TRC

May 6, 1998
RG206-98

Mr. David Lasky
610 East Walnut Street
Annville, PA 17003

Ref: Water Quality Data Collected in Quittapahilla Creek

Dear Mr. Lasky:

On behalf of AES Ironwood, Inc., I am enclosing copies of field screening and water quality sampling results for Quittapahilla Creek which you requested from Ms. Diana Rodriguez of AES Ironwood. I have also included corresponding sampling locations relative to the sampling results. These results are included in AES Ironwood's "Application for a Water Withdrawal" submitted to the Delaware and Susquehanna River Basin Commissions. The following excerpts are taken from the application:

4.2.9 Quittapahilla Creek Baseline Sampling

AES Ironwood conducted two baseline water quality sampling programs in the Quittapahilla Creek Basin. The first was directed at characterizing water quality near the Lebanon wastewater treatment plant outfall. Sampling was performed to evaluate the feasibility of reusing treated effluent to satisfy all or a portion of the water supply requirements for the proposed facility. The second was a screening level sampling program to assess water quality variations in Quittapahilla Creek from the Lebanon wastewater treatment plant outfall to its mouth. Results from each of these programs are summarized below.

4.2.9.1 Quittapahilla Sampling - Wastewater Reuse Evaluation

To assess the feasibility of reusing treated effluent from the Lebanon wastewater treatment facility, water quality samples were collected from three stream sampling sites: Quittapahilla Creek upstream of the Lebanon wastewater treatment plant discharge; Snitz Creek upstream of its confluence with Quittapahilla Creek; and Quittapahilla Creek downstream of both Snitz Creek and the Lebanon wastewater treatment plant discharge (See Figure 4.2-5). In addition, an effluent sample was obtained from the treatment plant outfall. Samples were analyzed for major anions, cations, heavy metals and general wet chemistry parameters. The grab samples were collected on October 24, 1997 and laboratory analytical work was performed by BetzDearborn.

The analytical results are summarized in Table 4.2-8. Sampling results for Quittapahilla and Snitz Creeks indicate that the water is hard, with total dissolved solids concentrations (TDS) ranging from 334 mg/l to 478 mg/l. The Lebanon wastewater treatment plant effluent TDS concentration of 566

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mg/l was above measured in-stream concentrations, but is consistent with results previously reported from the facility. Since TDS is typically added through domestic use of water and is not removed to any large extent through the treatment train, the elevated total dissolved solids concentration of the treated effluent is not unexpected.

Nitrate and phosphorous concentrations in the discharge from the treatment plant are also elevated when compared with background water quality results. Although the treatment plant provides an exceptionally high degree of treatment for most constituents in wastewater, conversion of ammonia nitrogen to nitrate (i.e., through nitrification) elevates nitrate concentrations in the discharge. As such, an increase in downstream nitrate levels is observed.

The downstream sample from Quittapahilla Creek had a marked increase in the phosphate concentration at the downstream sampling site. Phosphates are of concern in receiving waters because phosphorous is generally a limiting nutrient in fresh waters. Therefore, increasing the phosphorous concentration can exacerbate the potential for algal blooms to occur.

The treated wastewater discharge also has a measurable impact on downstream temperature. Baseline temperature readings from Snitz and Quittapahilla Creeks were 8.6 and 9.9 degrees centigrade (°C), respectively, whereas the downstream temperature measurement in Quittapahilla Creek was 13.5 °C. The corresponding temperature of the discharge was 17.5 °C.

4.2.9.2 Quittapahilla Creek – Water Quality Screening Program

A baseline water quality survey was conducted by TRC Environmental along Quittapahilla Creek and its tributaries on December 17, 1997. In-stream measurements for temperature, dissolved oxygen, specific conductivity, pH, and turbidity were obtained at 13 stations along the mainstream of Quittapahilla Creek (See Figure 4.2-6). The Quittapahilla Creek sampling sites extended from upstream of the Lebanon wastewater treatment plant outfall to its mouth. Most sampling sites were located at bridge crossings. In addition, measurements were obtained both upstream and downstream of Quittapahilla Creek's confluence with Swatara Creek, as well as along the following Quittapahilla Creek tributaries: Snitz Creek, Beck Creek, and Bachman Run. Sampling of sites along tributaries was performed near their confluence with Quittapahilla Creek.

