3.9 Groundwater Resources

Groundwater provides drinking water for communities and individual homeowners. The Illinois Groundwater Protection Act regulates the protection of groundwater and established factors that affect drinking water quality. Roadway projects must comply with both state and federal regulations protecting groundwater.

What are the groundwater resources in the study area?

Groundwater occurs in both shallow and deep aquifers in Illinois. The Illinois State Geological Survey (ISGS) has mapped and classified the shallow and deep aquifers in Illinois into seven zones. Zone 1 indicates the highest potential for groundwater recharge and the highest potential for groundwater contamination, and Zone 7 indicates the lowest potential. The majority of the study area is located in Zones 5-7, except Vandalia which lies in Zone 1 for groundwater recharge potential. The Vandalia area includes shallow deposits of sand and gravel where groundwater can occur. The project corridor is not within a regulated recharge area as established by the Illinois Pollution Control Board. There is a community wellhead protection area crossed by existing I-70 between Illinois Route 185 and CR 675 East.

According to the USEPA's list of designated sole-source aquifers, there are no sole-source aquifers in Illinois as defined by Section 1424(E) of the Safe Drinking Water Act. Therefore, the proposed project would not impact any such aquifers in Illinois Groundwater protection areas. In addition, there are no karst formations and there are no springs within the study area. There are seeps within the study area. See the Wetlands Technical Report and Section 3.11 Wetlands for more information on seeps.

Well records indicate that water in the study area is obtained from sand and gravel at depths ranging from 40 to 100 feet below the surface. Other wells not in the ISGS database may be present near the study area.

The drainage direction in the northern part of the study area is generally to the southeast, in the direction of the Kaskaskia River and its tributaries. The southern part of the study area has a general drainage direction to the west-southwest via numerous tributaries which also feed into the Kaskaskia River. The shallow groundwater flow direction was not specifically determined for the project but it is assumed that it generally follows the local topography.

What is groundwater recharge?

Groundwater recharge is water that has soaked into the ground and moved downward through soil and rock and into the water table. Groundwater recharge maintains the supply of fresh water for wells, streams, springs, and wetlands.

What is a sole source aquifer?

The U.S. Environmental Protection Agency (USEPA) defines a sole source aquifer as an underground water source that supplies at least 50% of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend upon the aquifer for drinking water.

What is Karst?

Karst terrain is characterized by springs, caves, sinkholes, and a unique hydrogeology that results in aquifers that are highly productive but extremely vulnerable to contamination.

Regulated recharge areas

Regulated recharge areas are areas with specific regulations in place to protect vital groundwater resources that are susceptible to pollution. In these areas there are regulations that prohibit building new landfills, radioactive sites, and injection wells used to dispose of drainage water.

How is drinking water provided in the study area?

A mixture of ground water and surface water is used to provide drinking water to the residents of the study area. Public water supplies provide water for residences located in Centralia, Patoka, Ramsey, and Vandalia. Centralia's water supply is drawn from Lake Centralia and Raccoon Lake. Patoka's water supply is obtained from the Patoka Old and New Reservoirs and the North Fork Kaskaskia River. The Village of Ramsey's water is obtained from one community supply well located one mile from the existing US 51 alignment. Vandalia's water supply comes from two sources: primarily the Kaskaskia River, with Vandalia Lake as a secondary source. Figure 3.8-1 in the Water Resources Section 3.8 depicts the location of these reservoirs and lakes.

The Safe Drinking Water Act (SDWA) – Wellhead

The Safe Drinking Water Act (SDWA) defines a Wellhead Protection Area as: "the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfields."

The other major supplier in the area is the Fayette Water Company that provides water from wells to over 7,000 people in communities 10 to 15 miles east of Vandalia. In April 2010 Fayette Water Company received a $1.275 million grant from United States Department of Agriculture (USDA) to expand their service area to include 1,400 homes and farms in the region of Vandalia Lake.

