STATEMENT OF BASIS

Inverness Water and Sanitation District
Arapahoe County, Colorado

Class V Aquifer Storage and Recovery Area Permit
CO52423-00000

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This Statement of Basis gives the derivation of site-specific UIC permit conditions and reasons for them. Referenced sections and conditions correspond to sections and conditions in CO52423-00000 (Permit).

The U. S. Environmental Protection Agency Underground Injection Control (UIC) Program permits regulate the injection of fluids into underground injection wells, so that the injection does not endanger underground sources of drinking water (USDWs). EPA UIC permit conditions are based upon the authorities set forth in regulatory provisions at 40 CFR parts 2, 124, 144, 146 and 147, and address potential impacts to USDWs. In accordance with 40 CFR § 144.35, issuance of this Permit does not convey any property rights of any sort or any exclusive privilege, nor authorize injury to persons or property or invasion of other private rights, or any infringement of other federal, state or local laws or regulations. Under 40 CFR § 144 Subpart D, certain conditions apply to all UIC permits and may be incorporated either expressly or by reference. General permit conditions for which the content is mandatory and not subject to site-specific differences (40 CFR parts 144, 146 and 147) are not discussed in this document.

Upon the Effective Date when issued, the Permit authorizes the construction and operation of injection well or wells so that the injection does not endanger USDWs. The Permit is issued for a duration of three (3) years unless terminated for reasonable cause under 40 CFR § 144.40 and can be modified or revoked and reissued under 40 CFR § 144.39 or § 144.41.

The Permit will expire upon delegation of primary enforcement responsibility (primacy) for applicable portions of the UIC Program to an approved state or tribal program, unless the delegated agency has the authority and chooses to adopt and enforce this Permit as a tribal or state permit.

Inverness is located approximately 18 miles southeast of Denver. The city's population as of the 2010 Census was 1,532. The Inverness Water and Sanitation District (District) provides

water and wastewater services to the businesses and residents of the Inverness Community. The District's operating objectives include:

Provide reliable, safe, high quality drinking water to customers.

Maximize the use of sustainable (renewable) water sources.

Maximize the re-use of treated wastewater to meet irrigation demands.

Encourage conservation through education, incentives and conservation-based pricing.

The Permittee intends to inject and store Water, Infrastructure, Supply and Efficiency (WISE) water in the Arapahoe aquifer through four decreed Arapahoe aquifer wells located in Inverness. WISE is a partnership with Denver Water and Aurora Water to supply renewable surface water to Inverness and many of its neighboring communities that are also members of the South Metro Water Supply Authority (SMWSA). Treated WISE water sources available to customers will be obtained from three Aurora Water District plants and the city of Denver. East Cherry Creek Valley's (ECCV) Quebec Street water treatment facility may also supply water to WISE members via the same water distribution system. The raw water sources will be both treated surface and ground water sources.

PART I. GENERAL INFORMATION AND DESCRIPTION OF PROJECT

Inverness Water and Sanitation District
2 Inverness Drive East, Suite 200
Centennial, Colorado 80112

submitted an application for a UIC Program permit for the following area:

INVERNESS DISTRICT SERVICE AREA

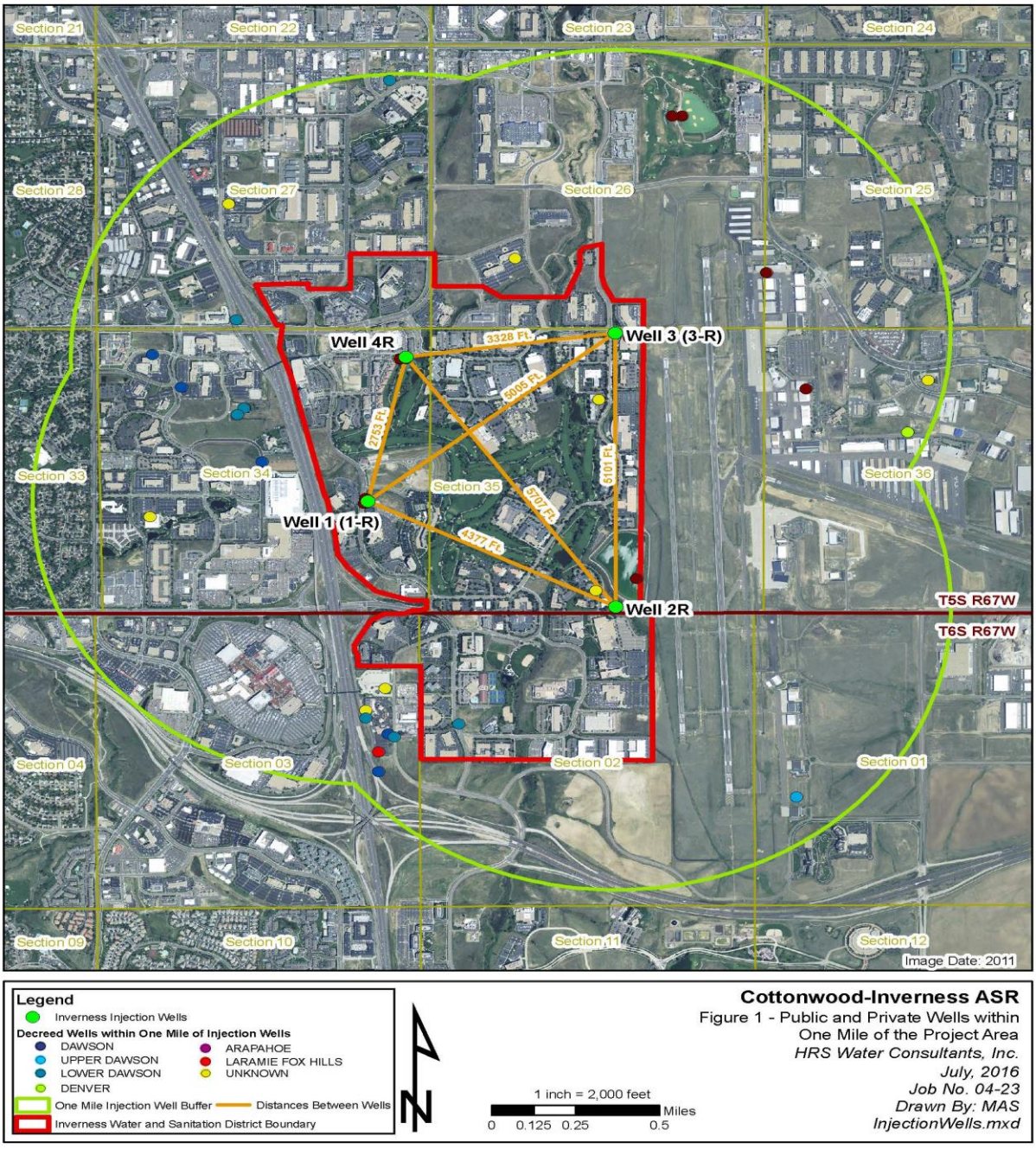

Figure 1. Inverness Water Service Area

The Legal description of the Inverness Service area is

Township 5 South, Range 67 West, Section 26	S ½ , SW ¼, SW ¼
	S ½ , SE ¼, SW ¼
	NE ¼ , SE ¼, SW ¼
	SW ¼, SW ¼, SE ¼
Township 5 South, Range 67 West, Section 27	SE ¼, SE ¼
	S ½ , SW ¼, SE ¼
Township 5 South, Range 67 West, Section 34	E ½, NE ¼
	NE ¼, W ½, E ½
	NW ¼, NE ¼
	E ½, NW ¼, SE ¼
	NE ¼, SE ¼
	N ½, SE ¼, SE ¼
	SE ¼, SE ¼, SE ¼
Township 5 South, Range 67 West, Section 35	W ½
	W ½, NE ¼
	W ½, SE ¼
Township 6 South, Range 67 West, Section 2	NW ¼
	W ½, NE ¼,
Township 6 South, Range 67 West, Section 3	NE ¼, NE ¼

Table 1. Legal Description of the Permittee Service Area

The application, including the required information and data necessary to issue or modify a UIC permit in accordance with 40 CFR parts 2, 124, 144, 146 and 147, was reviewed and determined by EPA to be complete.

