98-F-1968

Volume 15

Exhibits 101-140

Exh 101 missing

List of References used in Canace testimony

Ex. NJDEP-33

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 102

Ramapo Energy Application
Testimony of Robert Canace
References

Canace, Robert and Wayne Hutchinson, 1989. Bedrock topography and profiles of valley-fill deposits in the Ramapo River Valley, New Jersey, N.J. Geological Survey Geologic Map Series 88-6, 1:24,000 scale.

Hill, M.C., G.P. Lennon, G.A. Brown, C.S. Hebson, and S.J. Rheaume, 1992. Geohydrology of, and simulation of ground-water flow in, the valley-fill deposits in the Ramapo River Valley, NJ, U.S. Geological Survey Water Resources Investigations Report 90-4151, West Trenton, NJ, 4 pl.

Moore, R.B., D.H. Cadwell, W.G. Steitz, and J.L. Bell, 1982. Geohydrology of the valley-fill aquifer in the Ramapo and Mahwah River area, Rockland County, New York, U.S. Geological Survey Open-File Report 82-114, Albany, N.Y.

NYDEC, 1982. Rockland County water supply study, Appendix B, Ground-water study, N.Y. Department of Environmental Conservation , Division of Water, June 1982, 34 p.

United Water New York (UWNY), 2000. Master plan, United Water New York, West Nyack, NY, September 2000, section 1-9.

Vecchioli, John and E.G. Miller, 1973. Water resources of the New Jersey Part of the Ramapo River Basin, U.S. Geological Survey Water-Supply Paper 1974, Wash. DC, 77 p., 4 pl.

Written communications from Frederick Spitz of the United States Geological Survey Water Resources Division

Spitz, Frederick J., U.S. Geological Survey, written communication, Monday, April 30, 2001, e-mail transmission concerning monthly water withdrawal data for New York and New Jersey from USGS hydrogeologic study of the Ramapo River Basin.

Spitz, Frederick J., U.S. Geological Survey, written communication, Monday, April 30, 2001, e-mail transmission concerning location and flows at various stream-gaging locations along Ramapo and Mahwah Rivers in New York and New Jersey from USGS hydrogeologic study of RamapoRiver Basin.

Spitz, Frederick J., U.S. Geological Survey, written communication, Tuesday, May 8, 2001, e-mail transmission concerning interpretation of stream-flow measurements in vicinity of UWNY Mahwah wells along Mahwah River from USGS study of hydrogeology of the Ramapo River Basin.

Spitz, Frederick J., U.S. Geological Survey, written communication, Thursday, May 31, 2001, e-mail transmission concerning USGS estimate of 7Q10 for Ramapo River in New York State.

Ex. NJDEP-34

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-W-1968
EX 103

Date: Mon, 30 Apr 2001 12:12:51 -0400
From: Fred Spitz <fspitz@usgs.gov>
X-Mailer: Mozilla 4.7 [en] (WinNT; U)
X-Accept-Language: en
To: Bob Canace <bobc@njgs.dep.state.nj.us>
X-MIMETrack: Itemize by SMTP Server on gsvaresh01/SERVER/USGS/DOI(Release 5.0.3 |March 21, 2000) at 04/30/2001 12:13:03 PM,
Serialize by Router on gsvaresh01/SERVER/USGS/DOI(Release 5.0.3 |March 21, 2000) at 04/30/2001 12:13:16 PM
Subject: First installment--withrawals

Bob,

Here's the monthly withdrawal spreadsheet you wanted--it's my working copy. Because of the amount of time required to generate this spreadsheet, it only contains withdrawals for odd-numbered years, 1992-99. (I have a separate spreadsheet for the RVWF-Suffern withdrawal plot that contains every year of data, 1992-99.) It would take 1-2 days to complete the attached spreadsheet for even-numbered years. If you need every year, I'll need to talk to Tony before working on that. Let me know what your data needs are or if you have any questions about the attached spreadsheet.