A water quality sample from Swatara Creek, approximately 1,100 feet downstream of the Quittapahilla Creek confluence, was also submitted for laboratory analysis. The sample was analyzed for anions, cations, heavy metals, and wet chemistry parameters by BetzDearborn (See Table 4.2-13).

Field measurement results were consistent with previously reported data suggesting that water quality in Quittapahilla Creek is generally good (See Table 4.2-10). The field screening program was directed at characterizing the water quality variability using field instrumentation. The field screening parameters tested included temperature, dissolved oxygen, pH, conductivity and turbidity.

Testing of these parameters was significant for the following reasons:

Temperature governs the biological species present in the water and their rates of activity. Temperature also impacts the chemical reactions that occur in the water and the solubility of gases, such as oxygen, in the water. The temperature is reported in the table in degrees Centigrade.

Dissolved Oxygen is the measure of oxygen present in the water. The Pennsylvania Department of Environmental Protection generally sets a minimum dissolved oxygen level of 6 mg/l for trout streams. The dissolved oxygen is reported in the table in mg/l.

pH is the measure of the acidity or alkalinity of the water. pH is calculated using the negative logarithm of [H+]. Trout generally prefer waters that maintain a pH within the range of 6.5 to 8.0.

Conductivity is an indirect measure of the ionic strength of a water (i.e., the relative abundance of dissolved salts). Conductivity measurements can be correlated with salinity and total dissolved solids. Conductivity is reported in the table in mS/cm.

Turbidity is a measure of the extent to which light is either absorbed or scattered by suspended material in water. Turbidity may impart a brown/other color to water and may interfere with light penetration and photosynthetic reactions. Accumulation of turbidity in streambeds may result in sediment deposits that can adversely affect the flora and fauna in the stream. The turbidity is reported in the table in Nephelometry Turbidity Units (NTU).

As indicated in Table 4.2-10, thermal impacts associated with the Lebanon wastewater treatment plant outfall appear to dissipate between the outfall and the confluence with Beck Creek near Annville. The observed decrease in-stream dissolved oxygen levels associated with the treated effluent discharge also appears to recover within this reach. This is likely attributable to the additional dilution capacity of the basin with increasing downstream distance.

I hope that the information provided herein is beneficial. Should you have any questions regarding this information, please feel free to call me at (201) 933-5541 or Dave Schafer of my office at (978) 970-5600.

Sincerely,

TRC Environmental Corporation

Robert J. Golden, Jr.
Manager, Environmental Permitting

cc: Diana Rodriguez, AES Ironwood, Inc.
Dave Schafer, TRC Environmental
Bart Rossi, AES Ironwood, Inc.