PART II. PERMIT CONSIDERATIONS (40 CFR § 146.24)

Hydrogeologic Setting

Inverness is one of several water districts which operate in the Denver Basin. The Denver Basin, variously referred to as the Julesburg Basin, Denver-Julesburg Basin (after Julesburg, Colorado), or the D-J Basin, is a geologic structural basin centered in eastern Colorado in the United States, but extending into southeast Wyoming, western Nebraska, and western Kansas. It underlies the Denver-Aurora Metropolitan Area on the eastern side of the Rocky Mountains.

The basin consists of a large asymmetric syncline of Paleozoic, Mesozoic, and Cenozoic sedimentary rock layers, trending north to south along the east side of the Front Range from the vicinity of Pueblo northward into Wyoming. The basin is deepest near Denver, where it reaches a depth of approximately 13,000 ft. (3900 meters (m)) below the surface. The basin is strongly asymmetric: the Dakota Sandstone outcrops in a "hog-back" ridge near Morrison a few miles west of Denver, reaches its maximum depth beneath Denver, then ascends very gradually to its eastern outcrop in central Kansas. The Dakota hogback exposes Dakota Sandstone overlying and protecting the Morrison Formation beneath and to the west. Between Golden and Morrison, the

Dakota hogback is called Dinosaur Ridge and is the site of a dinosaur trackway and dinosaur fossils exposed in the outcrop that are part of a Colorado State Natural Area and Geological Points of Interest. The Lyons and Lykins formations outcrop in a smaller hogback. Farther west, the Fountain Formation outcrops as flatirons and forms the namesake of the Red Rocks Park and Amphitheatre. Against the eastern edge of the Rocky Mountain Front range, the Fountain Formation is in nonconformable contact with the Precambrian crystalline rock of the Idaho Springs Formation.

The basin started forming as early as 300 million years ago, during the Colorado orogeny that created the Ancestral Rockies. Rocks formed during this time include the Fountain Formation, which is most prominently visible at Red Rocks, and the Boulder Flatirons. The present basin was within the Cretaceous Interior Seaway, which deposited a thick Cretaceous section in the basin.

The basin was most likely further deepened in Paleogene time, between 66 and 45 million years ago, during the Laramie orogeny that created the modern Colorado Rockies. In particular, the uplifting of the Rockies in the Front Range caused the crust near Denver to buckle downward on the eastern side, deepening the basin. The basin later became filled with sediment eroded from the Rockies. The Front Range peaks rise approximately 22,000 ft. (6,600 m) from the floor of the basin under Denver.

The deep part of the basin near Denver became filled with Paleogene sandstone and conglomerate, a layer now called the Denver Formation. In the regions to the north and south of Denver, however, stream erosion removed the Paleogene layers, revealing the underlying Cretaceous Pierre Shale. The upper formations of the Denver Basin are aquifers that serve as important sources of water supply in the region. The Denver Basin includes four aquifers of major significance. In ascending order, these are: Laramie-Fox Hills Aquifer; Arapahoe Aquifer; Denver Aquifer; and Dawson Aquifer.

Table 2.1A
1-R GEOLOGIC SETTING

Geologic Log #1
Well No.: 1-R
Location: 2050 FNL 1030 FEL, NE1/4, SE ¼, Section 34, T5S, R63W
Total Depth: 1740 feet
CSEO Permit No.: 15810-F R

Depth (ft. BGL)	Lithology
Surface Casing Hole	
0 – 8	Clay: tan to brown, sandy in part, white caliche streaks
8 – 10	Sandstone: fine to medium grained, light gray to rusty, pinkish downward, clayey in part, very weathered
10 – 20	Sandstone: as above, very clayey, wet at 17 ft.
20 – 21	Claystone: greenish, firm
21 – 31	Sandstone: as above, slightly clayey
31 – 32	Claystone: reddish to yellow, dry, cobble layer at top
32 – 34	Claystone: gray, firm, dry
34 – 43	Claystone: lignitic at top – dark gray to black, grading downward to greenish, blocky, dry
Production Hole	
43 – 100	Claystone: gray, flakey to blocky, firm, trace fine grained sand at 80 to 100 ft.
100 – 120	Sandstone: medium grained, sub-angular to sub-rounded, 95% quartz, lithic grains, micaceous, medium sorting
120 – 170	Claystone: gray, firm, blocky
170 – 180	Sandstone: medium grained, trace coarse grained, sub-angular to sub-rounded, 95% quartz, lithic grains, medium sorting
180 – 200	Claystone: as above
200 – 210	Claystone: as above Sandstone: as above
210 – 220	Sandstone: as above
220 – 240	Claystone: as above
240 – 250	Sandstone: as above
250 – 260	Claystone: as above
260 – 270	Claystone: as above Sandstone: as above

Base of Lower Dawson at 278 ft. from Geophysical Logs
Top of Denver at 290 ft. from Geophysical Logs

270 – 330	Claystone: medium to dark gray, firm, blocky
330 – 340	Sandstone: medium grained, grayish, as above
340 – 370	Claystone: as above
370 – 390	Sandstone: fine to medium grained, grayish, as above

Depth (ft. BGL)	Lithology
390 – 460	Claystone: gray to greenish, firm
460 – 470	Siltstone: gray, to very fine grained sandstone
470 – 520	Claystone: gray to dark gray, firm
520 – 530	Sandstone: fine to medium grained, gray, clayey
530 – 540	Sandstone: as above Claystone: greenish, trace lignitic
540 – 550	Sandstone: same as 520 – 530 ft.
550 – 670	Claystone: gray lenses
670 – 690	Claystone: dark gray, firm, sandy in part – fine grained
690 – 770	Claystone: dark gray to greenish gray, firm, blocky
770 – 800	Sandstone: fine to medium grained, gray, sub-angular to sub-rounded, 95% quartz, fair sorting, clayey in part
800 – 870	Claystone: greenish gray to dark gray interbedded, firm, blocky
870 – 890	Siltstone: gray, firm
890 – 930	Claystone: gray to dark gray with greenish gray interbedded, firm, blocky
930 – 940	Siltstone: as above
940 – 1160	Claystone: dark gray, firm, blocky, trace mica

Base of Denver at 1,134 ft. from Geophysical Logs

1160 – 1170	Sandstone: fine grained, gray, clayey, with claystone as above
1170 – 1200	Claystone: dark gray, sticky