Fred
771-3954
Attachment Converted: "C:\EUDORA\Attach\ramapowithd.xls"

Date: Mon, 30 Apr 2001 15:26:52 -0400
From: Fred Spitz <fspitz@usgs.gov>
X-Mailer: Mozilla 4.7 [en] (WinNT; U)
X-Accept-Language: en
To: Bob Canace <bobc@njgs.dep.state.nj.us>
X-MIMETrack: Itemize by SMTP Server on gsvaresh01/SERVER/USGS/DOI(Release 5.0.3 |March 21, 2000) at 04/30/2001 03:26:54 PM,
Serialize by Router on gsvaresh01/SERVER/USGS/DOI(Release 5.0.3 |March 21, 2000) at 04/30/2001 03:28:51 PM
Subject: Seepage Run Data

Bob,

Here's the remainder of the data you requested this morning. I have attached a word document of the seepage run table which has a new column for the gain/loss in the river subreach above the particular measuring station. I have also attached an Arc/Info export file of the seepage run sites. This point coverage contains a new item called gain/loss, which contains the same info mentioned above. If you have Arc/Info software in your office, the export file can be imported to a coverage using the import command, and then the coverage can be brought into ArcView by adding a theme. If you don't have Arc/Info, then I'll need to make a shapefile of the coverage for you (not something I've done before, but could probably figure out).

Fred
Attachment Converted: "C:\EUDORA\Attach\seeptab.doc"

```
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 5.7866019E+05 8.4848756E+05 5.7866019E+05 8.4848756E+05
         3         0 5.7775975E+05 8.4362763E+05
 5.7775975E+05 8.4362763E+05 5.7775975E+05 8.4362763E+05
         4         0 5.7652931E+05 8.4544450E+05
 5.7652931E+05 8.4544450E+05 5.7652931E+05 8.4544450E+05
         5         0 5.8343244E+05 8.4051025E+05
 5.8343244E+05 8.4051025E+05 5.8343244E+05 8.4051025E+05
         6         0 5.9773869E+05 8.4077113E+05
 5.9773869E+05 8.4077113E+05 5.9773869E+05 8.4077113E+05
         7         0 5.9248506E+05 8.3467763E+05
 5.9248506E+05 8.3467763E+05 5.9248506E+05 8.3467763E+05
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 5.8974369E+05 8.3132631E+05 5.8974369E+05 8.3132631E+05
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 5.8876306E+05 8.2777950E+05 5.8876306E+05 8.2777950E+05
        10         0 5.8892663E+05 8.2514988E+05
 5.8892663E+05 8.2514988E+05 5.8892663E+05 8.2514988E+05
        11         0 5.8575894E+05 8.3252400E+05
 5.8575894E+05 8.3252400E+05 5.8575894E+05 8.3252400E+05
        12         0 5.8685094E+05 8.2736713E+05
 5.8685094E+05 8.2736713E+05 5.8685094E+05 8.2736713E+05
        13         0 5.8700394E+05 8.2736788E+05
 5.8700394E+05 8.2736788E+05 5.8700394E+05 8.2736788E+05
        14         0 5.8249731E+05 8.2471913E+05
 5.8249731E+05 8.2471913E+05 5.8249731E+05 8.2471913E+05
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 5.8242963E+05 8.2239275E+05 5.8242963E+05 8.2239275E+05
        16         0 5.8840575E+05 8.2140356E+05
 5.8840575E+05 8.2140356E+05 5.8840575E+05 8.2140356E+05
        17         0 5.8159156E+05 8.2127525E+05
 5.8159156E+05 8.2127525E+05 5.8159156E+05 8.2127525E+05
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```

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 5.7555813E+05 8.1680069E+05 5.7555813E+05 8.1680069E+05
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 5.7258275E+05 8.1335063E+05 5.7258275E+05 8.1335063E+05
         22          0 5.7006300E+05 8.1091363E+05
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 5.6090444E+05 7.9914694E+05 5.6090444E+05 7.9914694E+05
         28          0 5.5930006E+05 7.9732000E+05
 5.5930006E+05 7.9732000E+05 5.5930006E+05 7.9732000E+05
         29          0 5.5327238E+05 7.8657725E+05
 5.5327238E+05 7.8657725E+05 5.5327238E+05 7.8657725E+05
         30          0 5.7922825E+05 8.1843369E+05
 5.7922825E+05 8.1843369E+05 5.7922825E+05 8.1843369E+05
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 5.6312238E+05 8.0067006E+05 5.6312238E+05 8.0067006E+05
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TOL  2
          1          2 6.4723501E+00
          2          2 0.0000000E+00
          3          2 0.0000000E+00
          4          2 0.0000000E+00
          5          2 0.0000000E+00
          6          2 6.4334812E+02
          7          2 6.4334812E+01
          8          2 6.4334812E+01
          9          2 6.4334812E+01
         10          2 6.4334812E+01
         -1          0          0          0          0          0          0
SIN  2
EOX
LOG  2
200012061535    0     2    14fspitz GENERATE seep98
~
200012061535    0     2     8fspitz BUILD seep98 POINT
~
200012061535    0     0     0fspitz CREATEPOINT seep.9810.data seep98
~
200012061536    0     4    16fspitz PROJECT cover seep98 seep98p /gis/soft/prj/nj
~.prj
200012061537    0     0     0fspitz rename seep98p seep98
~
200012061531    0     0     0fspitz import cover seep98 seep98
~
200012061942    0     0     0fspitz build seep98 point
~
200104301335    0     0     0fspitz ARCEDIT E:\RAMAPO\SWDATA\SEEP98
~
EOL
PRJ  2
Projection    STATEPLANE
~
```

