Appendix Z

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MILES

Fibers, Organics and Rubber Division

Product Information

Organics

Lewatit TP 207

Product Information 310

Lewatit TP 207 is a weakly acidic, macroporous cation exchange resin with chelating iminodiacetate groups for the selective extraction of heavy metal cations from weakly acidic to weakly basic solutions. Divalent cations are removed from neutralized waters in the following order:

copper > vanadium (VO) > uranium (UO_2) > lead > nickel > zinc > cadmium > iron (divalent) > beryllium > manganese > calcium > magnesium > strontium > barium > sodium.

Lewatit TP 207 is of standard bead size distribution. Its good chemical and mechanical stability make it specially suitable for use in the following applications:

- selective removal of heavy metals traces from effluents after their normal precipitation by hydroxides, even in the presence of high calcium contents
- recovery of precious metals from electroplating rinse waters
- concentration and extraction of heavy metals from hydrometallurgical solutions
- recovery of precious metals from pickling baths.

The selective extraction is achieved even in the presence of the following complexing agents:

- nitrogen compounds, e.g. ammonia, aliphatic, and aromatic amines
- multivalent carboxylic acids, e.g. citric acid, gluconic acid, glucuronic acid, oxalic acid, tartaric acid
- phosphates, e.g. tetrasodium diphosphate, sodium polyphosphate.

Lewatit TP 207 does not remove heavy metals from solutions containing EDTA or NTA respectively. Only cadmium is removed from solutions containing cyanides.

For the extraction of those heavy metals which follow the uranyl oxide ion in the selectivity sequence as shown above, **Lewatit TP 207** has to be conditioned with caustic soda solution after every regeneration cycle/**before** every exhaustion cycle. After the conditioning it is partially in a salt-form, e.g. mono-sodium-form.

Before commissioning a **Lewatit TP 207** unit, see our Technical Information OC/I 20343e for laboratory tests.

Ion Exchange Resins

AMBERLITE® IRC-718

AMBERLITE IRC-718 chelating cation exchange resin has a high affinity for heavy metal cations over alkali or alkaline earth metals, such as sodium, potassium, calcium and magnesium. Selectivity is achieved by an iminodiacetic acid functionality chemically bonded to a macroreticular resin matrix. The functional group coordinates heavy metal ions with several active sites, binding the ions very tightly.

The selective nature of AMBERLITE IRC-718 resin may dramatically decrease the cost of waste treatment. When small amounts of toxic metals are in solution with larger amounts of alkali or alkaline earth cations, AMBERLITE IRC-718 resin will prefer the toxic metals over the other cations. This allows removal of the undesirable metal contaminant without the need to completely deionize the waste stream. Regenerant costs and, in some cases, capital costs can be reduced, since a smaller system can be used.

The macroreticular structure of AMBERLITE IRC-718 resin provides a number of advantages over traditional gel resins. It is highly resistant to osmotic shock, providing greater resin life than gel resins used under the same conditions. Due to the short ion diffusion path, the high porosity of AMBERLITE IRC-718 resin improves the kinetics of ion exchange.

AMBERLITE IRC-718 resin is ideal for use in non-aqueous media, such as chemical process streams, because of its macroreticular structure. The resin is based on a very stable styrene-divinyl benzene matrix. Typical physical properties are given in Table 1.

Selectivity

The apparent selectivity of any ion exchange resin for a given metal depends upon concentration, the presence of other species, and pH. This makes absolute selectivities very difficult to determine, especially for waste treatment applications. Because of this, laboratory testing is essential when a resin is required to remove one or more types of metal ions selectively. Selectivities have been measured under various conditions to give starting points for choosing a resin for selective metal removal.

