

2011 Idaho Reuse Conference



Update: Nampa Infiltration Option

Michael Fuss, City of Nampa, Public Works Director
Steve Burgos, Brown and Caldwell



Agenda

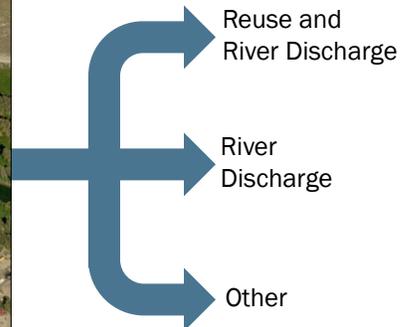
- Review Background
- Review of Infiltration Evaluations:
 - Vadose Zone Map
 - Basalt Rock Map
 - Soil Permeability Map
 - Land Slope Map
 - Land Use Map
- Public Outreach
- Regulatory Update
- Next Steps

Thanks to the Various Contributors

- Bennett Engineering
- Brown and Caldwell
- CH2M Hill
- J-U-B Engineering
- Murray, Smith and Associates
- MWH
- RBCl
- Voltaic Solutions

Facility Plan Update and Reuse Fatal Flaw Analysis

- Facility Plan Update completed in January 2009
- The recommendations in the Facility Plan Update resulted in a fork in the road:



City decided to perform a Fatal Flaw Analysis on Reuse

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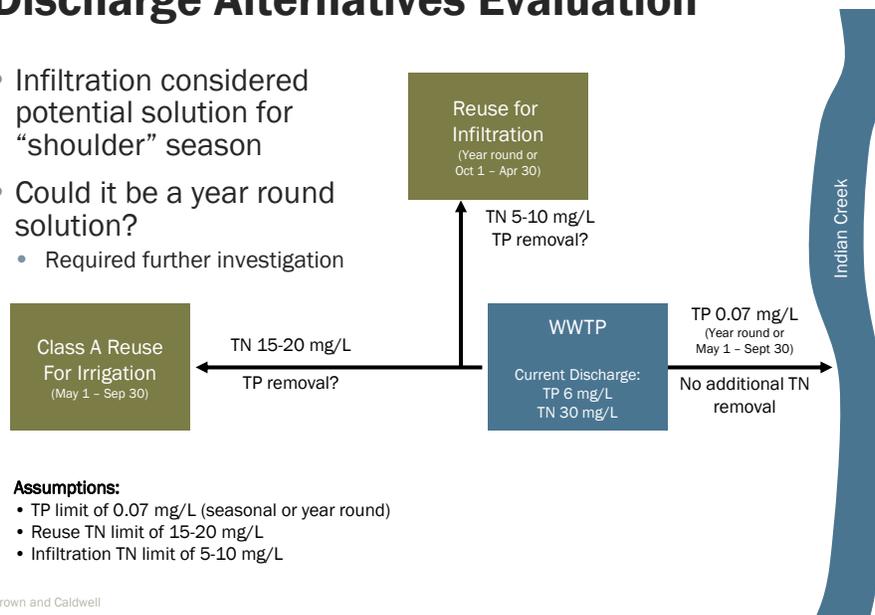
Reuse Considerations

- City-wide existing pressurized irrigation system considered favorable for reuse
- Pilot testing of reuse at golf courses and cemeteries
 - Significant financial commitment
- On paper, reuse fits Nampa . . . but
 - Regulatory concerns
 - Public Works Director life cycle
- How to deal with “shoulder” season?

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Discharge Alternatives Evaluation

- Infiltration considered potential solution for “shoulder” season
- Could it be a year round solution?
 - Required further investigation

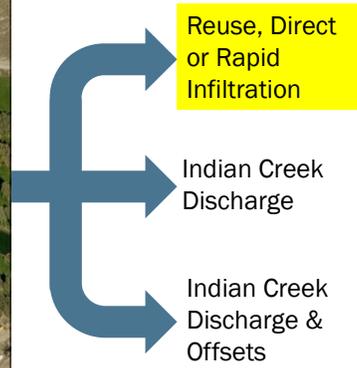


Assumptions:

