

Identifying Domestic Use Exposure Pathways Using MRBCA

An Overview

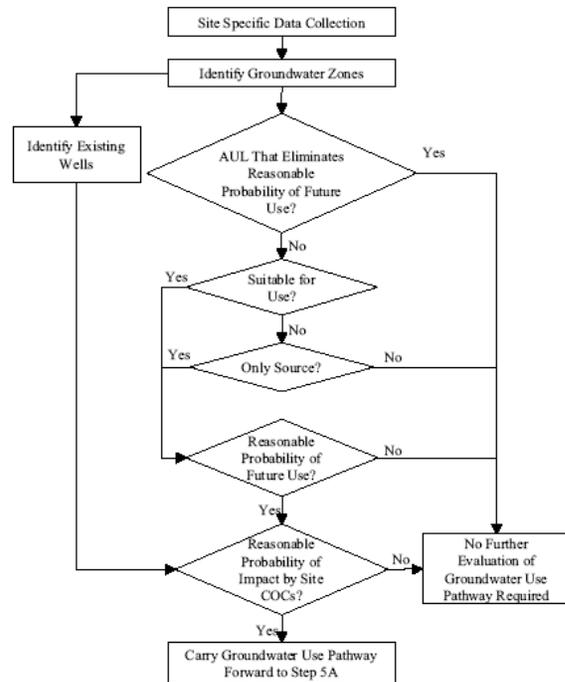


Missouri
Department of
Natural Resources

Data Collection

- Site Characterization
 - Site history
 - Source Identification
 - Soil contamination
 - Groundwater contamination
 - Off site Contamination?
 - Soil Type
 - Exposure pathways

Domestic Use Pathway



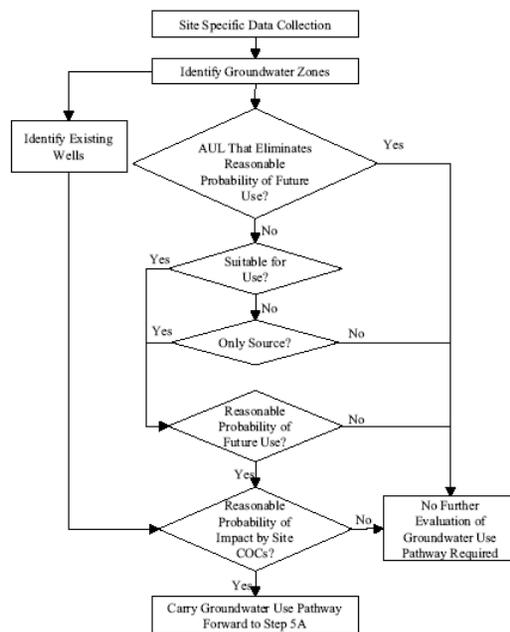
NOTE:

1. In this chart, "use" refers to domestic consumption.
2. The analysis embodied in the chart is performed for each groundwater zone of interest. The conclusion of the analysis (the groundwater use pathway is either carried forward for additional consideration, or no further evaluation of the pathway is required) applies to the individual groundwater zone under analysis. Different conclusions may apply to different groundwater zones at a given site.
3. The attributes of an AUL must be sufficient to "eliminate reasonable probability of future use", and, by that, allow a conclusion that "no further evaluation of groundwater use pathway required."

Figure 6-2. Site Conceptual Model for Domestic Consumption of Groundwater Exposure Pathway Analysis

- MRBCA Guidance
 - Chapter 6 (Sect 6.3)
 - Figure 6-2
 - Current and Future groundwater use

Identify Groundwater Zones



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Figure 6-2. Site Conceptual Model for Domestic Consumption of Groundwater Exposure Pathway Analysis

- Part of initial site investigation
- Includes groundwater near the site or reasonably likely to be impacted
 - Perched (all zones)
 - Bedrock (if applicable)

Perched Groundwater (in soil)

- Must consider each saturated zone
- If multiple perched zones, each must be considered
- Eliminate potential through screening/sampling
- Soil types must be considered

**PROVIDE SUPPORTING
DOCUMENTATION!!**

Bedrock

- Should provide discussion of bedrock based on observed field conditions and/or literature information
 - Bedrock Type
 - Competency
 - Karst or Karst Features
- If contamination (soil or groundwater) is located at the soil/bedrock interface, DNR will consider the need for bedrock wells
- Karst bedrock will require a more detailed discussion.

Identify Existing Wells

- MEGA 2007 (DGLS)

- (573) 368-2100
- Registered Wells
(post 1987)
 - *Rock specific*
 - *Required notification*
 - *Larger coverage*
- Historic Wells
(Pre- 1987)
 - *Formation specific*
 - *Voluntary notification*
 - *Less complete coverage*

- Other groundwater uses

- Cooling water
 - Irrigation
 - Industrial process
- Door to door survey

Activity Use Limitations (AUL)

- Deed Notice/Restriction limiting installation of domestic water wells
 - Must cover all impacted properties
 - If no AUL exists, we will consider the groundwater unit to have a reasonable probability of future use.
 - Each groundwater zone with reasonable probability of future use should proceed through process to the Probability of Future use determination

Activity Use Limitations (AUL)

