





- Saturated subsurface zone from which drinking water is drawn: EPA's PA guidance defines an aquifer as a saturated subsurface zone from which drinking water is drawn. The principal threat under the groundwater pathway is the threat posed to drinking water and to populations relying on groundwater as their source of drinking water.
- Groundwater may be used for certain resources such as agriculture and recreation: Groundwater affected by a site may also be used for resources, such as agriculture, commercial food production, livestock, silviculture or recreation. If groundwater is used for certain resources, the groundwater score can be increased.
- Not all groundwater is used for drinking purposes: Groundwater may not be used for drinking in some areas. The reasons could be poor yield, poor quality or the availability of a high quality surface water source.





- What is the local stratigraphy?: Proper evaluation of the groundwater pathway requires a general understanding of the local geology and subsurface conditions. Publications of the USGS and State geological surveys are good sources for local and regional geologic information. Other local sources of information may include well drillers, well logs (possibly maintained by local and State government agencies) and university geology departments.
- What aquifer(s) serves the nearby areas?: The target distance limit for groundwater is 4 miles. All aquifers within 4 miles of the site should be evaluated to determine if they are used for drinking water. In many cases, a shallow aquifer may be used by private residents with individual wells while a deeper aquifer is used by a community or municipality.
- How deep is the shallowest aquifer that is used for drinking purposes?: The PA identifies the shallowest aquifer used for drinking purposes. This information is necessary to evaluate the potential to release if an observed release cannot be established.





Groundwater pathway questions: The groundwater pathway is scored by determining (1) the likelihood that hazardous substances have been released to the groundwater (the higher the likelihood the higher the score); (2) the number of targets affected or potentially affected by the contaminated groundwater (the greater the number of targets the greater the score); and (3) the toxicity, mobility and quantity of hazardous substances at the site (the more toxic and mobile, and the greater the quantity the greater the score).





- Observed release: This factor evaluates the likelihood that contamination from the site has reached groundwater. At the PA stage, groundwater sampling data may not be available. Therefore, several contaminant and hydrogeologic factors are evaluated to make this determination.
- Potential to release: This factor measures the likelihood of groundwater becoming contaminated based on site-specific factors. These factors include source containment, net precipitation, depth to aquifer and contaminant travel time.
- Evaluate sources/wastes/hydrogeology: The likelihood of release requires an evaluation of the sources at the site and the level of containment of those sources, the physical state of the contaminants, precipitation levels, infiltration rates, presence of karst geology, permeability, aquifer depth, contaminant mobility and any analytical or circumstantial evidence regarding releases.





- Actual Level I and II contamination: Actual contamination targets include populations associated with drinking water wells that are contaminated. Level I contamination occurs when contaminant levels in drinking water wells are above established standards, such as maximum contaminant levels (MCL). Level II contamination occurs when contaminant levels in drinking water qualifies as an observed release but is at or below established standards.
- Potential contamination: Potential contamination evaluates all drinking water wells within 4 miles of the sources. The population served by these wells is counted even if they live farther than 4 miles from the source. Populations associated with drinking water wells are distance weighted. The farther the well is from the source, the greater the reduction in target numbers due to distance weighting.





- Resources: This pathway score can be increased if groundwater is used for particular resources within 4 miles of the sources at the site.
- Wellhead Protection Area: If there is a formally established Wellhead Protection Area within 4 miles of the sources at the site then additional points can be added to the score. Only final Wellhead Protection Areas established in accordance with the Safe Drinking Water Act count. Proposed areas cannot be counted.





- Determine based on: At the PA stage, there may not be any analytical data to indicate that drinking water wells are subject to actual contamination. Therefore, BPJ must be used to evaluate whether actual contamination should be scored. These judgments should be conservative and err on the side of caution. The BPJ should consider the characteristics of the site and local hydrogeology; source types and quantities of waste; the proximity of drinking water wells; the depth to drinking water aquifers; and any information about closed wells or complaints of residents about the quality of well water. Existing analytical information from past sampling efforts can also be useful.
- Level I: Actual contamination can either be Level I or Level II. Level I groundwater contamination means that a drinking water well has contamination at levels that equal or exceed regulatory or health-based standards, such as, MCLs. Level I contamination is scored higher than Level II contamination.
- Level II: Level II contamination means that a drinking water well has contamination at levels that qualify as an observed release but are less than regulatory or health-based standards.





- Drinking water wells within 4 miles of sources: All drinking water wells within 4 miles of the source should be evaluated, including municipal wells, private wells and community supply wells. The depths of these wells and their distances from the sources should be established.
- Count all populations served by wells within 4 miles of sources: All populations served by wells located 4 miles from the source should be counted. Well located within 4 miles of the sources may serve populations outside 4 miles. Conversely, wells located outside the 4 mile distance limit may serve populations located within the 4 mile target distance limit.
- Groundwater flow direction is not considered: The PA, SI and HRS do not consider groundwater flow direction. The target distance limit is measured from sources in all directions.





Well location example: This example illustrates how populations are counted. The population from Well A would not be included because the well is located outside the 4 mile target distance limit, even though the population resides within the target distance limit. The population associated with Well B would be counted even though most of the people live outside the target distance limit because the well is within the target distance limit.





- Evaluate all groundwater targets within 4 miles of the sources regardless of which aquifer they draw from: Many sites will have more than one aquifer associated with them. All drinking water wells within the 4 mile target distance limit should be evaluated even if they draw from different aquifers.
- If two or more aquifers are interconnected, they can be counted as one aquifer: Interconnected aquifers can be counted as one aquifer. Evidence of interconnected must be established through existing geologic information or information developed during the SI.





- **Determine the following about each well:** As part of the PA, the following information should be collected for each well:
 - » Location, depth and screened interval
 - » Aquifer(s) tapped
 - » Number of people served
 - » Number of connections
 - » Volume of water pumped annually
- Locate and determine reason for any closed wells: If any wells have been closed, the PA should locate these wells in relation to the site, determine if they are within the target distance limit, and establish the reason for closing the well.





- Blended systems mix together water from several wells before distribution: Municipal systems may blend together water from two or more wells before distribution to users. In addition, the entire system may be interconnected, by way of valves or connecting lines, so that water drawn from any individual well has the potential to reach any user of the system. The population from such blended systems must be apportioned.
- ◆ Apportion population as follows: Population apportions for blended systems follows the 40% rule. If any one well contributes 40% or more to annual production, apportion the population based on actual contributions from wells. If no single well contributes 40% or more, apportion population evenly for all wells.



WELL #	% CONTRIBUTION	POPULATION SERVED
DW-1	30	?
DW-2	35	?
DW-3	35	?

#	WELL	% CONTRIBUTION	POPULATION SERVED
DW-2 35 3,333			POPOLATION SERVED
	DW-1	30	3,333
DW-3 35 3,333	DW-2	35	3,333
	DW-3	35	3,333
TOTAL POPULATION = POPULATION SERVED		TOTAL POPULATION = POPU	ILATION SERVED

WELL	% CONTRIBUTION	POPULATION SERVED
#		
DW-1	50	?
DW-2	25	?
DW-3	25	?

WELL #	% CONTRIBUTION	POPULATION SERVED
DW-1	50	5,000
DW-2	25	2,500
DW-3	25	2,500





- Evaluate if they are served less than 1 mile from source: Worker and student populations served within 1 mile of sources should be evaluated if they are not already included in the population served by the municipal system.
- Count same person 3x if they are a worker, student and resident: A single individual can be counted three times if they are a worker, student and resident.
- Do NOT spend time collecting information on populations beyond 1 mile because distance-weighting will reduce their score: It generally will not be advantageous to spend time collecting information on worker and student populations beyond 1 mile because of the effects of distance-weighting. The exception to this may be the presence of a large major university or major manufacturing complex with many employees.

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• The participants will now score the groundwater pathway for the ABC site. Open the Pathway Scoresheets tab.

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• Open the Ground Water Scoresheet tab. Next review groundwater information for the ABC Vacuum Site.