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Zone            4701
~
Datum           NAD83
~
Zunits          NO
~
Units           FEET
~
Spheroid        GRS1980
~
Xshift          0.0000000000
~
Yshift          0.0000000000
~
Parameters
~
EOP
IFO  2
SEEP98.BND                          XX   4    4   16         1
XMIN              4-1   14-1  12 3 60-1  -1  -1-1                   1-
YMIN              4-1   54-1  12 3 60-1  -1  -1-1                   2-
XMAX              4-1   94-1  12 3 60-1  -1  -1-1                   3-
YMAX              4-1  134-1  12 3 60-1  -1  -1-1                   4-
 5.5327238E+05 7.8657725E+05 5.9773869E+05 8.5091206E+05
SEEP98.PAT                          XX  11   11   72        31
AREA              4-1   14-1  12 3 60-1  -1  -1-1                   1-
PERIMETER         4-1   54-1  12 3 60-1  -1  -1-1                   2-
SEEP98#           4-1   94-1   5-1 50-1  -1  -1-1                   3-
SEEP98-ID         4-1  134-1   5-1 50-1  -1  -1-1                   4-
STATION           8-1  174-1   8-1 30-1  -1  -1-1SID                5-
CSTATION          8-1  254-1   8-1 20-1  -1  -1-1CSID               6-
NAME             30-1  334-1  30-1 20-1  -1  -1-1                   7-
TYPE              1-1  634-1   1-1 20-1  -1  -1-1                   8-
CFS               5-1  644-1   5 2 40-1  -1  -1-1                   9-
ACCURACY          2-1  694-1   2-1 20-1  -1  -1-1                  10-
GAIN/LOSS         1-1  714-1   1-1 20-1  -1  -1-1                  11-
 0.0000000E+00 0.0000000E+00          1          1 138725001387250Ramapo Riv at
Sloatsburg      C 1.7200000E+01FP
 0.0000000E+00 0.0000000E+00          2          2 138730001387300Stony  Brk at
Sloatsburg        8.1000000E-01 P
 0.0000000E+00 0.0000000E+00          3          3 138731501387315Ramapo Riv ab
Nakoma Brk        1.8200000E+01 FG
 0.0000000E+00 0.0000000E+00          4          4 138735001387350Nakoma Brk at
Sloatsburg        3.0000000E-02 G
 0.0000000E+00 0.0000000E+00          5          5 138740001387400Ramapo Riv at
Ramapo          C 1.7500000E+01GFL
 0.0000000E+00 0.0000000E+00          6          6 138745001387450Mahwah Riv nr
Suffern         C 5.6000000E-01 P
 0.0000000E+00 0.0000000E+00          7          7 138746501387465Mahwah Riv at
Montebello Rd     1.1500000E+00 PG
 0.0000000E+00 0.0000000E+00          8          8 138748001387480Mahwah Riv at
Suffern           8.2000000E-01 FL
 0.0000000E+00 0.0000000E+00          9          9 138748301387483Mahwah Riv at
W Mahwah          1.0200000E+00 PG
 0.0000000E+00 0.0000000E+00         10         10 138749001387490Masonicus Brk
at W Mahwah       1.3400000E+00 GG
 0.0000000E+00 0.0000000E+00         11         11 138742001387420Ramapo Riv at
Suffern         C 1.5000000E+01 FL
 0.0000000E+00 0.0000000E+00         12         12 138742501387425Ramapo Riv ab
Mahwah Riv        1.7040000E+01 FG
 0.0000000E+00 0.0000000E+00         13         13 138749201387492Mahwah Riv at
mouth             2.9100000E+00 GG
 0.0000000E+00 0.0000000E+00         14         14 138752501387525Ramapo Riv ab
```