Top of Arapahoe at 1,192 ft. from Geophysical Logs

1200 – 1210	Sandstone: medium grained, gray to white, quartz, sub-angular to sub-rounded, fair sorting, lot dark gray claystone chips 1200 – 1210 ft.
1210 – 1220	Claystone: light gray, semi-firm, trace sandstone as above
1220 – 1230	Sandstone: as above with claystone chips as above
1230 – 1250	Claystone: dark gray, semi-firm
1250 – 1270	Sandstone: medium grained, gray due to mud, quartz, sub-angular to sub-rounded, fair sorting, some dark gray claystone chips
1270 - 1280	Claystone: light to dark gray Sandstone: fine grained, white, clay matrix, as large chips
1280 – 1310	Claystone: dark gray, sticky, several large pieces - micaceous
1310 – 1320	Claystone: bark gray, hard, as chips
1320 – 1330	Sandstone: medium grained, white, quartz, sub-angular to sub-rounded, medium sorting, trace lithic grains
1330 – 1350	Claystone: gray to dark gray, sticky

Depth (ft. BGL)	Lithology
1350 – 1360	Claystone: dark gray firm, as chips Sandstone: fine grained, white, clay matrix, as clumps Sandstone: medium grained, white, quartz, sub-angular to sub-rounded, medium sorting, trace lithic grains
1360 – 1380	Claystone: dark gray, sticky
1380 – 1410	Sandstone: same as 1320 – 1330, trace coarse grained
1410 – 1450	Claystone: dark gray to gray, firm to soft
1450 – 1460	Sandstone: fine grained, gray, clayey
1460 – 1500	Sandstone: same as 1320 – 1330, interbedded dark gray claystone
1500 – 1510	Claystone: dark gray, soft
1510 – 1530	Sandstone: as above
1530 – 1610	Claystone: as above with firmer pieces
1610 – 1640	Sandstone: as above interbedded with claystone as above
1640 – 1660	Claystone: light gray to gray, soft, sticky
1660 – 1680	Sandstone: as above, some white fine grained clusters, interbedded claystone
1680 – 1690	Claystone: gray, trace sand

Base of Arapahoe - Top of Laramie from Geophysical Logs

1690 – 1730	Claystone: light gray, as balls, semi-firm
1730 – 1740	Claystone; dark gray, firm chips

Note: Bedrock at approximately 8 feet BGL

*Geologic logs are based on data obtained from cutting samples, geolograph readings, and geophysical logs. Depths are approximate values.

Table 2.1B
2-R GEOLOGIC SETTING

Geologic Log #2
Well No.: 2-R
Location: 150 FSL 2350 FEL, SW ¼ , SE ¼, Section 35, T5S, R67W
Total Depth: 1710 feet
CSEO Permit No.: 15885-F

Formation Name	Top (ft)*	Base (ft)*	Lithology
Alluvium	0	40	Sands and clays
Dawson Arkose	40	328	Green to gray clays and shales with interbedded conglomeritic sand
Denver	328	1162	Predominantly gray to brown sandy clays and clayey sands with some brown and green volcanic detritus
Arapahoe	1162	1680	Dark gray and green clays and shales interbedded with fine to medium quartz sand
Laramie	1680	1710	Gray and black organic clays and shales

*Geologic logs are based on data obtained from cutting samples, geolograph readings, and geophysical logs. Depths are approximate values.

Table 2.1C
3-RR GEOLOGIC SETTING

Geologic Log #3
Well No.: 3-RR
Location: 150 FNL 2150 FEL, NW ¼ , NE ¼, Section 35, T5S, R67W
Total Depth: 1710 feet
CSEO Permit No.: 16303-F R

Depth (ft. BGL)	Lithology
0 – 0.5	Asphalt
0.5 – 12	Clay: gray to brown downward, sandy
12 – 19	Claystone: brown to gray downward, weathered, firm
19 – 25	Claystone/Siltstone: blue gray, firm
25 – 26	Siltstone: blue gray, hard
26 – 40	Claystone: blue gray to light and dark gray layers, light gray below 33 ft.
40 – 130	Claystone: light gray to gray, firm
130 – 150	Claystone: as above Siltstone: blue gray, micaceous
150 – 180	Claystone: as above, micaceous
180 – 240	Claystone: light to dark gray, hard chips
240 – 260	Siltstone: blue gray, hard
260 – 540	Claystone: as above, harder and softer zones
540 – 550	Claystone: light gray, harder
550 – 610	Claystone: light gray to brown
610 – 640	Claystone: light gray
640 – 650	Claystone: light gray. Harder
650 – 780	Claystone: light gray
780 – 790	Claystone: light brown
790 – 960	Claystone: light gray
960 – 970	Claystone: as above, mica chips
970 – 1100	Claystone: light gray
1100 – 1110	Claystone: as above, mica chips
1110 – 1150	Claystone: light gray
1150 – 1180	Sandstone: fine grained, gray, angular grains, fair sorting
1180 – 1200	Claystone: light gray
1200 – 1320	Sandstone: fine grained, gray, angular grains, fair sorting
1320 – 1350	Claystone: light gray
1350 – 1450	Sandstone: fine grained, gray, angular grains, fair sorting
1450 – 1470	Claystone: light gray and Sandstone: fine grained, gray, angular grains, fair sorting
1470 – 1520	Claystone: light and dark gray lenses
1520 – 1550	Sandstone: fine grained, gray, angular grains, fair sorting
1550 – 1620	Claystone: light and dark gray lenses
1620 – 1630	Sandstone: fine grained, gray, angular grains, fair sorting
1630 – 1640	Sandstone: fine grained, gray, angular grains, fair sorting with dark brown Claystone
Depth (ft. BGL)	Lithology
1640 – 1665	Claystone: bark brown

Note: Bedrock at approximately 12 feet BGL

*Geologic logs are based on data obtained from cutting samples, geolograph readings, and

geophysical logs. Depths are approximate values.

Table 2.1D
4-RR GEOLOGIC SETTING

Geologic Log #4
Well No.: 4-RR
Location: 539 FNL 390 FEL, NE ¼ , NE ¼, Section 34, T5S, R67W
Total Depth: 1710 feet
CSEO Permit No.: 16309-F R

Depth (ft. BGL)	Lithology
0 – 1	Top soil: clay, black.
1 – 6	Sand & Gravel: light brown, fine to coarse grained, some gravel, silty.
6 – 40	Sandstone: light brown & yellowish orange, weathered. Fine to coarse grained sand, silty, medium sorting. Some interbedded siltstone, light brown, and claystone, light brown.
40 – 50	Sandstone: light brown and light gray, weathered. Fine to coarse grained sand, sub-angular to angular.
50 – 70	Siltstone: light gray & tan. Some interbedded claystone, gray.
70 – 80	Claystone: gray, greenish gray.
80 – 100	Sandstone: gray. Fine to medium grained sand, sub-angular, well sorted.
100 – 110	Siltstone: gray. Possible transition to claystone, gray.
110 – 140	Claystone: greenish gray.
140 – 150	Claystone: olive gray, some interbedded gray siltstone to sandstone, fine grained.
150 – 160	Siltstone: gray. Some claystone, olive gray.
160 – 170	Sandstone: gray, fine to medium grained sand, well sorted.
170 – 180	Claystone: gray. Some interbedded siltstone, gray.
180 – 200	Claystone: gray.
200 – 240	Claystone: greenish gray. Some interbedded siltstone, greenish gray.
240 – 250	Sandstone: white to gray. Medium to coarse grained sand, moderately well sorted, sub-angular.
Base of Lower Dawson at 253 ft. from Geophysical Logs	
250 – 260	Claystone: greenish gray. Some interbedded siltstone, gray (transition).
260 – 280	Claystone: greenish gray.
280 – 300	Claystone: greenish gray. Some interbedded siltstone, greenish gray.
300 – 330	Claystone: greenish gray, brown.
Top of Denver at 333 ft. from Geophysical Logs	
330 – 340	Siltstone: greenish gray, light brown.
340 – 350	Claystone: gray. Some interbedded siltstone (transition).
350 – 360	Sandstone: light gray, white. Fine grained sand, lignitic.
360 – 380	Claystone: greenish gray.
380 – 400	Claystone: greenish gray, lignitic.