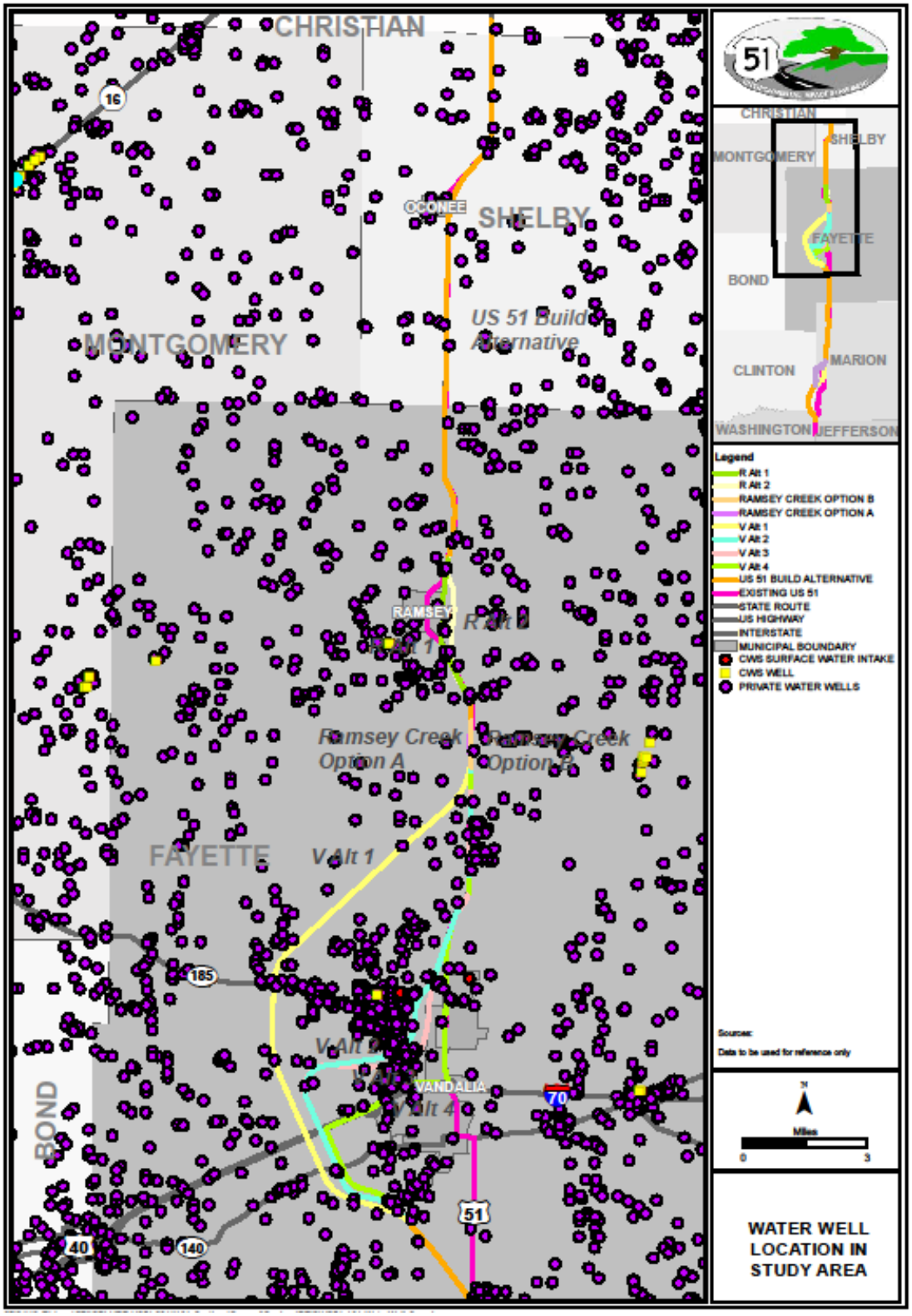
Private wells supply water for residences outside of the public water supply areas. Table 3.9-1, *Summary of Private Wells by County*, identifies the number of private wells in each county. Fayette, Shelby, and Clinton Counties had the highest concentration of private wells, with over 2,000 private wells in each county. Due to the large number of wells, especially in the Vandalia area in Fayette County, they all cannot be avoided. Figure 3.9-1 depicts the concentration of private wells in the Vandalia area of Fayette County.

Table 3.9-1: Summary of Private Water Wells by County

County	Number of Private Water Wells
Jefferson	537
Washington	686
Clinton	2,253
Marion	1,079
Fayette	2,692
Shelby	2,501
Christian	1,931

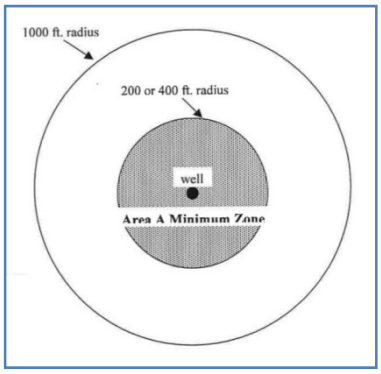
Source: ISGS, 2009

Figure 3.9-1: Private Wells in the Vandalia Area of Fayette County



How will public water supplies be affected by the alternatives?

