

**Memorandum of Understanding
between
Equus Beds GMD2
and
The City of Wichita**

**Regarding the Proposed Aquifer
Storage and Recovery Project
Phase 1**

ASR Items of Understanding

Issue 1:

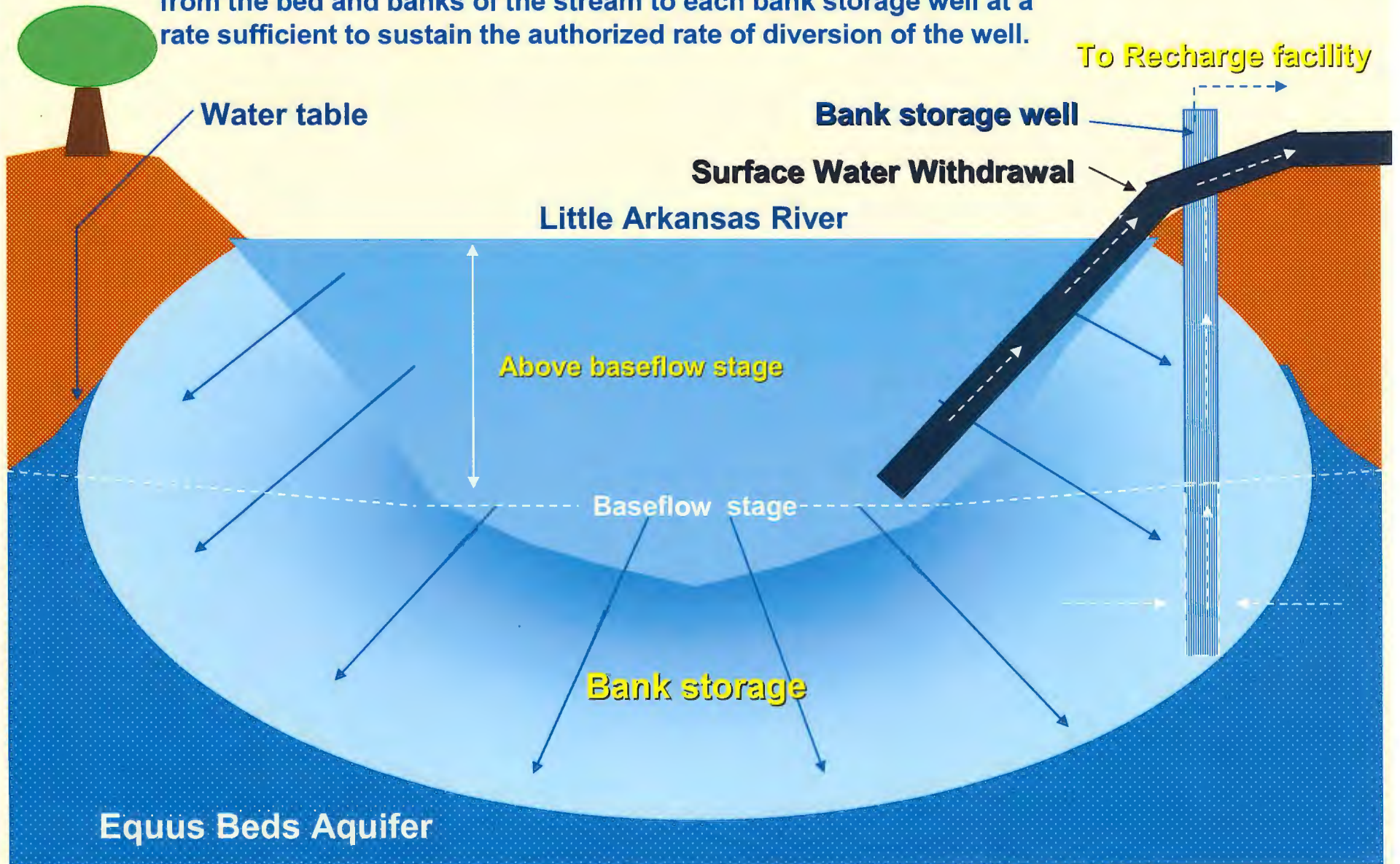
The conceptual Plan is to develop both direct surface water diversions and diversions using bank storage water from induced infiltration. The initial conceptual plan was for installation of 75 MGD of bank storage facilities and 25 MGD of direct surface water diversion. With recent advances in water treatment technology, development of additional surface supplies appears to be feasible.

Commitment:

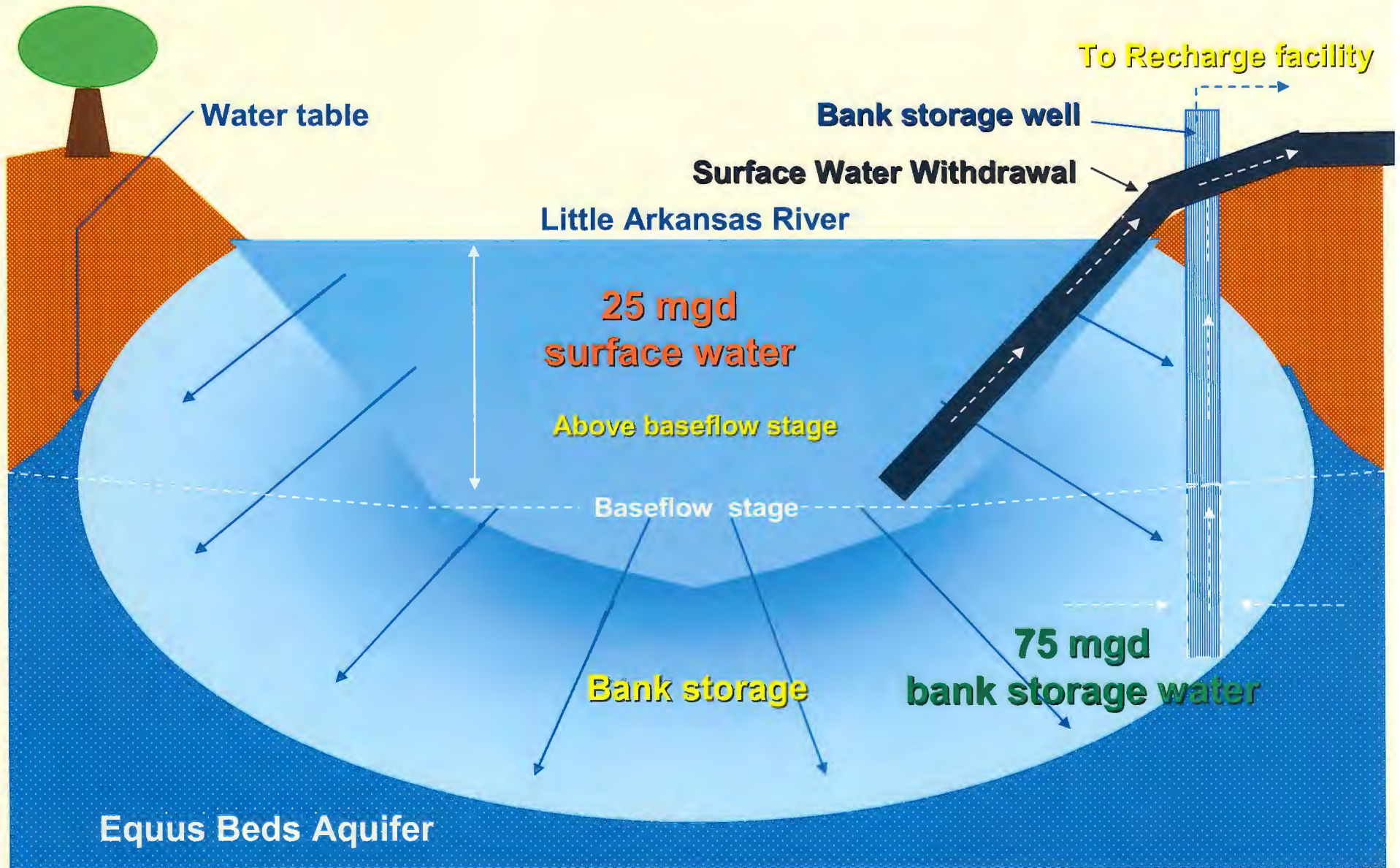
Based on current technology the City will develop at least 60 MGD of direct surface water diversion. With recent advances in water treatment technology, development of additional surface supplies appears to be feasible.

Aquifer Storage and Recovery Project - ASR

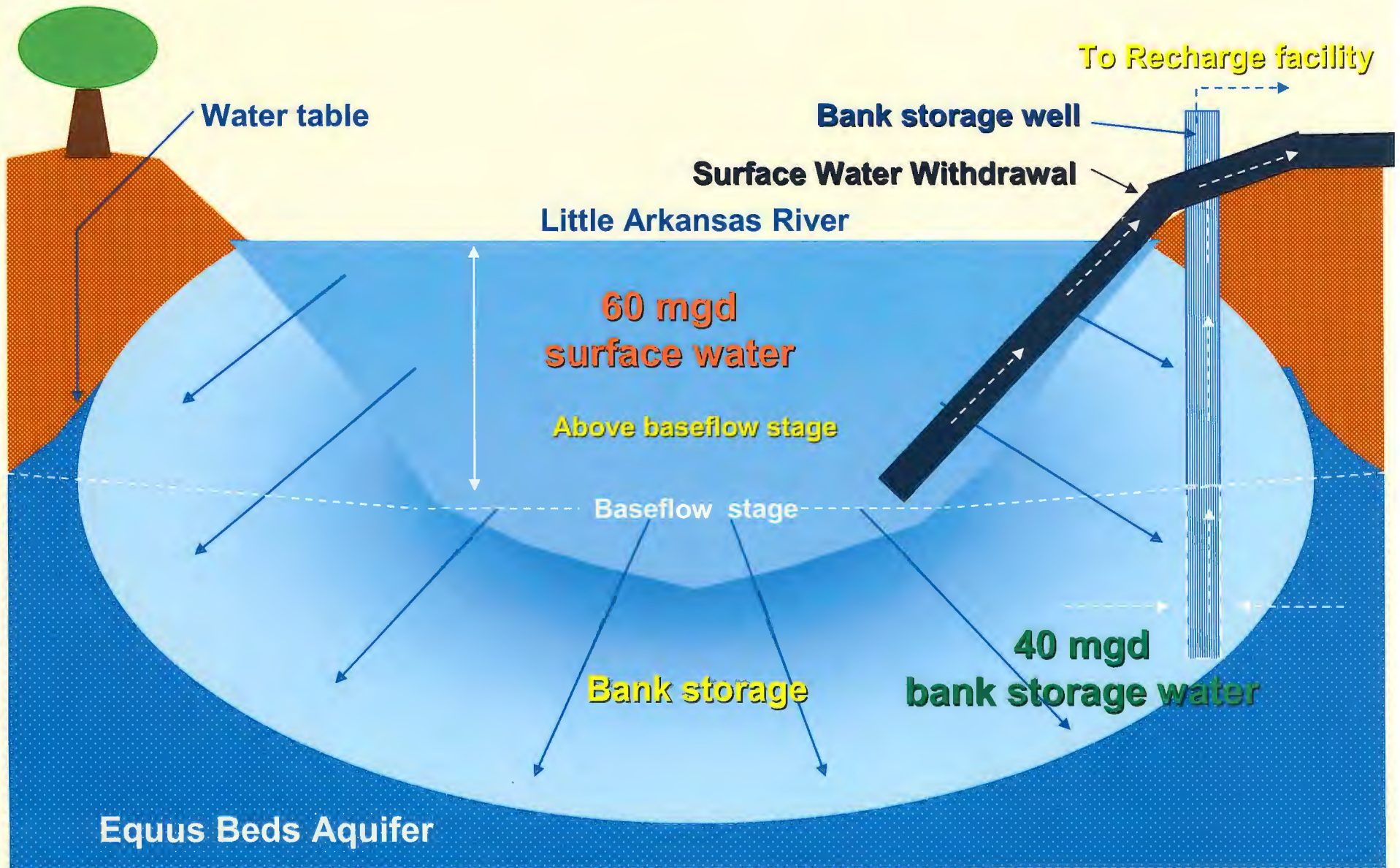
The hydraulic connection from the streambed and banks to each bank storage well must be sufficient to transmit bank storage water from the bed and banks of the stream to each bank storage well at a rate sufficient to sustain the authorized rate of diversion of the well.