TABLE 1

Typical Physical Properties
(These do not constitute specifications)

Appearance	Hydrated, opaque beads
Shipping Weight	42 lbs./ft.^{3} (Na form)
Screen Grading (wet)	16 to 50 mesh (U.S. Standard Screen)
Moisture Content	62 to 68% (Na form)
Swelling	40% H → Na
Cation Exchange Capacity	1.1 meq/ml wet resin

1) pH = 2

Metal Ion	K^M_{Ca}
Fe^{+++}	325,000
Cu^{++}	130,000
Hg^{++}	> 43,000
Au^{+++}	> 8,100
Ag^{+}	4,600
Ni^{++}	3,200
Cd^{++}	620
Fe^{++}	190
Mn^{++}	120
Zn^{++}	120
Al^{+++}	50
Mg^{++}	20
Ca^{++}	1.0

2) pH = 4

Metal Ion	K^M_{Ca}
Hg^{++}	2,800
Cu^{++}	2,300
Pb^{++}	1,200
Ni^{++}	57
Zn^{++}	17
Cd^{++}	15
Co^{++}	6.7
Fe^{++}	4.0
Mn^{++}	1.2
Ca^{++}	1.0

3) pH = 9, very high ammonium background ($200g/L(NH_4)_2SO_4$).

Metal ion	K^M_{Ca}
Ni^{++}	30
Cd^{++}	14
Cu^{++}	10
Zn^{++}	3
Ca^{++}	1.0

These data provide a guideline of relative selectivities; no table can provide selectivities under all conditions. Using these starting points, the affinity of the resin for a given metal can be increased or decreased by adjusting pH.

Operating Conditions

AMBERLITE IRC-718 resin is widely used in waste treatment, chemical processing, and hydrometallurgical applications where there is high variability in feed streams and competition from other species present in solution. Changes in pH, concentration, and background composition (especially complexing ions such as EDTA) may change sorption characteristics. The suggested conditions listed in Table 2 should, therefore, be considered a starting point; laboratory experiments should be done to determine the effectiveness of any ion exchange process for a desired application.

Operating Capacity

The total exchange capacity of AMBERLITE IRC-718 resin in the sodium form is 1.1 meq/ml wet resin. In normal use, however, the resin bed is usually not completely exhausted during operation, and economic considerations may dictate less than 100 percent regeneration. Actual operating capacity will be less than the total exchange capacity and should be determined by specific applications testing.

Backwashing

Many feed streams contain particulate matter which can clog an ion exchange bed. Backwashing is necessary at regular intervals to remove this material. When there are large amounts of suspended matter, backwashing may be necessary at each regeneration cycle. The backwash should be at a sufficient rate to give at least 50 percent bed expansion. The proper flow rate can be found in Figures 3 and 4.

Exhaustion Flow Rate

Chelating ion exchange resins may have slightly poorer kinetic characteristics than conventional (strong electrolyte) ion exchangers. Flow rates,

TABLE 2

Suggested Operating Conditions for AMBERLITE IRC-718

pH (minimum pH depends on application)	1.5 to 14.0
Maximum Temperature	190°F. (90°C) (Na) 160°F. (70°C) (H)
Service Flow Rate	1.0 to 4.0 gpm/ft.^{3} (8.0 to 32.0 BV/hr.)
Regeneration	5 to 15% HCl or H_2SO_4 0.25 to 0.50 gpm/ft.^{3} (2.0 to 4.0 BV/hr.) 6 to 12 lbs. acid/ft.^{3}
Neutralization (if necessary)	1 to 3% sodium hydroxide or ammonium hydroxide 0.25 to 0.50 gpm/ft.^{3} (2.0 to 4.0 BV/hr.) 2 to 4 lbs./ft.^{3}
Pressure Drop	See Figures 1 and 2
Hydraulic Expansion During Backwash	See Figures 3 and 4

200 100 0 200 400

SCALE 1" = 200'
CONTOUR INTERVALS =25'

LEGEND

- SEWER HOOK-UP
- SEPTIC TO TYPE 4 PERMIT
- SEPTIC TO SEWER
- TYPE 4 GENERAL PERMIT
- PERMIT RENEWAL
- SEPTIC
- FIRE DAMAGE
- EXISTING ROADWAY
- SEWER PLANNING AREA