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	2. Potential to Release		8b. Level II Concentra	
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	2b. Net Precipitation (3-4) 0	-	8d. Population [lines 8a+8b+8c]	0
	2c. Depth to Aquifer (3-5) 1		9. Resources	0 🔻
	2d. Travel Time (3-7) 1	•	10. Wellhead Protection Area	0 💌
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	6. Waste Characteristics 0	·	Uncapped Score:	0
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• Go to name the Aquifer or Scenario and check the box below that tells the program to use this aquifer in scoring. The sheet will not go "live" until you name the aquifer. Click on the summary tab to get the program to recognize the name.

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• Click the observed release drop down which shows 550 and 0.









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	Human Food Chain					
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	Soil Scoresheet				0	10/10/2009
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• The evidence points to a likely observed release.





Source Containment BPJ – Drums and Tanks

Drums

- » 200 drums on a concrete pad
- » No berm around the pad is noted

♦ Tanks

- » On a concrete pad
- » Covered by shed
- » No berm or secondary containment noted

\$€PA

All containers buried	Evaluate using All Sources criteria.
Evidence of hazardous substance migration from container area (i.e., container area includes containers and any associated containment structures).	10
No liner (or no essentially impervious base) under container area.	10
No diking (or no similar structure) surrounding container area.	10
Diking surrounding container area unsound or not regularly inspected and maintained.	10
No evidence of hazardous substance migration from container area, container area surrounded by sound diking t maintained, and:	hat is regularly inspected and
(a) Liner (or essentially impervious base) under container area.	9
(b) Essentially impervious base under container area with liquids collection and removal system.	7
(c) Containment system includes essentially impervious base, liquids collection system, sufficient capacity to contain 10 percent of volume of all containers, and functioning and maintained run-on control; plus functioning groundwater monitoring system, and spilled or leaked hazardous substances and accumulated precipitation removed in timely manner to prevent overflow of collection system, at least weekly inspection of containers, hazardous substances in leaking or deteriorating containers transferred to containers in good condition, and containers sealed except when waste is added or removed.	5
(d) Free liquids present, containment system has sufficient capacity to hold total volume of all containers and to provide adequate freeboard, single liner under container area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5
(e) Same as (d) except: double liner under container area with functioning leachate collection and removal system between liners.	3
Containers inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate would be generated from any unsealed or ruptured containers, liquids or materials containing free liquids not deposited in any container, and functioning and maintained run-off control present.	0
No evidence of hazardous substance migration from container area, containers leaking, and all free liquids eliminated at closure (either by removal of liquid or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquid deposited).

criteria. Evidence of hazardous substance migration from tank area (i.e., tank area includes tank, ancillary equipment such as piping, and any associated containment structures). 10 Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued)		Tank	
such as piping, and any associated containment structures). 10 Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued) Source Assigned Val Tank Tank and ancillary equipment not provided with secondary containment (e.g., liner under tank area, vault 10 No diking (or no similar structure) surrounding tank and ancillary equipment. 10 No evidence of hazardous substance migration from tank area, tank and ancillary equipment surrounded by sound diking that is regul inspected and maintained, and: (a) Tank and ancillary equipment provided with secondary containment. 9 (b) Tank and ancillary equipment provided with secondary containment. 7 (c) Tank and ancillary equipment provided with secondary containment with leak detection and collection system. 7 (c) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary stem. 8 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide dequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 3	ow-ground tank		Evaluate using All Source criteria.
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Tank and ancillary equipment not provided with secondary containment (e.g., liner under tank area, vault 10 System, double wall). 10 No diking (or no similar structure) surrounding tank and ancillary equipment. 10 No evidence of hazardous substance migration from tank area, tank and ancillary equipment surrounded by sound diking that is regul inspected and maintained, and: 9 (a) Tank and ancillary equipment provided with secondary containment. 9 (b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system. 7 (c) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary 5 (containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3	rce		Assigned Value
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No evidence of hazardous substance migration from tank area, tank and ancillary equipment surrounded by sound diking that is regul inspected and maintained, and: (a) Tank and ancillary equipment provided with secondary containment. (b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system. 7 (c) Tank and ancillary equipment provided with secondary containment with leak detection and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3		condary containment (e.g., liner under tank area, vau	lt 10
inspected and maintained, and: (a) Tank and ancillary equipment provided with secondary containment. (b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system. (c) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3	diking (or no similar structure) surrounding tan	k and ancillary equipment.	10
(b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system. 7 (c) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary containing groundwater monitoring system. 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3		m tank area, tank and ancillary equipment surrounded	by sound diking that is regularly
System. 7 (c) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary 5 containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3	Tank and ancillary equipment provided with se	condary containment.	9
or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary 5 containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3		condary containment with leak detection and collection	n 7
percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary 5 containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3	Fank and ancillary equipment provided with se	condary containment system that detects and collects	spilled
accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary 5 containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning 5 (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to 5 provide adequate freeboard, single liner under that containment area with functioning leachate collection and 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3			
containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system. (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners.			
groundwater monitoring system. (d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3			5
provide adequate freeboard, single liner under that containment area with functioning leachate collection and second system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3		nk systems promptly responded to, and functioning	
removal system below liner, and functioning groundwater monitoring system. 5 (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners. 3	Containment system has sufficient capacity to I	nold volume of all tanks within tank containment area	and to
removal system below liner, and functioning groundwater monitoring system. (e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners.	vide adequate freeboard, single liner under tha	t containment area with functioning leachate collection	n and _
removal system between liners.	oval system below liner, and functioning grour	dwater monitoring system.	3
removal system between liners.		tainment area with functioning leachate collection an	d 3
Tank is above ground, and inside or under maintained intact structure that provides protection from			Ū.
precipitation so that neither runoff nor leachate would be generated from any material released from tank,			
liquids or materials containing free liquids not deposited in any tank, and functioning and maintained run-on 0 control present.		osited in any tank, and functioning and maintained ru	n-on U

Participant Poll – Containment Scores for Drums and Tanks

- Based on description of the drum storage area and the descriptions in Table 3-2, what score would you assign the drums?
- Based on description of the mixing tanks and the descriptions in Table 3-2, what score would you assign the tanks?

\$€PA



Surface Impoundment	
Evidence of hazardous substance migration from surface impoundment.	10
No liner.	10
Free liquids present with either no diking, unsound diking, or diking that is not regularly inspected and maintained.	10
No evidence of hazardous substance migration from surface impoundment, present, sound diking that is regularly inspected and maintained, adequate	•
(a) Liner	9
(b) Liner with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system	5
(c) Double liner with functioning leachate collection and removal system between liners, and functioning groundwater monitoring system.	3
No evidence of hazardous substance migration from surface impoundment and all free liquids eliminated at closure (either by removal of liquids or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquid deposited).





All Sources (Except Surface Impoundments, Land Treatment, Containers, and Tanks)	
Evidence of hazardous substance migration from source area (i.e., source area includes source and any associated containment structures).	10
No liner	10
No evidence of hazardous substance migration from source area, a liner, and:	
(a) None of the following present: (1) maintained engineered cover, or (2) functioning and maintained run-on control system and runoff management system, or (3) functioning leachate collection and removal system immediately above liner.	10
(b) Any one of the three items in (a) present.	9
(c) Any two of the items in (a) present.	7
(d) All three items in (a) present plus a functioning groundwater monitoring system.	5
(e) All items in (d) present, plus no bulk or non-containerized liquids nor materials containing free liquids deposited in source area.	3
No evidence of hazardous substance migration from source area, double liner with functioning leachate colle removal system above and between liners, functioning groundwater monitoring system, and:	ection and
(f) Only one of the following deficiencies present in containment: (1) bulk or noncontainerized liquids or materials containing free liquids deposited in source area, or (2) no or nonfunctioning	
or nonmaintained run-on control system and runoff management system, or (3) no or nonmaintained engineered cover.	3
(g) None of the deficiencies in (f) present.	0
Source area inside or under maintained intact structure that provides protection from	
precipitation so that neither runoff nor leachate is generated, liquids or materials containing free liquids not deposited in source area, and functioning and maintained run-on control	
present.	0