Aquifer Storage and Recovery Project - ASR



Aquifer Storage and Recovery Project - ASR



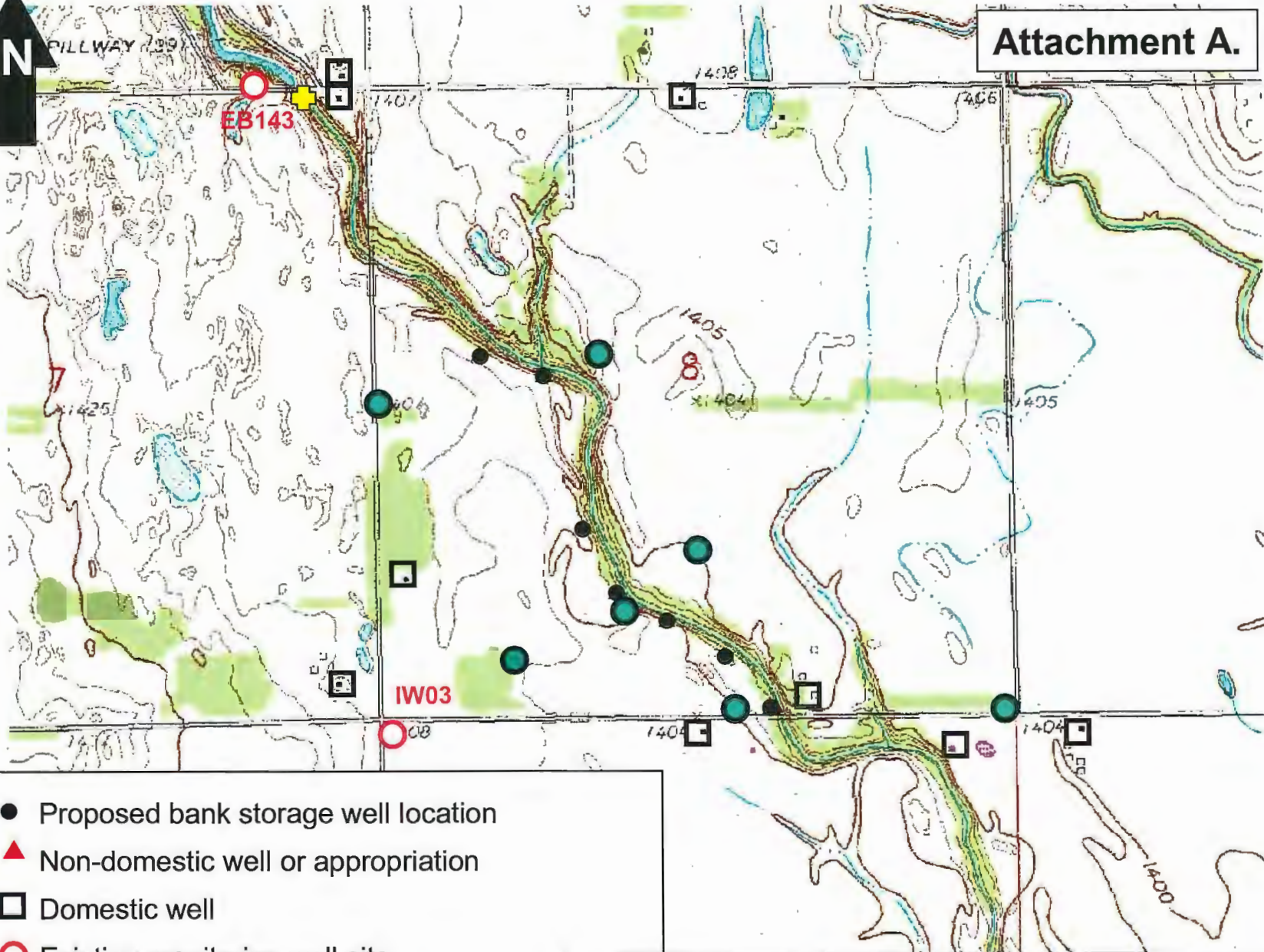
Issue 2:

The City's initial plans are for bank storage wells to be screened in the lower parts of the aquifer because of water quality and well efficiency concerns. The GMD2 is concerned about screening the bank storage wells in the lower aquifer zone. The GMD2 consultant has suggested a tes of the upper aquifer zone.

Commitment:

The City will install one shallow test well at one diversion well site to determine the approximate yield, water quality and connectivity to the river. The test plan will be developed in consultation with GMD2 staff.

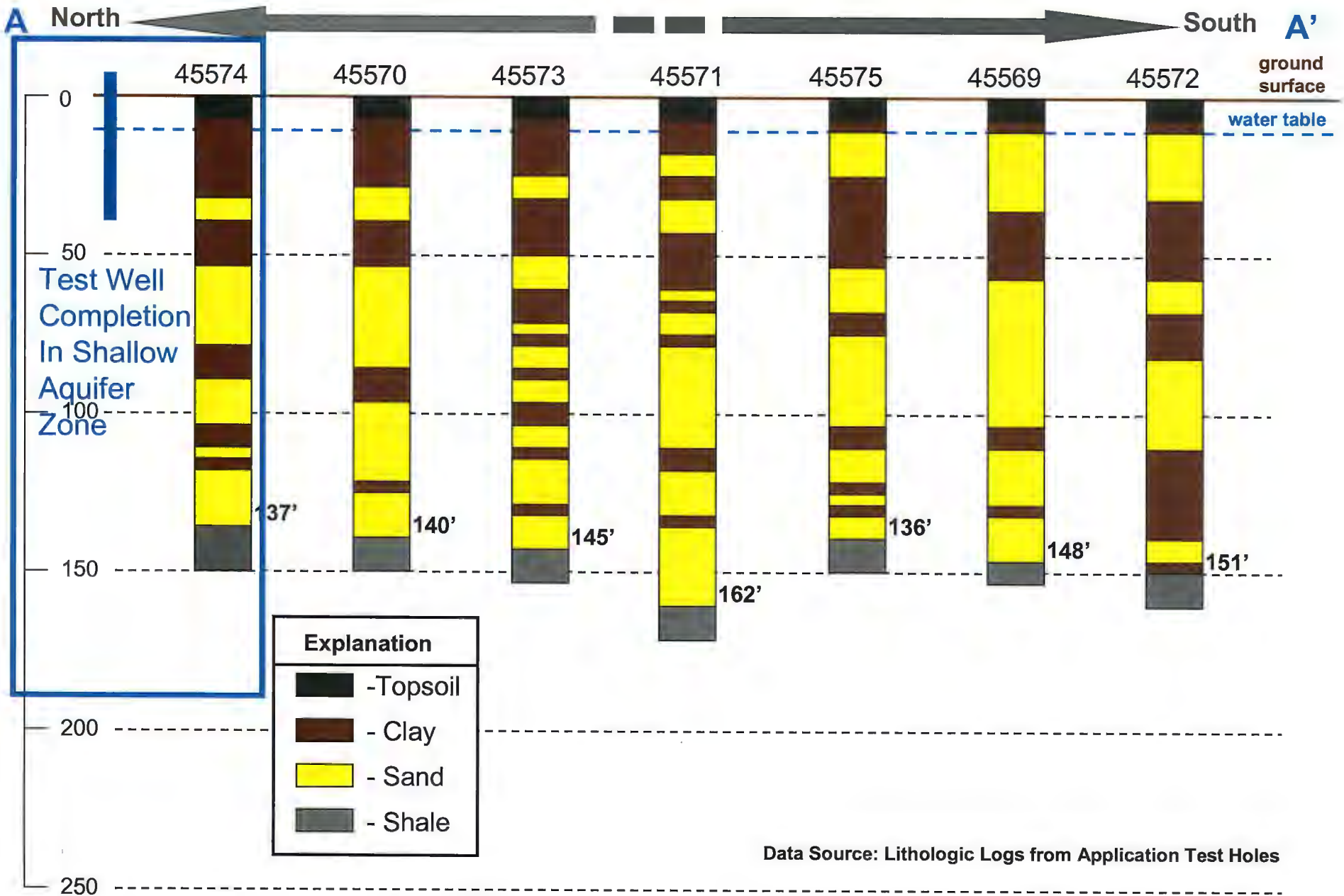
Attachment A.



- Proposed bank storage well location
- ▲ Non-domestic well or appropriation
- Domestic well
- Existing monitoring well site
- Proposed monitoring well site

Attachment A. – Application No. 45570 Site Map - NW 08-23S-2W
Prepared by: Equus Beds Groundwater Management District No. 2 - 07/06/04

Generalized Lithology of Equus Beds Aquifer at Bank Storage Withdrawal Site, Sec. 8, T23S, R2W



Issue 3:

As addressed in item 2, the City's initial plans were for the bank storage diversion wells to be screened in the lower parts of the aquifer because of water quality and efficiency concerns. The GMD2 consultant recommended also screening the upper aquifer zones to alleviate GMD2 concerns about the diversion wells being screened only in the lower aquifer zone.

Commitment:

The City will design bank storage diversion wells screened in the upper (where present) as well as the lower sand zones. If the upper sand zone adversely affects water quality to an unacceptable amount, the City may seal it after consultation with GMD2 staff.

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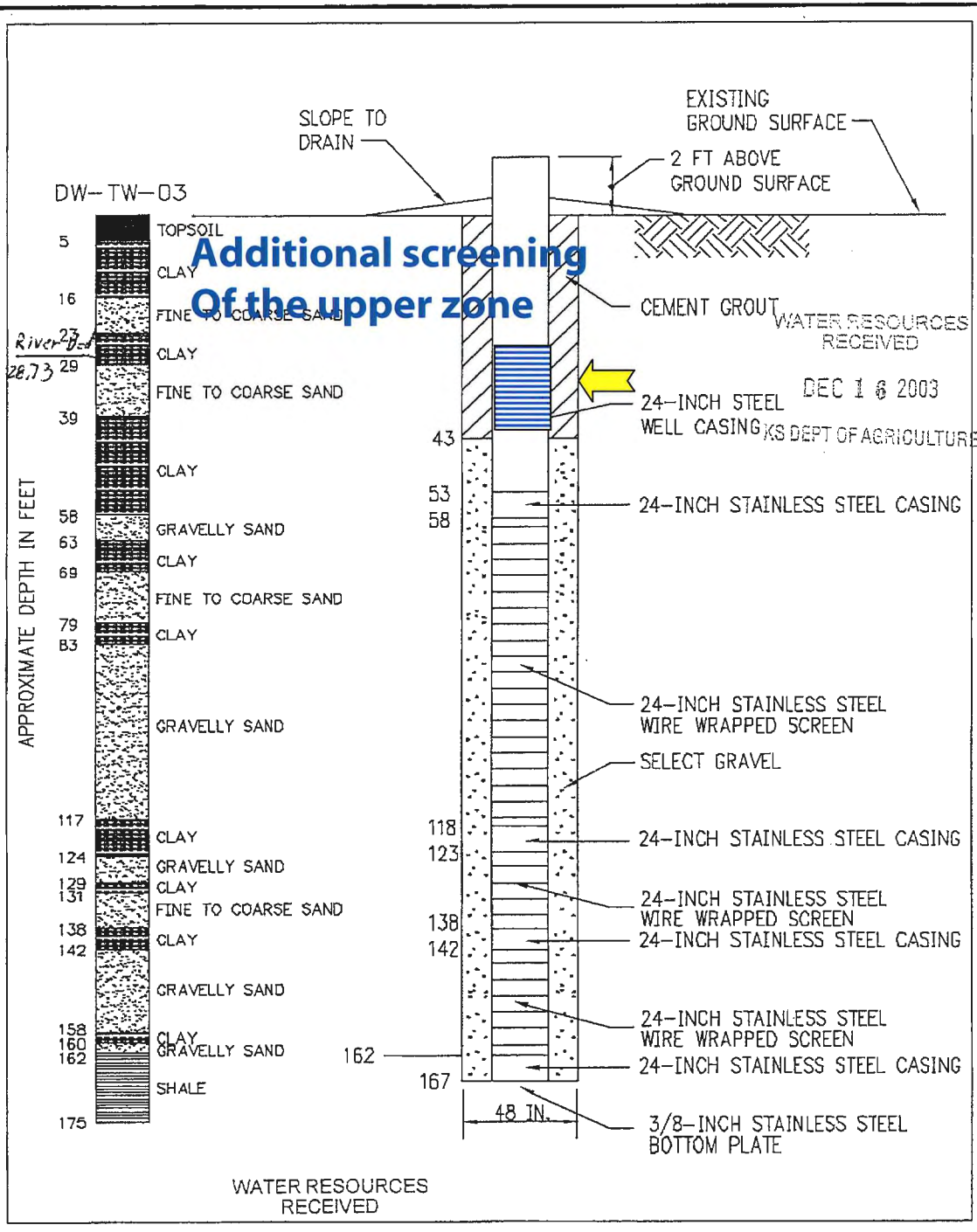


Figure 4. –
Example of
Lithologic Log
and Construction
Design for
Bank Storage
Well

Issue 4.