The alternatives would not create any new potential "routes" for groundwater pollution or any new potential sources of groundwater pollution as defined in the Illinois Environmental Protection Agency (IEPA) near public water supplies. The public water supplies in Centralia, Patoka, Vernon, and Vandalia are obtained from surface water. These sources would not be affected. Ramsey operates a municipal well as its primary source, and the well is located over one mile from any alternative. The Ramsey municipal well would not be affected by US 51. Vandalia Lake is fed by numerous tributaries, some of which would receive stormwater runoff. The water quality effects to Vandalia Lake are discussed in the Water Resources section.



Source: ISGS

The quantity and quality of public water supplies would not be affected by the alternatives. A slight reduction in recharge area would be caused by road pavement; however, the effect would not be measurable for public and private well operations. Groundwater quality also is not expected to be measurably affected by the alternatives.

How will private water supplies be affected by the alternatives?

The Illinois Groundwater Protection Act protects groundwater by limiting the location of pollution sources close to private and public wells. The distance requirement is called a setback zone. Examples of these pollution sources are underground storage tanks and stockpiles of deicing chemicals. Setback zones would be considered in the siting of any maintenance facilities for the alternatives; however, no maintenance facilities are planned for the project. As such, the alternatives would not create any new potential "routes" for groundwater pollution or any new potential "sources" of groundwater pollution. Accordingly, the alternatives are not subject to compliance with the minimum setback requirements for community water supply wells or other potable water supply wells.

A **setback zone** is a geographic area containing a public or private well with restrictions on land uses within that zone to protect water supply—400 feet for public water supplies and 200 feet for private wells.

Private wells were identified within the right of way and within 200 feet of the right of way to assess potential impacts. Wells that can potentially be adversely affected by a new roadway would be those within 200 feet of the roadway and are shallow, improperly cased, or directly hydraulically connected to highway runoff. Deep wells can also be adversely affected if the wells are improperly constructed. For these wells there is the possibility of increased chlorides in the groundwater as well as other surface runoff contaminants that may be present such as total dissolved solids and heavy metals. The increase in chloride concentrations in shallow aquifers may be attributed primarily to road salt runoff. The increase in heavy metal concentrations in shallow aquifers may be attributed to oils on the roadway. Additionally, where shallow ground water

aquifers exist, the direction and supply of groundwater must be maintained. Table 3.9-2, Summary of Private Water Wells Potentially Impacted by Alternatives, shows the number of wells that may be affected for the various alternatives. Table 3.9-2 identifies the number of private wells that are within the proposed right-of-way and those that are within 200 feet of the various alternatives.

Table 3.9-2: Summary of Private Water Wells Potentially impacted by Alternatives

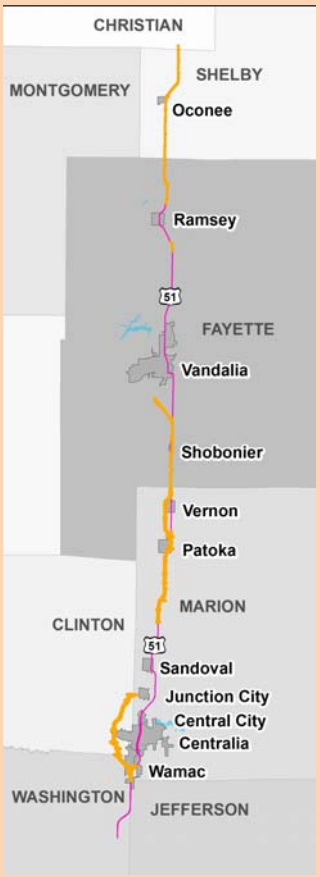
Alternative	Number of Private Water Wells within Proposed ROW	Number of Private Water Wells within 200 feet[a]	Total Wells within Proposed ROW and within 200 feet
US 51 Build Alternative	8	17	25
CS Alt 1	0	1	1
CS Alt 2	0	0	0
V Alt 1	4	1	5
V Alt 2	4	13	17
V Alt 3	7	17	24
V Alt 4	6	10	16
Ramsey Creek Option A	0	1	1
Ramsey Creek Option B	0	1	1
R Alt 1	3	3	6
R Alt 2	1	2	3

Source: ISGS, 2012

a Number represents those wells outside of the ROW and within 200 feet.