Participant Poll – Containment Scores for Stained Soil and Rubbish Pile

- Based on description of the stained soil and the descriptions in Table 3-2, what score would you assign the stained soil
- Based on description of the rubbish pile and the descriptions in Table 3-2, what score would you assign the rubbish pile

Version: July 2014

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Quick					Quickscore Ho	
SCORE						
Action Toolbar: Save As	Import Export Undo	Redo Print Calculat	or			
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🛅 LPQ Auto Parts	Aquifer Name or Path	way Scenario: * ABC Va			Required	1
Quickscore Tutorial Tutorial EX/IM Try	Check to use this	Aquifer in Site Score calo	ulations	Targets:		
ABC Vacuum	Likelihood of Relea			7. Nearest We 8. Population	el (3-11) O	V
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	2. Potential to Rele	ase		8b. Level I	I Concentra	
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containment	2b. Net Precipit. 2c. Depth to Ac				tion [lines 8a+8b+8c]	
	2c. Depth to Ac 2d. Travel Time	(3-7) 3		9. Resources	0	•
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justifies a 10	4. Toxicity/Mobility			Ground Water	Migration Pathway Score	
J	Using Substan		•	13. Pathway 9	Score (Sgw) 0 value from line 12 for all aquifers ex	at at all
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• Highest containment value should be 10.

Table 3-2. Containment Factor Values for Groundwater Migration Pathway

Source	Assigned Value			
All Sources (Except Surface Impoundments, Land Treatment, Containers and Tanks)				
Evidence of hazardous substance migration from source area (i.e., source area includes source and any associated containment structures).	10			
No liner	10			
No evidence of hazardous substance migration from source area, a liner, and:				
(a) None of the following present: (1) maintained engineered cover, or (2) functioning and maintained run-on control system and runoff management system, or (3) functioning leachate collection and removal system immediately above liner.	10			
(b) Any one of the three items in (a) present.	9			
(c) Any two of the items in (a) present.	7			
(d) All three items in (a) present plus a functioning groundwater monitoring system.	5			
(e) All items in (d) present, plus no bulk or non-containerized liquids nor materials containing free liquids deposited in source area.	3			
No evidence of hazardous substance migration from source area, double liner with f collection and removal system above and between liners, functioning groundwater r and:				
(f) Only one of the following deficiencies present in containment: (1) bulk or noncontainerized liquids or materials containing free liquids deposited in source area, or (2) no or nonfunctioning or nonmaintained run-on control system and runoff management system, or (3) no or nonmaintained engineered cover.	3			
(g) None of the deficiencies in (f) present.	0			
Source area inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate is generated, liquids or materials containing free liquids not deposited in source area, and functioning and maintained run-on control present.	0			
Surface Impoundment				
Evidence of hazardous substance migration from surface impoundment.	10			
No liner.	10			
Free liquids present with either no diking, unsound diking or diking that is not regularly inspected and maintained.	10			
No evidence of hazardous substance migration from surface impoundment, free liquidiking that is regularly inspected and maintained, adequate freeboard, and:	uids present, sound			
(a) Liner	9			
(b) Liner with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system	5			
(c) Double liner with functioning leachate collection and removal system between liners, and functioning groundwater monitoring system.	3			
No evidence of hazardous substance migration from surface impoundment and all free liquids eliminated at closure (either by removal of liquids or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquid deposited).			
Land Treatment				
Evidence of hazardous substance migration from land treatment zone.	10			
No functioning, maintained, run-on control and runoff management system.	10			

Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued)

Source	Assigned Value
Land Treatment	
No evidence of hazardous substance migration from land treatment zone and:	
(a) Functioning and maintained run-on control and runoff management system.	7
(b) Functioning and maintained run-on control and runoff management system,	
and vegetative cover established over entire land treatment area.	5
(c) Land treatment area maintained in compliance with 40 CFR 264.280.	0
Containers	
All containers buried	Evaluate using All
	Sources criteria.
Evidence of hazardous substance migration from container area (i.e., container area includes containers and any associated containment structures).	10
No liner (or no essentially impervious base) under container area.	10
No diking (or no similar structure) surrounding container area.	10
Diking surrounding container area unsound or not regularly inspected and maintained.	10
No evidence of hazardous substance migration from container area, container area a diking that is regularly inspected and maintained, and:	surrounded by sound
(a) Liner (or essentially impervious base) under container area.	9
(b) Essentially impervious base under container area with liquids collection and removal system.	7
(c) Containment system includes essentially impervious base, liquids collection system, sufficient capacity to contain 10 percent of volume of all containers, and functioning and maintained run-on control; plus functioning groundwater monitoring system, and spilled or leaked hazardous substances and accumulated precipitation removed in timely manner to prevent overflow of collection system, at least weekly inspection of containers, hazardous substances in leaking or deteriorating containers transferred to containers in good condition, and containers sealed except when waste is added or removed.	5
(d) Free liquids present, containment system has sufficient capacity to hold total volume of all containers and to provide adequate freeboard, single liner under container area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5
(e) Same as (d) except: double liner under container area with functioning leachate collection and removal system between liners.	3
Containers inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate would be generated from any unsealed or ruptured containers, liquids or materials containing free liquids not deposited in any container, and functioning and maintained run-off control present.	0
No evidence of hazardous substance migration from container area, containers leaking and all free liquids eliminated at closure (either by removal of liquid or solidification of remaining wastes and waste residues).	Evaluate using All Sources criteria (with no bulk or free liquid deposited).
Tank	
Below-ground tank	Evaluate using All
Evidence of hazardous substance migration from tank area (i.e., tank area includes tank, ancillary equipment such as piping, and any associated containment structures).	Sources criteria. 10

Table 3-2. Containment Factor Values for Groundwater Migration Pathway (Continued)

Source	Assigned Value
Tank	
Tank and ancillary equipment not provided with secondary containment (e.g., liner under tank area, vault system, double wall).	10
No diking (or no similar structure) surrounding tank and ancillary equipment.	10
No evidence of hazardous substance migration from tank area, tank and ancillary eq by sound diking that is regularly inspected and maintained, and:	uipment surrounded
(a) Tank and ancillary equipment provided with secondary containment.	9
(b) Tank and ancillary equipment provided with secondary containment with leak detection and collection system.	7
(c) Tank and ancillary equipment provided with secondary containment system that detects and collects spilled or leaked hazardous substances and accumulated precipitation and has sufficient capacity to contain 110 percent of volume of largest tank within containment area, spilled or leaked hazardous substances and accumulated precipitation removed in timely manner, at least weekly inspection of tank and secondary containment system, all leaking or unfit-for-use tank systems promptly responded to, and functioning groundwater monitoring system.	5
(d) Containment system has sufficient capacity to hold volume of all tanks within tank containment area and to provide adequate freeboard, single liner under that containment area with functioning leachate collection and removal system below liner, and functioning groundwater monitoring system.	5
(e) Same as (d) except: double liner under tank containment area with functioning leachate collection and removal system between liners.	3
Tank is above ground, and inside or under maintained intact structure that provides protection from precipitation so that neither runoff nor leachate would be generated from any material released from tank, liquids or materials containing free liquids not deposited in any tank, and functioning and maintained run-on control present.	0