- TP limit of 0.07 mg/L (seasonal or year round)
- Reuse TN limit of 15-20 mg/L
- Infiltration TN limit of 5-10 mg/L

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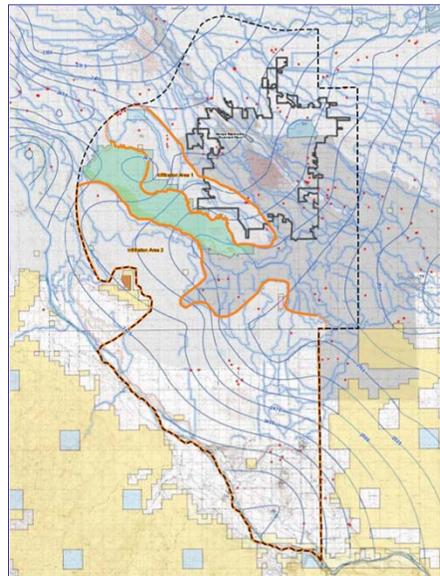
The Resulting Forks in the Road



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Preliminary Hydrogeologic Evaluation

- Performed analysis of key hydrogeologic considerations
 - Groundwater quality
 - Surface and near-surface lithology
 - Vadose zone thickness
 - Groundwater use
 - Groundwater flow direction/gradient
 - Proximity of surface water bodies
 - Current and future land use
 - Land ownership
 - Distance from WWTP



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Recent Infiltration Studies

- Objective: Narrow potential areas conducive to infiltration based on the following criteria
 - Vadose zone thickness
 - Background geology
 - Soil permeability
 - Land use
 - Land slope
 - Additional Info
- Work completed utilizing GIS

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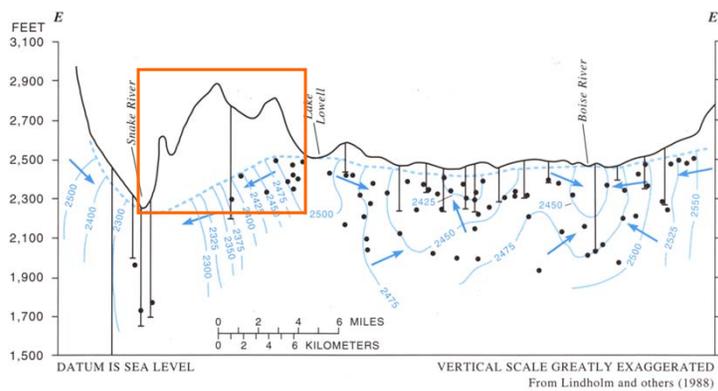
Vadose Zone Thickness Evaluation

- Area needs to effectively manage mounding effect
- Define areas of unsaturated subsurface material
- Areas with vadose zone exceeding 50 feet in thickness is considered suitable
- Areas with vadose zone less than 50 feet were removed from further investigation

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Generalized Water Table Cross Section Beneath Dry Lake Area (from Lindholm, 1988)



EXPLANATION

Note: Line of section shown in figure 13

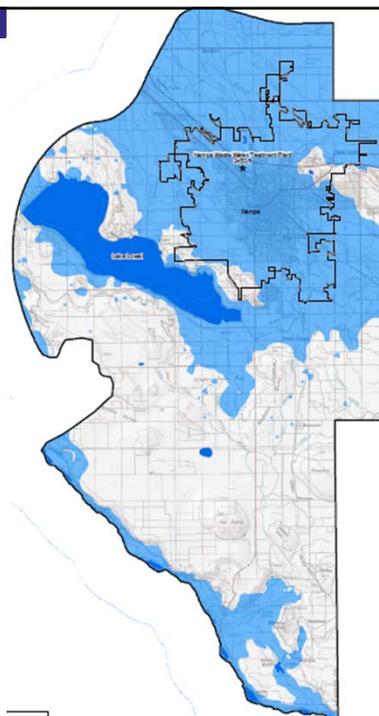
- Water table
- Line of equal hydraulic potential (head)—Intervals 25 and 100 feet
- General direction of ground-water movement
- Well

