Water Treatment Cost and a Growing Community City of Saint Peter

Minnesota Ground Water Association

April 24, 2013

History of Saint Peter Water

- 1970's to 1987
- One Plant (Jefferson)
- Removed Iron/Manganese
- Treated water from two multi-aquifer wells
- Capacity 1.0 MGD
- Three wells that pumped directly into the distribution system with no treatment (all are now sealed)
- Capacity of .5 MGD from untreated well sources
- Untreated Wells were high in nitrates (6 mg/l to 16 mg/l)
- Hardness 25 grains per gallon – varies throughout town

- 1987 to 2012
- Two plants (Saint Julien & Broadway)
- Removed Iron/Manganese
- Treated water from two multi-aquifer wells
- Capacity 2.2 MGD
- Wells are blended at beginning of treatment process
- Shallow wells (Jordan) are high in nitrates (10 mg/l to 28 mg/l)
- Deep wells (Mount Simon) are high in dissolved solids 1000 mg/l
- Hardness 25 grains per gallon – consistent throughout town

History of Saint Peter Water (present)

- 2012 to present
- Two plants (Saint Julien & Broadway)
- Remove Iron/Manganese
- Treat 85% of filtered water with Reverse Osmosis
- Capacity 4.0 MGD
- Wells are blended at beginning of treatment process
- Shallow wells (Jordan) are high in nitrates (10 mg/l to 28 mg/l)
- Deep wells (Mount Simon) are high in dissolved solids 1000 mg/l
- Hardness 5 grains per gallon – consistent throughout town
- Many softeners have been removed or properly set

History of Saint Peter Water

- Use three different aquifers (STJU & BW)
  - Jordan
    - Wells #6, #9 and #11
    - Capacity 250 gpm with spacing requirements
  - Franconia / Ironton / Galesville (FIG)
    - Wells #8, #10 and #12
    - Capacity 450 gpm – flowing at STJU
  - Mount Simon
    - Wells #7 and #13, #14
    - Capacity 700 to 1,500 gpm

Water Quality – Prior to R.O.

- **Primary Standards**
  - Nitrates are lowered by blending the water – MDH mandated a 5 mg/l nitrate limit
  - Radium 226 & 228 – above the 5 pCi/l combined
  - Both are reduced by R.O.
- **Secondary Standards**
  - Total Dissolved Solids (Secondary Standard) was reduced to 600 mg/l by restricting FIG and Mount Simon use.
  - Sulfates and Chlorides 200 mg/l
    - Taste
    - Odor

Wellhead Protection (WHP)

- Started working on initial plan in 1991 with a grant. MDH, Nicollet County, City of Saint Peter – all active participants.
- Identified 9 critical steps and 13 chapters covered the action items and path to be taken.
- Initial WHP plan adopted in October 1997.
- Updated WHP initiated in January 2007
  - Phase I accepted by MDH July 2008
  - Phase II accepted by MDH June 2010

Wellhead Protection (WHP)

- Previous focus was on land use issues for vulnerable well formations
- Jordan - Nitrates
  - Well 6 – 6.9 mg/l in 1994 to 11.3 mg/l in 2007
  - Well 9 – 4.6 mg/l in 1994 to 8.1 mg/l in 2007
- FIG – unchanged WHPA delineation
- Mt Simon – unchanged WHPA delineation

The Sand Prairie

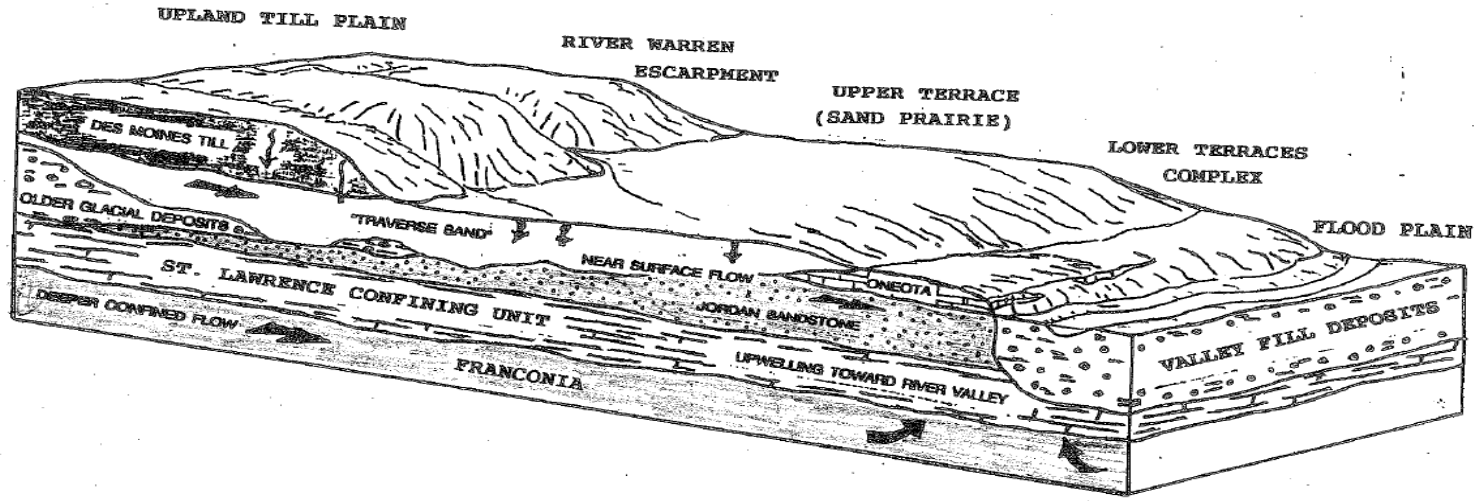
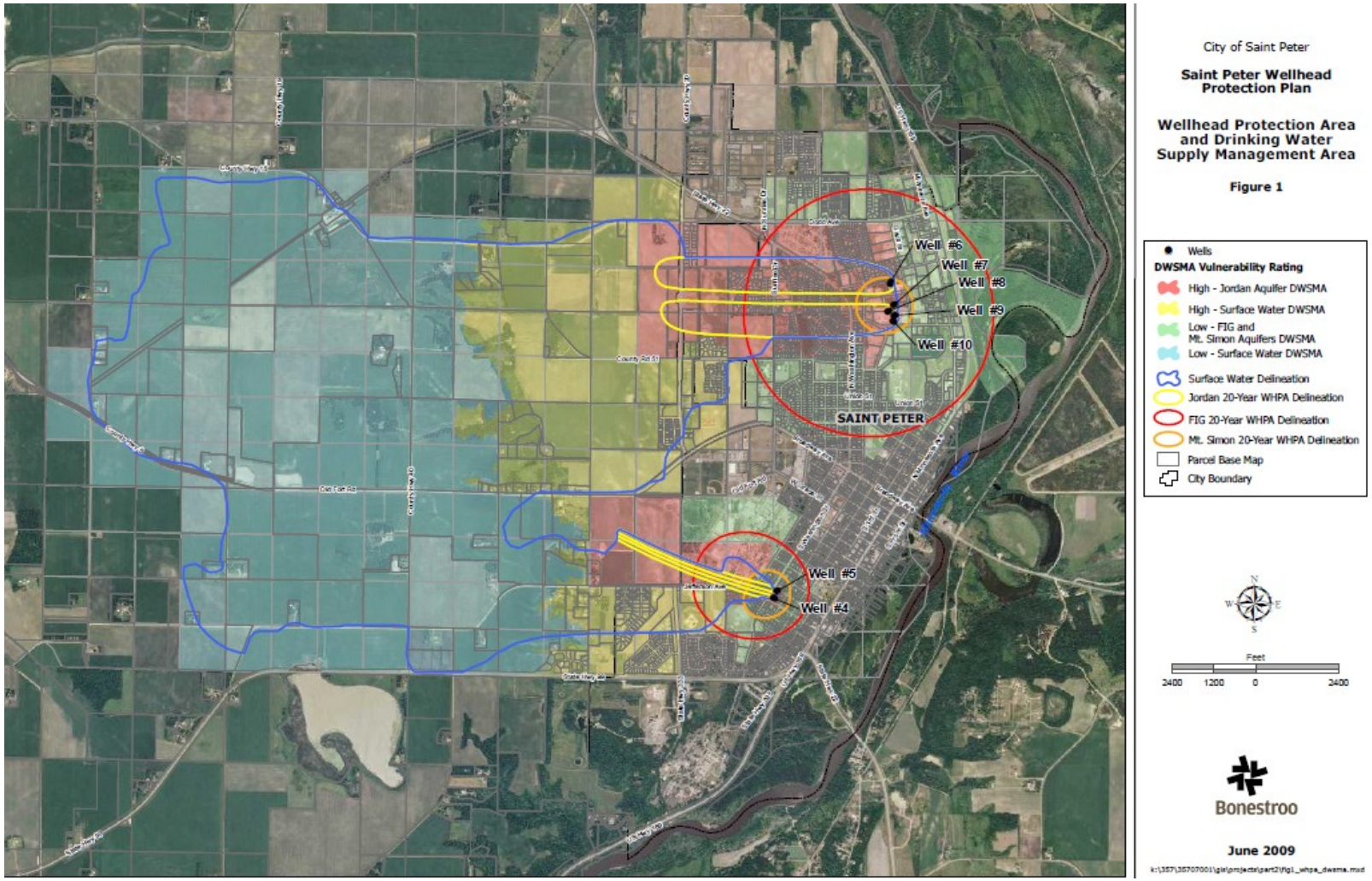