```
Ford wells         2.0600000E+01 GG
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Ford wells         1.8380000E+01 PL
 0.0000000E+00 0.0000000E+00          16          16 138748801387488Masonicus Brk
at Sunset Lk       5.3000000E-01 F
 0.0000000E+00 0.0000000E+00          17          17 138753601387536Ramapo Riv at
Washington Ln      1.7400000E+01 GL
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Halifax Rd         1.8800000E+01 PG
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Middle Vly         1.5700000E+01 GL
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Fike Brk           1.8300000E+01 FG
 0.0000000E+00 0.0000000E+00          21          21 138767001387670Ramapo Riv ab
Bear Swamp Brk     2.4300000E+01 FG
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Berlets            1.6500000E+01 FL
 0.0000000E+00 0.0000000E+00          23          23 138776501387765Ramapo Riv at
Glen Gray Rd       1.9500000E+01 FG
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Patriots Way       1.8200000E+01 FL
 0.0000000E+00 0.0000000E+00          25          25 138781101387811Ramapo Riv at
Lenape Ln          2.0200000E+01 FG
 0.0000000E+00 0.0000000E+00          26          26 138750001387500Ramapo Riv nr
Mahwah           C 1.7100000E+01 FG
 0.0000000E+00 0.0000000E+00          27          27 138789001387890Ramapo Riv at
Oakland Av       C 2.0400000E+01 FG
 0.0000000E+00 0.0000000E+00          28          28 138791001387910Ramapo Riv at
Oakland            2.1700000E+01 GG
 0.0000000E+00 0.0000000E+00          29          29 138800001388000Ramapo Riv at
Pompton Lks      C 2.2300000E+01 GG
 0.0000000E+00 0.0000000E+00          30          30 138760001387600Darlington Bro
ok at Rt. 202      6.1000000E-01 G
 0.0000000E+00 0.0000000E+00          31          31 138788801387888Crystal Lake O
utlet              4.3000000E-01 G
SEEP98.TIC                       XX   3   3  12         4
IDTIC              4-1   14-1   5-1 50-1  -1  -1-1                  1-
XTIC               4-1   54-1  12 3 60-1  -1  -1-1                  2-
YTIC               4-1   94-1  12 3 60-1  -1  -1-1                  3-
          1 5.9742713E+05 7.8632469E+05
          4 5.9779619E+05 8.5079475E+05
          2 5.5327238E+05 7.8657725E+05
          3 5.5364150E+05 8.5104819E+05
EOI
EOS
```

Date: Tue, 08 May 2001 16:24:54 -0400
From: Fred Spitz <fspitz@usgs.gov>
X-Mailer: Mozilla 4.7 [en] (WinNT; U)
X-Accept-Language: en
To: Bob Canace <bobc@njgs.dep.state.nj.us>
Subject: Re: Stream coverage in New York
X-MIMETrack: Itemize by SMTP Server on gsvaresh01/SERVER/USGS/DOI(Release 5.0.3 |March 21, 2000) at 05/08/2001 04:24:33 PM,
Serialize by Router on gsvaresh01/SERVER/USGS/DOI(Release 5.0.3 |March 21, 2000) at 05/08/2001 04:24:56 PM,
Serialize complete at 05/08/2001 04:24:56 PM

Actually, the UWNY Ramapo wells (on the Mahwah River) do induce stream leakage. Glen made some instream potentiomanometer measurements near UWNY wells 27 and 29 (the Ramapo wells on the Mahwah River) in late 1998 that verify this. Complicating the issue is the fact that a local confining unit within the valley fill aquifer may terminate between the two wells. The confining unit appears to be absent near the northern well (#27), but present near the southern well (29). Suffern's wells are probably too far from the Mahwah River to have a discernable impact on the river, however, there is scant hydrologic data in the area to support this claim.

Fred

\>Fred,
\>
\>Thanks. I just remembered I do have this. I was trying to process it, but
\>it took so long to group into a text file I think I bailed out!
\>
\>bob
\>
\>P.S.: When we spoke you didn't seem to think the UWNY Ramapo wells were
\>causing stream leakage per se. Is that true? I think you believed the
\>loss on the Mahwah River might be more attributable to the Suffern wells.

At 03:15 PM 5/8/01 -0400, you wrote:
\>I think I sent you this coverage last week. It's the coverage of the streams
\>in and around the watershed, which includes the mainstems of the Ramapo and
\>Mahwah Rivers. I recall you were looking for a mainstems only coverage,
which
\>I didn't have. In any case, I've reattached the export file.
\>