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Vadose Zone Thickness Map

- Areas adjacent to Lake Lowell and upgradient of lake are unsuitable
- Thins and becomes too shallow for infiltration within City limits
- North, south and east of lake appear suitable for infiltration
- Rapidly thickens south of Lake Lowell
 - Exceeds several hundred in feet near the Dry Lake area
- Thins again near Snake River to south



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Underlying Geology Evaluation

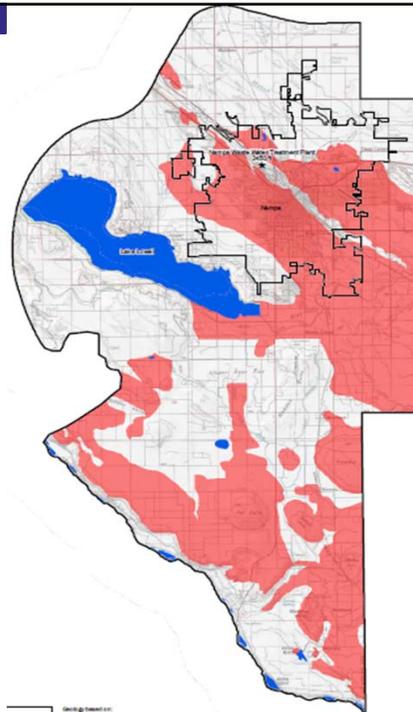
- Define areas where basalt either crops out at surface or at depth (based on available logs)
- Registered well boring logs were researched to clarify lateral extent of basalt
- Areas exhibiting basalt at surface or within subsurface removed from further investigation
 - At least to depths identified in registered wells
 - Info field checked to compare surface outcrops with GIS mapped areas

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Basalt Rock Map

- Non-basalt areas typically occur north and south of Lake Lowell
- Basalt underlies most of City limits
- However, “pockets” of basalt occur within areas mapped as non-basalt
- Field review identified basalt abutting Snake River



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Soil Permeability Evaluation

- Soil permeability dictates ability to infiltrate and size of infiltration area
- Canyon County Natural Resource Conservation Survey (NRCS) soil survey used
- Soil types, depths, and permeabilities reviewed
- Soil permeabilities ≥ 3 gpd/sq ft have been considered suitable for infiltration

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NRCS Classified Soils and Corresponding Permeabilities

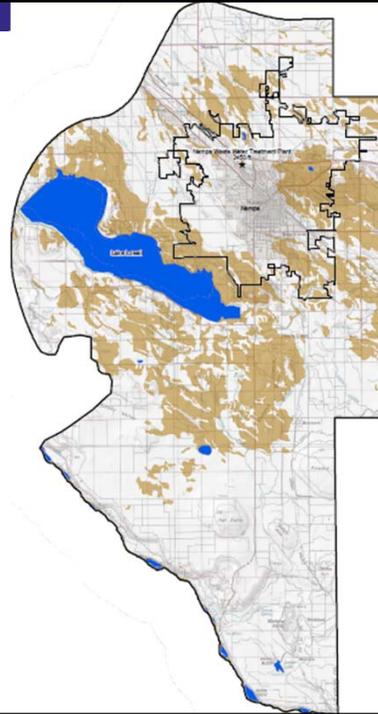
Permeability Classification	Infiltration Rate (gpd/sq ft)	Infiltration Area (acres)
Rapid	89.8 - 299.2	2 - 7
Moderately Rapid	7.5 - 89.8	7 - 20
Moderate	9.0 - 29.9	20 - 66
Moderately Slow	3.0 - 9.0	66 - 200
Slow	0.9 - 3.0	200 - 665
Very Slow	0.02 - 0.9	665 - 26,595
Impermeable	0 - 0.02	> 26,595

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Surface Permeability Map

- Some inaccuracies are apparent in NRCS soil map areas
 - Soil boundaries closely follow parcel tract boundaries or irrigation pivot patterns
- Defining actual boundaries requires additional field testing



