Appendix 4: Current Study Groundwater Recharge Estimates for Predevelopment Conditions and Ranges of Previously Reported Estimates of Groundwater Recharge for Each Hydrographic Area within the Great Basin Carbonate and Alluvial Aquifer System Study Area

By Melissa D. Masbruch

Appendix 4 of
Conceptual Model of the Great Basin Carbonate and Alluvial Aquifer System

Edited by Victor M. Heilweil and Lynette E. Brooks

Scientific Investigations Report 2010–5193

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Conversion Factors

Inch/Pound to SI

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
acre	0.4047	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m^3)
gallon (gal)	3.785	cubic decimeter (dm^3)
cubic foot (ft^3)	28.32	cubic decimeter (dm^3)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
acre-foot (acre-ft)	1,233	cubic meter (m^3)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
	Flow rate	
acre-foot per year (acre-ft/yr)	1,233	cubic meter per year (m^3/yr)
acre-foot per year (acre-ft/yr)	0.001233	cubic hectometer per year (hm^3/yr)
foot per year (ft/yr)	0.3048	meter per year (m/yr)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per day (ft^3/d)	0.02832	cubic meter per day (m^3/d)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
	Hydraulic conductivity	
foot per day (ft/d)	0.3048	meter per day (m/d)
inch per day (in./d)	25.38	millimeter per day (mm/d)
	Transmissivity*	
foot squared per day (ft^2/d)	0.09290	meter squared per day (m^2/d)

Note: The conversion factors given above are for the entire report. Not all listed conversion factors will be in any given chapter of this report.

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:
°F=(1.8×°C)+32

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:
°C=(°F-32)/1.8

Temperature in kelvin (K) may be converted to degrees Fahrenheit (°F) as follows:
°F=1.8K-459.67

Temperature in kelvin (K) may be converted to degrees Celsius (°C) as follows:
°C=K-273.15

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Altitude, as used in this report, refers to distance above the vertical datum.

*Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft^3/d)/ft^2]ft. In this report, the mathematically reduced form, foot squared per day (ft^2/d), is used for convenience.

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Table A4–1. Current study groundwater recharge estimates for predevelopment conditions and ranges of previously reported estimates of groundwater recharge for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.

[All values in acre-feet per year rounded to two significant figures. Estimated error in all current study values is ±50 percent. Previously reported total groundwater recharge minimum and maximum: totals adjusted to exclude reported recharge by subsurface inflow (unadjusted estimates are presented in Auxiliary 3G). Abbreviations: HA, hydrographic area; #, number; —, no estimate]

HA #	HA name	Current study groundwater recharge estimates					Previously reported estimates	
		In-place recharge	Runoff	Mountain stream baseflow	Imported surface water	Total groundwater recharge	Total groundwater recharge (minimum)	Total groundwater recharge (maximum)
Flow System 7: Humboldt System								
42	Marys River Area	31,000	20,000	120	—	51,000	48,000	73,000
43	Starr Valley Area	18,000	24,000	390	—	42,000	26,000	98,000
44	North Fork Area	30,000	15,000	630	—	46,000	56,000	71,000
45	Lamoille Valley	5,900	9,900	1,100	—	17,000	29,000	65,000
46	South Fork Area	8,700	4,200	0	—	13,000	3,300	52,000
47	Huntington Valley	45,000	2,500	0	—	48,000	14,000	180,000
48	Tenmile Creek Area	5,800	2,300	3	20,000	28,000	12,000	18,000
49	Elko Segment	2,900	730	0	—	3,600	7,400	9,500
50	Susie Creek Area	5,200	900	22	—	6,100	6,400	8,000
51	Maggie Creek Area	6,100	2,900	15	—	9,000	12,000	17,000
52	Marys Creek Area	310	180	750	—	1,200	300	1,500
53	Pine Valley	20,000	6,300	0	—	26,000	22,000	66,000
54	Crescent Valley	5,400	880	0	—	6,300	13,000	19,000
55	Carico Lake Valley	4,600	570	0	—	5,200	2,800	20,000
56	Upper Reese River Valley	29,000	21,000	1,300	—	51,000	24,000	91,000
59	Lower Reese River Valley	3,600	1,000	0	—	4,600	10,000	14,000
60	Whirlwind Valley	47	58	0	—	100	1,700	2,000
61	Boulder Flat	1,900	1,300	0	—	3,200	5,200	14,000
62	Rock Creek Valley	1,500	510	[1]110	—	2,100	6,900	9,800
63	Willow Creek Valley	12,000	780	See footnote 1	—	13,000	12,000	15,000
Flow System 23: Monte Cristo Valley								
136	Monte Cristo Valley	1,200	63	0	—	1,300	400	3,300