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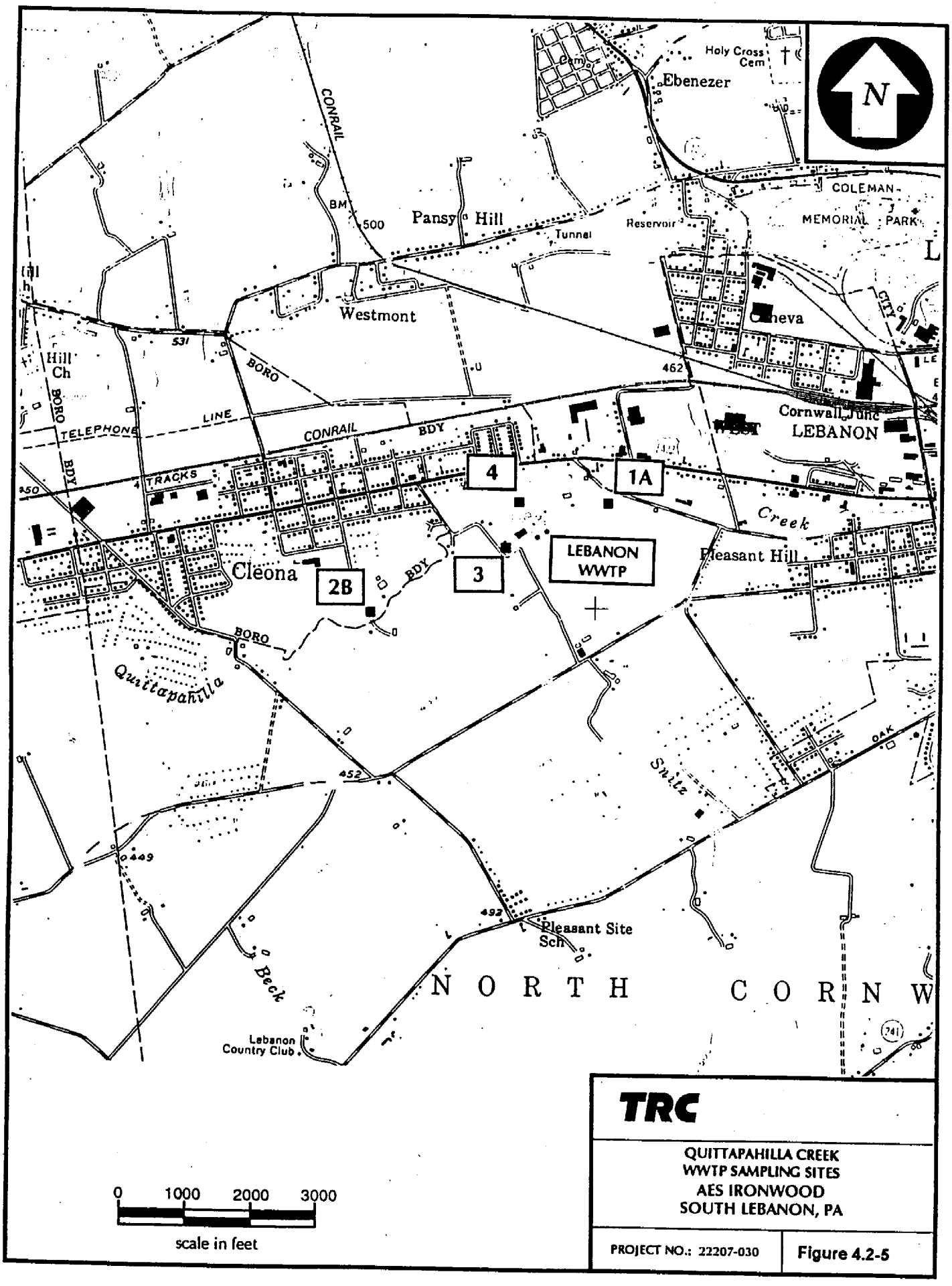
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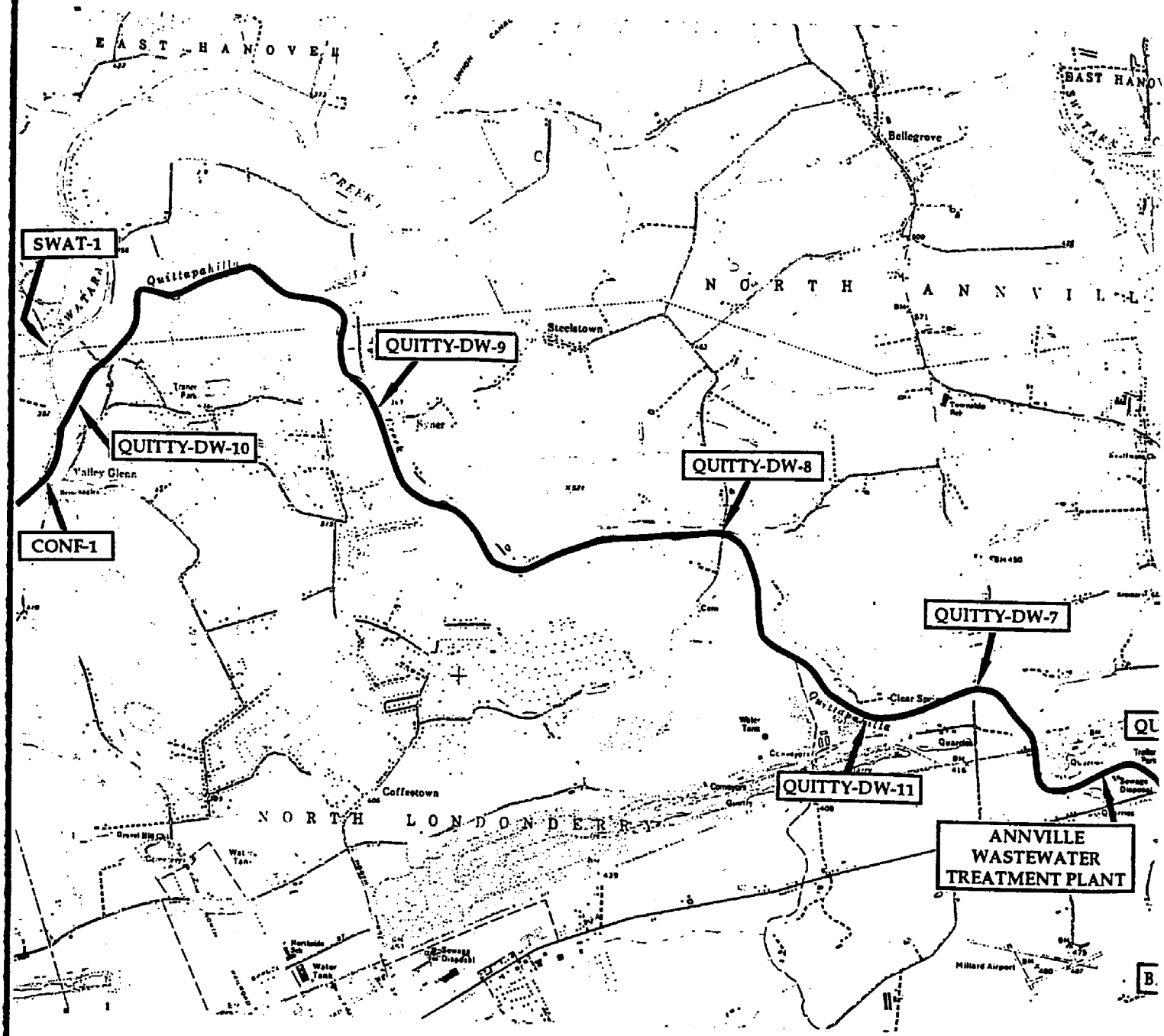
TRC
QUITTAPAHILLA CREEK
WWTP SAMPLING SITES
AES IRONWOOD
SOUTH LEBANON, PA
PROJECT NO.: 22207-030
Figure 4.2-5