Figure 2.5 Relationships between geologic units and groundwater conditions in the St. Peter area (Brown-Nicollet-Cottonwood Clean Water Partnership Groundwater Assessment Project, 1992).

Saint Peter DWSMA



Future Needs Identified (2008)

- More water would be required
  - Was existing quality acceptable?
  - Design to meet primary and secondary standards?
  - Design to year 2030
- Jefferson Plant already 58 years old.
  - Both wells were multi-aquifer formations
  - Sealing of wells and demolition of old plant
- New facilities to meet redundancy requirements
- Quality must remain consistence throughout City
- Increase capacity to meet 2030 population growth
- Cost Estimate $14,000,000

Jefferson Plant

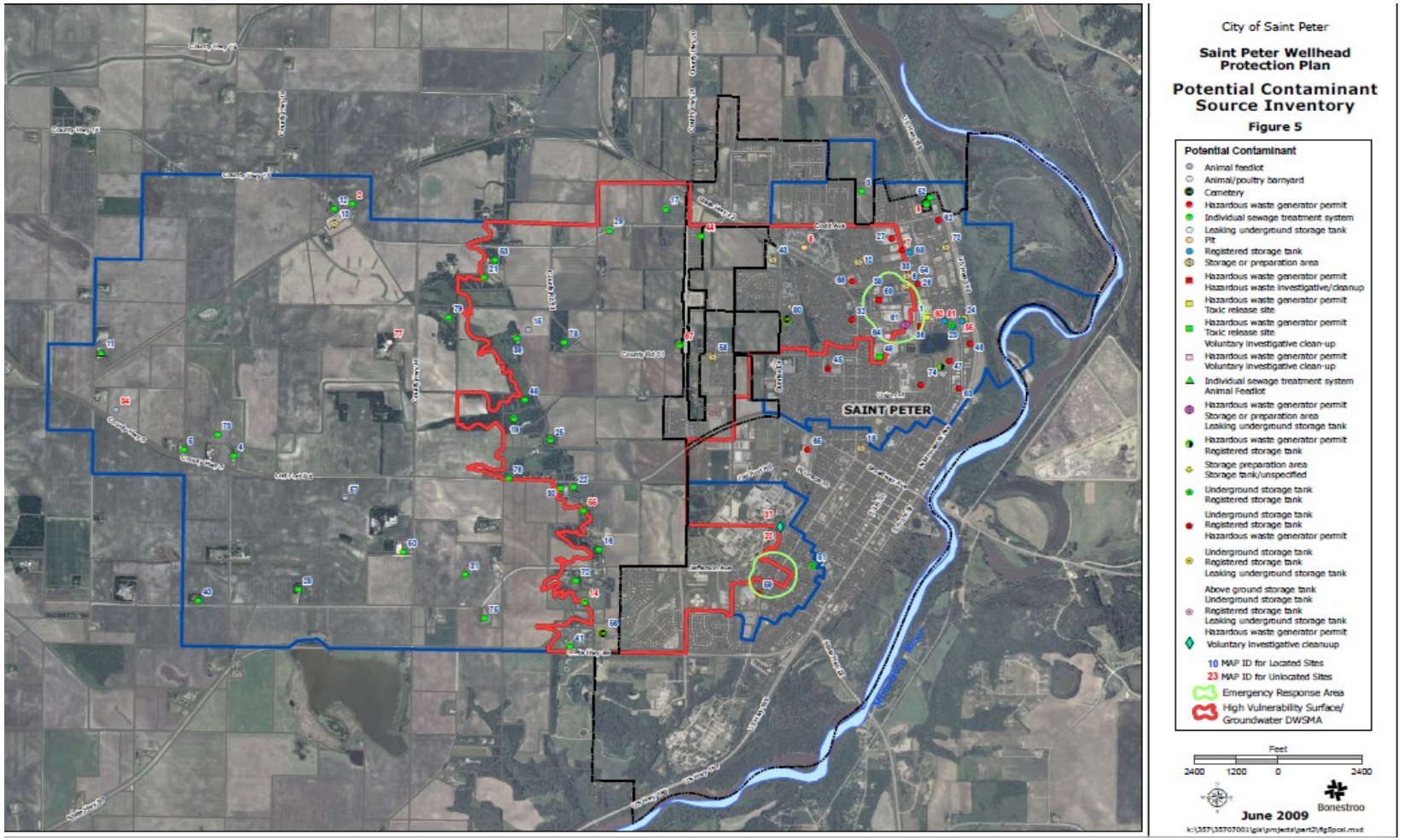
Goals Identified (2009)

- Water Quantity
  - Average Day to increase from 1.29 to 1.68 MGD
  - Maximum Day to increase from 2.58 to 3.35 MGD
  - Population to increase from 11,750 to 15,250 (2030)
- Water Quality
  - Existing quality was not acceptable!
  - Plant must meet primary and secondary standards!
  - Must meet anticipated future regulations!
- Improvements: new facility at Broadway and refurbish Saint Julien
  - Jefferson Plant and Wells to be eliminated, sealed and building demolished
- New facilities to meet redundancy requirements (eggs split into baskets)
- Quality must remain consistence throughout City
- Increase capacity to meet 2030 population growth
- Cost $16,500,000