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Land Use Evaluation

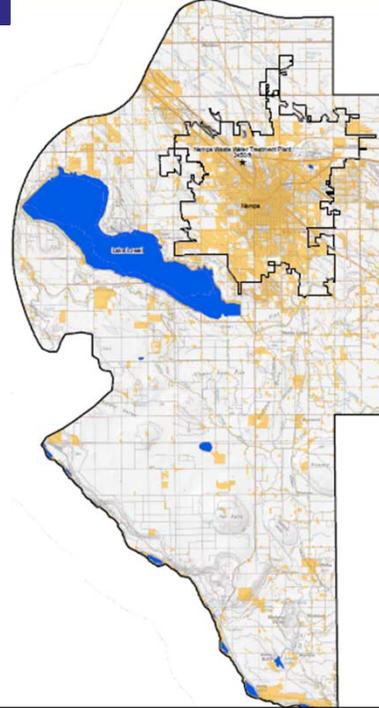
- Infiltration Areas require open land
 - Defined as areas containing cropland, pasture land, and zoned agriculture
- Areas containing residential development or proposed acreage development considered non-conductive
- Also identify areas of potential environmental concern
 - Confined animal feeding operations
 - Drums and tanks of unknown content
 - Other areas of use non-conductive to an infiltration area

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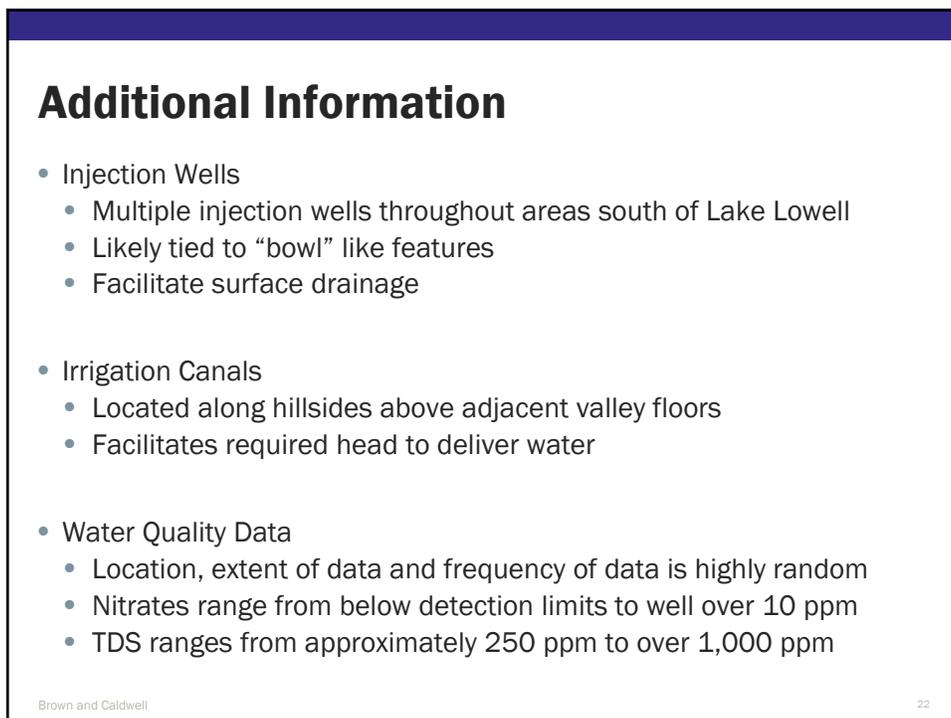
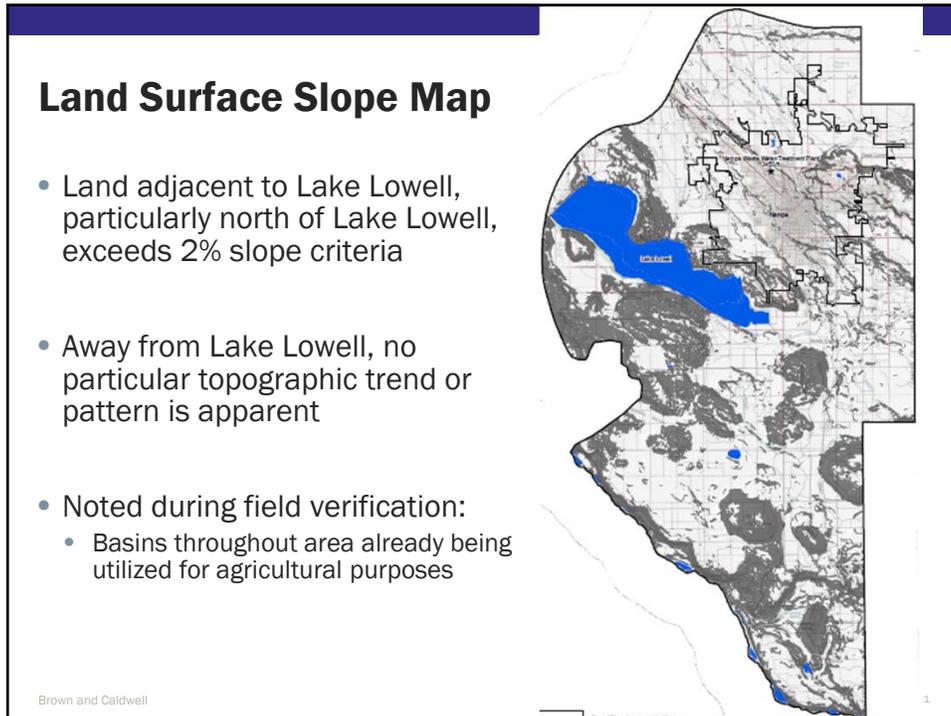
Usable Land Map