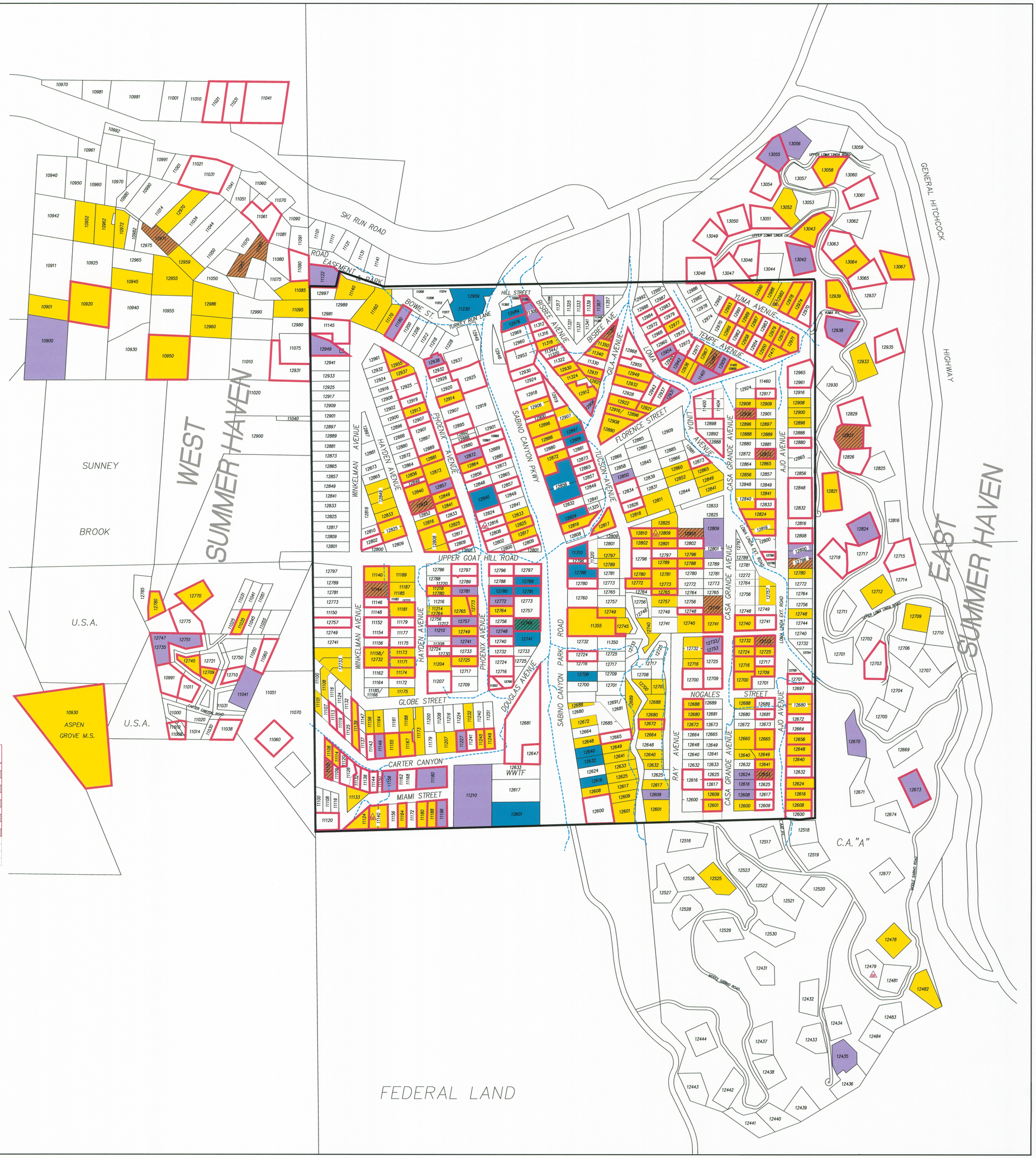
Total Number		Number	
52	4.02 Septic tank with disposal by Trench, Bed or Chamber Technology	48	4.02
		1	4.02, 4.04
		1	4.02, 4.04, 4.12
		1	4.02, 4.04, 4.22
		1	4.02, 4.15, 4.20
8	4.14 Sewage Vault System	6	4.14
		1	4.14, 4.04, 4.15
		1	4.14, 4.20, 4.15
2	4.15 Aerobic Treatment System	0	4.15
		1	4.15, 4.22, 4.04, 4.12
		1	4.15, 4.22, 4.04, 4.20
2	4.20 Disinfection Device on System	2	4.20
2	4.22 Subsurface Drip Irrigation Disposal System	2	4.22