Depth (ft. BGL)	Lithology
400 – 410	Claystone: gray to greenish gray, lignitic. Some interbedded siltstone (transition).
410 – 420	Sandstone: gray. Fined grained sand, well sorted, lignitic.
420 – 430	Sandstone: gray. Fine to coarse grained sand, sub-angular.
430 – 450	Claystone: greenish gray.
450 – 460	Sandstone: greenish gray, brown. Fine grained sand, silty, lignitic.
460 – 470	Claystone: olive gray.
470 – 480	Claystone: olive gray. Some interbedded siltstone, gray (transition).
480 – 490	Sandstone: gray. Very fine to fine grained sand, well sorted.
490 – 500	Siltstone: greenish gray, olive gray.
500 – 510	Claystone: olive gray.
510 – 520	Claystone: olive gray. Some interbedded siltstone, gray (transition).
520 – 530	Claystone: olive gray.
530 – 570	Claystone: greenish gray.
570 – 580	Siltstone: gray, greenish gray.
580 – 600	Claystone: greenish gray, olive gray.
600 – 610	Claystone: greenish gray. Some sandstone, fine to coarse grained (transition).
610 – 620	Sandstone: gray. Fine to coarse grained sand, moderately well sorted.
620 – 630	Sandstone: gray. Fine grained sand, well sorted. Some claystone, greenish gray (transition).
630 – 650	Claystone: greenish gray, olive gray. Large claystone chips.
650 – 660	Claystone: olive gray, lignitic.
660 – 670	Claystone: olive gray. Some interbedded siltstone, gray.
670 – 680	Claystone: greenish gray. Large claystone chips.
680 – 690	Claystone: greenish gray. Some interbedded siltstone, gray.
690 – 700	Claystone: greenish gray.
700 – 710	- Section Missing -
710 – 750	Claystone: gray, greenish gray.
750 – 760	Siltstone: gray.
760 – 780	Claystone: greenish gray, lignitic.
780 – 790	Siltstone: gray, lignitic.
790 – 820	Claystone: gray, greenish gray.
820 – 830	Claystone: greenish gray. Some interbedded siltstone.
830 – 840	Claystone: gray.
840 – 850	Claystone: greenish gray, lignitic.
850 – 860	Siltstone: greenish gray. Very hard chips, pyrite visible.
860 – 900	Claystone: greenish gray to olive gray, lignitic.
900 – 910	Claystone: greenish gray. Some interbedded siltstone, gray.
910 – 940	Claystone: greenish gray, olive gray.

Depth (ft. BGL)	Lithology
940 – 950	Sandstone: light gray. Fine grained sand, silty, well sorted.
950 – 980	Claystone: greenish gray. Some interbedded siltstone, gray.
980 – 990	Sandstone: gray. Fine to medium grained sand. Some Calcite visible.
990 – 1010	Sandstone: light gray, white. Fine grained sand, silty. Muscovite visible.

Base of Denver at 1,012 ft. from Geophysical Logs

1010 – 1020	Claystone: dark gray. Some interbedded siltstone, gray.
1020 – 1050	Claystone: olive gray, dark gray.
1050 – 1070	Claystone: olive gray. Some interbedded siltstone, gray.
1070 – 1080	Sandstone: gray. Fine to medium grained sand, sub-rounded to rounded, moderately well sorted. Some interbedded claystone, olive gray.
1080– 1110	Claystone: olive gray, dark gray.
1110 – 1120	Claystone: greenish gray. Some interbedded sandstone, medium to coarse grained sand.
1120 – 1130	Claystone: greenish gray. Some interbedded siltstone, gray.
1130 – 1140	Claystone: greenish gray. Some interbedded sandstone, medium to coarse grained sand.
1140 – 1150	Claystone: olive gray.

Top of Arapahoe at 1,057 ft. from Geophysical Logs

1150 – 1160	Sandstone: light gray, white. Medium to coarse sand, sub-angular to sub-rounded.
1160 – 1170	Claystone: olive gray. Some interbedded siltstone, gray.
1170 – 1180	Sandstone: light gray, white. Fine to coarse grained sand, sub-angular to sub-rounded.
1180 – 1200	Claystone: olive gray, light gray. Some interbedded siltstone and sandstone.
1200 – 1210	Sandstone: light gray. Fine grained sand, silty. Rounded, well sorted.
1210 – 1220	Claystone: dark gray. Some interbedded siltstone.
1220 – 1230	Claystone: dark gray. Some interbedded siltstone to sandstone, fine grained.
1230 – 1260	Sandstone: light gray. Fine to coarse grained sand, sub-angular to sub-rounded. Some interbedded siltstone.
1260 – 1270	Sandstone: light gray, white. Fine to medium grained sand. Some interbedded siltstone.
1270 – 1290	Sandstone: light gray, white. Fine to medium grained sand.
1290 – 1300	Sandstone: gray. Fine grained sand, silty.
1300 – 1310	Claystone: gray. Some interbedded siltstone.
1310 – 1330	Claystone: gray, lignitic.

Depth (ft. BGL)	Lithology
1330 – 1350	Sandstone: Fine grained sand, silty.
1350 – 1390	Claystone: gray, olive gray.
1390 – 1400	Claystone: gray, olive gray. Some interbedded siltstone.
1400 – 1410	Sandstone: gray. Fine to medium grained sand, well sorted, sub-angular to sub-rounded.
1410 – 1480	Sandstone: gray. Fine to coarse grained sand, silty, well sorted, sub-angular to sub-rounded.
1480 – 1510	Claystone: dark gray. Some interbedded siltstone.
1510 – 1520	Claystone: dark gray. Some interbedded siltstone to sandstone, medium grained.
1520 – 1550	Claystone: dark gray, olive gray.
1550 – 1560	Silstone: dark gray. Some interbedded sandstone, fine grained.
1560 – 1570	Claystone: dark gray, olive gray, lignitic.
1570 – 1610	Claystone: dark gray, olive gray.
1610 – 1630	Sandstone: gray. Fine to coarse grained sand, sub-rounded, moderately well sorted, sub-angular.
Base of Arapahoe - Top of Laramie at 1640 ft. from Geophysical Logs	
1630 – 1660	Claystone: dark gray to black, lignitic.

Note: Bedrock at approximately 6 feet BGL

The formation tops and bottoms are subject to interpretation. The Colorado State Engineer's Office (SEO) provides a Denver Basin modeling tool which estimates the depth of the Denver Basin Aquifers. The SEO picks tops and bottoms for each aquifer, but the bottom of one aquifer is not the top of the underlying aquifer. Instead, the SEO has tried to define confining beds which lie between the aquifers and interprets the bottom of an aquifer as the top of the underlying clay/shale confining bed, and the top of the next deep aquifer as the bottom of the overlying clay/shale bed.

Injection Zone

An injection zone is a geological formation, group of formations, or part of a formation that receives fluids through a well. The proposed injection zone is listed in Table 2.2.

Injection will occur into an injection zone that is separated from USDWs by a confining zone which is free of known open faults or fractures within the Area of Review (AOR).