- Created by reviewing most recent aerial photography and mapping areas of open land
- Developed acreage areas occur south and southeast of Lake Lowell
- Open farmland throughout



Land Slope Evaluation

- Infiltration basins requires a relatively broad flat surface
- Slopes less than 2% were considered suitable
- Slopes exceeding 2% have been considered unsuitable



Example: Chemical Analysis of Groundwater from southern Canyon County

TABLE 2.—Chemical analyses of ground water from southern Canyon County (Stevens, 1962)
 (Chemical constituents in parts per million. Analyses by the U.S. Geological Survey and Bureau of Reclamation)

Well	Date of collection	Temperature (F)	Silica (SiO ₂)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonates (HCO ₃)	Carbonate (CO ₃)	Sulfate (SO ₄)	Chloride (Cl)	Fluoride (F)	Nitrates (NO ₃)	Boron (B)	Dissolved solids	Hardness as CaCO ₃		Specific conductance (micro-mhos at 25°C)	pH
																	Carbonate	Noncarbonate		
2N-3W-4b1	Aug. 27, 1956	63	.....	.....	72	25	6	261	0	0	126	61	.....	22	0.02	541	287	73	845	7.3
7a1	.....	64	.....	.....	72	19	6	215	0	0	126	61	.....	22	0.02	541	287	73	845	7.4
8a1	Aug. 28, 1956	64	.....	.....	37	13	36	6	147	0	61	24	.....	6	.....	32	438	146	584	7.4
9c1	Aug. 27, 1956	61	.....	.....	35	10	33	3	125	0	50	20	.....	3	.....	14	388	120	508	7.5
22b1	May 6, 1954	86	59	0	40	11	55	6.5	242	.....	82	22	0.6	0	.....	28	354	145	500	8.0
23c1	Aug. 28, 1956	73	.....	.....	34	10	61	6	194	0	44	22	.....	1	.....	33	205	101	476	8.0
34d1	Aug. 27, 1956	83	.....	.....	29	16	126	4	184	0	268	22	.....	1	.....	26	550	135	685	7.5
35a1	.....	81	.....	.....	6	1	77	4	198	5	17	8	.....	Tr.	.....	27	248	19	385	8.4
1N-3W-12a1	.....	98	.....	.....	13	4	100	14	398	15	6	8	.....	1	.....	38	555	49	604	8.6
3c1	Aug. 28, 1956	69	.....	.....	22	8	24	2	112	0	25	25	.....	4	.....	02	184	88	368	8.2
3c1	May 10, 1954	69	.....	.....	18	8	27	2	118	0	21	10	.....	4	.....	08	188	71	258	8.2
4d1	Aug. 27, 1956	72	40	0	15	4	4	.....	.....	1	12	10	.....	3	.....	54	156	65	211	7.9
5c1	.....	72	.....	.....	25	4	21	2	129	1	23	23	.....	1	.....	58	189	79	266	8.1
6c1	.....	72	.....	.....	13	2	49	4	175	6	10	8	.....	1	.....	49	216	88	304	8.2
8b1	.....	73	.....	.....	21	3	34	2	121	1	22	10	.....	1	.....	40	181	65	246	8.2
10b1	.....	75	.....	.....	19	3	20	2	112	0	15	7	.....	3	.....	09	159	81	240	7.7
16c1	.....	75	.....	.....	32	34	69	7	194	0	225	80	.....	26	.....	10	684	370	1,054	7.7
16c1	May 6, 1954	68	35	0	83	29	72	6.3	136	.....	217	89	.....	8	.....	84	619	327	946	8.1
17d1	Aug. 28, 1956	72	.....	.....	39	15	69	6	181	0	68	59	.....	11	.....	23	428	159	587	7.9