\>Fred
\>
\>
\>Bob Canace wrote:
\>>
\>> Fred,
\>>
\>> Didn't you say you had a GIS coverage of New York streams? Can I get that
\>> from you? I want to show the locations of the NY gaging stations and
\>> that'll show the Ramapo, I assume. Thanks.
\>>
\>> bob
\>>
\>> Robert Canace, Section Chief
\>> Bureau of Ground Water Resources Evaluation
\>> New Jersey Geological Survey
\>> P.O. Box 427
\>> Trenton, N.J. 08625
\>>

Date: Thu, 31 May 2001 11:50:30 -0400
From: Fred Spitz <fspitz@usgs.gov>
X-Mailer: Mozilla 4.7 [en] (WinNT; U)
X-Accept-Language: en
To: Bob Canace <bobc@njgs.dep.state.nj.us>
Subject: Re: What Else?!
X-MIMETrack: Itemize by SMTP Server on gsvaresh01/SERVER/USGS/DOI(Release 5.0.7 |March 21, 2001) at 05/31/2001 11:49:58 AM,
Serialize by Router on gsvaresh01/SERVER/USGS/DOI(Release 5.0.7 |March 21, 2001) at 05/31/2001 11:50:11 AM,
Serialize complete at 05/31/2001 11:50:11 AM

I checked our final testimony document that includes Bob Schopp's estimates. It says the "7Q10" for the Ramapo River at Suffern (01387420) is 3.4 cfs. Because of UWNY's outputs and inputs above this gage, I think it's wrong for them to refer to the flow at this gage as "natural". For example, the "7Q10" at the gage above the well field, Ramapo River at Ramapo (01387400), is 8.8 cfs. Downstream, the "7Q10" at Ramapo River near Mahwah (01387500) is 13 cfs. This estimate is based on data before 1980, due to a trend in the recent data.

Fred

Bob Canace wrote:

> Fred,
>
> During one of our meetings Tony Navoy had indicated that the 8 mgd passing flow requirement at Suffern is close to the Q7/10 for the stream at that point. UWNY claims that they've asked for exemptions from this requirement during drought because of lower natural flows during drought. Has USGS calculated the Q7/10 for the Ramapo at the Suffern gage?
>
> bob
>
> Robert Canace, Section Chief
> Bureau of Ground Water Resources Evaluation
> New Jersey Geological Survey
> P.O. Box 427
> Trenton, N.J. 08625
>
> 609-984-5587 (main line)
> 609-633-1052 (voicemail)
> 609-633-1004 (fax)
>
> **
> New Jersey Geological Survey homeboypage
> http://www.state.nj.us/dep/njgs/
> **

periods, a significant portion of the water released from Lake Tiorati is lost due to infiltration and evapotranspiration as water travels along this 8-mile streambed. Although these losses have not been quantified, practical experience indicates that less than 50% of the water released from Lake Tiorati reaches the Stony Point WTP during dry weather.

4.2 Groundwater

4.2.1 Sand and Gravel Wells

The primary well field in this category is the Ramapo Valley Well Field (RVWF) consisting of 10 wells located in the Village of Hillburn, Town of Ramapo, NY along the bank of the Ramapo River (see wells 84, 85 and 93-100 on Figure 4-1). Wells 84 and 99 are currently inactive due to trichlorofluoromethane contamination of a portion of the aquifer. UWNY is in the process of adding an air-stripping unit to these wells to remove this contamination prior to use as a potable supply. The wells are drilled in deposits of stratified drift to depths ranging from approximately 75 to 125 ft. The water contained in these deposits is referred to as the Ramapo Valley Aquifer, which is designated at the federal and state level as a sole source or primary public water supply aquifer, which means that it is utilized for supplying potable water and, if contaminated would create a significant hazard to public health (See 57 Fed. Reg. 39201, August 28, 1992; 591 NYCRR Section 591.2). The wells are highly productive and range between approximately 500 to 1,400 gpm.

Each of the 10 wells pumps to a central location, the Ramapo Valley Pump Station, where sodium hypochlorite and a corrosion inhibitor are added prior to being pumped to the distribution system. As specified in NYSDEC WSA No. 6507, flow in the Ramapo River, as measured at the Suffern Gauge (USGS No. 01387420) must be greater than 8.0 mgd in order to use RVWF. The maximum allowable usage of RVWF is a daily maximum of 14 mgd.

When RVWF is active, UWNY maintains river flow greater than 8 mgd by releasing water from Cranberry and Potake Ponds, for which a water release agreement exists.