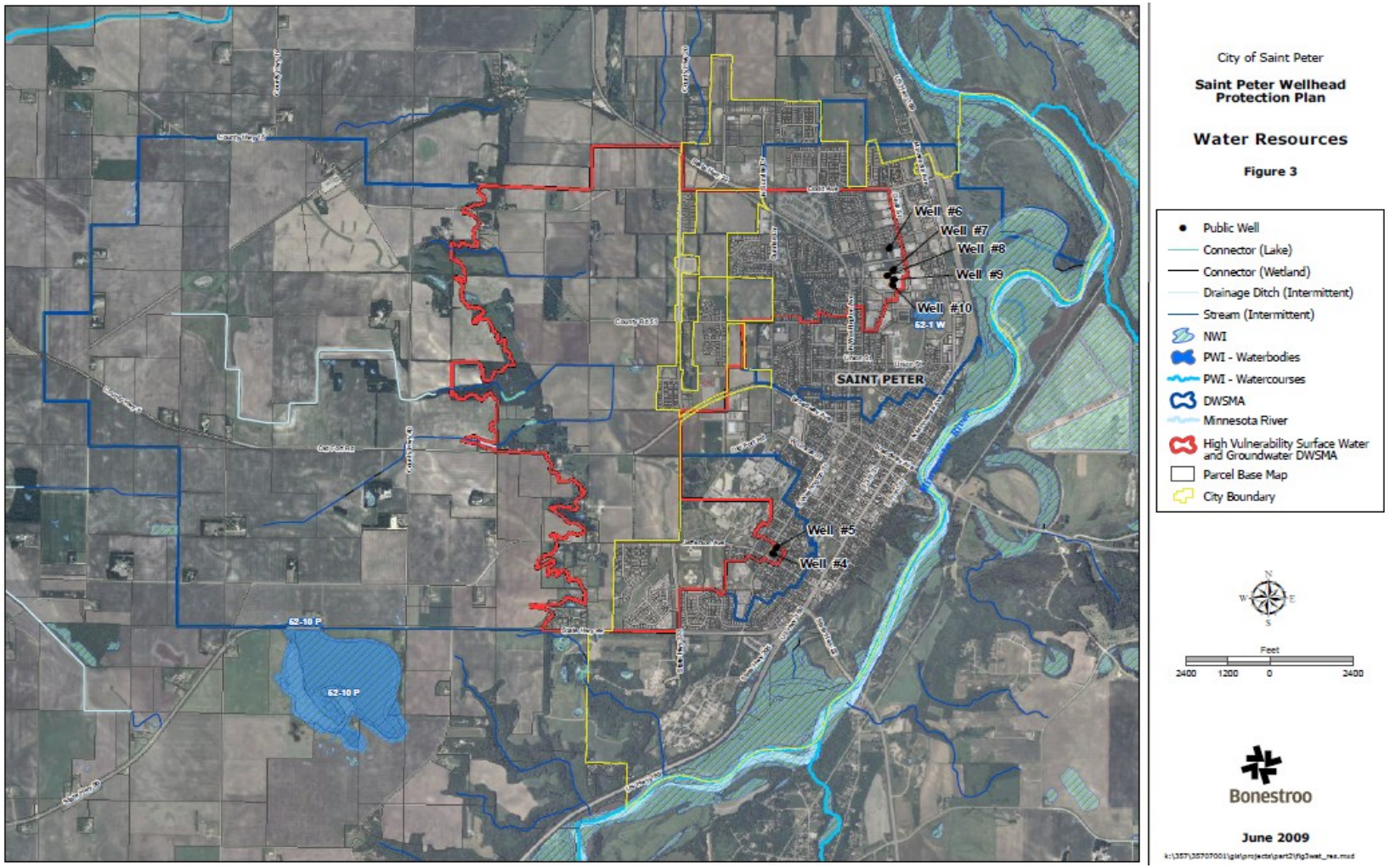
Drinking Water Sources?

- Jordan Sandstone
  - Quick Recharge (?)
  - Vulnerable – to surface water impacts (agriculture)
  - Limited Quality – nitrates
  - Limited Quantity – over 250 gpm significant drawdown
  - Limited formation (35’ – 55’)

Contamination Sources



Shallow Aquifer Vulnerability



Drinking Water Sources?

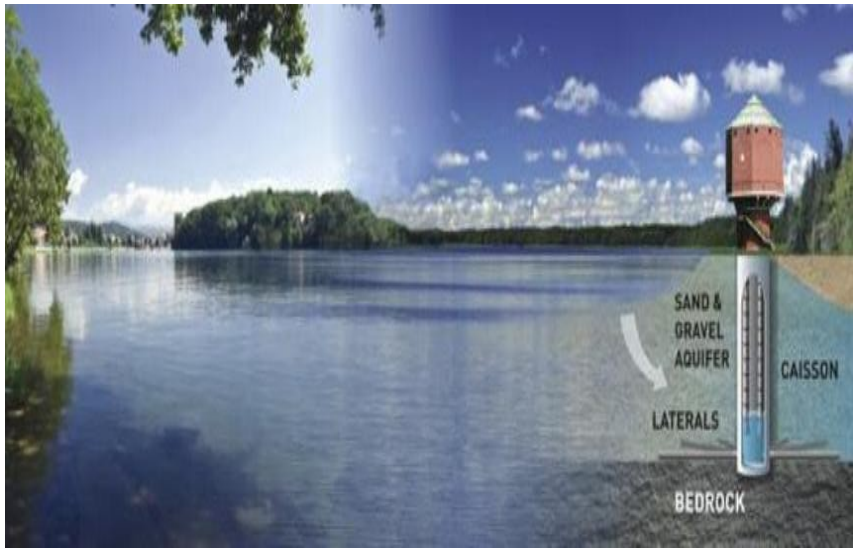
- Franconia Ironton-Galesville (FIG)
  - Not Vulnerable – to surface water impacts
  - Quality Issues – iron, hardness and total dissolved solids prevalent
  - Limited Quantity – 500 gpm
  - Would need multiple wells

Drinking Water Sources?

- Mount Simon
  - Not Vulnerable – to surface water impacts
  - Low Quality – hardness, total dissolved solids, sulfates, chlorides
  - Quantity Good – 1,500 gpm +
  - Would need fewer wells
  - Would need additional treatment

Surface Water

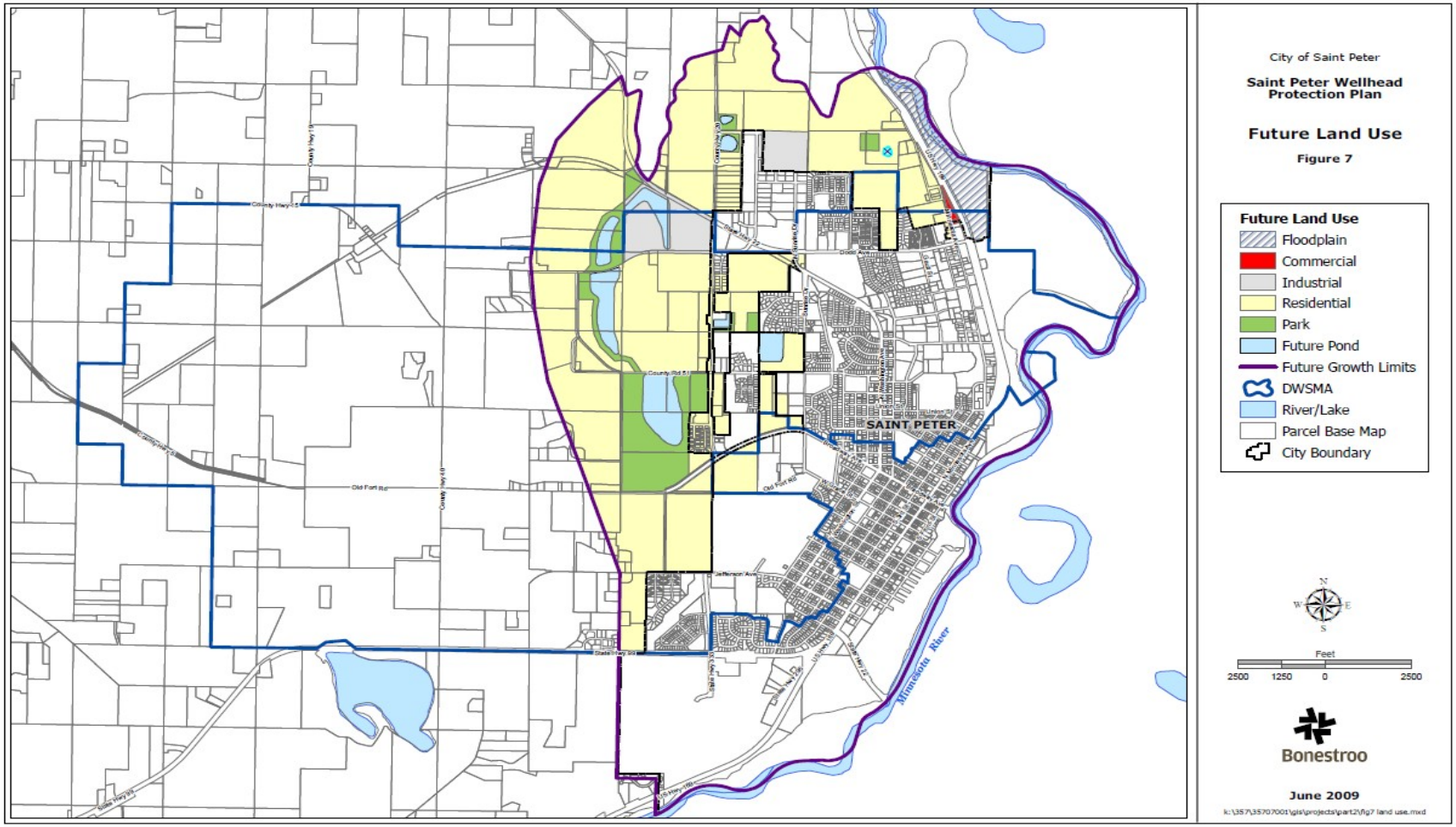
- Minnesota River
  - Ranney Wells
  - Additional regulations
  - Additional cost
  - Quickly ruled out