With HRS Quickscore	
Quick	Quickscore Ho Quickscore H
Action Toolbar: Save As	Import Export Undo Redo Print Calculator
	Site/Scenario Information Source Information Pathway Scoresheets
Create New Si	Site Name: ABC Vacuum Site Score: 0 Scenario Name: Initial Site Scoring
Create New S	Scenario Summary (0) GW Scoresheet (0) SW Scoresheet (0) SE Scoresheet (0) Air Scoresheet (0)
View/Edit Existing	Ground Water Migration Pathway Scoresheet
🛅 LPQ Auto Parts 🛅 Quickscore Tutorial	Aquifer Name or Pathway Scenario: * ABC Vacuum Aquifer *=Required
Tutorial EX/IM Try	Check to use this Aquifer in Site Score calculations Targets: Likelihood of Release to an Aquifer: 8. Population (3-11)
	1. Observed Release 550 V 8a. Level I Concentrati 2. Potential to Release 8b. Level II Concentrati
Next	2a. Containment (3-2) 10 💌 8c. Potential Contaminati (3-12)
evaluate	2b. Nat Precipitation (3-4) 0 ▼ 8d. Population [Inst 8+86+8c] 2c. Deoth to Acuifer (3-5) 1 ▼ 9. Resources 0 ▼
	2d. Travel Time (3-7) 1 V 10. Wellhead Protection Area 0 V
Net	2e. Potential to Release 20 11. Targets [7 + 8d + 9 + 10] 0 [ines 2a x (2b + 2c + 2d)] 0 0 0 0
Precipitation	3. Likelihood of Release 550 Ground Water Migration Score for an Aquifer (Higher of lines 1 and 2e) ([[Ines 3 e x 11])82,500)]
	Waste Characteristics: 4. Toxicity/Mobility Assign Mobility (3-9) 0 Ground Water Migration Pathway Score
	Using Substance: 13. Pathway Score (Sgw) 0 5. Hazardous Waste Ouantity (2-6) 100 [Highest value from line 12 for all aquifers evaluated]
	6. Waste Characteristics 0 Uncapped Score: 0
	[lines 4 x 5, then use Table 2-7] Calculate Add New Aquifier Delete Aquifier
	Scoresheets Likelihood of Release Waste Characteristics Targets Pathway Score Date Last Updated GW Scoresheet 0 10/10/2009
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• Next evaluate net precipitation.
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	PQ Auto Parts uickscore Tutorial	Aquifer Name or Pat	hway Scenario: * ABC Va	icuum Aquifer		equired	-
	utorial EX/IM Try		Aquifer in Site Score cal	culations	Targets: 7. Nearest We	a (3-11)	0
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		2. Potential to Re		50 💌		Concentrati	
		2a. Containmer) 💌	8c. Potenti	al Contaminati(3-12)	
		2b. Net Precipi		-		ion [lines 8a+8b+8c]	
	Select	2c. Depth to A 2d. Travel Time			9. Resources		0 🔻
	value	2e. Potential to	Release 🗾 3		10. Weinead F 11. Targets 7	Protection Area 1 + 8d + 9 + 101	
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 Select the value from the dropdown menu that is obtained from Figure 3-2 in the HRS rule.













• Now evaluate depth to aquifer.



Depth to Aquifer Factor Values	
Table 3-5_Depth to Aquifer Factor ValuesAssigned Assigned Depth to aquifer ^a (feet)Value	-
Less than or equal to 25	
a Use depth of all layers between the hazardous substances and aquifer. Assign a thickness of 0 feet to any <u>karst</u> aquifer that underlies any portior of the sources at the site.	
≎EPA	4-52



Quick					Quickscore	Ho Quickscor
IRS SCORE						
tion Toolbar: Save A	is Import Export Undo	Redo Print Calculat	or			
	Site/Scenario Informatio	n Source Informatio	n Pathway Scoresh	eets		
Create New Si		Vacuum			Site Scor	e: 0
Create New S	Scenario Name: Initial	Site Scoring				
or out o reote out	Scenario Summary (0)	GW Scoresheet (0)	SW Scoresheet (0)	SE Scoresheet (0)	Air Scoresheet (0)	
w/Edit Existing		0				
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itorial EX/IM Try BC Vacuum	Likelihood of Relea		culations	7. Nearest W		-
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	2. Potential to Relea	ise			II Concentra	
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	2c. Debth to Adu 2d. Travel Time	(3-7) 1		9. Resources	Protection Area	-
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· · · · · · · · · · · · · · · · · · ·		Assign Mobility (3-9) 0	-	Ground Wate 13. Pathway	r Migration Pathway Scor Score (Sow)	e
down	Using Substano 5. Hazardous Waste				value from line 12 for all aquifers	: evaluated]
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	[lines 4 x 5, then use	Table 2-7]	Calculate	Add New	Aquifier Delet	te Aquifier
		Likelihood of Release	Waste Characteristics		Pathway Score	Date Last Updat
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	Drinking Water					
	Human Food Chain Environmental					
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- L		Scenario Summary (0) GW Scoresheet (0) SW Scoresheet (0)) SE Scoresheet (0) Air Scoresheet (0)	
Vie	w/Edit Existing	Ground Water Migration		
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🚞 Q	uickscore Tutorial		Targets:	
	utorial EX/IM Try BC Vacuum	Check to use this Aquifer in Site Score calculations Likelihood of Release to an Aquifer:	7. Nearest Well (3-11) 0	
		1. Observed Release 550 V	8. Population 8a. Level I Concentrati	
		2. Potential to Release	8b. Level II Concentra	
		2a. Containment (3-2) 10 💌	8c. Potential Contaminati(3-12)	
		2b. Net Precipitation (3.4) 6 2c. Depth to Aguifer (3.5) 5	8d. Population [lines 8a+8b+8c]	
	Final	2d. Travel Time (3-7)	9. Resources 0 10. Wellhead Protection Area 0	v
		2e. Potential to Release 120	11. Targets [7 + 8d + 9 + 10]	
	step is 🥖	[lines 2a x (2b + 2c + 2d)]	Ground Water Migration Score for an Aquife	ег
	to	3. Likelihood of Release 550 [Higher of lines 1 and 2e]	12. Aquiter Score 0 [(lines 3 x 6 x 11)/82,500)]	
	evaluate	Waste Characteristics: 4. Toxicity/Mobility Assign Mobility (3-9) 0	Ground Water Migration Pathway Score	
		4. Loxicity/Mobility Assign Mobility (3-9) U Using Substance:	13. Pathway Score (Sgw) 0	
	Travel	5. Hazardous Waste Quantity (2-6) 100	[Highest value from line 12 for all aquifers eval. Uncapped Score: 0	uated]
	Time	6. Waste Characteristics 0 [lines 4 x 5, then use Table 2-7] Calculate		wifter
		Culouluto	Dolote In	luinei
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		GW to SW Scoresheet Drinking Water		
		Human Food Chain		
		Environmental Soil Scoresheet	0	10/10/2009
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This factor value estimates contaminant travel time in the interval between 10 feet below ground surface and the top of the aquifer.

Use Table 3-6 to Determine Hydraulic Conductivity

Table 3-6. Hydraulic Conductivity of Geologic Materials

Clay; low permeability till (compact unfractured till); shale; unfractured metamorphic and igneous rocks. Silt; losses; silty clays; sediments that are predominantly silts; moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no karst); low permeability sandstone; low permeability fractured igneous	10 ⁻⁸
moderately permeable till (fine-grained, unconsolidated till, or compact till with some fractures); low permeability limestones and dolomites (no	10 ⁻⁶
and metamorphic rocks.	10
Sands; sandy silts; sediments that are predominantly sand; highly permeable till (coarse-grained, unconsolidated or compact and highly fractured); peat; moderately permeable limestones and dolomites (no karst); moderately permeable sandstone; moderately permeable fractured igneous and metamorphic rocks.	10 ⁻⁴ 10 ⁻³ ?
Gravel; clean sand; highly permeable fractured igneous and metamorphic rocks; permeable basalt; karst limestones and dolomites	10 ⁻²

Use Table 3-7 and Hydraulic Conductivity from Table 3-6 to Determine Score for Travel Time

Table 3-7: Travel Time Factor Values^a

Hydraulic Conductivity	Thickness of Lowest Hydraulic Conductivity Layer(s) (feet) ^b				
(cm/sec)	Greater than 3 to 5	Greater than 5 to 100	Greater than 100 to 500	Greater than 500	
Greater than or equal to 10 ⁻³	35	35	35	25	
Less than 10 ⁻³ to 10 ⁻⁵	35	25	15	15	
Less than 10 ⁻⁵ to 10 ⁻⁷	15	15	5	5	
Less than 10 ⁻⁷	5	5	1	1	

If <u>depth to aquifer</u> is 10 feet or less or if, for the interval being evaluated, all layers that underlie a portion of the sources at the site are karst, assign a value of 35.

^b Consider only layers at least 3 feet thick. Do not consider layers or portions of layers within the first 10 feet of the depth to the aquifer.