To provide additional protection against possible negative impacts of the diversion wells, GMD2 suggested that the City initiall install and operate the diversion wells under a three (3) to five (5) year term permit.

Commitment:

Subject to favorable rulings (as reasonably determined by the City) from the Department of Agriculture, Division of Water Resources (DWR), the City will temporarily suspend its water appropriation applications for the seven (7) Phase 1 diversion wells and obtain term permits for a three (3) to five (5) year period.

Issue 5:

The City recognizes that the GMD2 will incur extraordinary expense to monitor and review the Project. GMD2 asked that in light of budgetary constraints the City provide GMD2 with financial assistance during the term permit period referred to in Issue 4.

Commitment:

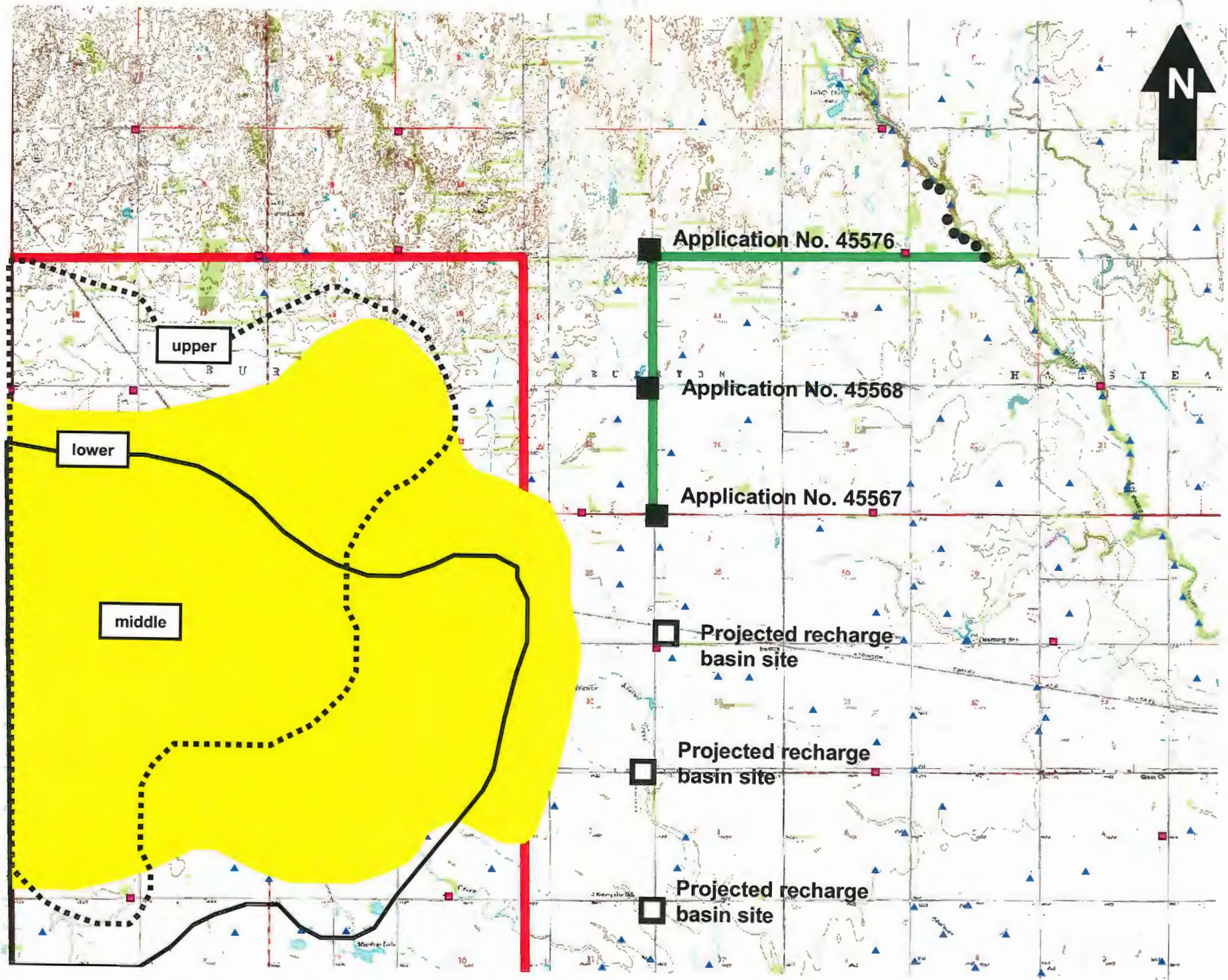
The City will provide a grant of up to \$20,000 per year during the duration of the term permit for the diversion wells or for five (5) years whichever is less, to help offset extraordinary costs GMD2 will incur.

Issue 6:

One objective of the Project is to retard the eastward movement of the Burrton saltwater contamination. Phase 1 has multiple objectives including beginning to build a hydraulic barrier to the Burrton contamination. Additional phases are required to fully implement the hydraulic barrier.

Commitment:

Upon expiration of the term permits and when the City has received approval for its water appropriation applications for Phase 1 of the Project, the City in consultation with GMD2 staff, will re-evaluate the design and placement of recharge facilities near the Burrton contamination plume to determine if more effective plume control will be needed in the Project. If the Project proceeds with other than a term permit due to DWR rulings (Issue 4), the City will re-evaluate plume control after no less than three (3) or more than five (5) years of Project operation.



upper

lower

middle

Application No. 45576

Application No. 45568

Application No. 45567

Projected recharge basin site

Projected recharge basin site

Projected recharge basin site



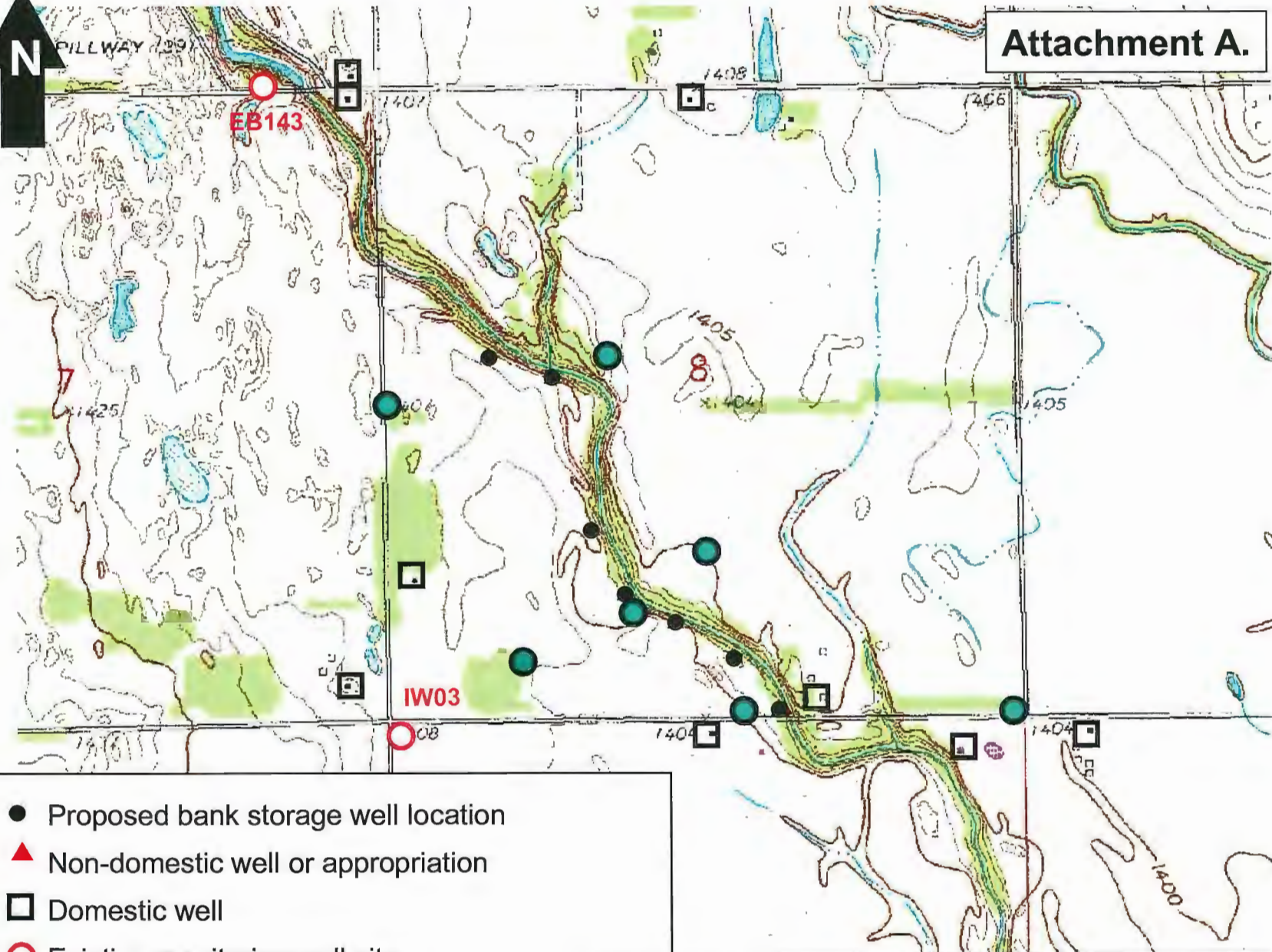
Issue 7:

GMD2 has requested a number of monitoring wells to be located on property where the City has no right of entry. Additionally, GMD2 has requested water quality sampling of domestic wells near the diversion and recharge facilities where the City has no right of entry.