17d1	.....	74	.....	.....	50	29	60	9	193	0	138	60	.....	12	.....	19	504	244	748	7.9
23e1	.....	64	.....	.....	127	71	88	12	121	0	330	139	.....	196	.....	08	1,080	610	1,690	7.7
34c1	.....	64	.....	.....	85	42	194	20	344	0	627	22	.....	19	.....	54	1,720	634	2,354	7.6
34c1	.....	64	.....	.....	85	42	81	4	295	0	207	8	.....	4	.....	21	291	55	455	8.4
18-3W-34d2	.....	77	.....	.....	12	6	78	4	295	0	185	33	.....	26	.....	12	600	293	893	7.8
34d2	.....	63	42	.....	63	37	57	7	298	.....	224	85	.....	20	.....	12	600	293	893	7.8
14c1	.....	64	.....	.....	51	31	104	7	284	0	112	16	.....	25	.....	32	573	335	908	7.6
14c1	Aug. 28, 1956	64	.....	.....	47	14	17	2	250	0	17	4	.....	6	.....	10	298	175	473	7.7
15b1	Aug. 28, 1956	64	.....	.....	43	23	151	9	449	0	109	22	.....	13	.....	46	608	211	819	7.4
17b1	Aug. 27, 1956	70	.....	.....	16	5	159	12	373	0	1	12	.....	1	.....	63	397	61	458	7.8
17a1	Oct. 6, 1954	78	.....	.....	13	2.7	111	12	312	.....	8	7	.....	.....	.....	22	397	44	441	7.8
1N-3W-34c1	Sept. 5, 1956	64	67	02	76	75	180	18	373	519	35	30	37	1,060	601	1,660	7.6
1N-2W-16cc	May 18, 1956	120	75	0	2.0	0	123	1.4	100	35	81	23	379	2	0	542	9.2

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32 Dry Lake area groundwater samples: found high sodium, magnesium
 TDS range from 156 to 1,220 ppm, highest TDS around Melba

Composite Map

- City developed composite map identifying 9 specific areas that meet criteria
 - 3 areas considered priority areas
 - Next steps include field investigation
- Enter Public Outreach . . .

TO BE CONTINUED

Public Outreach

- Before field investigations, initiate public outreach
 - Developing clear communications material on alternatives
 - Brief City Council
 - Discuss alternatives with Canyon County
 - Discuss potential areas with nearby property owners



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Regulatory Update



- IDEQ Meetings:
 - Confirmed City on right path of investigation
 - Stressed importance of modeling long term impacts
 - Some flexibility on secondary constituents
 - Do not see total phosphorus as significant impediment



- IDWR Meeting:
 - Confirmed water rights outside of City Impact Zone
 - Confirmed City retain rights for future residential irrigation
 - If water sold for irrigation, then answer less clear

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Next Steps

- Public outreach
- Field investigation of sites
- Continued regulatory coordination
- Integration of Infiltration Option information into Wastewater Program decision making process

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