4-58

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🚞 ABC Vacuum	Likelihood of Release to an Aquifer:	7. Nearest Well (3-11) 0 💌
	1. Observed Release 550 2. Potential to Release	8a. Level I Concentrati 8b. Level II Concentra
Assign value	2. Potentia to Release 2a. Containment (3-2) 10 V	80. Level II Contentra 8c. Potential Contaminati(3-12)
for travel time	2b. Net Precipitation (3-4) 6	8d. Population [lines 8a+8b+8c]
obtained fron	2c. Depth to Aquifer (3-5) 5 2d. Travel Time (3-7)	9. Resources
Table 3-7 by	2e. Potential to Release	10. Wellhead Protection Area 11. Targets [7 + 8d + 9 + 10]
selecting the	[lines 2a x (2b + 2c + 2d)] 5	Ground Water Migration Score for an Aquifer
value from th	S. Likelihood of Release 15 Higher of lines 1 and 2e1 25	12. Aquiter Score 0 [(lines 3 x 6 x 11)/82,500)]
	Waste Characteristics:	
drop down	4. Toxicity/Mobility Assign Mobility (599)	Ground Water Migration Pathway Score 13. Pathway Score (Sgw) 0
menu	5. Hazardous Waste Quantity (2-6) 100	[Highest value from line 12 for all aquifers evaluated]
	6. Waste Characteristics 0 [lines 4 x 5, then use Table 2-7] Calculate	Uncapped Score: 0 Add New Aquifier Delete Aquifier
	culculate	
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	Residential Population 0	
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• The score of 35 can be justified. A more conservative score would be 25. Either is acceptable for the data we now have. Note the potential to release score has a maximum of 500 and will always be lower than an observed release score.

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	2. Potential to Release	8b. Level II Concentr	·a
The	2a. Containment (3-2) 10	Sc. Potential Contam	inati(3-12)
Potential to	2b. Net Precipitation (3-4) 6 2c. Depth to Aquifer (3-5) 5	Sd. Population [lines 8	
Release	2d. Travel Time (3-7) 35	9. Resources 10. Wellhead Protection	0 V
score of 460	2e. Potential to Release 460	 10. Weinead Protection 11. Targets (7 + 8d + 9 + 	
000.0 000	[lines 2a x (2b + 2c + 2d)]	Ground Water Migration	- 0
is obtained.	3. Likelihood of Release 550 [Higher of lines 1 and 2e]	12. Aquiter Score	0
The	Waste Characteristics:	[(lines 3 x 6 x 11)/82,50	
maximum	4. Toxicity/Mobility Assign Mobility (3-9) 0	Ground Water Migration 13. Pathway Score (Sow	
value is 500.	Using Substance: 5. Hazardous Waste Quantity (2-6) 100		e 12 for all aquifers evaluated]
	6. Waste Characteristics 0	Uncapped Score:	0
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C Tutorial EX/IM Try	Check to use this Aquifer in Site Score calculations Likelihood of Release to an Aquifer:	7. Nearest Well (3-11) 0
	1. Observed Release	8. Population 8a. Level I Concentrati
	2. Potential to Release	8b. Level II Concentra
	2a. Containment (3-2) 10 🔻	8c. Potential Contaminati(3-12)
	2b. Net Precipitation (3-4) 6 💌	8d, Population [lines 8a+8b+8c]
Assess	2c. Depth to Aquifer (3-5) 5 💌	9. Resources 0
	2d. Travel Time (3-7) 35 💌	10. Wellhead Protection Area 0 💌
Toxicity/	2e. Potential to Release 460 [lines 2a x (2b + 2c + 2d)]	11. Targets [7 + 8d + 9 + 10] 0
Mobility of	3. Likelihood of Release 550	Ground Water Migration Score for an Aquifer 12. Aquiter Score 0
Chemicals	[Higher of lines 1 and 2e] Waste Characteristics:	[(lines 3 x 6 x 11)/82,500)]
	4. Toxicity/Mobility Assign Mobility (3-9) 0	Ground Water Migration Pathway Score
of	Using Substance:	13. Pathway Score (Sgw) 0 [Highest value from line 12 for all aquifers evaluated]
Concern	5. Hazardous Waste Quantity (2-6) 100 6. Waste Characteristics 0	Uncapped Score: 0
	6. Waste Characteristics 0 [lines 4 x 5, then use Table 2-7] Calculate	Add New Aquifier Delete Aquifier
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	GW to SW Scoresheet	
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	Soil Scoresheet	0 10/10/2009
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• Now score waste characteristics. Click on Assign Mobility to begin.

🕌 Ground Water Scoresheet - As:	sign Mobility			
	1. Select the first	st chemical		
1) Choose a Substance			2) Choose a Mobility Type	2. Liquid or non- liquid refers to the
Arsenic			🔾 Liquid/Karst	contaminant as
Benzene Cadmium Chromium Lead			Liquid/Non-Karst	disposed and karst or non-karst
Phenol Selenium			Non-Liquid/Karst	refers to
Trichloroethylene (TCE)			O Non-Liquid/Non-Karst	hydrogeology beneath sources.
	3. Toxicity and	mobility values are	O In Observed Release	For this site Liquid/Non-Karst
		e Toxicity/Mobility		is appropriate for
		calculated		all COCs.
			Save & Retur	m to Scoresheet
Substance	Toxicity	Mobility Type	Mobility Value	Toxicity/Mobility
Arsenic Benzene	10000	Liquid/Non-Karst	0.01	100
Cadmium	10000			
Chromium	10000			
Lead	10000			
Phenol	10			
Selenium Trichloroethylene (TCE)	100			
		at process for all c	hemicals	
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 Click on the first chemical and then click Liquid/Non-karst. The chemical and its values will show up in the table at the bottom. Repeat this for every chemical.

🖆 Ground Water Scoresheet – Assign Mobility				0
1) Choose a Substance			2) Choose a Mobility Type	
Arsenic]	🔾 Liquid/Karst	
Barium Benzene				
Benzo(a)pyrene			Liquid/Non-Karst	
Cadmium Chromium			O Non-Liquid/Karst	
Lead			O Homelquantarior	
Phenol Selenium		When all chemicals	are entered, click	the Save &
Trichloroethylene (TCE)			Scoresheet butto	
	I			
				_
			Save & Return	to Scoresheet
Substance	Toxicity	Mobility Type	Mobility Value	Toxicity/Mobility
Arsenic	10000		.01	100
Barium Benzene	10000		.01	100
Benzo(a)pyrene	1000		.01 .0E-4	10
Cadmium	10000		.01	100
Chromium	10000		.01	100
Lead	10000		.01	100
Phenol	10	Liquid/Non-Karst 1	.0	10
Selenium	100		.0	100
Trichloroethylene (TCE)	1000	Liquid/Non-Karst 1	.0	1000
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 When all substances are in the table at the bottom, click Save & Return to Scoresheet.

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Create New Site	Site Name: ABC				Site Score: 64	4.39	
	Scenario Name: PA						
Create New Scenario	Scenario Summary (64.35) GW Scoresheet (62.91)	SW Scoresheet (100) SE Scoresheet (51.2) Air Scoreshe	et (2.48)				
		Ground Water Migration Pathway	icoresheet				1
View/Edit Existing	Aquiter Name or Pathway Scenario: *	ABC Vacuum Aquifier		*=Required			
LPQ Auto Parts	Check to only evaluate this Aquifer in Site Score		Target		(2.17)	50	
🛉 🧰 PA	Likelihood of Release to an Aquifer:		7. Nez 8. Pop	rest Well ulation	(3-11)	50	
 Sources Pathways 	1. Observed Release	550 -		Ba. Level I Concentrations		20	x 10 = 200
	2. Potential to Release			8b. Level II Concentrations		1	x 1 = 1
	2a. Containment 2b. Net Precipitation	(3-2) 10 * (3-4) 6 *		Bc. Potential Contamination	(3-12)	2682	x 0.1 = 268.20
	2c. Depth to Aquifer	(3-5) 5 *		Bd. Population (ines Ba+Bb+I	k]	469.20	
	2d. Travel Time	(3-7) 35 •	9. Res	sthead Protection Area		· ·	
	Ze. Potential to Release	460	11. Ta			524.20	
	[lines 2a x (2b + 2c + 2d)]			1 Water Nigration Score for an Aquifer		324.29	
	3. Likelhood of Release	550		ulfer Score		62.91	
	[Higher of lines 1 and 2e] Waste Characteristics:			$[(lines 3 \times 6 \times 11)(62,500)]$			
		issign Mobility (3-9) 1000	Ground	d Water Nigration Pathway Score			
	Using Substance:	Trichloroethylene (T 💌	13. Pa	thway Score (Sgw) [Highest value from line 12 for all aquifers eva	- total	62.91	
	5. Hazardous Waste Quantity	(2-6) 100	lincan	ped Score:	canac)	62.91	
	 Waste Characteristics [ines 4 x 5, then use Table 2-7] 	18	Calculate	Add New Aquiller		Delete Aquifier	
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	тся	E gives highest to	vicity/mobili	ty cooro w	hon		
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• The program should select the substance with the highest toxicity/mobility score as shown. The program also uses the information from sources to calculate the WC.