Commitment:

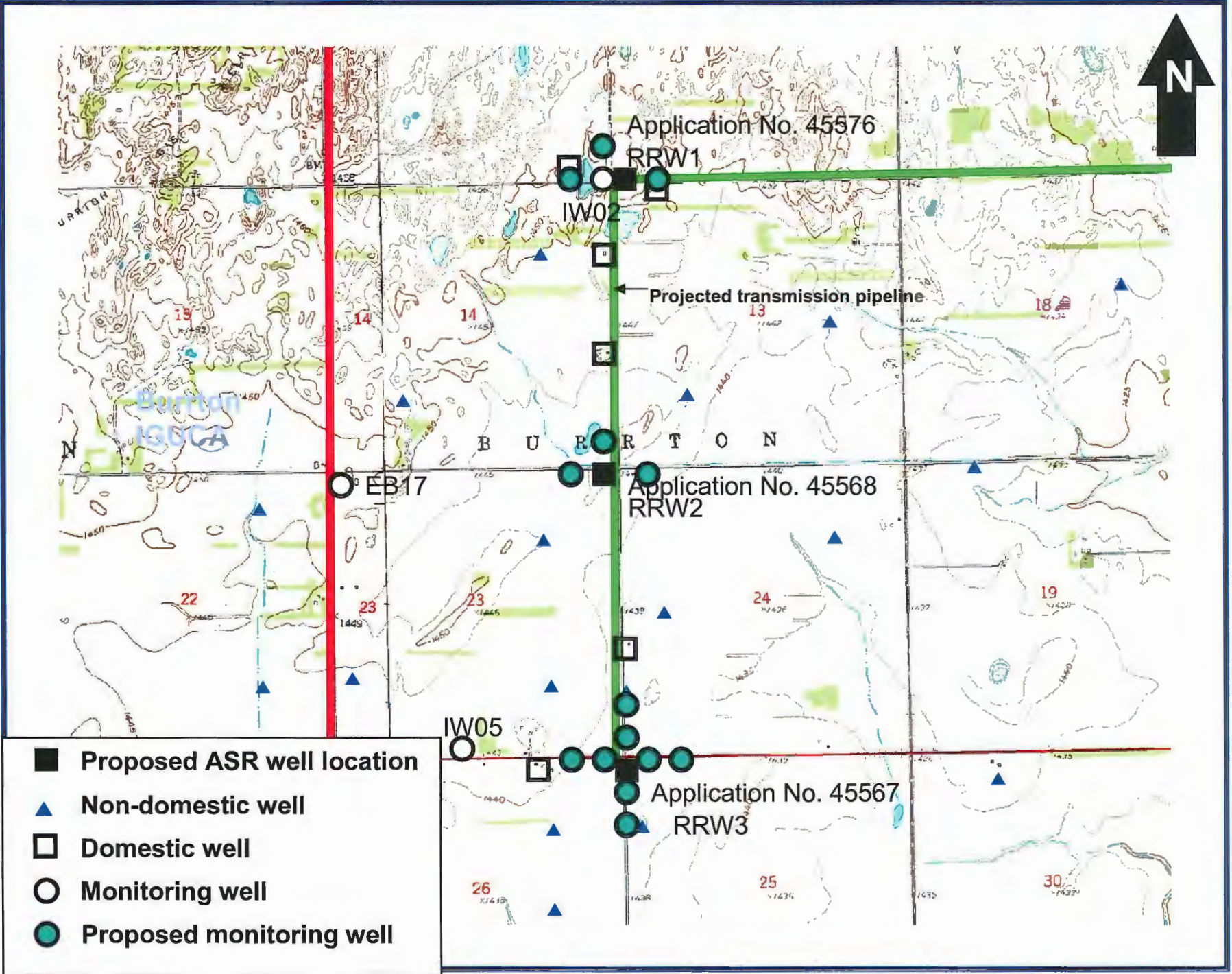
GMD2 will assist the City by obtaining permission for right of entry to sites for the Project monitoring facilities including but not limited to monitoring well sites and access to domestic wells for water quality sampling.

Attachment A.



- Proposed bank storage well location
- ▲ Non-domestic well or appropriation
- Domestic well
- Existing monitoring well site
- Proposed monitoring well site

Attachment A. – Application No. 45570 Site Map - NW 08-23S-2W
Prepared by: Equus Beds Groundwater Management District No. 2 - 07/06/04



Issue 8:

GMD2 and the City are committed to maintaining water quality in the Project area.

Commitment:

The quality of the recharge water injected into the aquifer through the proposed ASR wells will meet USEPA/KDHE drinking water standards and will not degrade the ambient use of water in the basin storage area.

Issue 9:

GMD2 and the City are committed to protecting domestic water wells from changes in water quality standards.

Commitment:

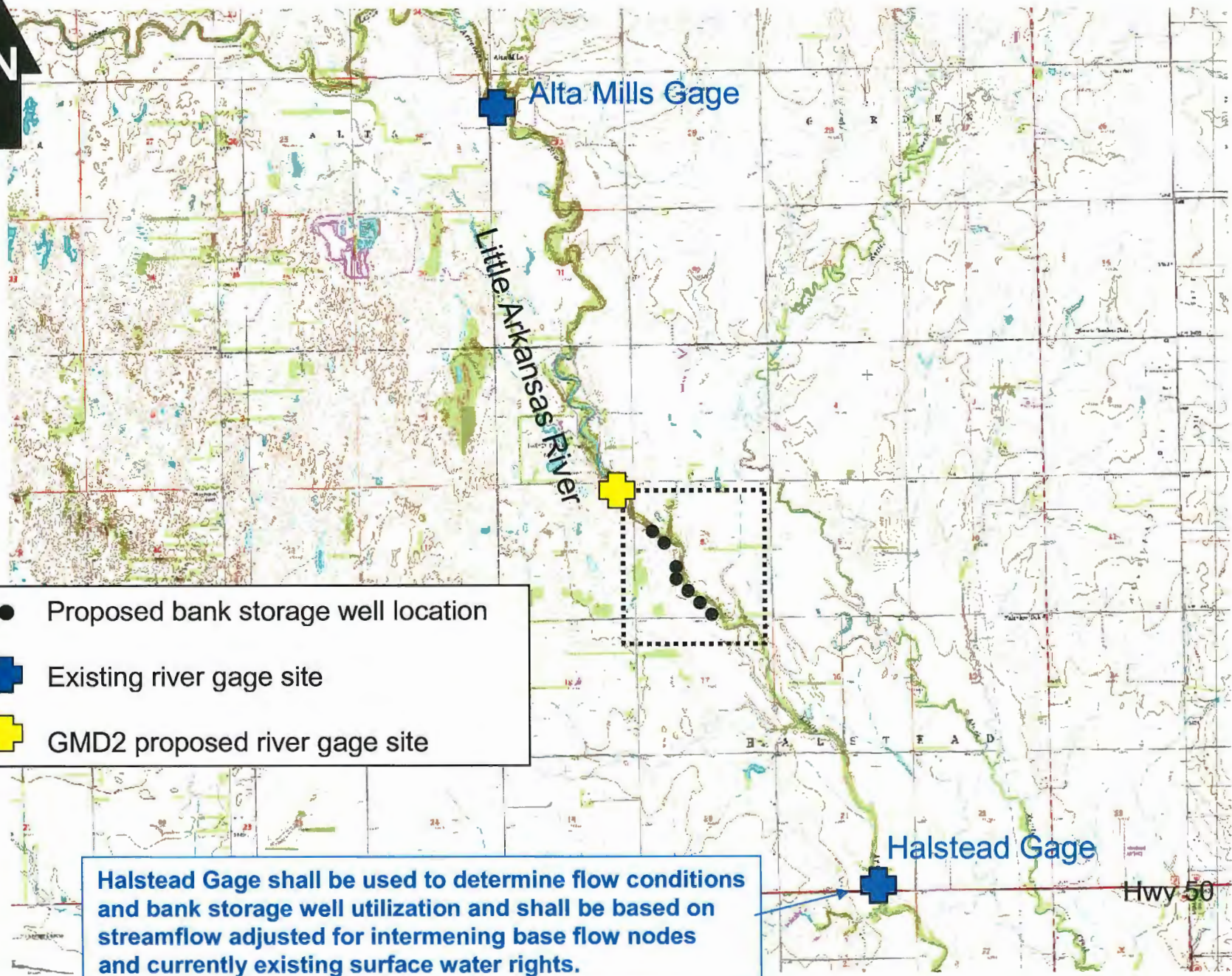
If water quality in existing or future domestic wells meets the then current drinking water standards and the water quality is subsequently changed by the Project such that the water no longer meets the then current drinking water standards, the City will provide and install a home water treatment system to bring the water back to drinking water standards or provide other appropriate remedial to replace the domestic water supply with water that meets the drinking water standard without additional cost to the resident.

Memorandum of Understanding
between
Equus Beds GMD2
and
The City of Wichita

Attachment “A”

**Bank Storage Application Nos.
45569 through 45575**

Recommendation No. 7



Alta Mills Gage

Little Arkansas River

Halstead Gage

Hwy 50

- Proposed bank storage well location
- Existing river gage site
- GMD2 proposed river gage site

Halstead Gage shall be used to determine flow conditions and bank storage well utilization and shall be based on streamflow adjusted for intermingling base flow nodes and currently existing surface water rights.

Recommendation No. 8 – Deleted as a result of modifications to Recommendation No. 7.

Recommendation No. 17 (added) – The drawdown limit in any zone, shallow or deep, will not exceed ten (10') feet at a distance 660 feet from the point of diversion on either side of the Little Arkansas River.

Recommendation Nos. 20 & 21 – The applicant shall submit a water level and water quality monitoring plan for review and comment by GMD2 and approval by the Chief Engineer, DWR.

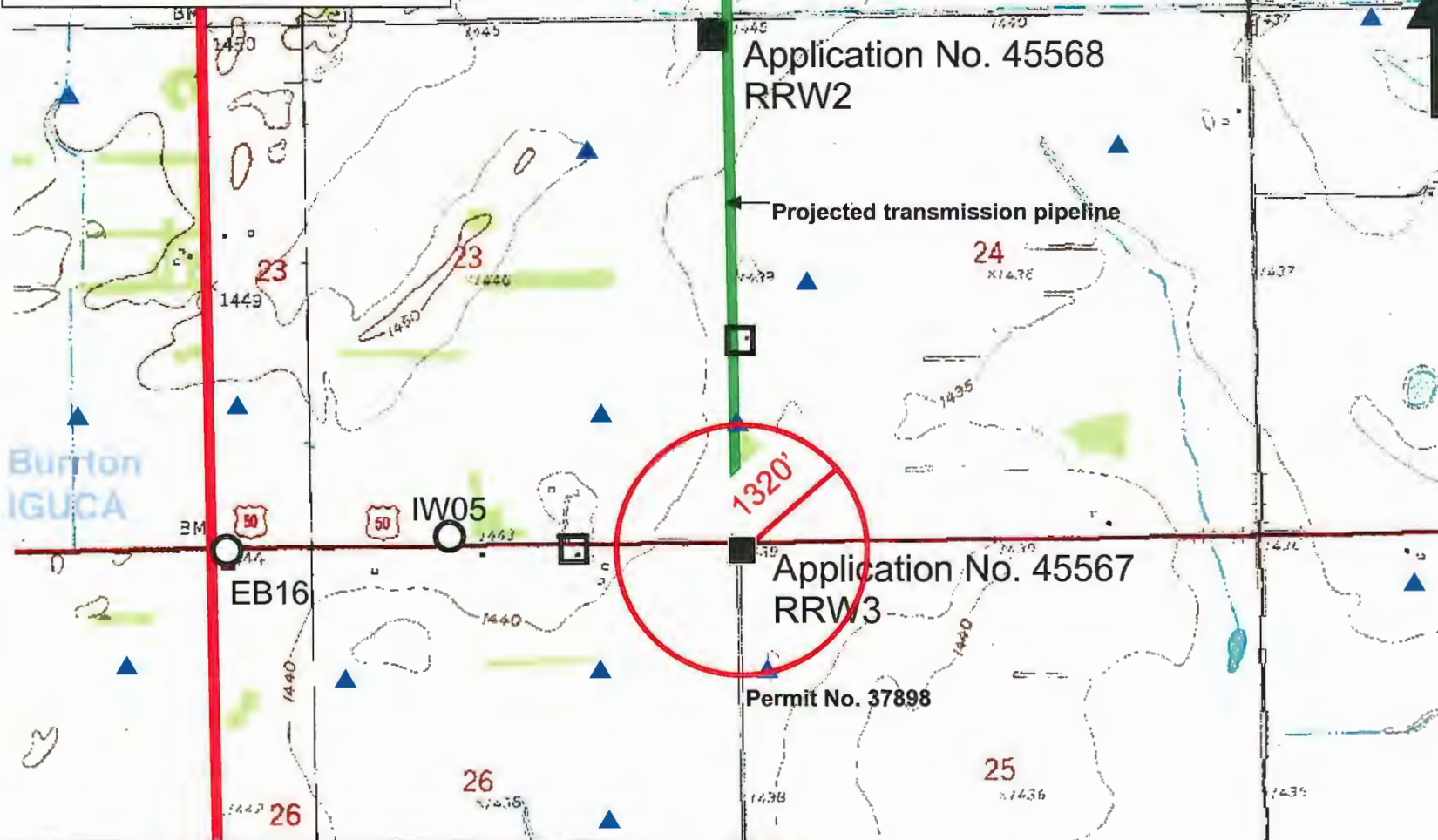
Recommendation Nos. 23 & 24 – The applicant shall submit a well field operation, monitoring and reporting plan for review and comment by GMD2 and approval by the Chief Engineer, DWR.