Evaluated Reclamation

- Saint Peter Wastewater Treatment is state of the art but only secondary treatment currently provided.
- Upgrade would require tertiary treatment with strict standards if water is intended for reuse.
- Uses may include grey water
  - Would require another distribution system
  - Additional staff

Future Land Uses



New Facility Information

- New Wells (Broadway)
  - Jordan Well – 400 gpm (300 gpm actual)
  - FIG Well – 500 gpm
  - 2 – Mount Simon Wells (1300 – 1400 gpm)
- Firm Capacity – 1600 gpm (2 skids @ 75%)
  - 2.0 MGD
- Firm Capacity – 1800 gpm (3 skids @ 85%)
  - 2.2 MGD

Cost of Well Construction

- Jordan Well #11 - $220,975
- FIG Well #12 - $290,770
- Mount Simon #13 - $349,795
- Mount Simon #14 - $357,015
- Well Upgrades - $1,218,555 (low bid)
- Actual Cost - $1,125,162 (saved $93,333)
- Engineer's Estimate - $1,450,000

New Treatment Processes

- Aeration
- Detention
- Filtration
- Reverse Osmosis
- Chlorination
- Fluoridation

Total Project Cost

- Four New Wells - $1,348,268
- Water Distribution Improvements $611,513
- Water Treatment - $16,845,000
  - Engineering Included

- TOTAL COST - $18,804,784

Water Rates

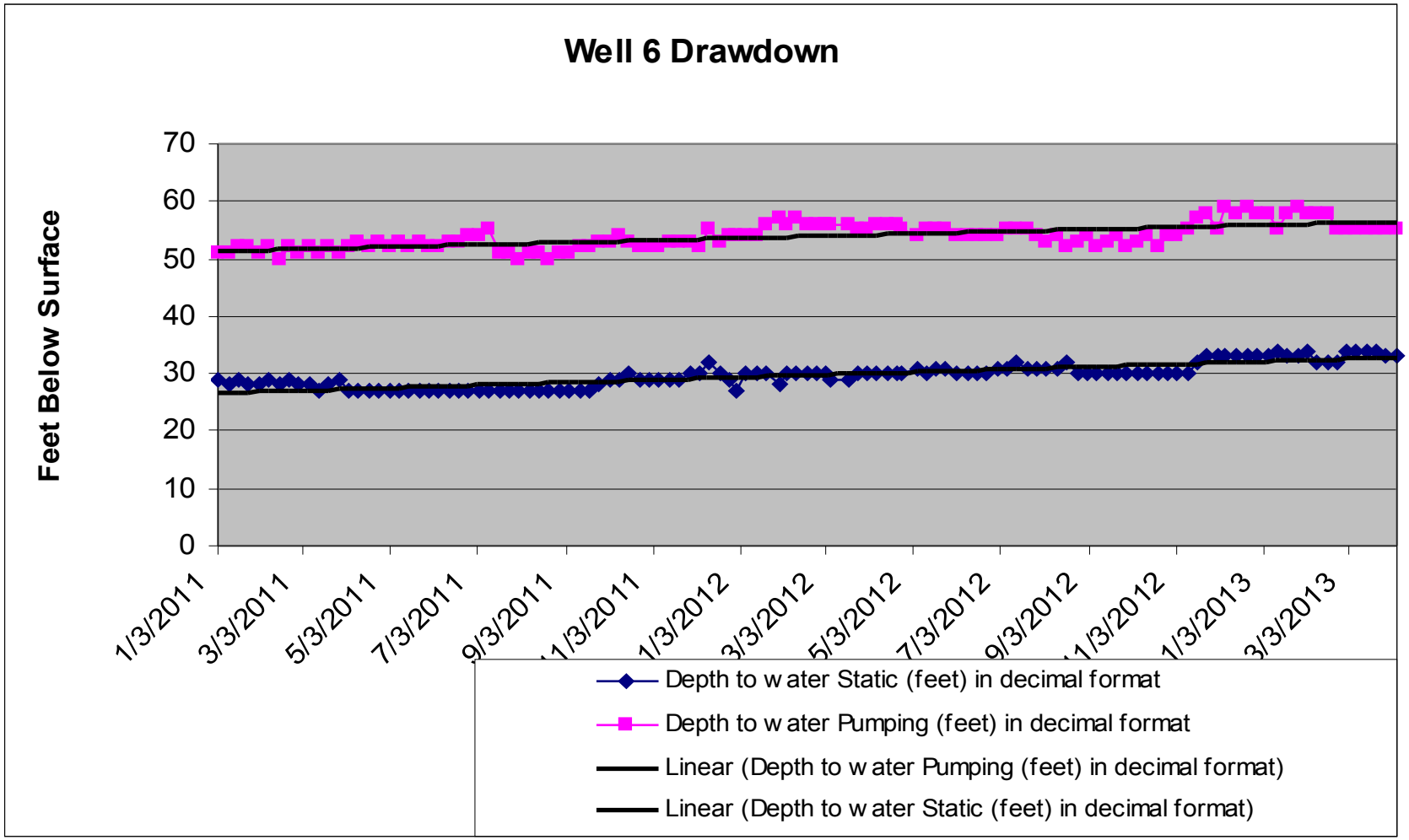
- 2006
- 380 MG Sold
- *Rates $4.00 / 1,000*
- Residential Use 53%
- Commercial Use 29%
- Other Uses 8%
- Water Loss 10%
- Budget $1,125,231

- 2012
- 375 MG Sold
- *Rates $6.00 / 1,000*
- Residential Use 48%
- Commercial Use 34%
- Other Uses 14%
- Water Loss 4%
- Budget $3,348,413

Cost Comparison

- Smart Phone - $78.00 / month
  - $78.00 of water gets you 13,000 gallons (2.6 months)
    - Average Customer in Saint Peter = 5,000 gallons ($35.00)
- Salt Reduction (savings)
  - Salt savings to homeowners $8.00 / month
  - Chloride levels have dropped 202 mg/l in discharge water
- 2-liter bottled water at Gas Station $1.79

Jordan – STJU


Well 6 Drawdown
Feet Below Surface
70
60
50
40
30
20
10
0
1/3/2011
3/3/2011
5/3/2011
7/3/2011
9/3/2011
1/3/2012
3/3/2012
5/3/2012
7/3/2012
9/3/2012
1/3/2013
3/3/2013
Depth to water Static (feet) in decimal format
Depth to water Pumping (feet) in decimal format
Linear (Depth to water Pumping (feet) in decimal format)
Linear (Depth to water Static (feet) in decimal format)