Table A4–1. Current study groundwater-recharge estimates for predevelopment conditions and ranges of previously reported estimates of groundwater recharge for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

[All values in acre-feet per year rounded to two significant figures. Estimated error in all current study values is ±50 percent. Previously reported total groundwater recharge minimum and maximum: totals adjusted to exclude reported recharge by subsurface inflow (unadjusted estimates are presented in Auxiliary 3G). Abbreviations: HA, hydrographic area; #, number; —, no estimate]

HA #	HA name	Current study groundwater recharge estimates					Previously reported estimates	
		In-place recharge	Runoff	Mountain stream baseflow	Imported surface water	Total groundwater recharge	Total groundwater recharge (minimum)	Total groundwater recharge (maximum)
Flow System 24: South-Central Marshes								
117	Fish Lake Valley	22,000	2,000	0	—	24,000	6,100	33,000
118	Columbus Salt Marsh Valley	1,400	74	0	—	1,500	600	3,500
137A	Big Smoky Valley-Tonopah Flat	10,000	1,400	0	—	11,000	12,000	23,000
141	Ralston Valley	7,600	750	0	—	8,400	3,200	25,000
142	Alkali Spring Valley	1,100	45	0	—	1,100	100	1,800
143	Clayton Valley	3,500	100	0	—	3,600	1,500	7,800
149	Stone Cabin Valley	4,600	370	4.6	—	5,000	3,200	28,000
Flow System 25: Grass Valley								
138	Grass Valley	16,000	1,400	0	—	17,000	9,100	31,000
Flow System 26: Northern Big Smoky Valley								
137B	Northern Big Smoky Valley	58,000	28,000	1,400	—	87,000	52,000	78,000
Flow System 27: Diamond Valley System								
139	Kobeh Valley	18,000	550	0	—	19,000	11,000	39,000
140A	Monitor Valley-Northern Part	32,000	2,000	33	—	34,000	6,300	37,000
140B	Monitor Valley-Southern Part	16,000	11,000	360	—	27,000	15,000	47,000
151	Antelope Valley	5,700	190	0	—	5,900	4,100	29,000
152	Stevens Basin	1,400	7.1	0	—	1,400	200	1,000
153	Diamond Valley	21,000	1,600	0	—	23,000	5,900	30,000
Flow System 28: Death Valley System								
	Amargosa/Death Valley Subarea							
144	Lida Valley	1,100	44	0	—	1,100	500	5,900
145	Stonewall Flat	1,300	29	0	—	1,300	100	3,800
146	Sarcobatus Flat	2,200	130	0	—	2,300	1,200	6,400
147	Gold Flat	10,000	530	0	—	11,000	2,800	9,300
148	Cactus Flat	1,000	47	0	—	1,000	500	4,600
157	Kawich Valley	5,100	420	0	—	5,500	2,200	6,800
158A	Emigrant Valley-Groom Lake Valley	4,500	300	0	—	4,800	2,200	8,400
158B	Emigrant Valley-Papoose Lake Valley	250	16	0	—	270	4	1,200
159	Yucca Flat	1,700	130	0	—	1,800	600	4,000
160	Frenchman Flat	1,600	19	0	—	1,600	0	5,200
161	Indian Springs Valley	4,300	110	0	—	4,400	3,100	10,000
168	Three Lakes Valley-Northern Part	1,300	32	0	—	1,300	700	3,900
169A	Tikapoo Valley-Northern Part	4,800	78	0	—	4,900	1,900	8,000
169B	Tikapoo Valley-Southern Part	2,000	5.5	0	—	2,000	1,300	5,000
170	Penoyer Valley	5,500	220	0	—	5,700	4,000	14,000
173A	Railroad Valley-Southern Part	3,800	160	0	—	4,000	5,500	8,200
211	Three Lakes Valley-Southern Part	2,500	39	0	—	2,500	4,400	8,700
225	Mercury Valley	140	25	0	—	160	200	1,300
226	Rock Valley	72	2.7	0	—	75	0	900
227A	Fortymile Canyon-Jackass Flats	1,000	66	0	—	1,100	200	2,400