Recommendation Nos. 24 & 25 – The operational plan shall include utilization of monitoring wells and the stream flow monitoring gage in an automated system.

ASR Application No. 45567

Recommendation No. 1

Attachment 45567-A.



- Proposed aquifer storage and recovery well
- ▲ Non-domestic well or appropriation
- Domestic well
- Existing monitoring well
- Proposed monitoring well

Attachment 45567-A. – Application No. 45567 Site Map - NW 25-23S-3W
Prepared by: Equus Beds Groundwater Management District No. 2 - 07/06/04

**ASR Application Nos.
45567, 45568 and 45576**

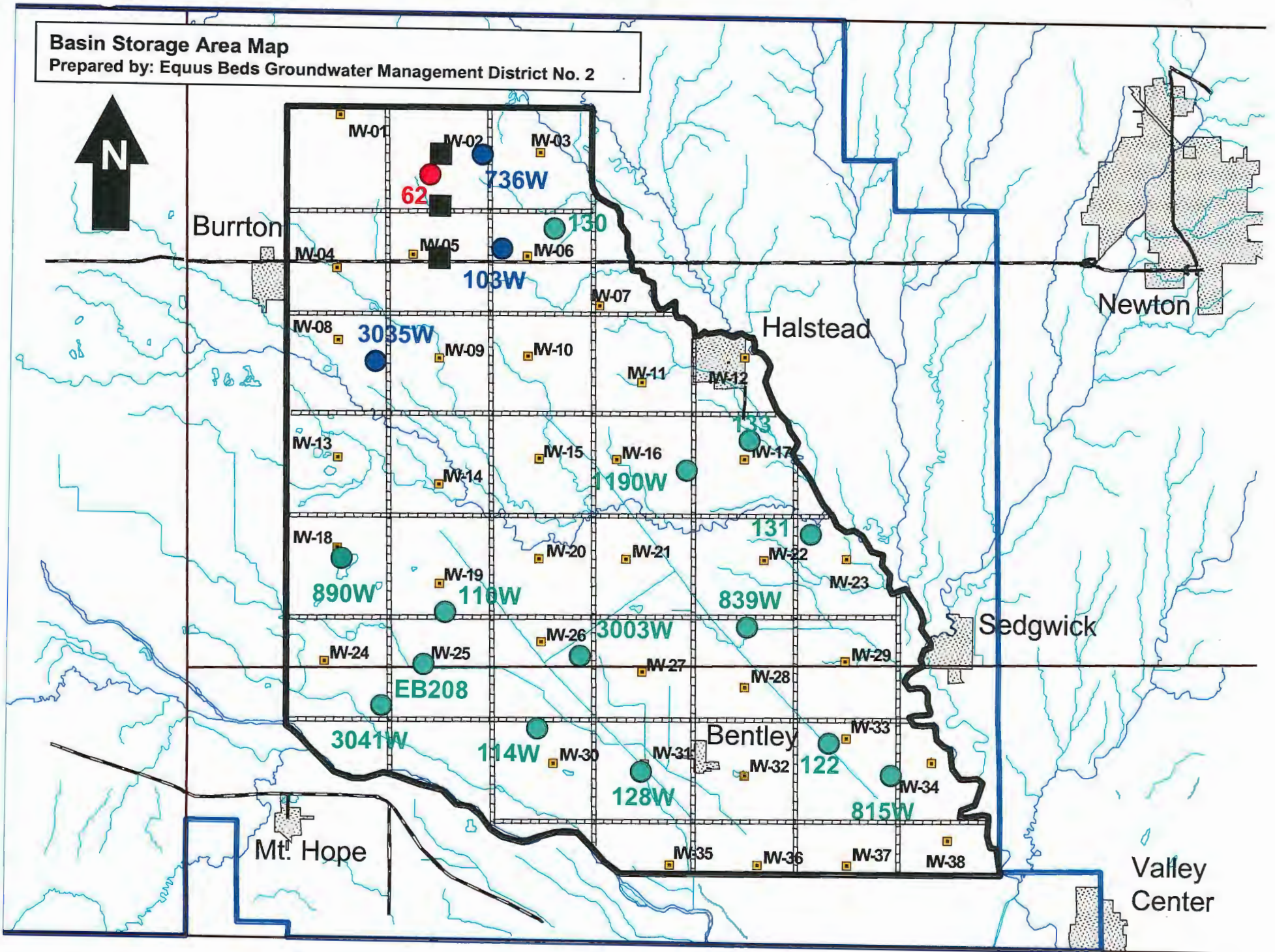
Recommendation Nos. 1 & 5 – Replaces referenced regulation K.A.R. 5-5-1(k) with K.A.R. 5-1-1(k).

Recommendation Nos. 2 & 6 – Replaces referenced regulation K.A.R. 5-5-1(oo) with K.A.R. 5-1-1(oo).

Recommendation Nos. 7 & 8 – The lowest index water level shall be determined per K.A.R. 5-12-1(b)(2) and the highest index water level shall be 1425 feet msl (17.6 feet bls), based on the pre-development water level for index well no. 5 as determined from KGS Bullentin No. 79 (1949)