Table 2.2
INJECTION ZONE

Well Name	Formation Name	Top (ft)*	Base (ft)*	Exemption Status
1-R	Arapahoe	1200	1680	Not applicable
2-R	Arapahoe	1162	1680	Not applicable
3-RR	Arapahoe	1150	1634	Not applicable
4-RR	Arapahoe	1070	1630	Not applicable

Confining Zones
A confining zone is a geological formation, part of a formation, or a group of formations that limits fluid movement above and below the injection zone. The confining zone or zones are listed in Table 2.3.

Table 2.3
CONFINING ZONES

1-R Well

Formation Name	Top (ft)*	Base (ft)*	Lithology
Upper Confining Zone Denver Formation	1170	1200	Claystone: dark gray
Lower Confining Zone Arapahoe/Laramie Formation	1680	1740	Claystone: grey

2-R Well

Formation Name	Top (ft)*	Base (ft)*	Lithology
Upper Confining Zone Denver Formation	1108	1162	Claystone: dark gray
Lower Confining Zone Laramie Formation	1680	1710	Claystone: grey

3-RR Well

Formation Name	Top (ft)*	Base (ft)*	Lithology
Upper Confining Zone Denver Formation	1088	1150	Claystone: gray
Lower Confining Zone Laramie Formation	1634	2365	Claystone: grey

4-RR Well

Formation Name	Top (ft)*	Base (ft)*	Lithology
Upper Confining Zone Denver & Arapahoe Formations	1010	1070	Claystone: dark gray
Lower Confining Zone Arapahoe & Laramie Formations	1630	1710	Claystone: grey

The upper and lower confining layers are based on the Geologic Log and the geophysical logs submitted with the application.

Underground Sources of Drinking Water (USDWs)
Aquifers, or the portions thereof, which:
1) currently supply any public water system, or
2) contain a sufficient quantity of groundwater to supply a public water system and currently supply drinking water for human consumption, or
3) contain fewer than 10,000 milligrams per liter (mg/L) total dissolved solids (TDS), are considered to be USDWs. The receiving aquifer, the Arapahoe, is a USDW and currently supplies water for the Denver metropolitan area. Pursuant to the UIC regulations at 40 CFR Part 144.12, underground injection cannot cause movement of a contaminant into a USDW, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 142. Whenever the Director learns that a Class V well may be adversely affecting the health of persons, he or she may prescribe such actions as may be necessary to prevent the adverse effect, including any action authorized under paragraph 144.12(c).

Other USDWs exist above and below the proposed injection zone. The proposed injection fluid is treated to drinking water standards at drinking water treatment plants operated by Aurora Water. EPA has concluded that the other USDWs at this location will not be impacted by injection activities due to the geologic isolation separating them from the injection zone for this project.

Sands and sandstone layers of the following aquifers are USDWs, in ascending order, in the proposed area: Laramie-Fox Hills Aquifer, Arapahoe Aquifer, Denver Aquifer, and Dawson Aquifer. Compliance with permit conditions will ensure that the Arapahoe Aquifer is protected as a USDW.

PART III. WELL CONSTRUCTION (40 CFR § 146.22)

The approved well construction plan, incorporated into the Permit as Appendix A, is a general representation of the wells, 1-R, 2-R, 3-RR, and 4-RR, expected construction prior to injection. Routine maintenance and/or minor physical alterations to constructed wells are within the scope of such wells' construction. Prior to beginning any such maintenance or alterations, the Permittee shall give the Director advanced notice. Upon such notice, the Director may impose additional requirements, if necessary, to ensure USDW protection.

Wells shall be cased and cemented to prevent the movement of fluids into or between USDWs. Wells shall be constructed in accordance with 40 CFR § 147.305 and the SEO's Water Well Construction Rules. The SEO Water Well Construction Rules may be found at:

Code of Colorado Regulations, Secretary of State, State of Colorado, Department of Natural Resources, Division of Water Resources, Rules and Regulations for Water Well Construction, Pump Installation, Cistern Installation, and Monitoring and Observation Hole/Well Construction, 2 CCR 402-2, Rule 10 Minimum Construction Standards for Water Wells.

These rules along with the requirements of 40 CFR § 147.305 have been evaluated and are expected to be protective of USDWs. The Colorado Office of the State Engineer's Water Well Construction Rules are being used for well construction in an effort to help the Permittee and both agencies to work more efficiently when evaluating the well construction for the approved Wells 1-R, 2-R, 3-RR, 4-RR and future injection wells.

The four wells have operated as recovery wells and will perform Pilot Cycle Testing (PCT) consistent with Permit requirements has been conducted. These wells are currently shut in and have not previously performed any Pilot Cycle Testing or any Injection activities. Additional logging and testing requirements, including Bench Scale Testing for nitrosamines, identified in Appendix B, must be completed prior to obtaining authorization to inject.

Casing and Cement

Four wells are currently approved for construction. The well construction plan for the four wells, 1-R, 2-R, 3-RR, and 4-RR were evaluated and determined to be in conformance with standard practices and guidelines that ensure well injection does not result in the movement of fluid containing any contaminant into USDWs, if the presence of that contaminant may cause a violation of any primary drinking water regulation or may otherwise adversely affect the health of persons.

Well construction details for the injection wells are shown in Table 3.1.

To protect shallow USDWs when drilling the surface hole for any new injection wells, the Permittee is limited to drilling with air or mud made with water containing no additives and no more than 3,000 mg/L TDS, unless waived by the Director.

Remedial cementing may be required if the casing cement is shown to be inadequate by cement bond log or other demonstration of external (Part II) mechanical integrity.

Table 3.1
WELL CONSTRUCTION REQUIREMENTS

Well Name	Casing Type	Casing Material	Hole Size (in)	Casing Size (in)	Cased Interval (ft)	Cemented Interval (ft)
1-R	Surface	steel	26	20	0 - 43	0 - 43
	Longstring	steel	17.5	10.75	0 - 1254	0 - 1190

Well Name	Casing Type	Casing Material	Hole Size (in)	Casing Size (in)	Cased Interval (ft)	Cemented Interval (ft)
2-R	Surface	steel	16	12 ¾	0 - 40	0 - 40
	Longstring	steel	12.25	8 5/8	0 - 1190	0 - 1126

Well Name	Casing Type	Casing Material	Hole Size (in)	Casing Size (in)	Cased Interval (ft)	Cemented Interval (ft)
3-RR	Surface	steel	32	20	0 - 40	0 - 40
	Longstring	steel	17.5	10 ¾	0 - 1665	0 - 1172

Well Name	Casing Type	Casing Material	Hole Size (in)	Casing Size (in)	Cased Interval (ft)	Cemented Interval (ft)
4-RR	Surface	steel	30	20	0 - 41	0 - 41
	Longstring	steel	17.5	10 ¾	0 - 1665	0 - 1050

The well construction plans were obtained from Inverness' application. A well Construction and Test Report Form No. GWS-31 was prepared for the SEO and is included in the application.

Sampling and Monitoring Devices
To fulfill Permit monitoring requirements and provide access for EPA inspections, sampling and monitoring equipment will need to be installed and maintained. Required equipment includes but is not limited to:

1) a pressure actuated shut-off device attached to the injection flow line set to shut-off the injection pump when or before the Maximum Allowable Injection Pressure (MAIP) is reached at the wellhead;
2) fittings or pressure gauges attached to the injection tubing, including a flow meter that measures flow in real time;
3) a fluid sampling point between the pump house or storage tanks and the injection well, isolated by shut-off valves, for sampling the injected fluid; and
4) a non-resettable flow meter that records the cumulative volume of injected fluid; and continuous recording of injection pressure, flow rate, volume, and any additional monitoring requirements.