Table A4–1. Current study groundwater-recharge estimates for predevelopment conditions and ranges of previously reported estimates of groundwater recharge for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

[All values in acre-feet per year rounded to two significant figures. Estimated error in all current study values is ±50 percent. Previously reported total groundwater recharge minimum and maximum: totals adjusted to exclude reported recharge by subsurface inflow (unadjusted estimates are presented in Auxiliary 3G). Abbreviations: HA, hydrographic area; #, number; —, no estimate]

HA #	HA name	Current study groundwater recharge estimates					Previously reported estimates	
		In-place recharge	Runoff	Mountain stream baseflow	Imported surface water	Total groundwater recharge	Total groundwater recharge (minimum)	Total groundwater recharge (maximum)
Flow System 28: Death Valley System—Continued								
	Amargosa/Death Valley Subarea—Continued							
227B	Fortymile Canyon-Buckboard Mesa	6,600	420	0	—	7,000	1,100	6,600
228	Oasis Valley	8,400	310	0	—	8,700	250	7,400
229	Crater Flat	320	9	0	—	330	100	2,100
230	Amargosa Desert	600	32	0	—	630	300	27,000
243	Death Valley	10,000	170	0	—	10,000	—	—
	Pahrump Valley Subarea							
162	Pahrump Valley	20,000	680	28	—	21,000	17,000	25,000
240	Chicago Valley	150	0.44	0	—	150	—	—
241	California Valley	440	4.3	0	—	440	—	—
242	Lower Amargosa Valley	330	1.4	0	—	330	—	—
244	Valjean Valley	340	4.8	0	—	340	—	—
245	Shadow Valley	830	6.3	0	—	840	—	—
Flow System 29: Newark Valley System								
154	Newark Valley	25,000	1,300	0	—	26,000	13,000	48,000
155A	Little Smoky Valley-Northern Part	7,500	160	0	—	7,700	3,100	23,000
155B	Little Smoky Valley-Central Part	440	17	0	—	460	200	1,400
Flow System 30: Railroad Valley System								
150	Little Fish Lake Valley	3,800	340	0	—	4,100	7,400	37,000
155C	Little Smoky Valley-Southern Part	1,800	68	0	—	1,900	1,400	12,000
156	Hot Creek Valley	4,400	330	4.9	—	4,700	4,800	28,000
173B	Railroad Valley-Northern Part	55,000	2,200	55	—	57,000	35,000	61,000
Flow System 32: Independence Valley System								
177	Clover Valley	10,000	1,800	0	—	12,000	21,000	60,000
188	Independence Valley	16,000	680	0	—	17,000	9,300	50,000
Flow System 33: Ruby Valley System								
176	Ruby Valley	54,000	13,000	750	—	68,000	57,000	160,000
178A	Butte Valley-Northern Part	10,000	560	0	—	11,000	3,000	14,000
Flow System 34: Colorado System								
	Lake Mead Subarea							
164A	Ivanpah Valley-Northern Part	1,300	15.0	0	—	1,300	700	1,900
164B	Ivanpah Valley-Southern Part	1,400	45	0	—	1,400	300	7,900
165	Jean Lake Valley	59	5.4	0	—	64	100	1,100
166	Hidden Valley (South)	3.4	2.4	0	—	6	0	400
167	Eldorado Valley	420	30	0	—	450	700	6,400
212	Las Vegas Valley	27,000	500	0	—	28,000	1,600	30,000
215	Black Mountains Area	640	7.9	0	—	650	70	6,900
	Muddy River Subarea							
171	Coal Valley	2,200	140	0	—	2,300	2,000	7,800
172	Garden Valley	6,400	210	0	—	6,600	6,100	19,000

Table A4–1. Current study groundwater-recharge estimates for predevelopment conditions and ranges of previously reported estimates of groundwater recharge for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