• Use BPJ to decide if there is actual contamination and that they should be conservative at this stage. They will need to decide for both aquifers.





• This map shows the location of the 5 private wells.





• This map shows the location of the municipal wells that draw from lower aquifer. Although the 4 miles target distance limit is not shown, these are the only wells within the 4 mile target distance limit.

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	 Observed Release Potential to Release 	550 💌	8a. Level I Concentrati 8b. Level II Concentra	
	2b. Net Precipitation	(3-2) 10 (3-4) 6 (3-5) 5 V	8c. Potential Contaminati(3-12) 8d. Population [lines 8a+8b+8c]	
			9. Resources 0	•
	2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	(3-7) 35 v 460	10. Wellhead Protection Area 0 11. Taroets [7 + 8d + 9 + 10] 0	-
	3. Likelihood of Release [Higher of lines 1 and 2e]	550	Ground Water Migration Score for an A 12. Aquiter Score 0 [(lines 3 x 6 x 11)/82,500)]	quifer
	Waste Characteristics: 4. Toxicity/Mobility Assign Mobility Using Substance: 5. Hazardous Waste Ouantity	(3-9) 10000 Trichlor ▼ (2-6) 100	Ground Water Migration Pathway Scor 13. Pathway Score (Sgw) 0 [Highet value from line 12 for all aquifers	
	6. Waste Characteristics	32	Uncapped Score: 0	
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• First evaluate the nearest well.





 This slide summarizes Section 3.3.1 from the HRS rule and describes how Tables 3-10 and 3-11 are used to select the factor value for the nearest well.



Table 3-11 Values		
Table 3-11: Nearest Well Facto	or Values	
Distance from Source (miles)	Assigned Value	
Level I concentrations ^a	50	
Level II concentrations ^a	45	
0 to $^{1}/_{4}$	20	
Greater than $1/_4$ to $1/_2$	18	
Greater than $1/_2$ to 1	9	
Greater than 1 to 2	5	
Greater than 2 to 3	3	
Greater than 3 to 4	2	
Greater than 4	0	
^a Distance does not apply.		
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🚞 ABC Vacuum	Likelihood of Rele	-			 7. Neares 8. Popula 	ition			
	 Observed Relea Potential to Rel 		550	•		evel I Concentrati evel II Concentra			
	2a. Containmen		10	•		stential Conternia	i. (3-12)		
	2b. Net Precipit	ation (3-4)	6	-		pulation [lines 8a+8]			
	2c. Depth to Ac		5	•	9. Resour		0	-	
	2d. Travel Time	(3-7)	35	•	10. Welh	ead Protection Are	ea 0	-	
	2e. Potential to [lines 2a x (2b + 2c		460			ets [7 + 8d + 9 + 10]	50		
	3. Likelihood of Re	ease	550		Ground V 12. Aquit	Vater Migration Sc er Score	ore for an Aquife 10.67	NT .	
	[Higher of lines 1 Waste Characteri				[(lin	es 3 x 6 x 11)/82,500)]			
		Assign Mobility (3-9	10000			Vater Migration Pa	thway Score		
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	5. Hazardous Wast 6. Waste Characte) 100 32		Uncappe		10.67		
	[lines 4 x 5, then u			Calculate	Add	New Aquifier	Delete Aq	uifier	
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	GW to SW Scoresheet Drinking Water								
	Human Food Chain								
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 Level I contamination of at least the shallow aquifer is justified based on existing information.





• A 50 for nearest well requires an estimation of Level I population. Sum the number of people served by contaminated wells and then multiply this by 10.

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orotico riori oni	Scenario Summary (0)	GW Scoresheet (53.3	34) SW Scoresheet (0)	SE Scoresheet (0)	Air Scoresheet (0)	
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🚞 Quickscore Tutorial				Targets:	eu	
Tutorial EX/IM Try ABC Vacuum	Check to use this Aque Likelihood of Release		culations	7. Nearest Well	(3-11) 50	
	1. Observed Release	55	50 💌	8. Population 8a. Level I Conce	entrati 20	x 10 = 200
	2. Potential to Releas	ie 🛄		8b. Level II Conc		
	2a. Containment	(3-2) 10) 🔻	8c. Potential Cor	ntaminati(3-12	
	2b. Net Precipitatio		-	8d. Population [I	lines 8a+8b+8c] 200	
	2c. Depth to Aquif		•	9. Resources	0	T
	2d. Travel Time	(3-7) 35		10. Wellhead Protec	tion Area 0	•
	2e. Potential to Re Flines 2a x (2b + 2c + 2		0	11. Targets [7 + 8d -	- 250	
	3. Likelihood of Relea	se 55	0	Ground Water Migra 12. Aquiter Score	ation Score for an Aquife 53.34	er 👘
	[Higher of lines 1 and			[(lines 3 x 6 x 11)		
	4. Toxicity/Mobility		000	Ground Water Migra	ation Pathway Score	
	Using Substance:		ichlor 🔻	13. Pathway Score	(Sgw) 53.34	
	5. Hazardous Waste C	Quantity (2-6) 10	0		om line 12 for all aquifers evalu	ated]
	6. Waste Characterist			Uncapped Score:	53.34	
	[lines 4 x 5, then use T	able 2-7	Calculate	Add New Aquifi	ier Delete Aq	uifier
		ikelihood of Release	Waste Characteristics	Targets	Pathway Score	Date Last Updated
		0.0	0 0	0)	10/10/2009
	SW/OL Scoresheet GW to SW Scoresheet					
	Drinking Water					=
	Human Food Chain					
	Environmental					
	Soil Scoresheet Residential Ronulation		0 0	0)	10/10/2009
	,	1				
🛃 start 🛛 🕜 Lexa	r (E:) 🎒 078_GW	/ Pathwa 💆 078_	GW Pathwa 🎇 HRS Qu	uickscore 🏉 E:\AB	3CVa_0.xml 🥜 💀	a 😰 ᅾ 🔇 🛄 2:19 PM



Record 20 in Level I contamination box. The Quickscore program does the calculation.





The process for scoring Level II contamination is similar as that for Level I except that is does not include Level I populations and that there is no multiplier.