If the well construction will allow, monitoring shall also be performed at the tubing casing annulus (TCA), and surface casing-production casing (Bradenhead) annulus. Injection pressure is the pressure that is measured in a pump house or alternate location whereas wellhead pressure is measured at the top of the well. Data is evaluated to determine if there may be a problem with field operations if data shows an interruption in injection activities.

All sampling and measurements taken for monitoring must be representative of the monitored activity.

PART IV. AREA OF REVIEW, CORRECTIVE ACTION PLAN (40 CFR § 144.55)

Area of Review (AOR)
Permit applicants are required to identify the location of all known wells within the AOR which penetrate the lowermost confining zone, which is intended to prevent injection fluids from migrating outside of the injection zone. Under 40 CFR § 146.6 the AOR may be a fixed radius of not less than one quarter (1/4) mile or a calculated? zone of endangering influence. For area permits, a fixed width of not less than one quarter (1/4) mile for the circumscribing area may be used.

The Permittee provided a list of 39 wells constructed within one mile of the proposed injection wells in APPENDIX B of the Permittees application. Of these 31 wells: twelve (12) are municipal; two (2) irrigation; six (6) commercial; two (2) industrial; seven (7) domestic; one (1) geothermal; one (1) house hold use only; two (2) wells identified as other in the application (identified as general use and dewatering wells in the Colorado Department of Water Resources database); and the remaining wells were not classified. Twelve (12) wells are known to be constructed into the Arapahoe Aquifer as follows:

CSEO PERMIT NO.	WELL OWNER	WELL USE
7729	Larrick William F & Louise Gilliam	Municipal
12264	Arapahoe Water and Sanitation District	Municipal

15810	Inverness Water and Sanitation District	Municipal
15885	Inverness Water and Sanitation District	Municipal
16213	Inverness Water and Sanitation District	Municipal
16302	Inverness Water and Sanitation District	Municipal
16309	Inverness Water and Sanitation District	Municipal
16602	Arapahoe City of Colorado	Commercial
18764	Arapahoe Water and Sanitation District	Commercial
22632	Arapahoe Water and Sanitation District	Irrigation
39133	Arapahoe Water and Sanitation District	Other
44218	Arapahoe Water and Sanitation District	Industrial

A list of wells in the AOR must be updated and reported in the Annual Report that is submitted to EPA.

Corrective Action Plan (CAP)
For wells in the AOR which are improperly sealed, completed, or abandoned, the Permittee will develop a CAP consisting of the steps or modifications that are necessary to prevent movement of fluid into USDWs.

No corrective action is required at this time as EPA's evaluation did not identify migration pathways that would impact USDWs within the AOR.

PART V. WELL OPERATION REQUIREMENTS (40 CFR § 146.23)

Mechanical Integrity (40 CFR § 146.8)
An injection well has mechanical integrity (MI) if:

1. Internal (Part I) MI: there is no significant leak in the casing, and
2. External (Part II) MI: there is no significant fluid movement into a USDW through vertical channels adjacent to the injection well bore.

The Permit requires MI to be maintained at all times. The Permittee must demonstrate MI prior to injection, as required in Appendix B Logging and Testing Requirements. A demonstration of well MI includes both internal (Part I) and external (Part II). The methods and frequency for demonstrating internal (Part I) and external (Part II) MI are dependent upon well conditions and are subject to change. Should well conditions change during the operating life of the well,

additional requirements may be specified and will be incorporated as minor modifications to the Permit.

A successful internal Part I Mechanical Integrity Test (MIT) is required prior to receiving authorization to inject. A demonstration of internal MI is also required following any workover operation that affects the casing or after a loss of MI. In such cases, the Permittee must complete work and restore MI within ninety (90) days following the workover or within the timeframe of the approved alternative schedule. After the well has lost MI, injection may not recommence until after internal MI has been demonstrated and the Director has provided written approval.

Internal MI may be demonstrated by performing periodic visual inspections of the injection well(s), including the well casing. Specifically, the operator must submit documentation of all video logs previously run for each proposed injection well accompanied by a report(s) from a qualified professional analyst. All video logs must be run from the top to the total depth of each proposed injection well. Analytical reports must include a discussion of all findings related to the mechanical integrity of the well, identification of any measures taken to resolve concerns and/or maintain the well, and any issues for which monitoring is needed on a regular basis. Video logs with an analyst report must be submitted to EPA prior to injection, following the repair of a well after the loss of mechanical integrity, and during routine maintenance, which is expected to occur at least every ten (10) years.

External (Part II) MIT may be demonstrated by evaluation of cement records and/or cement bond logs (CBLs) to show that adequate cement exists to prevent significant movement of fluid out of the approved injection zone through the casing cement. If a CBL is run, guidance on the logging and interpretation of the CBL can be found at https://www.epa.gov/uic/underground-injection-control-epa-region-8-co-mt-nd-sd-ut-and-wy#guidance.

Should the cement records and/or CBL analysis show inadequate external Part II MI, additional periodic tests may be required.

Injection Fluid Limitation

Injection fluids are limited to fluids from those public water systems sampled and submitted as part of the application. Sources of treated drinking water to be injected shall be obtained from East Cherry Creek Well Field Denver Basin Aquifers, Aurora Reservoir, Cherry Creek Well Field Denver Basin Aquifers, Quincy Reservoir, Rampart Reservoir and South Platte River.

The injectate will be treated to drinking water standards at the ECCV Quebec Street Treatment Plant and Aurora Water Treatment Plants. Injection fluid limitations are found in Part II. Section C.6 of the Permit.

Injection Pressure Limitation

40 CFR § 146.23(a)(1) requires that the injection pressure at the wellhead must not exceed a maximum calculated to ensure that the pressure during injection does not initiate new fractures or propagate existing fractures in the confining zone adjacent to the USDWs. In lieu of testing to determine the fracture pressure of the confining zone, which may be impractical, the MAIP will be set below a pressure that will not initiate new fractures or propagate existing fractures in the

injection zone thereby ensuring that no injection or formation fluids will migrate out of the injection zone and into other USDWs. Based on the calculations noted below, EPA has determined that a Part I MI injection of up to 200 pounds per square inch gauge (psig) can be safely conducted without causing such fracturing and that the MAIP be set at 2/3 of this pressure. Should the Permittee wish to inject at a higher pressure, then an additional test may be required such as a Step Rate Test. Since the Permittee anticipates injecting at pressures no higher than 133 psig, EPA is setting the MAIP at 133 psig for Wells 1-R, 2-R, 3-RR, and 4-RR.

The fracture pressure of the injection zone is determined by using the depth at the top of the well screen, a conservative fracture gradient value of 0.8 psi/foot, and a specific gravity for the injected fluid of 1.0 in the formula below.

$$FP = [FG - (0.433 * SG)] * D$$

FP = Fracture Pressure
FG = Fracture Gradient
SG = Specific Gravity
D = Depth

EPA has determined that a MAIP of 133 psig is sufficiently protective of USDWs outside of the injection zone.

Table 5.1 below provides the MAIP for the well which is authorized to construct for ASR purposes.