- City of St. Louis/Memo of Understanding
 - In addition to City Ordinance, it prohibits installation of wells in City Limits
 - Eliminates future well pathway
 - Does not include St. Louis County
- Other Metropolitan Areas
 - Zoning restrictions and ordinances limiting well installation are not enough
 - Ordinance/Zoning are not durable

Suitable for Use

- Section 6.3.2 MRBCA Guidance
- Appendix D, MRBCA Guidance
- Two Criteria
 - Total Dissolved Solids (TDS)
 - *< 10,000 mg/l is sufficient natural quality to serve as potential domestic water source*
 - Yield
 - *1/4 gal/min or 360 gal/day on sustained basis is considered sufficient yield*

Sole Source Determination

- If groundwater is only viable source of water
 - Assume & evaluate as reasonable future use
 - *(regardless of TDS or yield)*
- Determine availability of alternatives
 - Other viable groundwater zones
 - Municipal supplies
 - Surface water sources

PROVIDE SUPPORTING DOCUMENTATION

Probability of Future Use

- Based on:
 - Current groundwater patterns
 - Suitability (TDS, Yield)
 - Availability of alternative water supplies
 - AULs
 - Urban development patterns
 - Aquifer capacity limitations
- Evaluated on “weight of evidence” basis
- If verified reasonable future use, evaluate for reasonable probability of impact

Probability of Impact

- Factors to consider & document
 - Known extent of contamination
 - *Soil & groundwater*
 - *Vertical & Horizontal*
 - Site hydrogeology
 - *Hydraulic conductivity*
 - *Fate & Transport factors*
 - *Karst*
 - *Other site specific factors*

Other factors affecting probability of future impact

Vertical distribution vs depth of domestic well

- Is there a viable barrier between contamination and potable groundwater?
- Is there a vertical gradient component?
- Are deeper wells causing a vertical gradient?
- Can you prove it / Disprove it

See also Well Construction Rules (DGLS)

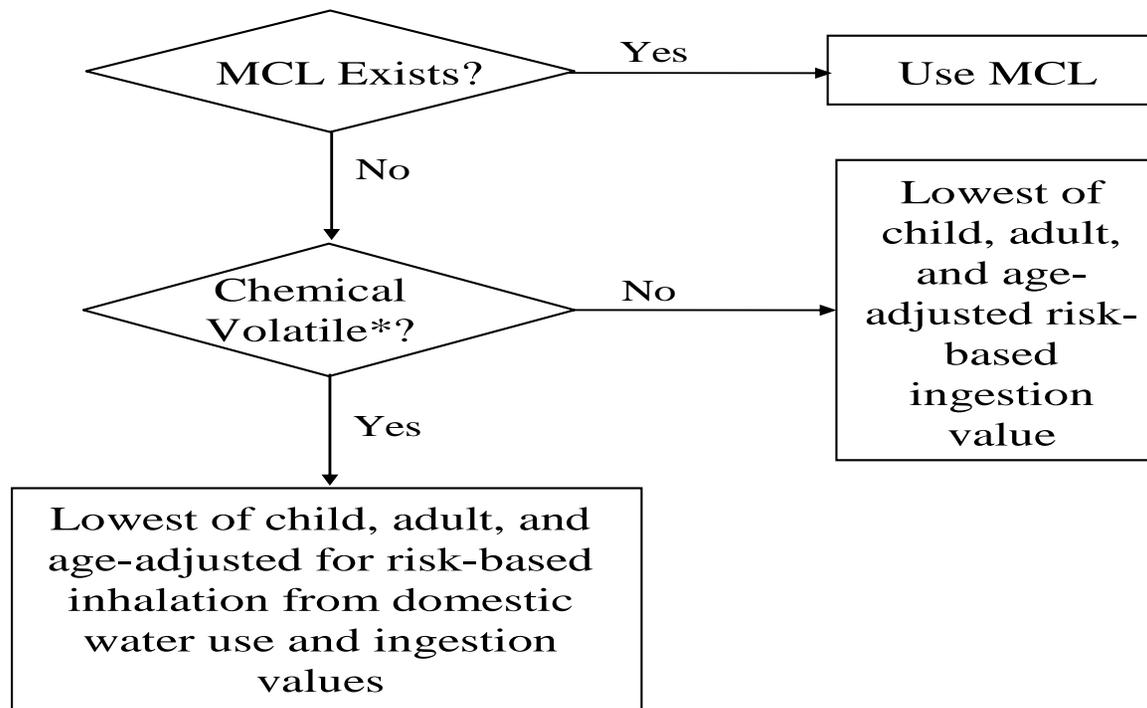
Special Areas (Excelsior Springs, Karst, etc)

Probability of Impact

- Evaluate to the nearest down-gradient location that could reasonably be considered for a groundwater well
 - Could be on-site
 - Could be off-site

If Complete (Potential) Pathway Exists (6.3.3)

- Determine target levels at:
 - Point of Exposure (POE)
 - Point of Determination (POD)
 - Soil/Area of Release (AOR)
 - Appendix B MRBCA Guidance
- Compare target levels to representative concentrations for the site



* Chemical is volatile if $MW < 200$ and H (dimensionless) $> 4.2 \times 10^{-4}$.

Figure 6-3. Determination of Groundwater Target Concentration at POE

End