4.02	Septic tank with disposal by Trench, Bed or Chamber Technology
4.04	Pressure Distribution Disposal System
4.12	Textile Filter Treatment System
4.14	Sewage Vault System
4.15	Aerobic Treatment System
4.20	Disinfection Device on System
4.22	Subsurface Drip Irrigation Disposal System

Data obtained from:
Type 4 permit data e-mailed from Mike Redmond of PDEQ and
4.02 General Permit data from Robert Flynt of PC IT

	West Summerhaven	East Summerhaven	Summerhaven Sewage Planning Area	Total
Total # Lots in Area (1,2)	107	92	679	878 *
Total # Lots with Fire Damage	24	29	287	340
# Convention Septic	20	13	212	245
# Convention Septic with Fire Damage	8	6	108	122
# of Type 4 General Permit	3	8	42	53
# of Type 4 from Septic	2	1	10	13
Total # Type 4	5	9	52	66
# of Type 4 with Fire Damage	1	6	33	40
# of Sewer	0	0	19	19
# of Sewer from Septic	0	0	1	1

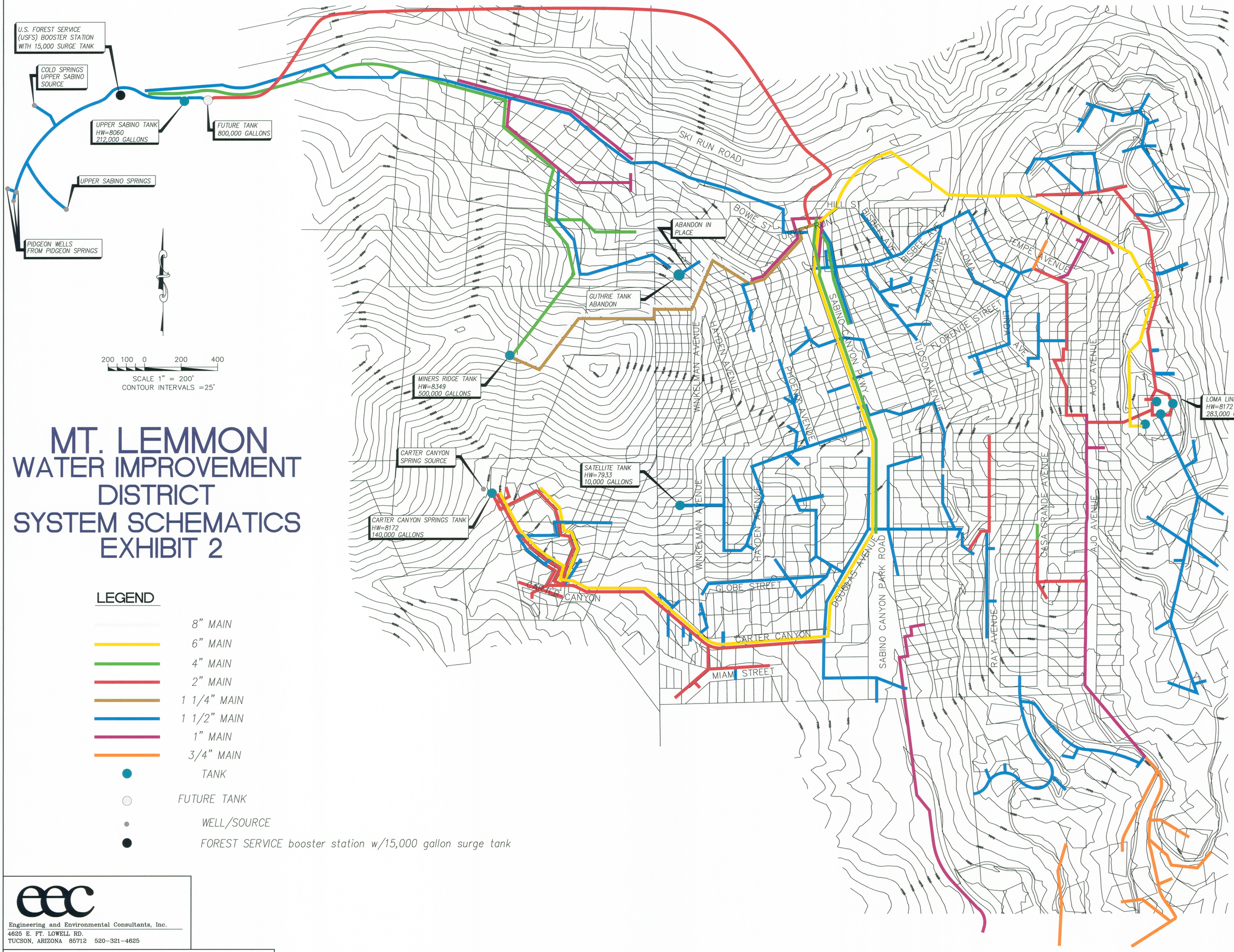
1. Numerous Lots with one address where counted as individual lots.
2. Numerous addresses per lot where counted as one lot.
* 600 pre-fire structures reported, 324 destroyed, and 5 damaged
"Fire on the Mountain The Aspen Fire." Pima County Public Works. March 2004