Basin Storage Area Map

Prepared by: Equus Beds Groundwater Management District No. 2



MW-01

MW-02

MW-03

62

736W

130

Burrton

MW-04

MW-05

MW-06

103W

MW-07

MW-08

3035W

MW-09

MW-10

Halstead

MW-11

MW-12

Newton

MW-13

MW-14

MW-15

MW-16

MW-17

190W

MW-18

890W

MW-19

116W

MW-20

MW-21

MW-22

131

MW-23

839W

Sedgwick

MW-24

MW-25

EB208

MW-26

MW-27

3003W

MW-28

MW-29

Mt. Hope

3041W

114W

MW-30

MW-31

128W

Bentley

MW-32

122

MW-33

815W

MW-34

MW-35

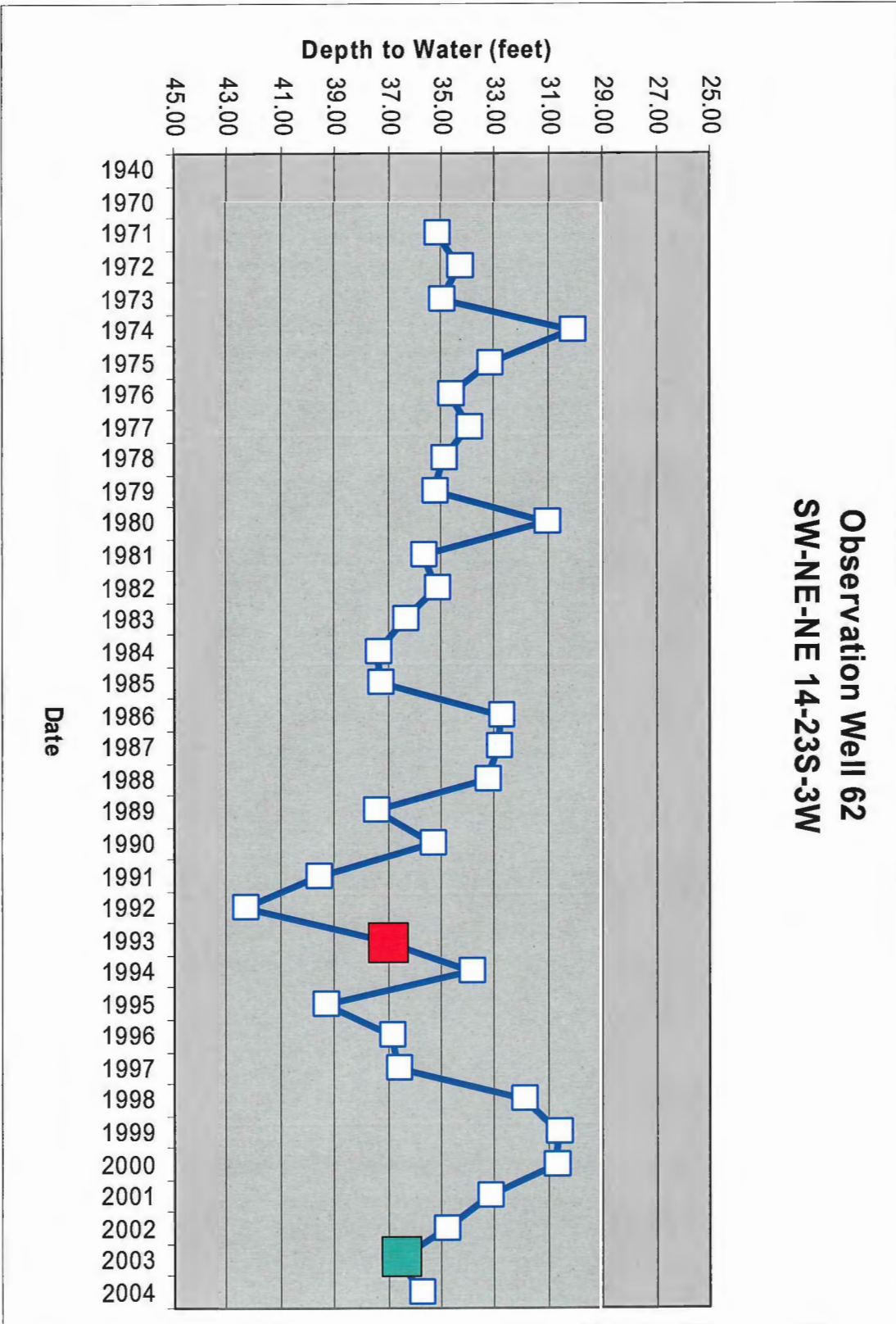
MW-36

MW-37

MW-38

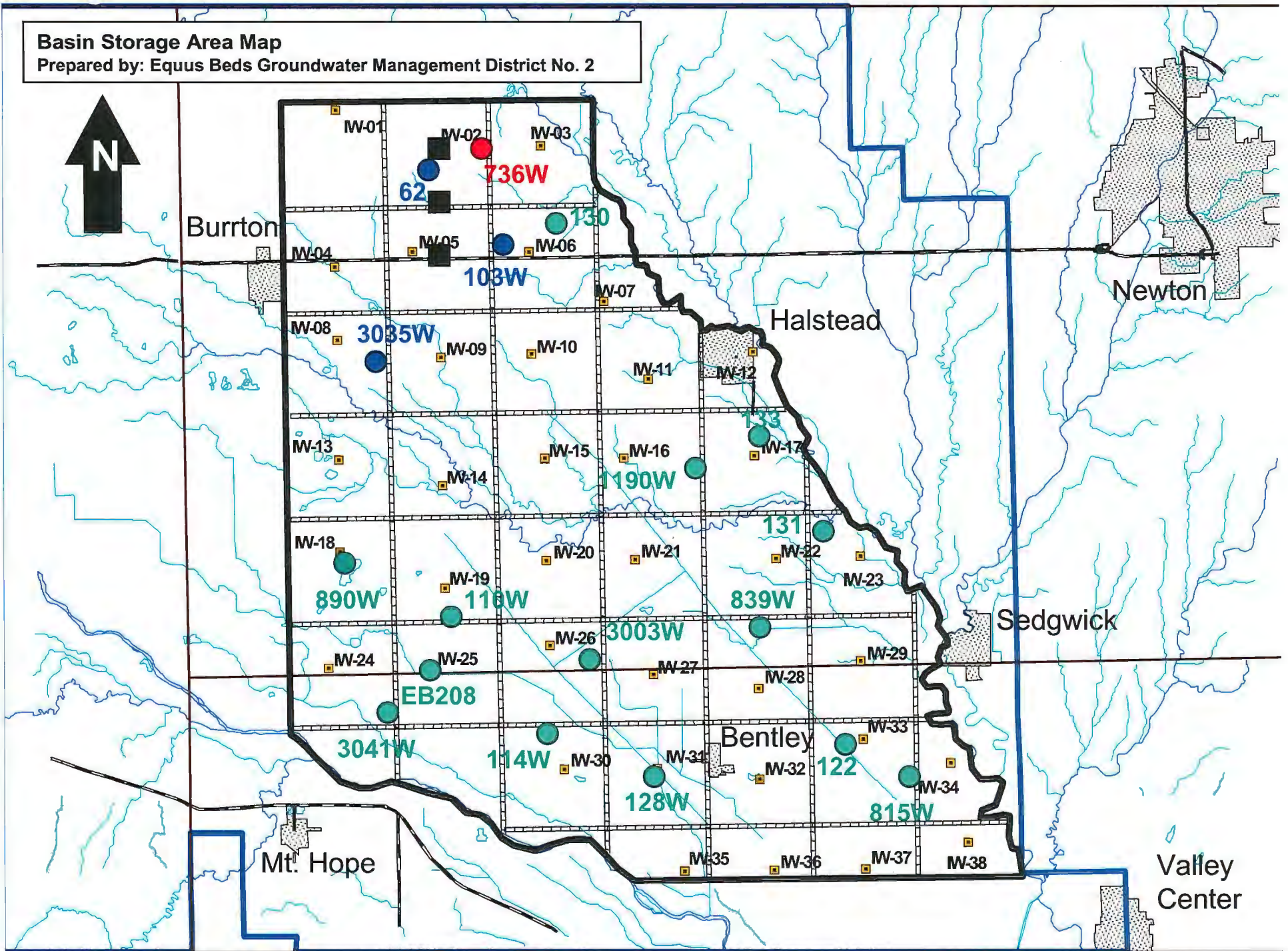
Valley Center

**Observation Well 62
SW-NE-NE 14-23S-3W**



Basin Storage Area Map

Prepared by: Equus Beds Groundwater Management District No. 2



Burrton

Halstead

Newton

Sedgwick

Bentley

Mt. Hope

Valley Center

MW-01

MW-02

MW-03

MW-04

MW-05

MW-06

MW-07

MW-08

MW-09

MW-10

MW-11

MW-12

MW-13

MW-14

MW-15

MW-16

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MW-29

MW-30

MW-31

MW-32

MW-33

MW-34

MW-35

MW-36

MW-37

MW-38

736W

103W

3035W

1190W

890W

116W

839W

3003W

3041W

114W

128W

815W

122

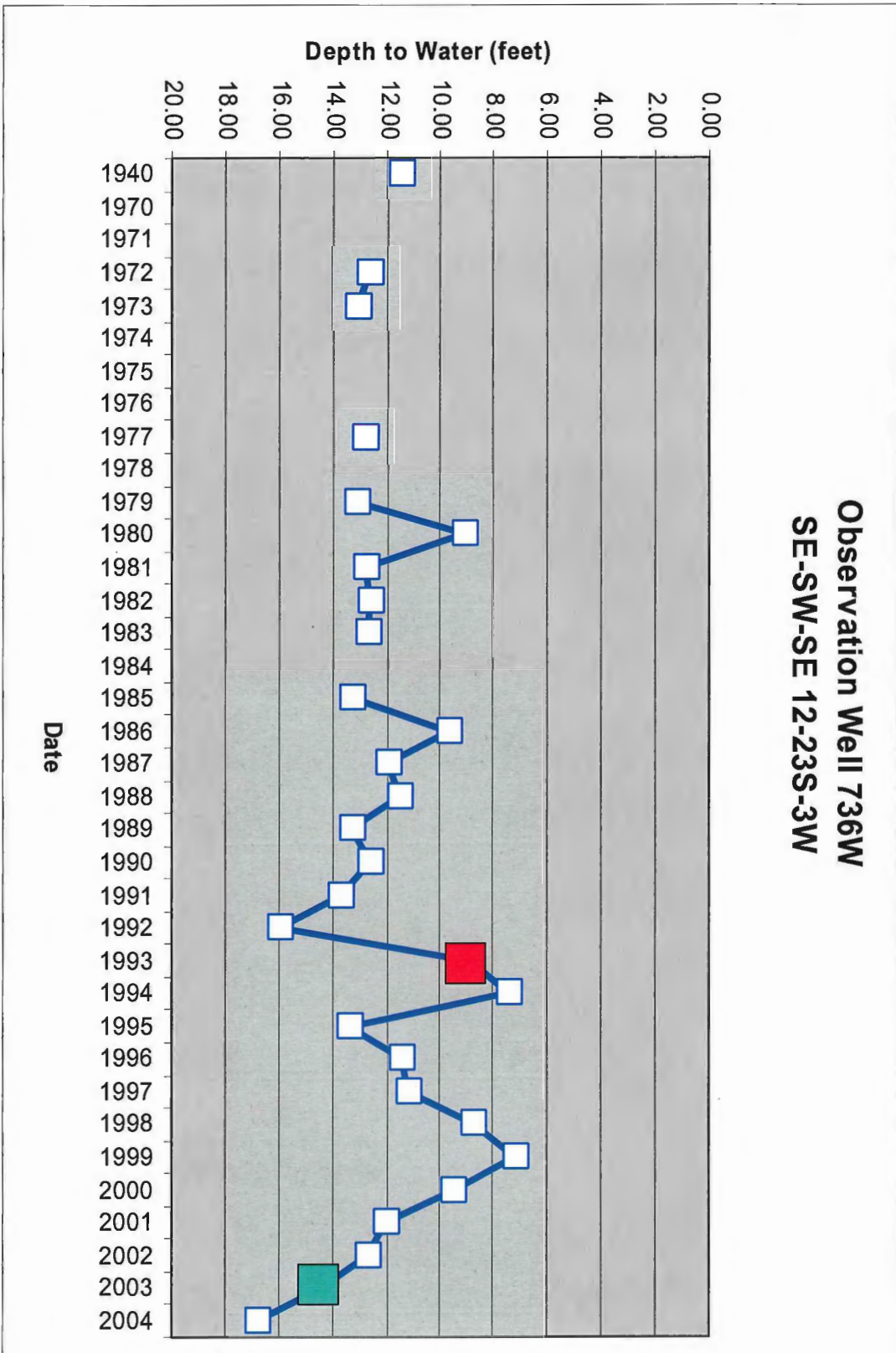
62

130

133

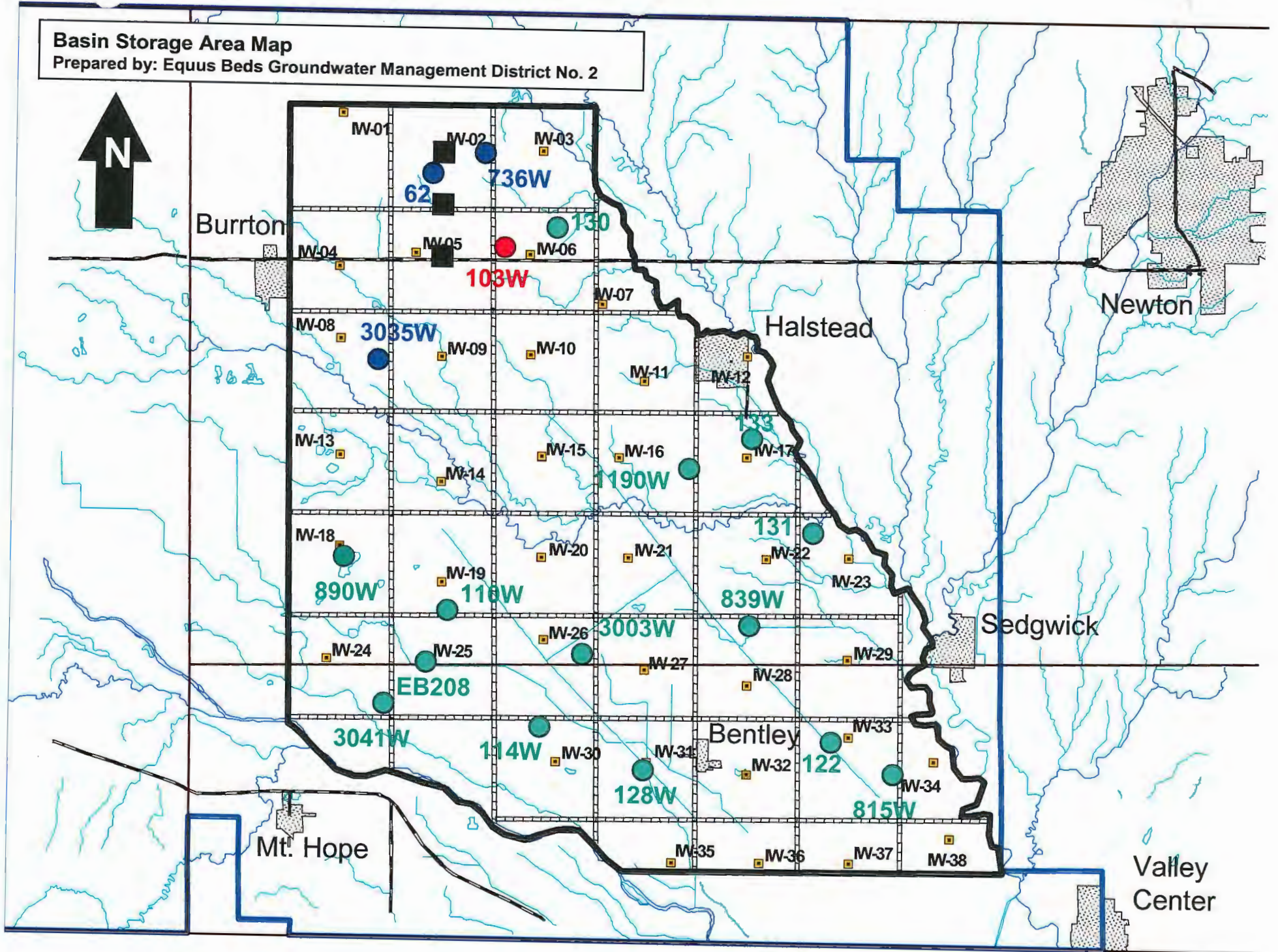
131

**Observation Well 736W
SE-SW-SE 12-23S-3W**



Basin Storage Area Map

Prepared by: Equus Beds Groundwater Management District No. 2



Burrton

Halstead