Quick Quickscore Action Toolbar: Save As Import Export Undo Redo Print Calculator Site Scenario Information Pathway Scoresheets Create New SL Site Scenario Information Source Information Pathway Scoresheets Create New SL Site Name: ABC Vacuum Site Scoring Scenario Name: Initial Site Scoring Site Scoresheet (0) SE Scoresheet (0)	e Ho Quickscore H
Site Scenario Information Source Information Pathway Scoresheets Create New Si Site Name: ABC Vacuum Scenario Name: Site Scoring	
Site Scenario Information Source Information Pathway Scoresheets Create New Si Site Name: ABC Vacuum Site Scoring Create New S Create New S Site Scoring Site Scoring	
Create New Si Site Name: ABC Vacuum Site Scon Scenario Name: Initial Site Scoring Stee Scoring	
Scenario Name: Initial Site Scoring	
Create New S	re: 0
Scenario Summary (0) GW Scenasheet (53.34) SW Scenasheet (0) SE Scenasheet (0) Air Scenasheet (0)	
Scenario summary (b) dw scoresneer (53.54) Sw scoresneer (b) SL scoresneer (b) All scoresneer (b))
View/Edit Existing Ground Water Migration Pathway Sc Assuming no Level	II contamination
LPQ Auto Parts Aquifer Name or Pathway Scenario: * ABC Vacuum Aquifer *-Required	
Quickscore Tutorial Check to use this Aquifer in Site Score calculations Targets:	
ABC Vacuum Likelihood of Release to an Aquifer: 7. Nearest Well (3-11) 5	50 -
	0 x 10 = 200
2. Potential to Release 8b. Level II Concentra	x 1=0
2a. Containment (3-2) 10 💌 8c. Potential Contaminati(3-12	
	00
9. Resources	
2e. Potential to Release 460 11 Transfer 7 + 84 + 9 + 101 2	50
[ines 2a x (2b + 2c + 2d)] Ground Water Migration Score for an J	
3. Likelihood of Release 550 12. Aquiter Score 5.	3.34
[Higher of lines 1 and 2e] [(lines 3 x 6 x 11)/82,500)] Waste Characteristics:	
4. Toxidity/Mobility Assign Mebility (3-9) 10000 Ground Water Migration Pathway Sco	
Flightst value from line 12 for all aquifer	3.34 /s evaluated]
5. Hazardous Waste Quantity (2.6) 100	3.34
	ete Aquifier
Scoresheets Likelihood of Release Waste Characteristics Targets Pathway Score	Date Last Updated
GW Scoresheet 550.0 0 0 0 0 0 0	10/10/2009
SW/OL Scoresheet	
GW to SW Scoresheet Drinking Water	=
Human Food Chain	
Environmental	
Soil Scoresheet 0 Residential Bonulation 0	10/10/2009
🕂 Start 🚯 🔇 Lexar (E:) 🚳 078_GW Pathwa 🖾 078_GW Pathwa 🎉 HRS Quickscore 🌈 E: ABCVa_0.xml 🦩	👳 😰 🗘 🔦 🕖 🛄 2:23 PM





Potential Contamination they should evaluate all wells within 4 miles of sources that have not been scored under Level I or II. The approach for the shallow and deeper aquifers is to consider them as one hydrogeological unit. Connecting the two aquifers makes scoring easier but whether or not they are connected would need to be addressed by the SI. The population for the blended municipal well system at ABC Vacuum must be apportioned and then distance-weighted.

Well Identification	Distance from Site	Percent Annual Production	Population Apportionment
Well A	2,600 ft (0.45 miles)	30	
Well B	4,000 ft (0.76 miles)	35	
Well C	4,000 ft (0.76 miles)	35	



• Complete this table using the 40% rule.

L

Well Identification	Distance from Site	Percent Annual Production	Population Apportionment
Well A	2,600 ft (0.45 miles)	30	2,966
Well B	4,000 ft (0.76 miles)	35	2,966
Well C	4,000 ft (0.76 miles)	35	2,966



• This is the ABC site apportionment.

Well Identification	Distance from Site	Population Apportionment	Table 3-12 Weighting
Vell A	2,600 ft (0.45 miles)	2,966	
Vells B and C	4,000 ft (0.76 miles)	5,932	



 Use Table 3-12 on the following slide to determine the distance weighted populations associated with Well A and the combined population of Wells B and C. Wells B and C can be combined because they are in the same target distance limit.

						Well A	Wells B & C					
Distance Number of People Within the Distance Category Category												
(miles)	1 -10	11-30	31-100	101-300	301- 1,000	1,001- 3,000	3,001- 10,000	10,001- 30,000	30,001- 100,000	100,001- 300,000	300,001- 1,000,000	1,000,001 3,000,000
Other than	Karst ^b		1									
0 to 1/4	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,45
>1/4 to 1/2	2	11	33	102	324	(1,013)	3,283	10,122	32,325	101,213	323,243	1,012,12
>1/2 to 1	1	5	17	52	167	523	1,669	5,224	16,684	52,239	166,835	522,385
> 1 to 2	0.7	3	10	30	94	294	939	2,939	9,385	29,384	93,845	293,842
> 2 to 3	0.5	2	7	21	68	212	678	2,122	6,778	21,222	67,777	212,219
> 3 to 4	0.3	1	4	13	42	131	417	1,306	4,171	13,060	41,709	130,596
Karst ^c		•				•						
0 to 1/4	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,45
>1/4 to 1/2	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,12
>1/2 to 1	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 1 to 2	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 2 to 3	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 3 to 4	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227



Well A is in the ¼ to ½ TDL and serves an apportioned population of 2,966 which equates to a distance-weighted population of 1,013. Wells B and C are in the ½ to 1 mile TDL and serve an apportioned population of 5,932 which equates to a distance-weighted population of 1,669.

Distance Category				Ν	umber of	People Wit	hin the Di	stance Cate	egory			
(miles)	1 -10	11-30	31-100	101-300	301- 1,000	1,001- 3,000	3,001- 10,000	10,001- 30,000	30,001- 100,000	100,001- 300,000	300,001- 1,000,000	1,000,001- 3,000,000
Other than	Karst [⊳]		•	•								, ,
0 to $^{1}/_{4}$	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,455
$>^{1}/_{4}$ to $^{1}/_{2}$	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,122
$>^{1}/_{2}$ to 1	1	5	17	52	167	523	1,669	5,224	16,684	52,239	166,835	522,385
> 1 to 2	0.7	3	10	30	94	294	939	2,939	9,385	29,384	93,845	293,842
> 2 to 3	0.5	2	7	21	68	212	678	2,122	6,778	21,222	67,777	212,219
> 3 to 4	0.3	1	4	13	42	131	417	1,306	4,171	13,060	41,709	130,596
Karst ^c												
0 to $^{1}/_{4}$	4	17	53	164	522	1,633	5,214	16,325	52,137	163,246	521,360	1,632,455
$>^{1}/_{4}$ to $^{1}/_{2}$	2	11	33	102	324	1,013	3,233	10,122	32,325	101,213	323,243	1,012,122
$>^{1}/_{2}$ to 1	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 1 to 2	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 2 to 3	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227
> 3 to 4	2	9	26	82	261	817	2,607	8,163	26,068	81,623	260,680	816,227

Table 3-12: Distance-Weighted Population Values for Potential Contamination Factor for Groundwater Migration Pathway^a

^a Round the number of people present within a distance category to nearest integer. Do not round the assigned distance-weighted population value to nearest integer.

^b Use for all aquifers, except karst aquifers underlying any portion of the sources at the site.

^c Use only for karst aquifers underlying any portion of the sources at the site.

-Assign a distance-weighted population value for each distance category based on the number of people included within the distance category. -Use the "Other Than Karst" portion of table 3-12 for the remainder of the population served by points of withdrawal subject to potential contamination.

-For this portion of the population, determine the number of people included within each "Other Than Karst" distance category in table 3-12. -Assign a distance-weighted population value for each distance category based on the number of people included within the distance category. -Calculate the value for the potential contamination factor (PC) as follows:

where: $PC = 1/10 \times (Wi + Ki)$

Wi	=	Distance-weighted population from '	"Other Than Karst" portion of table 3-12 for dista	ance category i.
----	---	-------------------------------------	--	------------------

Ki = Distance-weighted population from "Karst" portion of table 3-12 for distance category i.

n = Number of distance categories.

If PC is less than 1, do not round it to the nearest integer; if PC is 1 or more, round to the nearest integer. Enter this value in table 3-1.