MT. LEMMON
SEPTIC SYSTEMS
EXHIBIT 1

eec
Engineering and Environmental Consultants, Inc.
4625 E. FT. LOWELL RD.
TUCSON, ARIZONA 85712 520-321-4625

PIMA COUNTY
WASTEWATER MANAGEMENT
DEPARTMENT
201 North Stone Avenue * Tucson, Arizona 85701-1207 * Phone: (520) 740-6500



MT. LEMMON WATER IMPROVEMENT DISTRICT SYSTEM SCHEMATICS EXHIBIT 2

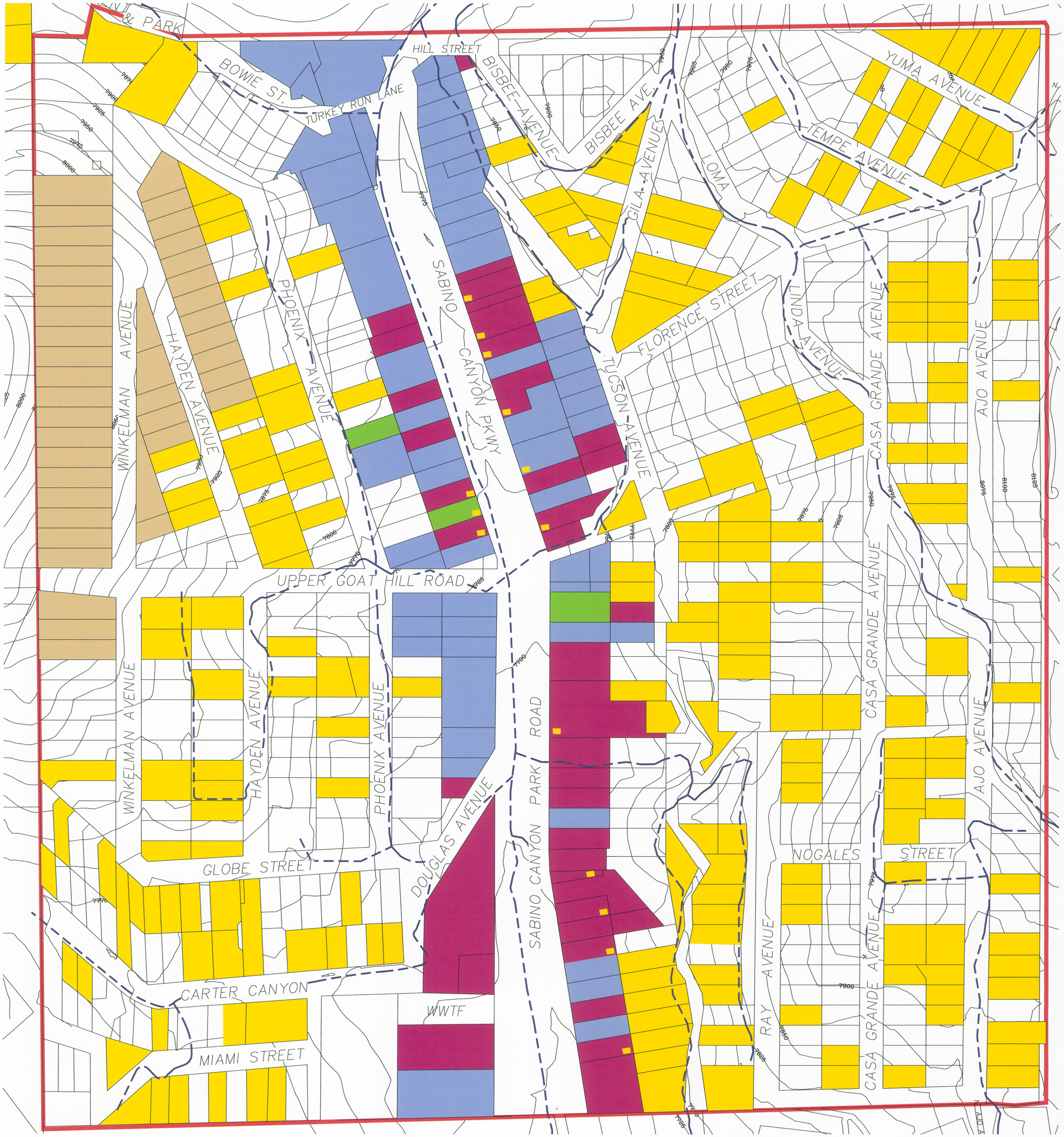
LEGEND

- 8" MAIN
- 6" MAIN
- 4" MAIN
- 2" MAIN
- 1 1/4" MAIN
- 1 1/2" MAIN
- 1" MAIN
- 3/4" MAIN
- TANK
- FUTURE TANK
- WELL/SOURCE
- FOREST SERVICE booster station w/15,000 gallon surge tank

eec
Engineering and Environmental Consultants, Inc.
4625 E. FT. LOWELL RD.
TUCSON, ARIZONA 85712 520-321-4625

PIMA COUNTY WASTEWATER MANAGEMENT DEPARTMENT
201 North Stone Avenue * Tucson, Arizona 85701-1207 * Phone: (520) 740-6500

MT. LEMMON SERVICE AREA WATERSHED STUDY & WATER RECLAMATION MANAGEMENT PLAN (PROJECT NO. 206145)
MARCH 2007



100 50 0 100 200

SCALE 1" = 100'
CONTOUR INTERVALS =25'

MT. LEMMON
PROPOSED SEWER BASIN EXHIBIT 3

LEGEND

	ORIGINAL SEWER PERMIT
	CONNECTION PERMITS
	SEPTIC
	ADDITIONAL LOTS THAT FRONT SEWER SERVICE
	SLOPES GREATER THAN _%
	PROPOSED SEWER BASIN
	EXISTING ROADWAY

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