visible on older aerial photographs, some obscured by later urban development

Hummock or hill, some visible on older aerial photographs, some obscured by later urban development

Gravel pit

Oil well, plugged and abandoned

Water well (letter corresponds to well ID in table 1)

Shorelines —

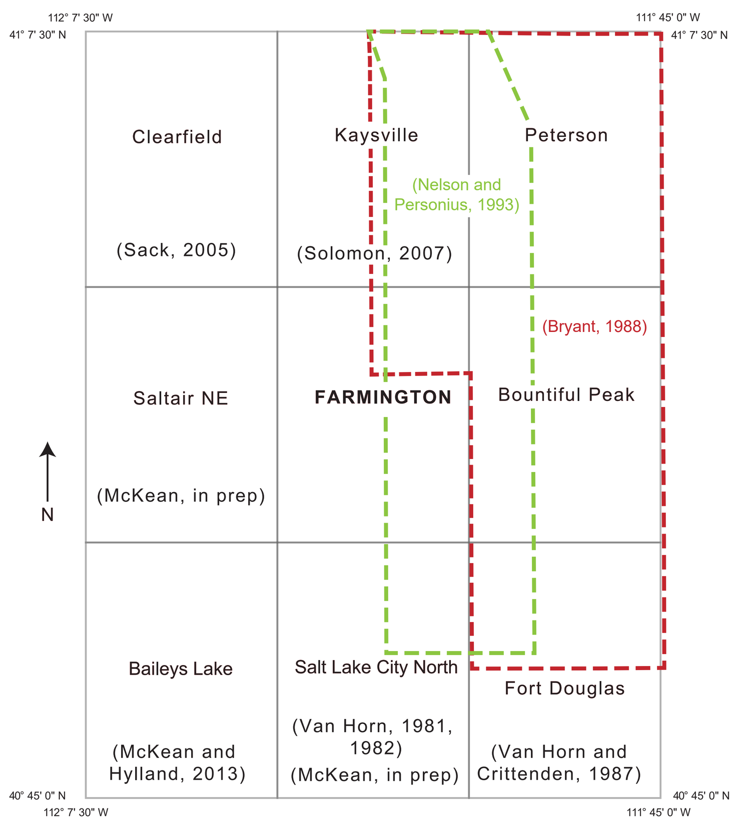
B — Bonneville shoreline

P — Provo shoreline

r — Intermediate regressional shoreline

G — Gilbert shoreline

I — Holocene intermediate shoreline

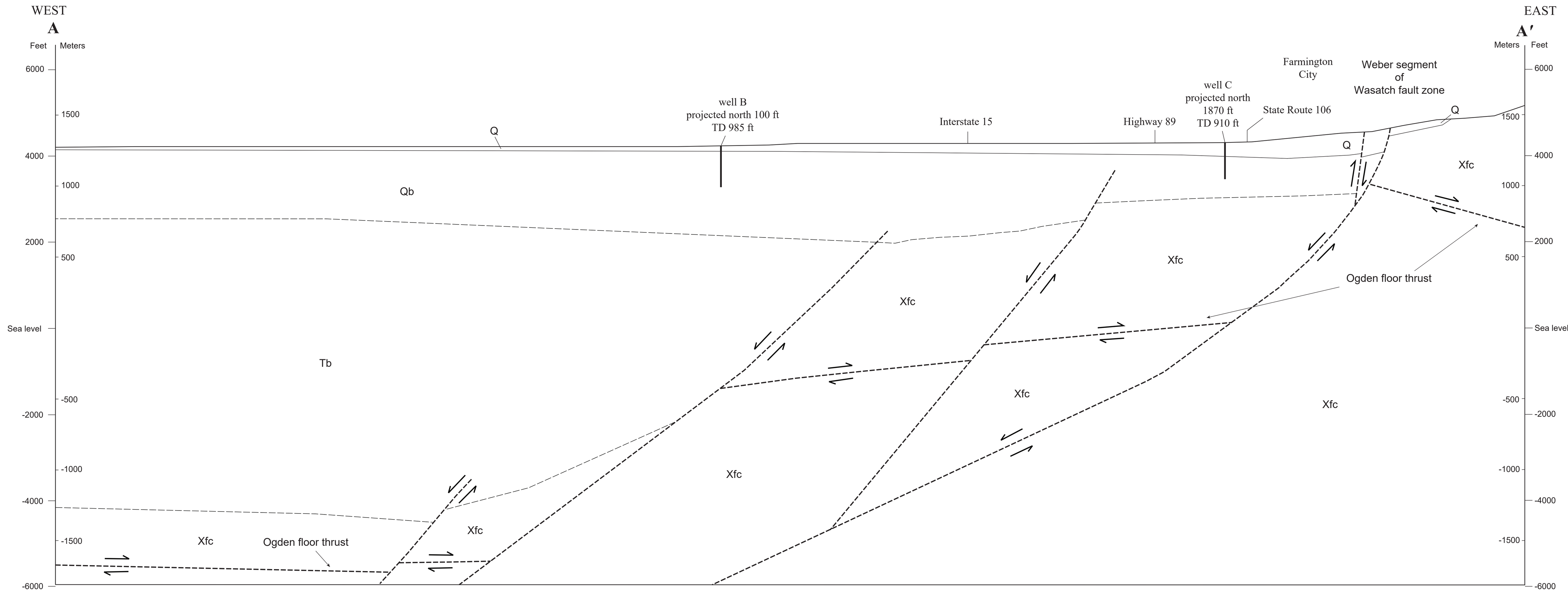


Index of select adjoining geologic maps.