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HA #	HA name	Current study groundwater recharge estimates					Previously reported estimates	
		In-place recharge	Runoff	Mountain stream baseflow	Imported surface water	Total groundwater recharge	Total groundwater recharge (minimum)	Total groundwater recharge (maximum)
Flow System 34: Colorado System—Continued								
	Muddy River Subarea—Continued							
181	Dry Lake Valley	8,700	190	0	—	8,900	4,300	20,000
182	Delamar Valley	4,100	230	0	—	4,300	1,000	10,000
183	Lake Valley	7,000	260	0	—	7,300	8,700	41,000
198	Dry Valley	1,700	49	0	—	1,700	1,300	4,400
199	Rose Valley	81	1.3	0	—	82	100	400
200	Eagle Valley	1,000	15	0	—	1,000	1,100	5,300
201	Spring Valley	7,800	100	0	—	7,900	2,600	16,000
202	Patterson Valley	5,200	200	0	—	5,400	3,000	16,000
203	Panaca Valley	2,900	110	0	—	3,000	1,500	10,000
204	Clover Valley	7,300	840	0	—	8,100	1,700	14,000
205	Lower Meadow Valley Wash	11,000	520	0	—	12,000	1,300	23,000
206	Kane Springs Valley	2,400	210	0	—	2,600	500	7,000
208	Pahroc Valley	4,100	90	0	—	4,200	1,800	45,000
209	Pahranagat Valley	3,800	44	0	—	3,800	1,200	10,000
210	Coyote Spring Valley	2,500	38	0	—	2,500	500	37,000
216	Garnet Valley	160	1.7	0	—	160	0	2,000
217	Hidden Valley (North)	130	0.17	0	—	130	0	1,000
218	California Wash	140	0.38	0	—	140	0	3,500
219	Muddy River Springs Area	120	0.19	0	—	120	0	500
220	Lower Moapa Valley	67	0.46	0	—	67	0	2,600
	White River Valley Subarea							
174	Jakes Valley	14,000	830	190	—	15,000	9,200	38,000
175	Long Valley	30,000	1,100	0	—	31,000	5,000	48,000
180	Cave Valley	14,000	610	0	—	15,000	7,600	22,000
207	White River Valley	34,000	2,000	120	—	36,000	35,000	62,000
	Virgin River Valley Subarea							
221	Tule Desert	4,200	43	0	—	4,200	200	5,900
222	Virgin River Valley	33,000	1,200	57	—	34,000	3,200	16,000
Flow System 35: Goshute Valley System								
178B	Butte Valley-Southern Part	20,000	880	0	—	21,000	14,000	35,000
179	Steptoe Valley	82,000	3,800	360	—	86,000	45,000	150,000
187	Goshute Valley	19,000	820	0	—	20,000	10,000	41,000
Flow System 36: Mesquite Valley								
163	Mesquite Valley	1,900	14	0	—	1,900	1,000	5,500

Table A4–1. Current study groundwater-recharge estimates for predevelopment conditions and ranges of previously reported estimates of groundwater recharge for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