Table 4.2-8

Summary of PaDEP Sampling Results from Quittapahilla Creek

Parameter	Number of Records	Mean	Maximum	Minimum
Turbidity (NTU)	57	13	175	1
Color (std. color units)	1	10	10	10
Conductivity (25 °C)	172	531	1000	90
Dissolved Oxygen	142	10.6	19.3	5.1
Dissolved O_2 Sat.	141	96.9	158.2	55.7
BOD	1	2.9	2.9	2.9
COD	2	14	16	12
pH Field (pH units)	146	7.7	8.7	5.6
Total Alkalinity	173	169	202	23
Residue (Dis. 105)	154	422	6420	118
NH3 +NH4 - N Total	172	0.33	2.52	0.01
Un-ionized NH3-N	156	0.004	0.044	0.00002
NO2-N	174	0.16	4.34	0.002
NO3-N Total	173	6.5	10.4	0.02
Total Phosphate	172	0.34	3.8	0.01
Hardness Total	173	240	374	25
Calcium-Total	125	78	891	6.3
Magnesium Total	117	20	173	0.0
Sodium -Total	2	18	19	18
Chloride - Total	173	24	50	6.0
Sulfate - SO4 Total	173	60	275	0.0
Iron-Total	170	0.794	12.97	0.01
Calcium Hardness	167	267	2937	0.7

1) Concentrations in milligrams/liter unless otherwise noted.