Newton

Sedgwick

Bentley

Mt. Hope

Valley Center

MW-01

MW-02

MW-03

MW-04

MW-05

MW-06

MW-07

MW-08

MW-09

MW-10

MW-11

MW-12

MW-13

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MW-29

MW-30

MW-31

MW-32

MW-33

MW-34

MW-35

MW-36

MW-37

MW-38

62

736W

130

103W

3035W

1190W

890W

116W

839W

3003W

EB208

3041W

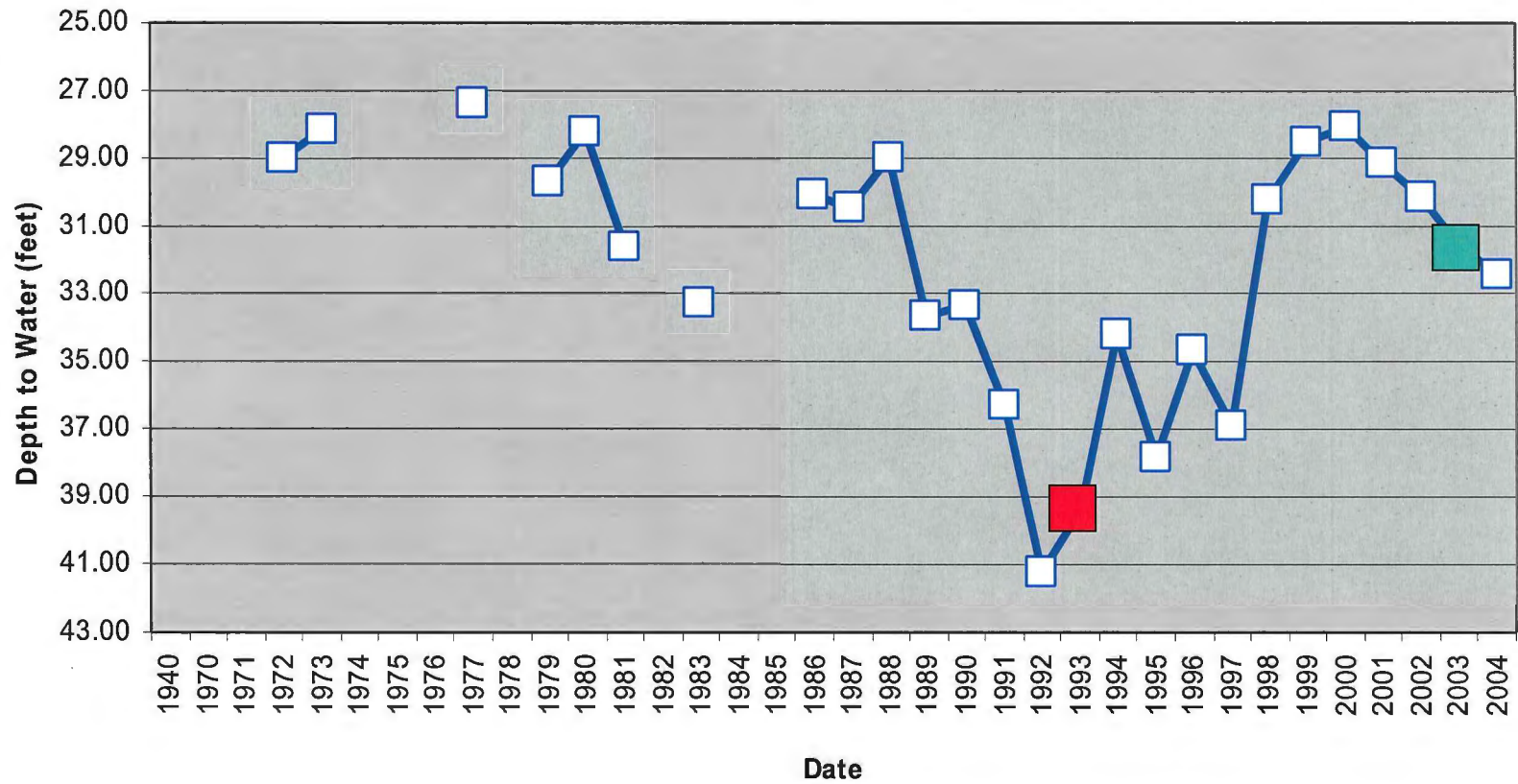
114W

128W

122

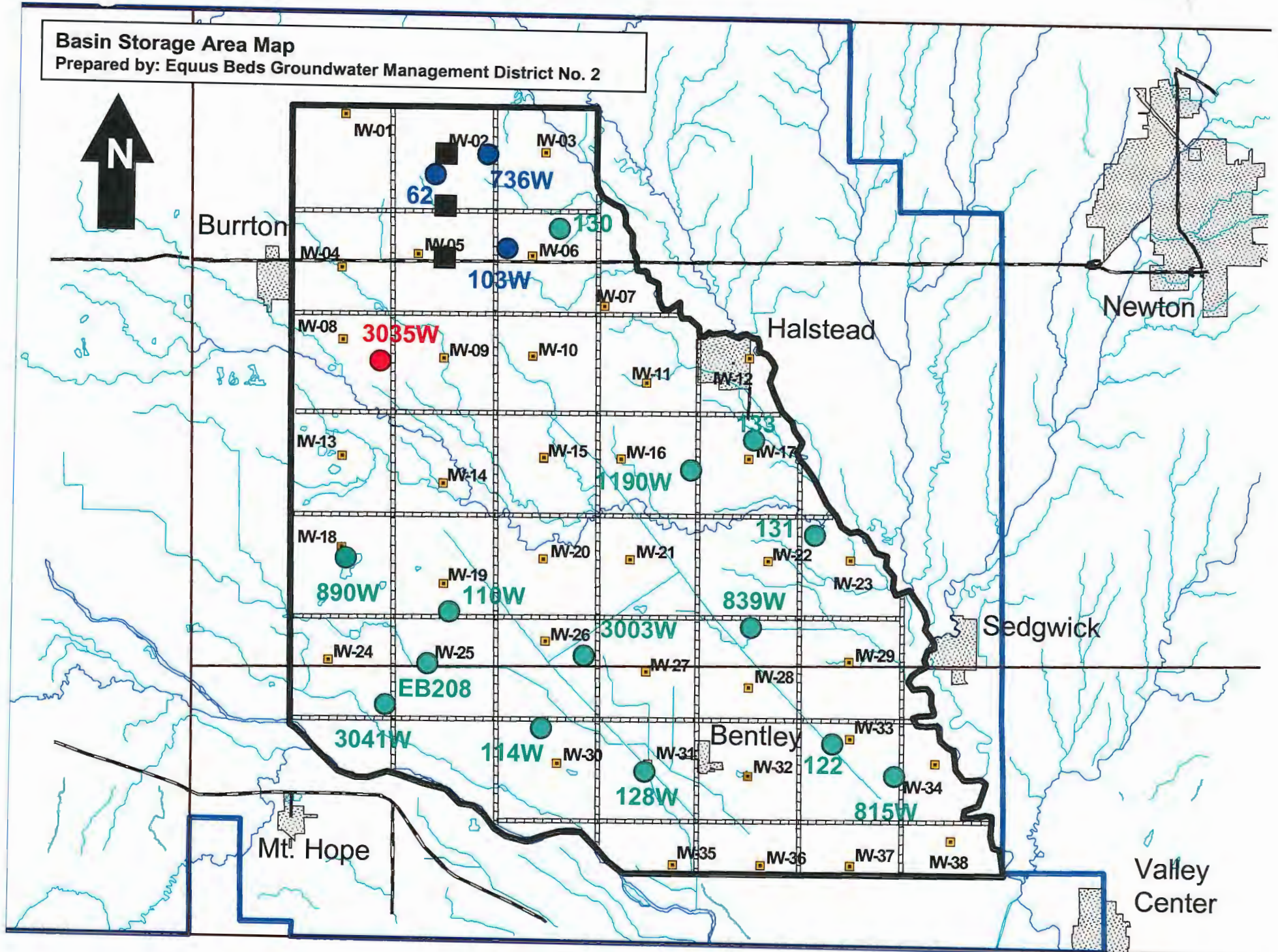
815W

**Observation Well 103W
SW-SW-SW 19-23S-2W**



Basin Storage Area Map

Prepared by: Equus Beds Groundwater Management District No. 2



Burrton

Halstead

Newton

Sedgwick

Bentley

Mt. Hope

Valley Center

MW-01

MW-02

MW-03

MW-04

MW-05

MW-06

MW-07

MW-08

MW-09

MW-10

MW-11

MW-12

MW-13

MW-14

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MW-32

MW-33

MW-34

MW-35

MW-36

MW-37

MW-38

62

736W

130

103W

3035W

1190W

890W

116W

131

839W

3003W

EB208

3041W

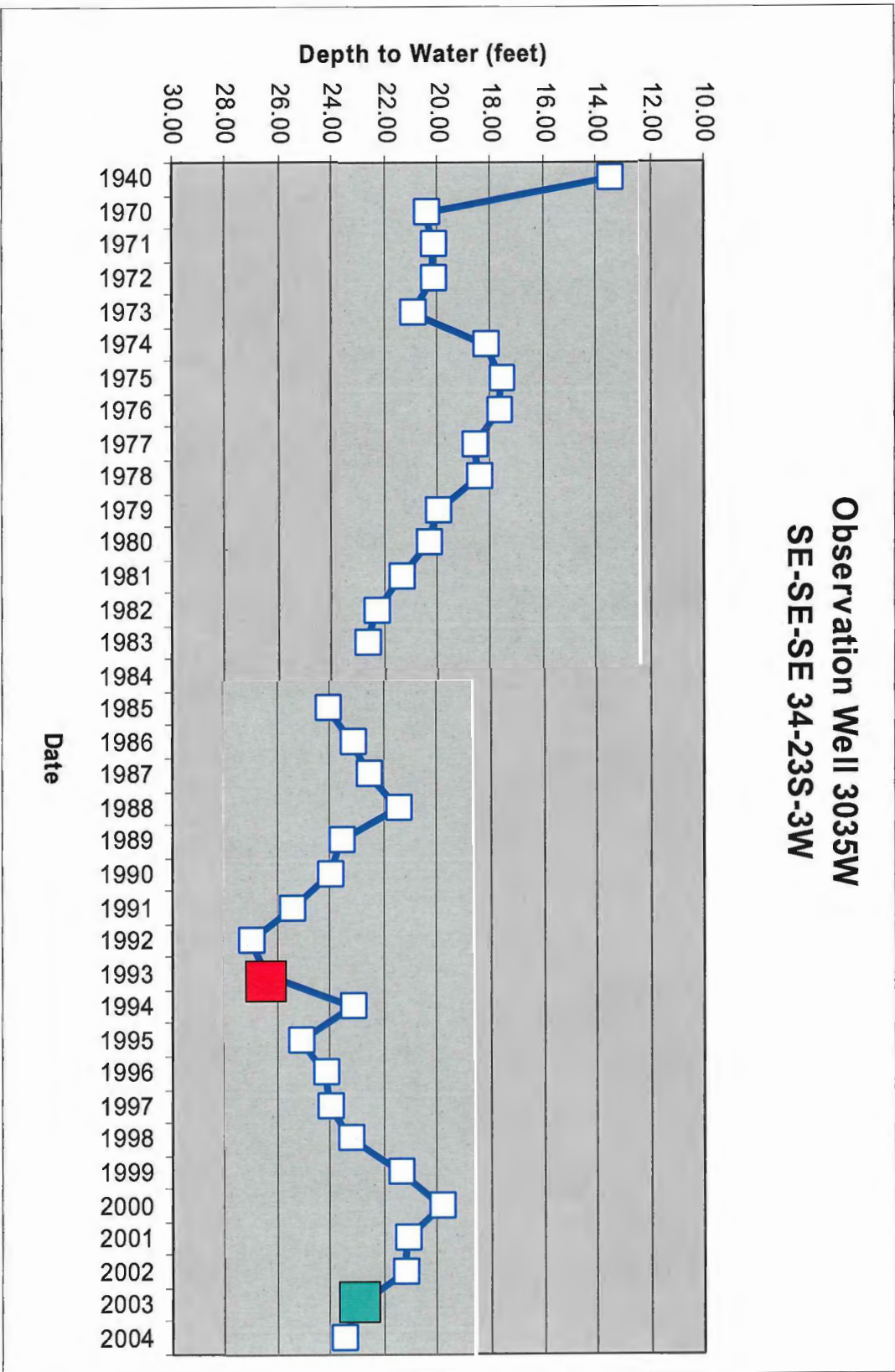
114W

128W

122

815W

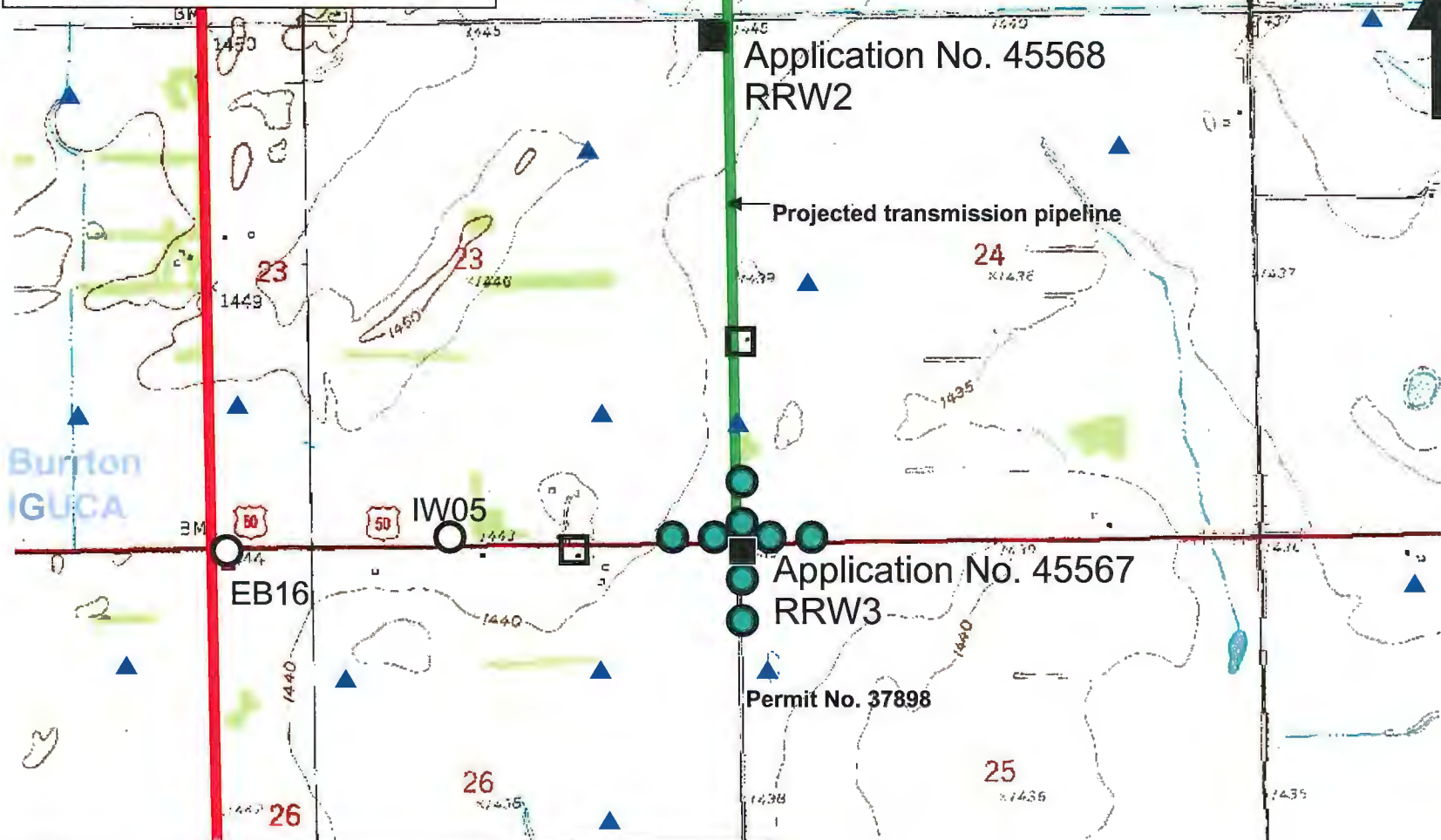
**Observation Well 3035W
SE-SE-SE 34-23S-3W**



ASR Application No. 45567

Recommendation No. 16

Attachment 45567-A(r).



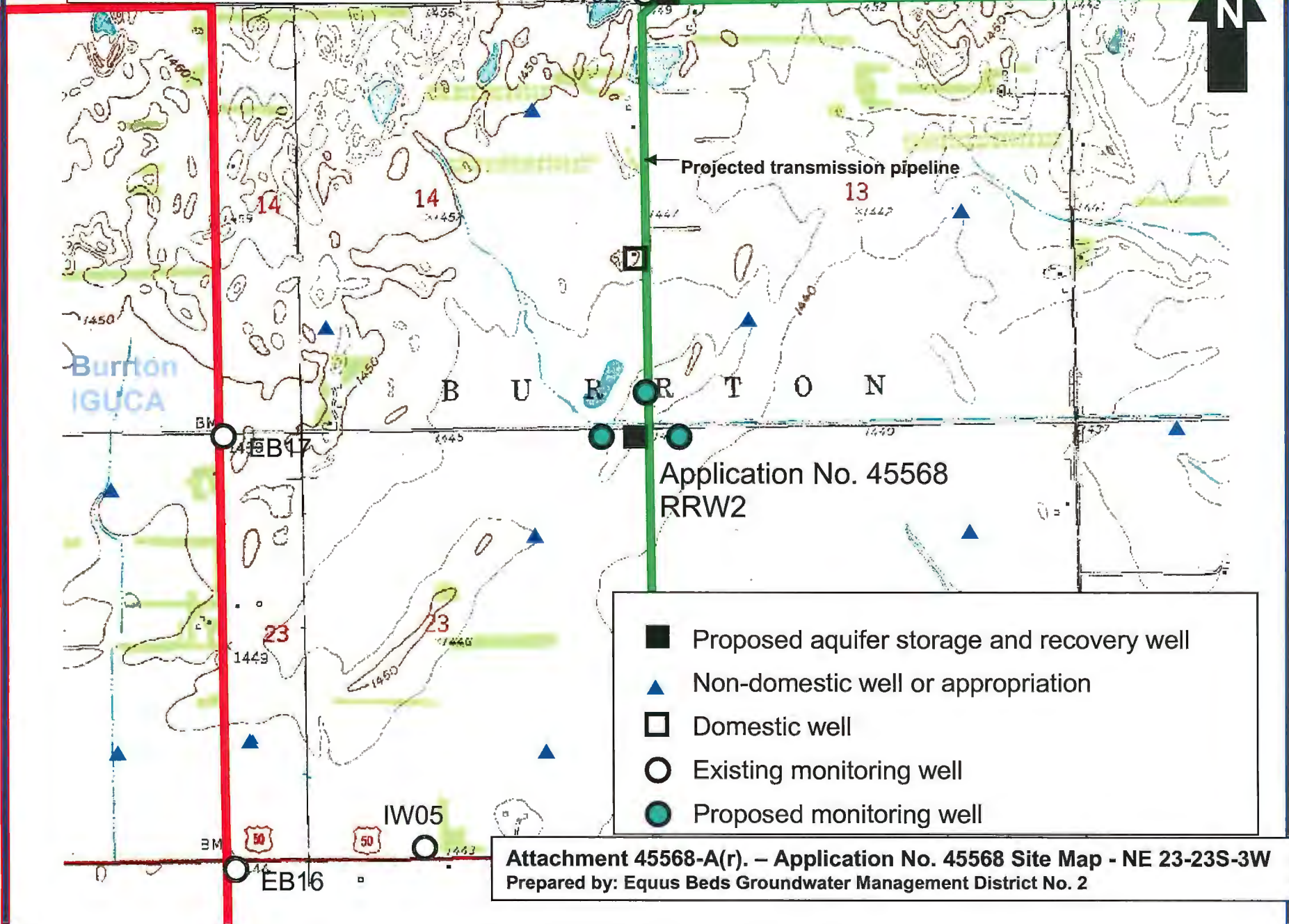
- Proposed aquifer storage and recovery well
- ▲ Non-domestic well or appropriation
- Domestic well
- Existing monitoring well
- Proposed monitoring well

Attachment 45567-A(r). – Application No. 45567 Site Map - NW 25-23S-3W