Well Identification	Distance from Site	Population Apportionment	Table 3-12 Weighting
Well A	2,600 ft (0.45 miles)	2,966	1,013
Wells B and C	4,000 ft (0.76 miles)	5,932	1,669



Quick								_ 🗗 🔼
						Quickscore Ho	. Quicksco	ore H
SCORE								
Action Toolbar: Save As	s Import Export Und	o Redo Print Cal o	culator					
	Site/Scenario Informat	ion Source Inform	nation Pathway	Scoresheets				
Create New Si		C Vacuum		Site Score: 0				
Create New S	Scenario Name: Initial Site Scoring							
	Scenario Summary (0) GW Scoresheet	(100) SW Score	sheet (0) SE	•	n makes calo		r _
View/Edit Existing			Ground Water Migr	potential contamination				
🚞 LPQ Auto Parts	Aquifer Name or Pat	way Scenario: * 🗛	C Vacuum Aquifer		*=Required	1		
Quickscore Tutorial Tutorial EX/IM Try	Check to use this	Aquifer in Site Score	calculations		Targets:			
🛅 ABC Vacuum	Likelihood of Rele	ase to an Aquifer:			7. Nearest Well 8. Population	(3-11) 50	-	
	1. Observed Relea		550 💌		8a. Level I Concer	20	x 10 = 2	200
	2. Potential to Re		17		8b. Level II Conce		x 1 = 0	
	2a. Containmer 2b. Net Precipi		10 •		8c. Potential Cont		× 0.1 =	268.20
	20. Net Precibi 2c. Depth to A		5 -		8d. Population [lin	es 8a+8b+8c] 468.20)	
	2d. Travel Time		35 💌		 Resources Wellhead Protecti 	ion Area		
	2e. Potential to		460		11. Targets [7 + 8d + 1			
	[lines 2a x (2b + 2o				Ground Water Migrat	ion Score for an Aquif	-	
	3. Likelihood of Release 550				12. Aquiter Score 100			
	[Higher of lines 1 and 2e] [(lines 3 x 6 x 11)/82,500)] Waste Characteristics:							
	4. Toxicity/Mobility Assign Mobility (3-9) 10000 Using Substance: Trichlor V				Ground Water Migration Pathway Score			
					13. Pathway Score (Sgw) 100 [Highest value from line 12 for all aquifers evaluated]			
	5. Hazardous Waste Quantity (2-6) 100 6. Waste Characteristics 32				Uncapped Score:	110.55	5	
	[lines 4 x 5, then u	se Table <mark>2-7</mark>]	Cal	culate	Add New Aquifie	r Delete A	quifier	
	Scoresheets	Likelihood of Relea	se 🛛 Waste Chara	cteristics	Targets	Pathway Score	Date Last Upp	lated
	GW Scoresheet	550.0	0	0	0	· ·	10/10/2009	-
	SW/OL Scoresheet GW to SW Scoresheet							
	Drinking Water							=
	Human Food Chain							
	Environmental Soil Scoresheet				0		4.0/4.0/20.00	
	Soll Scoresneet Residential Ponulation		n	0	U		10/10/2009	
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 Record 2,682 in the Potential Contamination box. Quickscore will perform the division that is required.

🗱 HRS Quickscore										
Quick		Quickscore Ho Quickscore H								
SCORE										
Action Toolbar: Save As Import Export Undo Redo Print Calculator										
	Site/Scenario Information Source Information Pathway Scoresheets	Evaluate Resources and								
Create New Si	Site Name: ABC Vacuum	WHPA next								
Create New S	Scenario Name: Initial Site Scoring									
	Scenario Summary (0) GW Scoresheet (100) SW Scoresheet (0) SE Scoresh	eet (0) Air Scoresheet (0)								
View/Edit Existing	Ground Water Migration Pathway Scoresheet									
LPQ Auto Parts	Aquifer Name or Pathway Scenario: * ABC Vacuum Aquifer	Required								
🚞 Quickscore Tutorial	Check to use this Aquifer in Site Score calculations Targets									
Tutorial EX/IM Try ABC Vacuum	Likelihood of Pelease to an Aquifer: 7. Near	7. Near st Well (3-11) 50 💌								
	1. Observed Release 550 V 83	evel I Concentrati 20 x 10 = 200								
	2. Potential to Release 50.	Level II Concentra 0 x 1 = 0								
		Potential Contaminati(3-12) 2682 x 0.1 = 268.20								
		Population [lines 8a+8b+8c] 468.20								
	9. Resu									
	10. We	Ihead Protection Area 0								
	[lines 2a x (2b + 2c + 2d)]	pets [7 + 8d + 9 + 10] 518.20								
		Water Migration Score for an Aquifer inter Score 100								
		ines 3 x 6 x 11)/82,500)]								
		Ground Water Migration Pathway Score 13. Pathway Score (Sgw) 100 [Highet value from live 12 for all aquifers avaluated] Uncapaped Score: 110.55								
	Using Substance: Trichlor 🔻 13. Pat									
	5. Hazardous Waste Quantity (2-6) 100									
	0. Waste Characteristics 32									
	[lines 4 x 5, then use Table 2-7] Calculate Ad	d New Aquifier Delete Aquifier								
	Scoresheets Likelihood of Release Waste Characteristics Targe GW Scoresheet 550.0 0 0	ets Pathway Score Date Last Updated								
	GW Scoresheet 550.0 0 0	0 10/10/2009								
	GW to SW Scoresheet									
	Drinking Water									
	Human Food Chain Environmental									
	Soil Scoresheet	0 10/10/2009								
	Residential Population 0 0									
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HRS Quickscore					
		Quickscore Ho Quickscore H			
Action Toolbar: Save As	Import Export Undo Redo Print Calculator				
	Site/Scenario Information Source Information Pathway Scoresheets	Crayfish farm uses GW = 5			
Create New Si Create New S	Site Name: ABC Vacuum Scenario Name: Initial Site Scoring	points No WHPA noted = 0 points			
	Scenario Summary (0) GW Scoresheet (100) SW Scoresheet (0) SE S	Coreancertor An acoreancertor			
View/Edit Existing	Ground Water Migration Pathway Sc Aquifer Name or Pathway Scenario: * <u>ABC Vacuum Aquifer</u>	oresheet // // // // // // // // // // // // //			
Cuickscore Tutorial	Likelihood of Release to an Aquifer:	Targets: 7. Nearest Well (3-11) 50			
	1. Observed Release 550 2. Potential to Release	8a. Level I Concentrati 20 x 10 = 200 8b. Level II Concentra 0 x 1 = 0			
	2b. Net Precibitation (3.4) 6 2c. Deoth to Aquifer (3.5) 5 g	8c. Potential Contaminati(3-12) 2682 x 0.1 = 268.20 8cl. Population [Ines 84+86+9c] 468.20 9 9. Resources 5 1 10. Wellback Protection Area 0 1			
	2e. Potential to Release 460 1 [lines 2a x (2b + 2c + 2d)]	11. Targets [7 + 8d + 9 + 10]			
		Ground Water Migration Score for an Aquifer 12. Aquifer Score 100 [(lines 3 x 6 x 11)/82,500)]			
	4. Toxicity/Mobility Assign Mobility (3-9) 10000 G Using Substance: Trichlor▼ 1 5. Hazardous Waste Ouantity (2-6) 100	Sround Water Migration Pathway Score (3. Pathway Score (Sgw) 100 [Highest value from line 12 for all aquifers evaluated] Incanned Score: 111.62			
	[lines 4 x 5, then use Table 2-7] Calculate	Add New Aquifier Delete Aquifier			
	Scoresheets Likelihood of Release Waste Characteristics GW Scoresheet 550.0 0 0 SW/OL Scoresheet	Targets Pathway Score Date Last Updated 0 10/10/2009			
	GW to SW Scoresheet Drinking Water Human Fond Chain				
	Human Food Chain Environmental Soil Scoresheet Seeidential Environmental 0 0 0 0	0 10/10/2009			
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Determine if groundwater within 4 miles of the site is used for any resources. Groundwater is used at the commercial cray fish farm. The site information indicated there was no WHPA. Resources gets a score of 5 and WHPA gets a score of 0.







- Using worst case assumptions guided by BPJ, the ground water pathway for ABC gets a score of 62.79. This indicates that the ground water pathway may be the only one needed to score the site.
- Quickscore can be used to run various scenarios to evaluate the minimum amount of information that needs to be collected. For example, a potential contamination scenario could be run to see if the site would score on potential alone if the shallow and deeper aquifers are connected. Other scenarios involving use of fewer private wells could also be evaluated.



Next Webinar – Friday, July 11, 2014