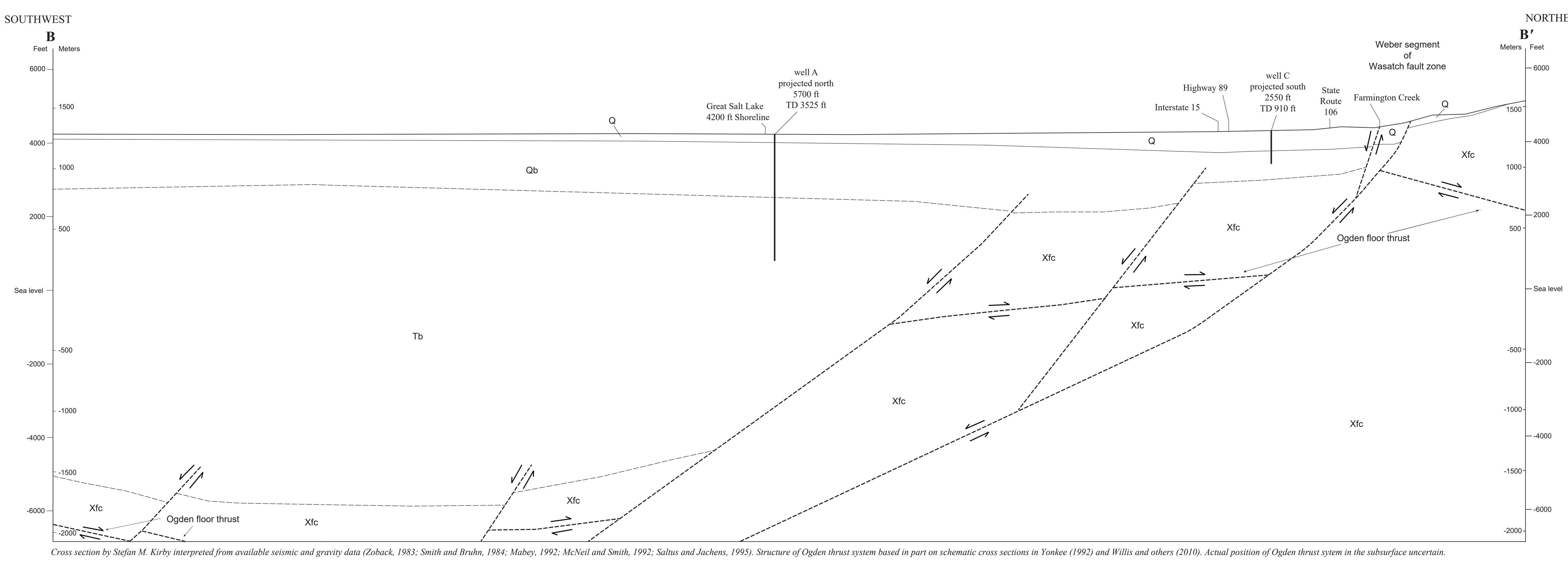
Mike Lowe examining exposure of Wasatch fault zone near the mouth of Davis Canyon just east of Farmington quadrangle.

View to the southwest across the Farmington quadrangle from near the mouth of Farmington Canyon. Banded gneiss typical of the Farmington Canyon Complex is in the foreground.

Damage caused in Farmington by 1983 Rudd Canyon debris flow.



Cross section located along northern map boundary. Cross section by Stefan M. Kirby interpreted from available seismic and gravity data (Zoback, 1983; Smith and Bruhn, 1984; Mabey, 1992; McNeil and Smith, 1992; Saltus and Jachens, 1995). Structure of Ogden thrust system based in part on schematic cross sections in Yonkee (1992) and Willis and others (2010). Actual position of Ogden thrust sytem in the subsurface uncertain.



Cross section by Stefan M. Kirby interpreted from available seismic and gravity data (Zoback, 1983; Smith and Bruhn, 1984; Mabey, 1992; McNeil and Smith, 1992; Saltus and Jachens, 1995). Structure of Ogden thrust system based in part on schematic cross sections in Yonkee (1992) and Willis and others (2010). Actual position of Ogden thrust sytem in the subsurface uncertain.