Table 5.1
MAXIMUM ALLOWABLE INJECTION PRESSURE (MAIP)

Well Name	Formation Name	Top Screen Depth (ft)	Estimated MAIP Value (psi)
1-R	Arapahoe	1254	133
2-R	Arapahoe	1192	133
3-RR	Arapahoe	1272	133
4-RR	Arapahoe	1174	133

PART VI. MONITORING, RECORD KEEPING AND REPORTING REQUIREMENTS

Injection Well Monitoring Program
At least once a year, the Permittee must analyze a sample of the injected fluid for parameters specified in Appendix J, based on the schedule presented in Appendix D, of the Permit. This analysis must be reported to EPA annually as part of the Annual Report to the Director.

Instantaneous injection pressure, injection flow rate, injection volume, and cumulative fluid

volume must be observed on a weekly basis. A recording, at least monthly, must be made of that month's injected volume and cumulative fluid volume to date, and the maximum and average value for injection tubing pressure and rate. This information is required to be reported in the Quarterly Report to the Director.

Injectate and Recovered Water

Treated injectate will be analyzed near the injection point to determine if there have been any changes in the water quality. Recovered water from the Arapahoe Aquifer will be analyzed prior to any further treatment to determine if mobilization or any other geochemical reactions are occurring over time as a result of injection activities.

The Permittee has submitted baseline water quality data of the treated source water collected at each of the three Aurora Water Treatment plants, East Cherry Creek Valley WTP's (ECCV) injectate samples collected at well 1-R in the service area, and water recovered from the Arapahoe Aquifer from the four proposed injection wells, 1-R, 2-R, 3-R and 4-RR. There were no exceedances of those constituents with maximum contaminant levels (MCLs).

- *10/4/2016 Lab Results for Four Proposed Injection Wells - samples of 3 types of nitrosamines: N-nitrosodimethylamine (NDMA), N-nitroso N-propylamine (NDPA) and N-Nitrosodiphenylamine ; semi-volatiles; and volatiles.*
  There were no exceedances of the reporting limits 2 ng/L for the three nitrosamines. There were no exceedances of regulatory and/or health-based levels for semi-volatiles, and volatiles.
- *8/17/2016 Lab Results for Four Proposed Injection Wells – samples of radionuclides were analyzed.*
  There were no exceedances of the regulatory limits for the parameters: gross alpha, gross beta, radium 226 and radium 228.
- *1/14/2019 Lab Results for ECCV Injectate water – samples obtained for metals, semi-volatiles, volatiles.*
  There were no exceedances of MCLs or health-based levels for metals. There were exceedances for nitrosamines reporting limit of 2.2 ng/L: N-nitrosodimethylamine (NDMA) at 2.3 ng/L. This data will be evaluated by resampling the injectate at a location near the injection point. There were no exceedances of metals, semi-volatiles or volatiles.
- *1/3/2019 Lab Results for ECCV Injectate water – samples of radionuclides were analyzed.*
  There were no exceedances of the regulatory limits for the parameters: gross alpha, gross beta, radium 226 and radium 228.
- *2/6/2020 Lab Results for Two Proposed Injection Wells 1-R and 2-R - samples of nitrosamines, metals and disinfection byproducts.*
  There were no exceedances of metals or disinfection byproducts. There were no detections of nitrosamines above the reporting limit.
- *1/9/2020 Lab Results for Two Proposed Injection Wells 3-RR and 4-RR - samples of nitrosamines, metals and disinfection byproducts.*
  - There were no exceedances of nitrosamines, metals or disinfection byproducts for results collected from the 3-RR well. There were no detections of nitrosamines above the reporting limit.
  - There were no exceedances of metals and disinfection byproducts for results collected

from the 4-RR well. There was a detection of the nitrosamine N-nitroso-diethylamine (NDEA) above the reporting limit with a concentration of 2.3 ng/L. This data will be evaluated by resampling the injectate at a location near the injection point.

- *11/23/2016 and 2/7/2017 Lab Results for Three Facilities operated by the Aurora Water Treatment Facilities (Griswold, Wemlinger, and Binney) - samples of nitrosamines (Wemlinger facility only), metals, volatiles and semi volatiles.*
  There were no exceedances of metals, semi-volatiles or volatiles. There was no detection of nitrosamines above the reporting limit for data collected at the Wemlinger Facility. The nitrosamine NDMA was detected at the Griswold facility according to data submitted in the permit application for the Meridian Metropolitan Water District.

  Water quality samples for the injectate treated at the Aurora Water Treatment Plant will be collected in accordance with conditions included in APPENDIX B of the application.

Nitrosamines

Nitrosamines are organic compounds, which are probable carcinogens. NDMA can be a potential degradation by-product of chloramination, which is the treatment of drinking water with a chloramine disinfectant. Both chlorine and small amounts of ammonia are added to the water sequentially and react together to form chloramine (also called combined chlorine), resulting in a long-lasting disinfectant. Aurora Water Treatment facilities do use chloramination. Therefore, ongoing monitoring of nitrosamines shall be performed.

Samples for nitrosamine analysis will be collected for the injectate from the tap at the wellhead and from the injection zone through the approved injection well on a quarterly basis. This information will be used to evaluate whether nitrosamines are present in the injectate, may be present in the Arapahoe aquifer, and whether it attenuates over time. A sample of the injectate from the tap at the wellhead will be obtained during the month where flows from surface water sources are at their maximum level. The peak month shall be determined by evaluating three years of monthly recovery rates at the supplying water systems. A trigger of 7 ng/L has been set for NDMA which, if exceeded, may cause EPA to re-evaluate the permit conditions.

Appendix D in the Draft Permit also requires additional sampling to be performed. EPA will evaluate the data results in an effort to safeguard USDWs in the area during injection activities. There was a detection of the nitrosamine, N-nitroso-diethylamine (NDEA) from a sample collected from the 4-RR well groundwater sample. The Arapahoe aquifer will be resampled thru the 4-RR well to further assess the water quality. Nitrosamines were not detected in the results collected from the baseline analysis of the injectate and or groundwater samples collected from Wells 1-R, 2-R or 3-RR.

New Injection Well

New injection well requests shall be submitted in accordance with Part II. Section B.1 and Appendices B, D, H and I. Well testing for injection wells will be performed to ensure that injection activities do not endanger USDWs through the introduction or mobilization of contaminants.

New Water Source

The Permittee may add new water sources beyond those listed in the Injection Fluid Section presented above. Baseline Water Quality Data and Bench Scale Test results must be collected for each new water source. The Director may require PCT be performed based on a review of prior to injection information (e.g., if there are concerns that injection of the new water source could result in mobilization). A new water source is defined as a new water treatment plant, new raw water source, or other public water systems. The Permittee shall follow the procedures identified Part II. Section C.7 and Appendices B, D, and H. The purpose of testing the new water source is to evaluate water quality prior to injection and to determine the potential formation of NDMA. Monitoring requirements for new water sources are included in Appendix D of the Permit.

Appendix G – ASR Baseline Constituent List

1. This Appendix contains a list of general constituents, anions, cations, metals, inorganics, radionuclides, volatile organic compound, semi volatile organic compounds, pesticides and herbicides, disinfectants and disinfection byproducts, nitrosamines, and the Permit Limit for each contaminant.
2. This is a larger list of constituents analyzed to establish a baseline and to evaluate water quality for a new water source and/or the injection zone for a new well. This information is needed to ensure that future injection activities will not adversely impact human health and/or cause the mobilization of contaminants into a USDW.
3. Injection activities will not be authorized if a contaminant exceeds a Permit Limit.
4. Nitrosamines are included on this list of analytes. The reporting limits for nitrosamines were obtained from the Second Unregulated Contaminants Monitoring Rule for EPA Method 521. If constituents not currently listed in Appendix J are detected during baseline evaluations and/or exceed a Permit Limit, the Director may choose to add it to Appendix J.
5. If cyanide is detected in the source water and not alkalized (pH less than 8.5), the Permittee must remove cyanide from the source water prior to any chloramination.