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HA #	HA name	Current study groundwater recharge estimates					Previously reported estimates	
		In-place recharge	Runoff	Mountain stream baseflow	Imported surface water	Total groundwater recharge	Total groundwater recharge (minimum)	Total groundwater recharge (maximum)
Flow System 37: Great Salt Lake Desert System								
184	Spring Valley	99,000	9,000	48	—	110,000	33,000	100,000
185	Tippett Valley	13,000	680	0	—	14,000	5,100	12,000
186A	Antelope Valley-Southern Part	3,100	240	0	—	3,300	800	3,800
186B	Antelope Valley-Northern Part	10,000	380	0	—	10,000	2,400	10,000
189A	Thousand Springs Valley-Herrell-Brush Creek	5,300	730	26	—	6,100	1,700	7,100
189B	Thousand Springs Valley-Toano-Rock Spring	13,000	990	0	—	14,000	4,200	22,000
189C	Thousand Springs Valley-Rocky Butte Area	8,900	140	0	—	9,000	1,100	5,800
189D	Thousand Springs Valley-Montello-Crittenden	17,000	840	0	—	18,000	2,600	13,000
191	Pilot Creek Valley	4,600	250	0	—	4,800	1,800	7,400
251	Grouse Creek Valley	8,300	4,800	290	—	13,000	14,000	14,000
252	Pilot Valley	1,400	180	0	—	1,600	3,400	3,400
253	Deep Creek Valley	16,000	1,100	0	—	17,000	17,000	17,000
254	Snake Valley	150,000	6,900	280	—	160,000	99,000	120,000
255	Pine Valley	26,000	950	0	—	27,000	21,000	21,000
256	Wah Wah Valley	5,500	460	0	—	6,000	7,000	7,000
257	Tule Valley	13,000	310	0	—	13,000	7,600	7,600
258	Fish Springs Flat	1,500	140	0	—	1,600	4,000	4,000
259	Dugway-Government Creek Valley	11,000	1,800	0	—	13,000	7,000	7,000
260A	Park Valley-West Park Valley	4,300	130	0	—	4,400	—	—
261A	Great Salt Lake Desert-West Part	28,000	600	0	—	29,000	94,000	97,000
Flow System 38: Great Salt Lake System								
260B	Park Valley-East Park Valley	1,600	1,900	330	—	3,800	—	—
261B	Great Salt Lake Desert-East Part	140	55	0	—	200	—	—
262	Tooele Valley	39,000	4,200	2,300	—	46,000	52,000	100,000
263	Rush Valley	66,000	9,300	1,800	—	77,000	34,000	34,000
264	Cedar Valley	27,000	2,000	120	—	29,000	—	—
265	Utah Valley Area	210,000	48,000	33,000	120,000	410,000	280,000	350,000
266	Northern Juab Valley	31,000	6,000	1,000	—	38,000	44,000	44,000
267	Salt Lake Valley	83,000	39,000	10,000	96,000	230,000	360,000	360,000
268	East Shore Area	26,000	42,000	1,900	220,000	290,000	150,000	150,000
269	West Shore Area	330	24	0	—	350	600	600
270	Skull Valley	23,000	2,400	0	—	25,000	40,000	40,000
271	Sink Valley	240	1.8	0	—	240	1,000	1,000
272	Cache Valley	390,000	84,000	57,000	190,000	720,000	210,000	320,000
273	Malad-Lower Bear River Area	90,000	15,000	960	330,000	440,000	380,000	380,000
274	Pocatello Valley	2,100	690	0	—	2,800	—	—

Table A4–1. Current study groundwater-recharge estimates for predevelopment conditions and ranges of previously reported estimates of groundwater recharge for each hydrographic area within the Great Basin carbonate and alluvial aquifer system study area.—Continued

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HA #	HA name	Current study groundwater recharge estimates					Previously reported estimates	
		In-place recharge	Runoff	Mountain stream baseflow	Imported surface water	Total groundwater recharge	Total groundwater recharge (minimum)	Total groundwater recharge (maximum)
275	Blue Creek Valley	6,300	21	0	—	6,300	14,000	14,000
276	Hansel and North Rozel Flat	2,400	36	0	—	2,400	8,000	8,000
277	Promontory Mountains Area	5,300	120	0	—	5,400	12,000	12,000
278	Curlew Valley	9,700	2,600	41	—	12,000	76,000	86,000
279	Great Salt Lake	1,300	1,600	0	—	2,900	—	—
	Flow System 39: Sevier Lake System							
280	Beryl-Enterprise Area	91,000	3,000	0	—	94,000	48,000	48,000
281	Parowan Valley	31,000	6,900	2,600	—	40,000	—	—
282	Cedar City Valley	19,000	11,000	2,000	—	32,000	40,000	42,000
283	Beaver Valley	62,000	14,000	4,500	—	80,000	56,000	56,000
284	Milford Area	12,000	560	0	—	13,000	56,000	56,000
285	Leamington Canyon	24,000	12,000	360	—	36,000	—	—
286	Pavant Valley	43,000	19,000	1,600	5,400	69,000	65,000	65,000
287	Sevier Desert	30,000	4,300	300	[2]6,600	41,000	53,000	53,000

[1]Total for HAs 62 and 63.

[2]Seepage studies showed 30 percent surface-water irrigation return flow from imported water; however 10% was used for recharge from runoff and mountain-stream baseflow due to small numbers of streams in the HA.