Mount Simon - STJU

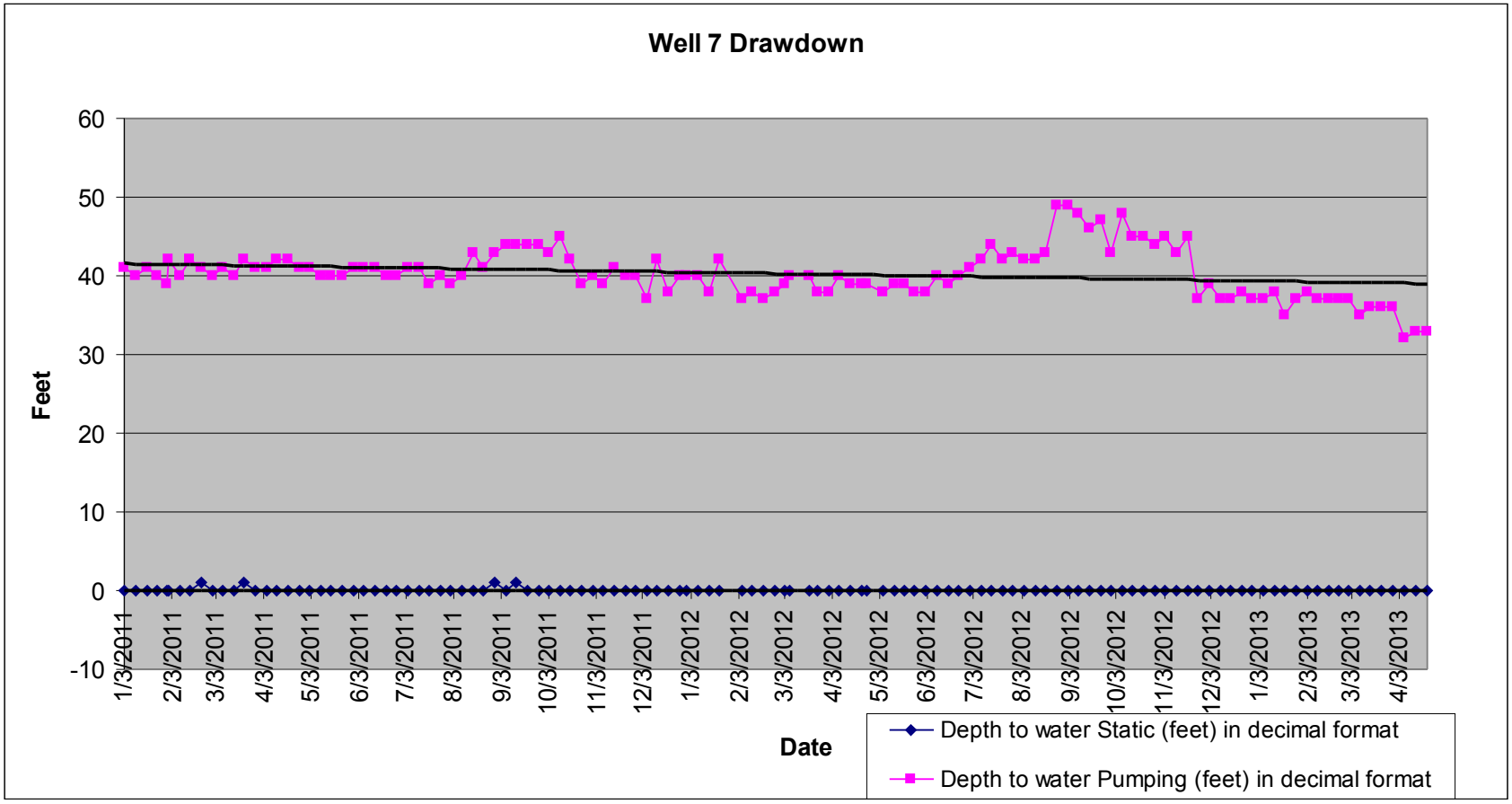
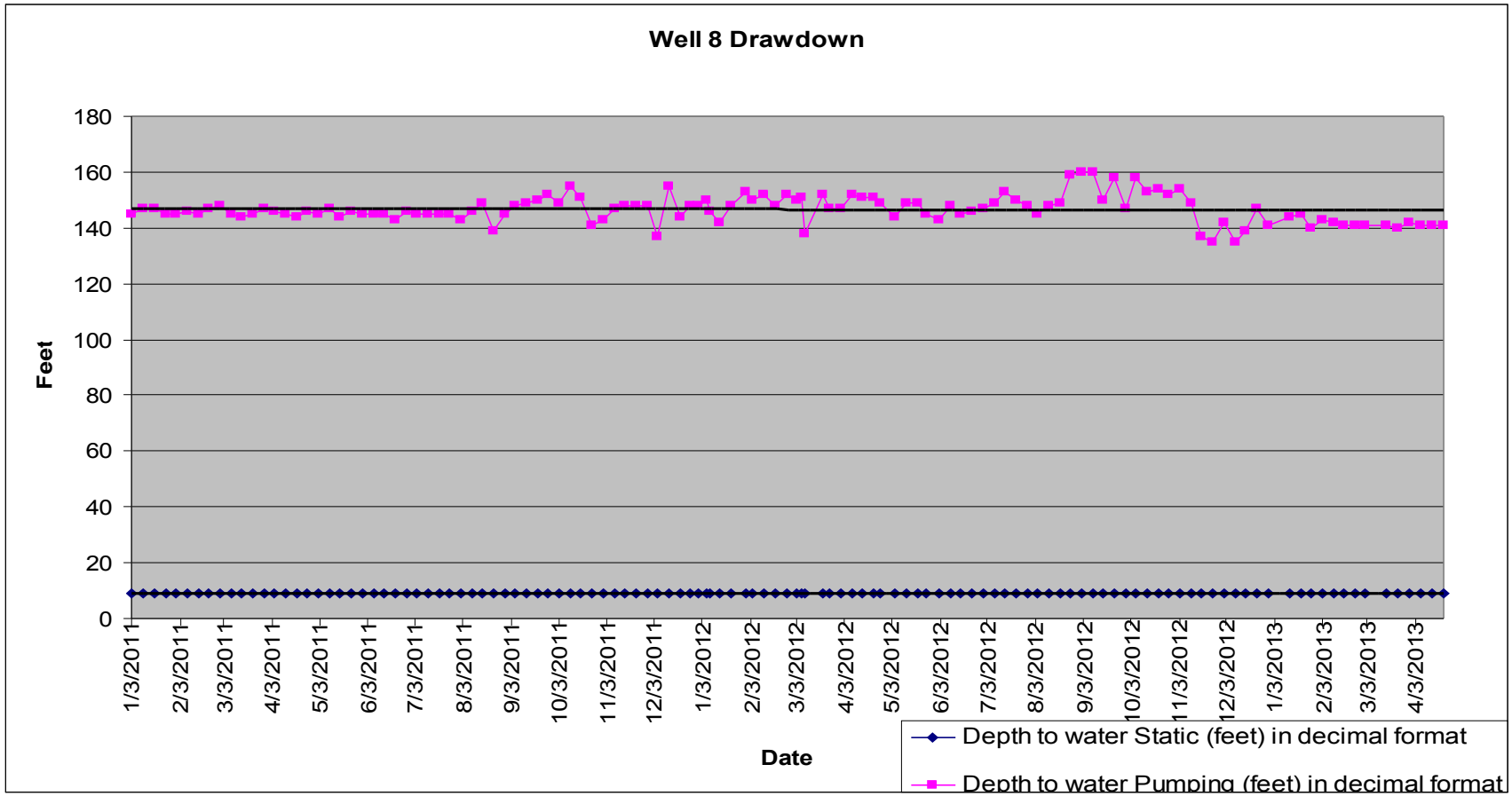


FIG – STJU


Well 8 Drawdown
Feet
180
160
140
120
100
80
60
40
20
0
1/3/2011
2/3/2011
3/3/2011
4/3/2011
5/3/2011
6/3/2011
7/3/2011
8/3/2011
9/3/2011
10/3/2011
11/3/2011
12/3/2011
1/3/2012
2/3/2012
3/3/2012
4/3/2012
5/3/2012
6/3/2012
7/3/2012
8/3/2012
9/3/2012
10/3/2012
11/3/2012
12/3/2012
1/3/2013
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3/3/2013
4/3/2013
Date
Depth to water Static (feet) in decimal format
Depth to water Pumping (feet) in decimal format