Prepared by: Equus Beds Groundwater Management District No. 2

ASR Application No. 45568

Recommendation No. 15

Attachment 45568-A(r).



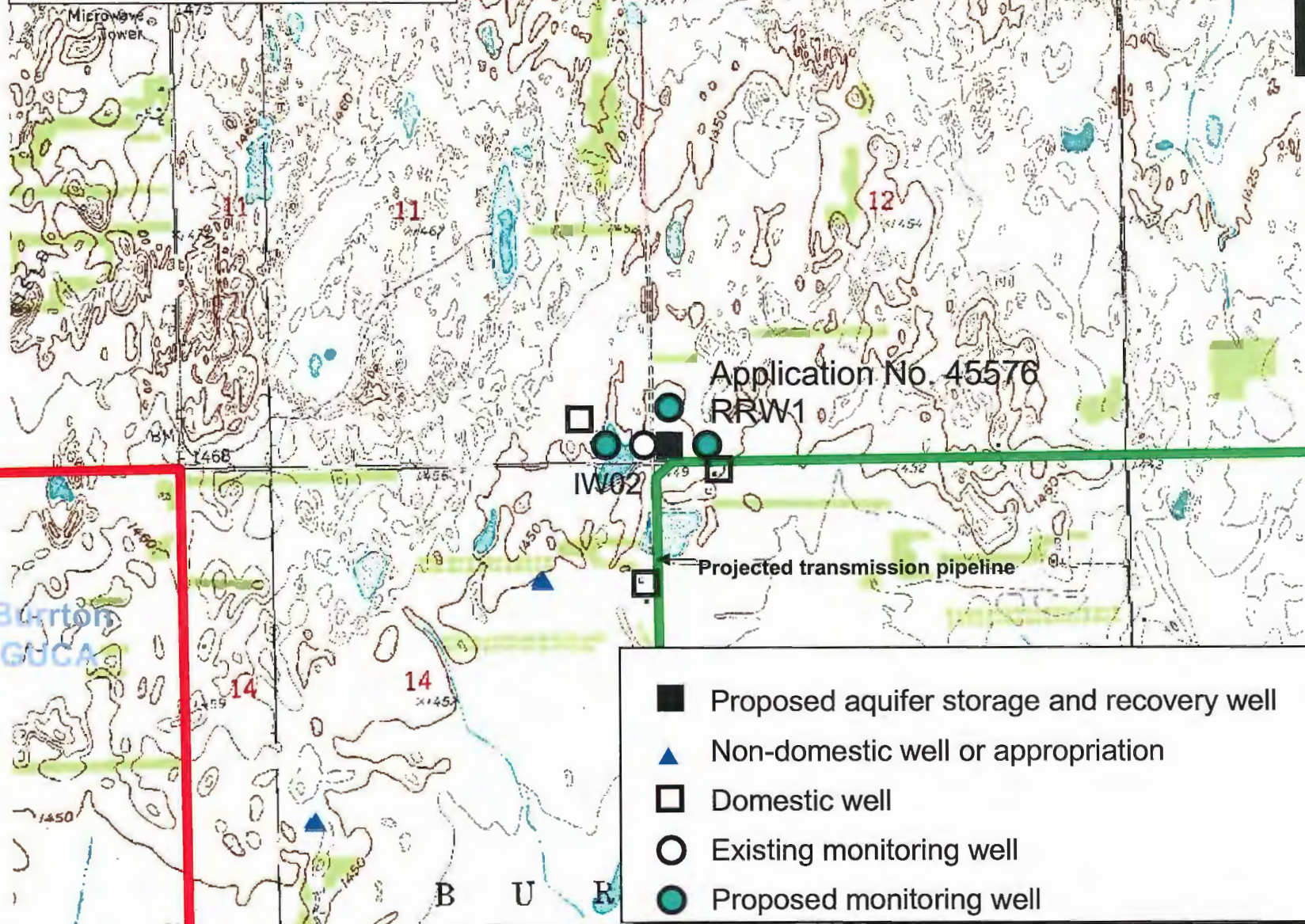
- Proposed aquifer storage and recovery well
- ▲ Non-domestic well or appropriation
- Domestic well
- Existing monitoring well
- Proposed monitoring well

Attachment 45568-A(r). – Application No. 45568 Site Map - NE 23-23S-3W
Prepared by: Equus Beds Groundwater Management District No. 2

ASR Application No. 45576

Recommendation No. 15

Attachment 45576-A(r).



- Proposed aquifer storage and recovery well
- ▲ Non-domestic well or appropriation
- Domestic well
- Existing monitoring well
- Proposed monitoring well

Attachment 45576-A(r). – Application No. 45576 Site Map - SW 12-23S-3W
Prepared by: Equus Beds Groundwater Management District No. 2

**ASR Application Nos.
45567, 45568 and 45576**

Recommendation Nos. 19 & 20 – Before installation of the proposed ASR wells, the applicant shall submit a water level and water quality monitoring plan to GMD2 for review and comment and to the Chief Engineer, DWR for approval.

Recommendation Nos. 25 & 26 – Delete nondomestic metering requirement as it is not an action to be taken by the applicant under a permit condition.

Figure 3. – Basin Storage Area Map
Prepared by: Equus Beds Groundwater Management District No. 2