Appendix H – Bench-Scale Water Chemistry Test Procedures for Nitrosamines

The Permit requires a bench scale water chemistry test for the nitrosamines NDMA and N-nitroso-di-n-butylamine (NDBA) following authorization to inject by EPA. There are two main goals for this test:

1) collect formation water and spike it with NDMA and NDBA to evaluate the conditions associated with any attenuation or other reactions which may occur over time; and

2) investigate changes in water chemistry that may occur over time for the injectate as a result of water storage and recovery.

More specifically, the Permittee will collect initial source water and formation water samples for this test prior to commencing injection in order to obtain representative samples for bench-scale testing. Part A of the water chemistry bench test is expected to provide more information about the potential for NDMA and NDBA to attenuate in the Arapahoe Aquifer. Part B of the bench test is performed to evaluate the potential for NDMA and NDBA formation in the aquifer over time. The Permittee shall perform this test for new well and new water source

additions. Bench scale testing of other nitrosamines may be required if they are detected in source water in the future.

Appendix I – ASR Pilot Cycle Testing Procedures

PCT is required to evaluate the potential impacts of injection for ASR on the Arapahoe Aquifer. There are three main goals for these procedures: 1) investigate the well and aquifer hydraulics and behavior during repetitive storage and recovery cycles; 2) evaluate the mechanics involved in well operation, flow and water level control, and instrumentation; and 3) investigate changes in water quality chemistry that may occur from water storage and recovery. This Appendix does not address all details, or all contingencies associated with an ASR PCT plan, as many of these cannot be reliably anticipated in advance of the actual testing. Rather, it is intended to provide an overall structure for conducting the pilot studies.

PCT will be required whenever a new well is added. The Director may require that PCT be performed when a new water source is added if there are concerns that injection activities may result in the mobilization of metals or a potential introduction of contaminants.

Appendix J – Constituent List for Pilot Cycle Testing Analysis and Ongoing Monitoring Requirements

The Permittee will use this shorter parameter list to evaluate water quality for the injectate and/or recovered water required in the PCT procedures in Appendix I and when analytical data is required for monitoring requirements provided in Appendix D. This list may be modified based on the initial samples collected and results of PCT.

PART VII. Plugging and Abandonment Requirements (40 CFR § 146.10)

Plugging and Abandonment Plan

All wells shall be plugged with cement in a manner which isolates the injection zone and will not allow the movement of fluids either into or between USDWs in accordance with 40 CFR § 146.10. Additional federal, state or local law or regulations may also apply.

Wells authorized under this Permit, must be either transferred out of the program or plugged and abandoned. The Permittee will notify EPA with any plans to permanently abandon the well. The Director will review and approve any plugging and abandonment plans prior to Permittee implementing any such plans.

Within thirty (30) days after plugging the owner or operator must submit Plugging Record (EPA Form 7520-19) to the Director. The Plugging Record must be certified as accurate and complete by the person responsible for the plugging operation. The plugging and abandonment plan is described in Appendix E of the Permit.

PART VIII. Considerations Under Other Federal Law (40 CFR § 144.4)

EPA will ensure that issuance of this Permit will be in compliance with the laws, regulations, and orders described at 40 CFR § 144.4, including the National Historic Preservation Act, the Endangered Species Act, and Executive Order 12989 (Environmental Justice), before a final permit decision is made.

National Historic Preservation Act (NHPA)
Section 106 of the National Historic Preservation Act, 54 U.S.C. § 306108, requires federal agencies to consider the effects on historic properties of actions they authorize, fund or carry out. EPA has determined that a decision to issue a Class V injection well permit for authorization of injection into these well constitutes an undertaking subject to the National Historic Preservation Act and its implementing regulations at 36 CFR part 800.

No planned ASR activities will affect historical properties. The wells are built, have operated for recovery and may require workover activities that will not impact surrounding areas. All roads are established, and injection fluid is transported to the site via completed subsurface infrastructure. Therefore, EPA has concluded that there will be no effect on historic properties.

Endangered Species Act (ESA)
Section 7(a)(2) of the Endangered Species Act (ESA), 16 U.S.C. § 1536 (a)(2), requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of federally-listed endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. EPA has determined that a decision to issue a Class V permit for authorization of injection into Wells 1-R, 2-R, 3-RR, and 4-RR would constitute an action that is subject to the Endangered Species Act and its implementing regulations (50 CFR part 402).

Federally-listed species which may occur in the project area of the Inverness Water and Sanitation District Facility Service Area Boundary include the following:

NAME	SPECIES	LISTING TYPE
Least Tern	Bird	Endangered
Mexican Spotted Owl	Bird	Threatened
Piping Plover	Bird	Threatened
Whooping Crane	Bird	Endangered
Greenback Cutthroat Trout	Fish	Threatened
Pallid Sturgeon	Fish	Endangered
Ute Ladies' tresses	Flowering Plant	Threatened
Western Prairie Fringed Orchid	Flowering Plant	Threatened
Bald Eagle	Bird	Migratory Birds
Buff breasted sandpiper	Bird	Migratory Birds
Burrowing Owl	Bird	Migratory Birds
Cassins Sparrow	Bird	Migratory Birds
Chestnut collared Longspur	Bird	Migratory Birds
Golden Eagle	Bird	Migratory Birds
Lark Bunting	Bird	Migratory Birds

Lesser Yellowlegs	Bird	Migratory Birds
Lewis's Woodpecker	Bird	Migratory Birds
Long billed curlew	Bird	Migratory Birds
McCown's Longspur	Bird	Migratory Birds
Mountain Plover	Bird	Migratory Birds
Semipalmated Sandpiper	Bird	Migratory Birds
Whimbrel	Bird	Migratory Birds
Willet	Bird	Migratory Birds
Willow Flycatcher	Bird	Migratory Birds

In a Memo-to-File dated December 3, 2020, EPA conducted an Endangered Species Act Evaluation based on publicly available information. Items reviewed included information available from the United State Fish and Wildlife Service Information and Planning and Consultation System (IPac).

The proposed ASR well and future wells, pipelines and water treatment plants are existing. Other than minimal work over requirements on the equipment inside the ASR wells, no other alterations will be made to the various sites associated with this ASR project. These work over activities are similar to those carried out during typical well operations and therefore do not pose a threat or impact to these listed species or their habitat. Therefore, no impacts are anticipated from the conversions to, and operation of, ASR wells.

Executive Order 12898

On February 11, 1994, the President issued Executive Order 12898, entitled "Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations." EPA has concluded that there may be potential EJ communities close to the Authorized Permit Area. The primary potential human health or environmental effects to these communities associated with injection well operations would be to local aquifers that are currently being used or may be used in the future as USDWs. EPA's UIC program authority under the Safe Drinking Water Act is designed to protect USDWs through the regulation of underground injection wells. EPA has concluded that the specific conditions of UIC Permit CO52423-00000 will prevent contamination to USDWs, including USDWs which either are or will be used in the future by communities of EJ concern. These USDWs could include the aquifers within the proposed injection zones in which case injection would only commence if the aquifers are exempted and thereby no longer protected under the SDWA. The UIC program will be conducting enhanced public outreach to EJ communities by publishing a public notice announcement in local newspapers and holding a public hearing, if requested, or if public interest in the proposed permit is high.