Jordan – STJU

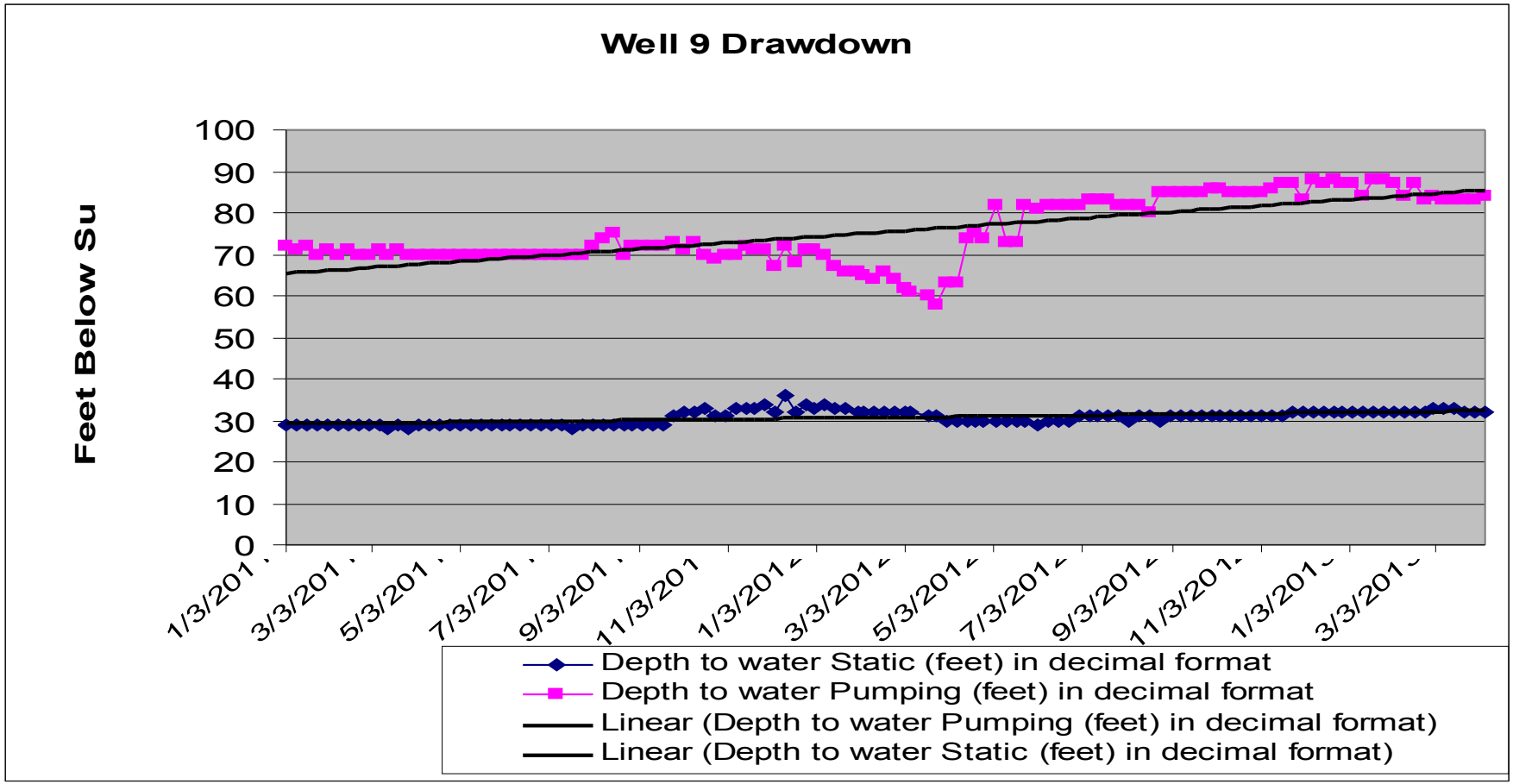
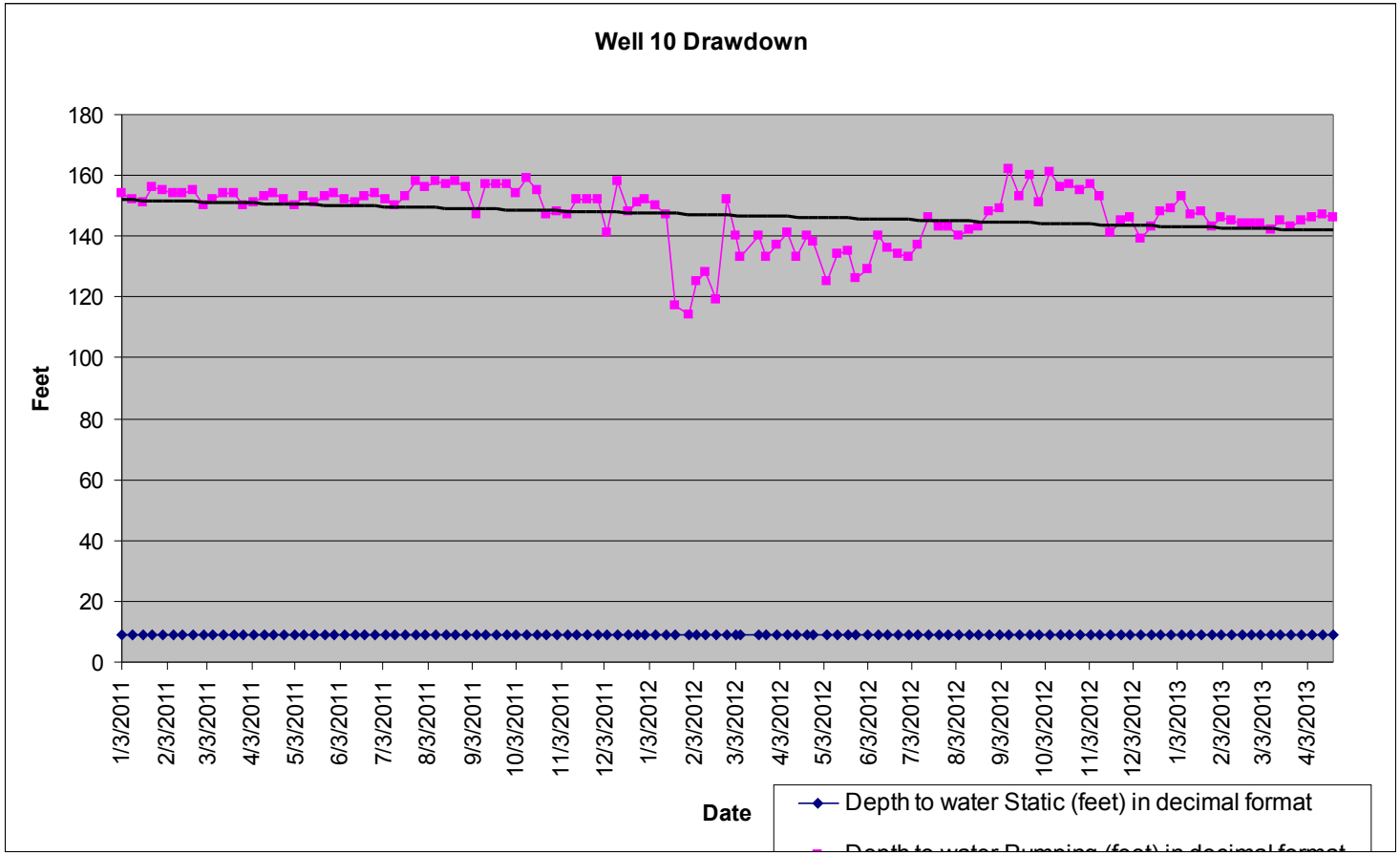

Well 9 Drawdown
Feet Below Su
100
90
80
70
60
50
40
30
20
10
0
1/3/201
3/3/201
5/3/201
7/3/201
9/3/201
11/3/201
1/3/2012
3/3/2012
5/3/2012
7/3/2012
9/3/2012
11/3/2012
1/3/2013
3/3/2013
Depth to water Static (feet) in decimal format
Depth to water Pumping (feet) in decimal format
Linear (Depth to water Pumping (feet) in decimal format)
Linear (Depth to water Static (feet) in decimal format)