BASE MAP IS A PORTION OF THE FOLLOWING 7.5' x 15' USGS TOPOGRAPHIC QUADRANGLES: LEBANON, PA 1955, PHOTOINSPECTED 1984, PHOTOREVISED 1969 AND 1976; PALMYRA, PA, PHOTOREVISED 1990

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scale in feet

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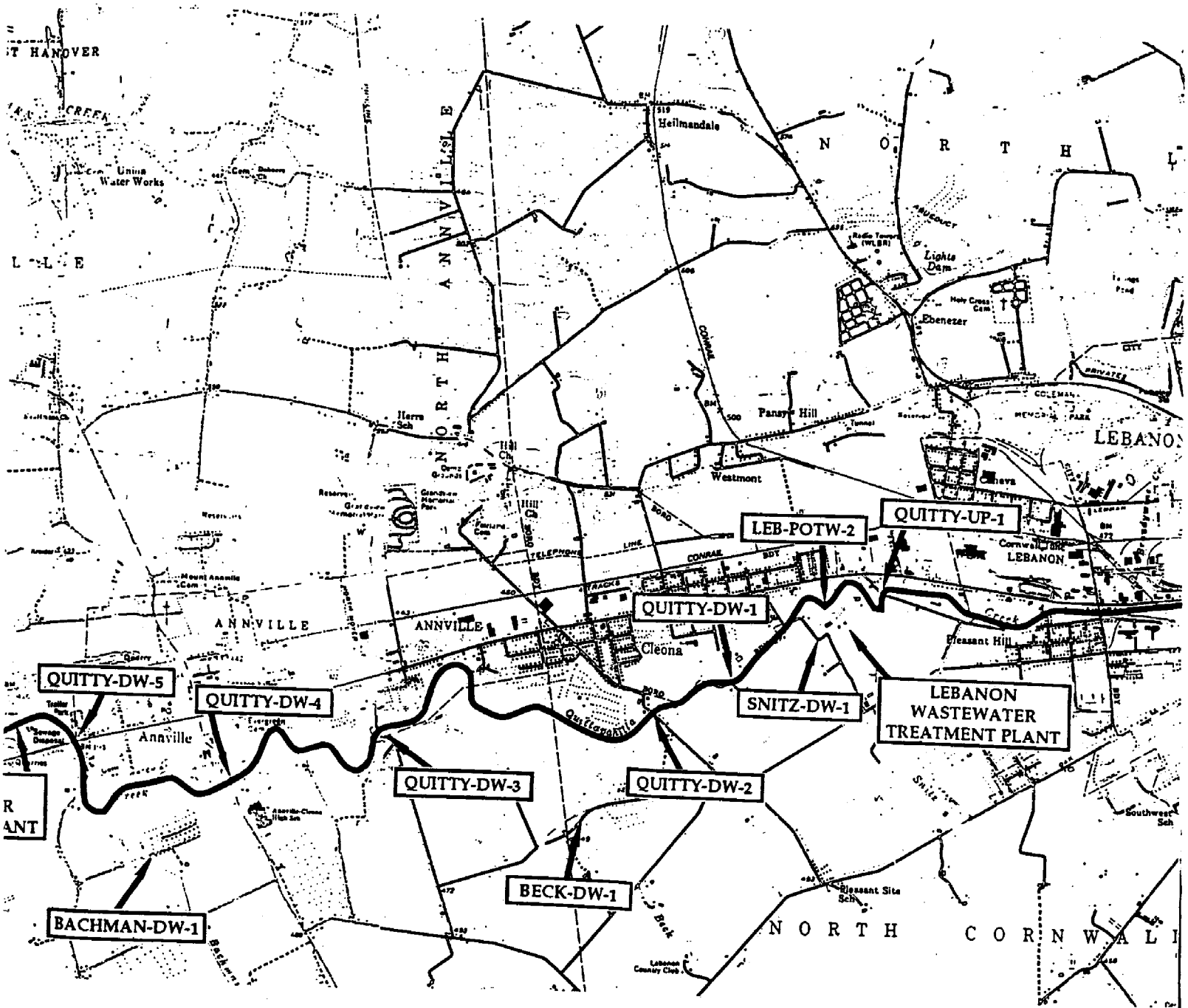