US 51 Build Alternative

The alternative between the larger towns where there is only one remaining alternative is referred to collectively as the US 51 Build Alternative. The US 51 Build Alternative is shown in orange below. Existing US 51 is shown in pink.



The US 51 Build Alternative is compared against the No Build Alternative. The US 51 Build Alternative and the remaining alternatives near the larger towns are described in Chapter 2.3.

Private Water Supplies – US 51 Build Alternative

The US 51 Build Alternative would displace eight private wells associated with residences due to right of way requirements. Those wells are located southwest of Centralia, south of Patoka, south of Vandalia, and south of Ramsey. There are an additional 17 water wells within the 200 feet of the right of way. The water wells are located southwest of Centralia, north of Sandoval, north and south of Patoka, north and south of Shobonier, and north of Oconee. The majority of the wells have a depth between 24 and 55 feet and are screened into the gravel. Displaced wells would be properly abandoned according to the Illinois Department of Health codes.

Private Water Supplies – CS Alt 1 and CS Alt 2

There are no private wells within the proposed ROW in the Centralia-Sandoval area. No wells would be directly abandoned as a result of the project. The one private water well located within the 200 feet of CS Alt 1 is at a depth of 1,572 feet, and therefore, should not be affected by CS Alt 1 due to its relative great depth.

Private Water Supplies – V Alt 1, 2, 3, and 4

The majority of private water wells within Vandalia are located within 60 feet of the soil surface and draw water from a sand and gravel aquifer. Approximately four to seven water wells fall within the proposed right of way of each alternative and these wells would be properly abandoned according to the Illinois Department of Health codes. These wells are associated with homes that likely would be displaced due to the roadway construction. If the home remains, the well would be replaced.

Those wells not directly taken by the alternative but within 200 feet of the ROW were further studied. Table 3.9-3 summarizes the number of private water wells and their depth. Shallow wells are at greater risk of contamination in the Vandalia sand and gravel aquifer.

Table 3.9-3: Summary of Vandalia Private Water Wells Outside of Right-of-Way and within 200 Feet of Alternative

Well Depth (feet)	V Alt 1	V Alt 2	V Alt 3	V Alt 4
0 to 20	0	0	1	0
21 to 40	0	5	8	4
41 to 60	0	7	5	5
61 to 80	0	0	1	0
81 to 100	0	0	1	0
> 100	1	1	1	1
Total	1	13	17	10

Source: ISGS, 2012

The majority of shallow wells are located northwest of Vandalia and southeast of Vandalia Lake. These private water wells are depicted on Figure 3.9-1 and occur in sand and gravel layers that are most susceptible to shallow groundwater contamination. These wells could be potentially impacted depending upon their depth and construction. Groundwater is assumed to flow to the southeast and southwest near Vandalia depending upon the alternative as groundwater follows the topography. Wells that occur upgradient of the alternatives would not have the potential to be affected. The shallowest private water well is located within the setback zone of V Alt 3, at a depth of 19 feet. V Alt 2 and V Alt 3 have the largest number of shallow wells within 200 feet of the proposed roadway.

Ramsey Creek Options, and R Alt 1 and Alt 2

One well is within 200 feet of both of the Ramsey Creek options, RCOA and RCOB. There is no difference in effects for these options. There are three water wells that would be taken with R Alt 1 and one that would be taken by R Alt 2; however, none would be directly affected by the Ramsey Creek Options. There are three other private water wells within 200 feet of R Alt 1 and two within 200 feet of R Alt 2.

What minimization/mitigation efforts will be made for affected well owners?

Private wells within the ROW would be properly abandoned in accordance with state requirements. Roadway runoff would be controlled via a ditch system in the study area and there would be no sheet runoff to adjacent areas. These actions minimize the potential for infiltration of chlorides and other pollutants.

In the Vandalia area where shallow groundwater is used for drinking water wells additional protection would be provided. The base of the ditch system would be designed to remain above the shallow water table. The depth is estimated at 19 feet based upon available water well data. The ditch system near V Alt 2 and V Alt 3 can also be lined with clay to reduce any possible infiltration to the shallow groundwater table.