FIG – STJU


Well 10 Drawdown
Feet
180
160
140
120
100
80
60
40
20
0
1/3/2011
2/3/2011
3/3/2011
4/3/2011
5/3/2011
6/3/2011
7/3/2011
8/3/2011
9/3/2011
10/3/2011
11/3/2011
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4/3/2013
Date
Depth to water Static (feet) in decimal format

Jordan – Broadway

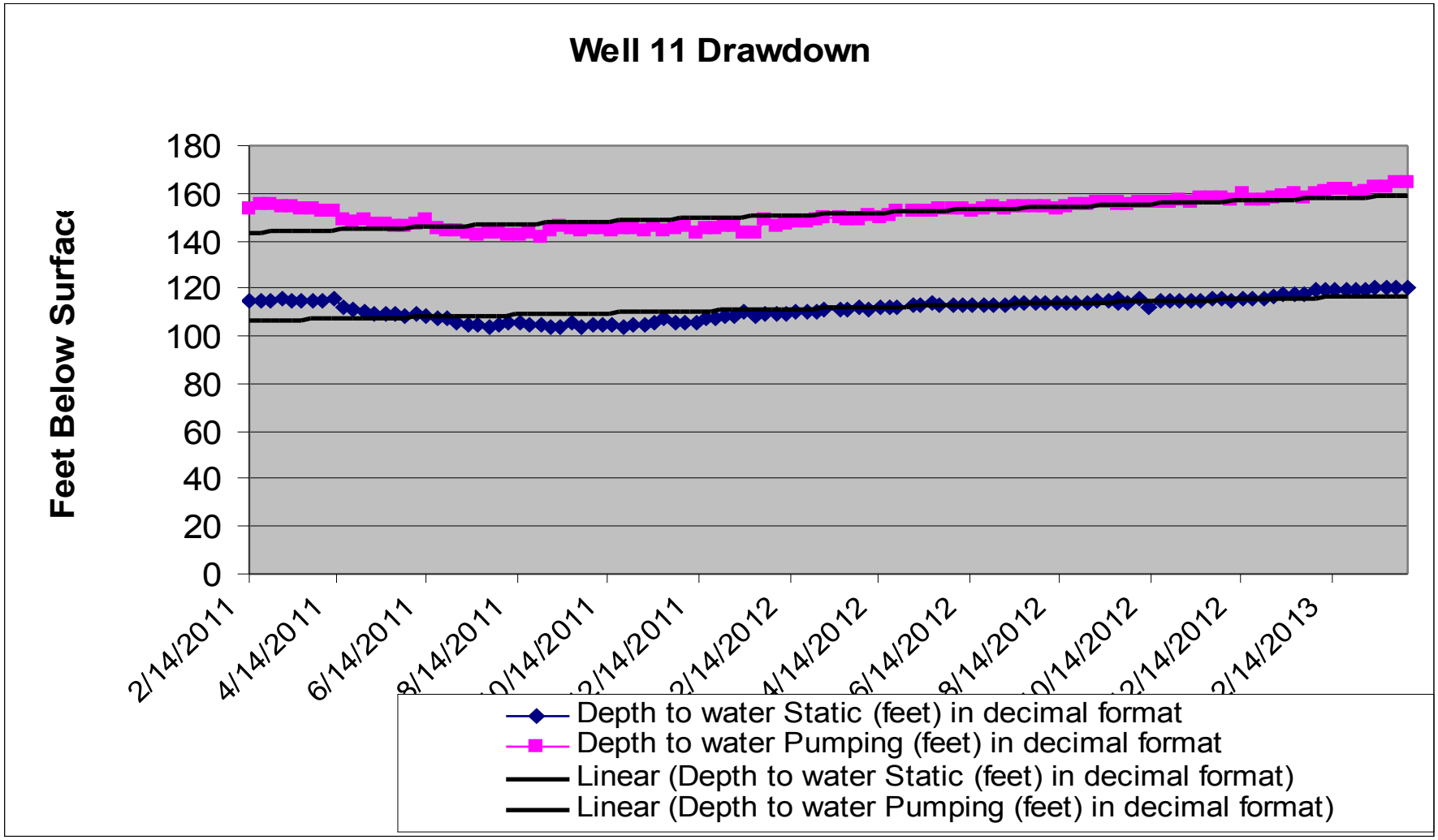
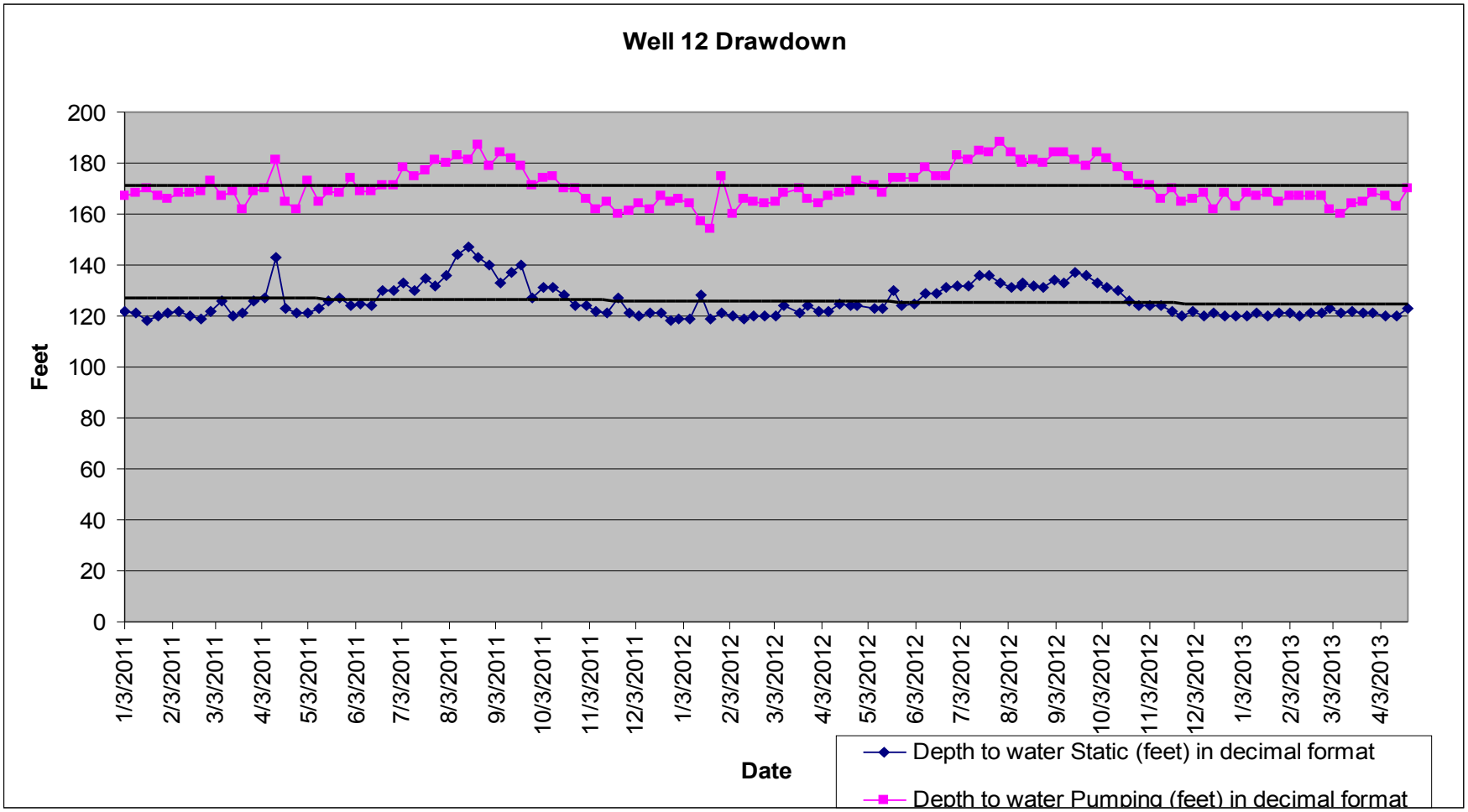
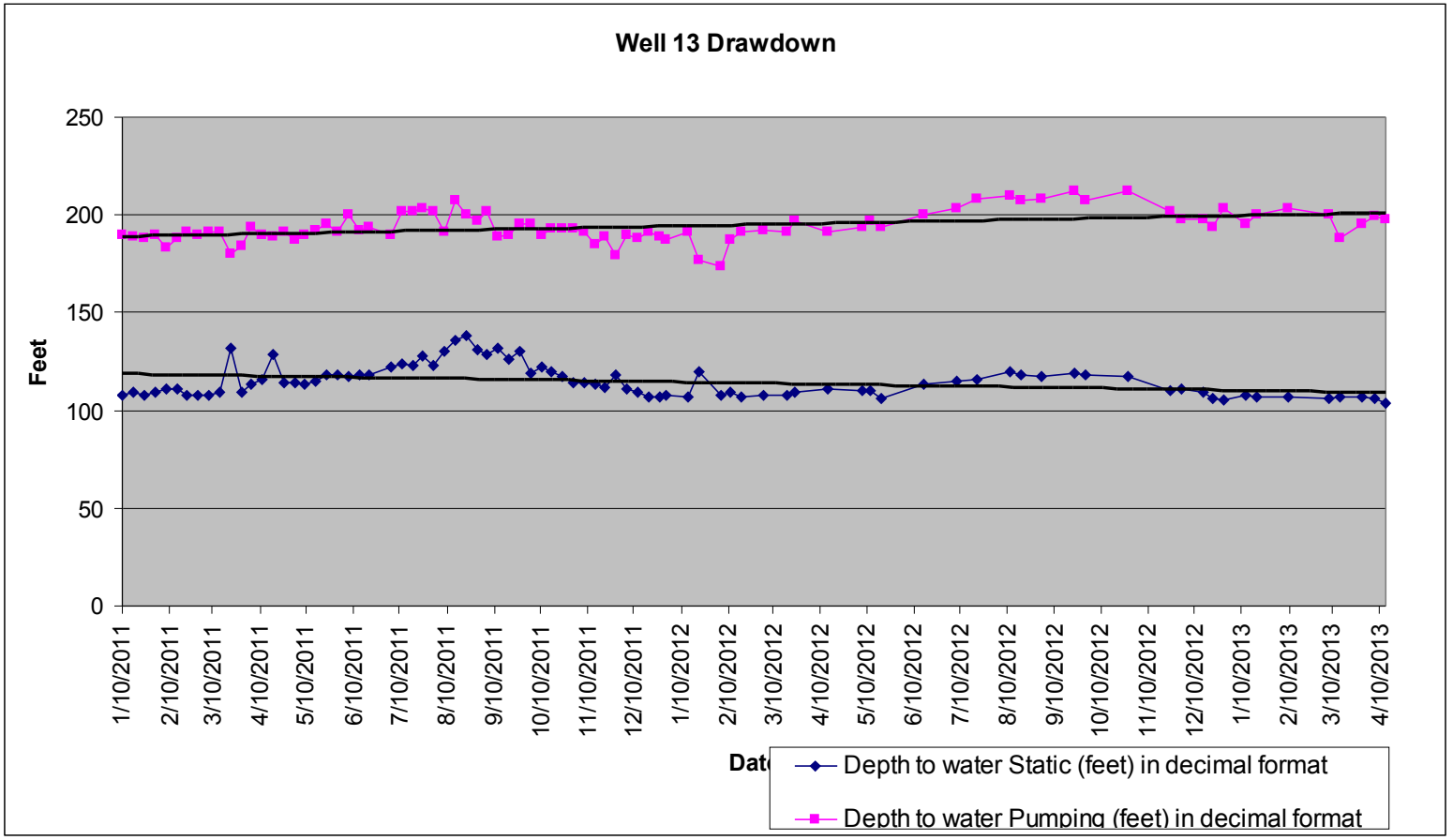