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QUITTAPAHILLA CREEK WATER QUALITY SCREENING SITES

AES IRONWOOD

SOUTH LEBANON TOWNSHIP, PA

Figure 4.2-6 | PROJ. NO. 22207-0300-0010

Table 4.2-10
Quittapahilla Stream Measurements - December 17, 1997

	Cumulative Downstream			Temp.	Dissolved O_2		Conductivity	Turbidity
Sample No.	Location/Description	Point-to-Point Dist. (ft)	Time	C^0	mg/l	pH	mS/cm	NTU
QUIT-UP-1	Quittapahilla @ bridge on W. Chestnut St., Lebanon	0	10:21	5.3	11.9	6.9	0.642	4
LEB-POTW-2	Lebanon POTW effluent	1,300	10:58	14.5	10.4	5.9	0.615	55
QUIT-DN-1	Quittapahilla @ bridge on S. Garfield St. Lebanon	4,200	11:56	8.9	12.0	6.8	0.627	19
QUIT-DN-2	Quittapahilla @ bridge on Walnut Mill Ln.	6,400	12:35	8.0	12.2	7.0	0.637	13
QUIT-DN-3	Quittapahilla @ bridge on S. Spruce Rd. Annville	12,900	13:14	7.1	14.7	7.6	0.603	8
QUIT-DN-4	Quittapahilla @ bridge on S. White Oak Rd. Annville	16,500	14:21	8.1	14.3	7.6	0.587	5
QUIT-DN-5	Bridge@ Route 422 in Annville	19,800	14:54	7.7	15.7	7.9	0.581	5
ANNVILLE-POTW	200 to 300 feet below POTW's outfall	21,900	15:04	8.0	14.3	7.6	0.580	7
QUIT-DN-7	150 ft upstream of bridge on Snyer Rd. in Annville	25,200	15:22	7.8	14.7	7.9	0.585	3
QUIT-DN-11	Quittapahilla @ bridge on Clear Spring Rd. in Annville	27,900	15:33	7.5	15.1	7.9	0.575	3
QUIT-DN-8	Bridge on Snyer Rd	41,300	15:59	7.3	14.2	8.0	0.581	5
QUIT-DN-9	Bridge on Snyer Rd	41,300	16:13	6.9	16.9	8.3	0.568	4
QUIT-DN-10	Bridge on Gravel Hill Rd	47,900	16:26	5.8	16.5	8.4	0.566	4
CONF-1	1,100 feet downstream of confluence of Quittapahilla & Swatara Creeks. Stream water sample collected at this location	49,800	16:58	3.9	13.6	8.2	0.400	3
SNITZ-DN-1	Snitz Creek @ bridge on Dairy Rd.	NA	11:35	3.4	17.5	7.9	0.523	112
BECK-DN-1	Beck Creek @ bridge on Bricker Rd.	NA	12:51	8.8	13.7	7.4	0.527	29
BACHMAN-DN-1	Bachman Creek @ bridge on Riegarts Ln	NA	14:36	6.7	16.0	8.3	0.540	7
SWAT-DN-1	200 ft below bridge on over Swatara Creek	NA	16:38	1.6	16.1	8.6	0.211	22