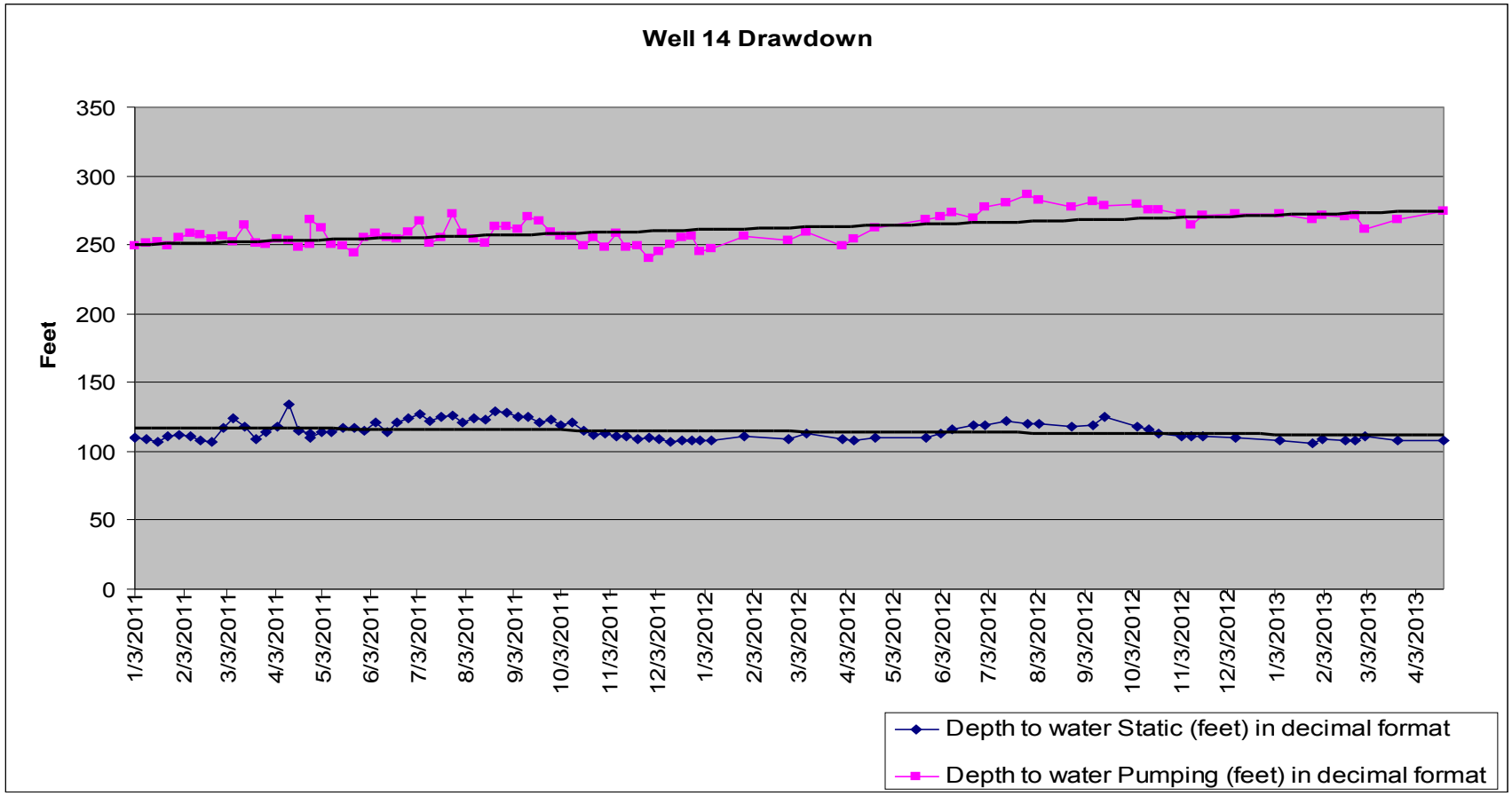
FIG – Broadway



Mount Simon – Broadway



Mount Simon – Broadway



Questions