Ex. NJDEP-35

This agreement with the owner of the Ponds, the Ramapo Land Company, allows UWNY to release water from the upper 2 ft of Cranberry Pond and the upper 4.5 ft of Potake Pond, which flows into Cranberry Pond. Figure 4-1 shows the location of these Ponds relative to RVWF. When available water in these Ponds is depleted, UWNY can re-direct water pumped from RVWF to the river to maintain greater than 8 mgd of river flow. While this may help keep the well field active, it significantly decreases its production capability and is only effective in the fall and winter as a sole augmentation source. A general rule-of-thumb is that UWNY can sustain about 5 mgd of production during dry periods by using Potake and Cranberry Ponds as well as RVWF pump-back to the Ramapo River. When river flow is high, and with all wells active, the practical pumping limit is approximately 11.8 mgd. Table 4-1 summarizes the production capacity of each of UWNY's wells.

In recent years, in cooperation with the Palisades Interstate Park Commission (PIPC), UWNY has released water from several lakes in Harriman Park (Primarily Lake Sebago and Pine Meadow Lake). UWNY developed a mathematical model of the Lake Sebago and Pine Meadow Lake watersheds to evaluate a minimum release that would not impact the primary purpose of these lakes, which is for recreation. UWNY has suggested the following release schedule to PIPC, which is under review:

- Pine Meadow Lake: 0.5 mgd in June through October
- Lake Sebago: 1.5 mgd in July, August and September ; 1.0 mgd in October and November

For the last three years UWNY has made releases from these lakes in a manner consistent with recreational usage objectives of PIPC. The above releases are intended to improve baseflow conditions in the Ramapo River, which should make augmentation releases from Potake and Cranberry Ponds more effective (i.e., less in-stream losses). UWNY continues to discuss these releases with PIPC with the goal of establishing a mutually beneficial public/private agreement that will ultimately benefit the residents of Rockland County by improving the reliability and yield of RVWF. As will be discussed further in

Stipulation between New Jersey and Spring Valley Water Company establishing 8 mgd passing flow at Suffern, NY

Ex. NJDEP-37

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 106

STIPULATION BY AND BETWEEN SPRING VALLEY WATER COMPANY, INC., AND THE DIVISION OF WATER RESOURCES OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION OF THE STATE OF NEW JERSEY

This Stipulation by and between the Spring Valley Water Company Incorporated, hereinafter referred to as first party, and the Division of Water Resources of the Department of Environmental Protection, State of New Jersey, hereinafter referred to as second party, is intended by the parties hereto to be incorporated in the record of the public hearings held before the New York State Department of Environmental Conservation on the first party's Water Supply Application No. 6507.

WHEREAS, first party recognizes that the second party has a real and substantial interest in the waters of the Ramapo River and has from time to time granted subterranean and surface diversion rights for portions thereof; and

WHEREAS, first party recognizes that an upstream subterranean withdrawal by it of an annual quantity of water equivalent to a daily withdrawal of ten million gallons in the manner described in the subject application from the Ramapo Valley Well Field, could conceivably reduce the volume of water available in the State of New Jersey; and

WHEREAS, the possible experiences of the future may make modifications of the aforesaid application as it now stands necessary in unforeseen particulars; and

WHEREAS, second party will withdraw its objection to said application, without prejudice, for the assurances and conditions hereinafter set forth; and

NOW, THEREFORE, the parties hereto, in consideration of the conditions herein, agree as follows:

1. In the event that the Bureau of Water Regulation of the Department of Environmental Conservation determines that all or part of the conditions hereinafter set forth, are unacceptable to the Bureau, then it is understood by the parties hereto that the second party will be offered the right to reinstate its objections to the aforesaid application without prejudice, and to pursue from any forum any relief it so deems appropriate.

2. First party shall after consulting with second party, install and operate such water monitoring and measuring devices as may be necessary to determine the impact, if any, on the exercise of the existing diversions permitted by the State of New Jersey. Same shall be constructed at locations upstream and downstream of the well field site, and shall be in accordance with plans approved by the Department of Environmental Conservation of the State of New York. Said devices shall be in operation at least thirty (30) days prior to any approved diversion taking place.

3. Said monitoring and measuring devices shall be in operation for the duration of this agreement, unless otherwise agreed upon in writing by the parties hereto.

4. First party shall furnish to the second party monthly summaries of the river flow and of the subject well field pumpage for the duration of this agreement, unless otherwise agreed upon in writing by the parties hereto.

5. First party shall provide second party with such reports as may become available, or as may be requested by second party, on the interpretation of hydrogeological data relating to the operation of the aforesaid well field, including, inter alia, data from a mathematical model as provided for in paragraph six.

6. A computer model of the aquifer involved herein shall be developed by the first party, within two years, or any mutually agreed upon extension by the parties hereto, after the approval of the aforesaid application by the Department of Environmental Conservation of the State of New York.

7. Whenever the flow of the Ramapo River, as measured at the gauging station, referred to in paragraph nine, is (a) between the rate of ten (10) million gallons per day and eight (8) million gallons per day and (b) in the event that the second party determines that as a result of the first party's pumping from the Ramapo Valley Well Field an infringement exists as to the existing diversion rights in the State of New Jersey, then the first party will forthwith reduce pumping by a quantity equal to the amount of the infringement but not exceeding 2 million gallons per day, without contest as to the

issue of infringement, provided such reduction of pumping does not affect a limitation on the first party's diversion rights in said well field to a quantity of less than eight million gallons per day.

8. In the event the second party determines that there is an infringement on the existing rights of authorized diverters in the State of New Jersey and the procedures as set forth in paragraph seven fails to cure said infringement, then the first party hereby agrees to submit the issue of infringement for determination to an appropriate forum.

9. Notwithstanding paragraphs seven and eight, the first party will forthwith cease pumping from the Ramapo Valley Well Field in the event the flow of the Ramapo River, as measured at the downstream gauge to be between the Suffern and Hillburn boundary and North of the New York Thruway crossing of the Ramapo River, is at or below the rate of eight (8) million gallons per day.

(Marked as Exhibit C (18)

10. It is understood by first party that the stipulations herein contained are in no way intended by first party to qualify any of the rights of the second party to grant new diversion authorizations with respect to the residual water resources of the Ramapo River Basin, if any, which are beyond the diversion allowances contemplated in Water Supply Application 6507, and in no way intended to qualify the rights of the second party to object to any further application by first party or other parties which may affect its interests as respects residual water resources of the Ramapo River Basin.

IN WITNESS WHEREOF, the said parties have hereunto set their hands and seals on this 11th day of September, 1975.

WITNESS:

Virginia T. Dombrowski

STATE OF NEW JERSEY
Department of Environmental Protection

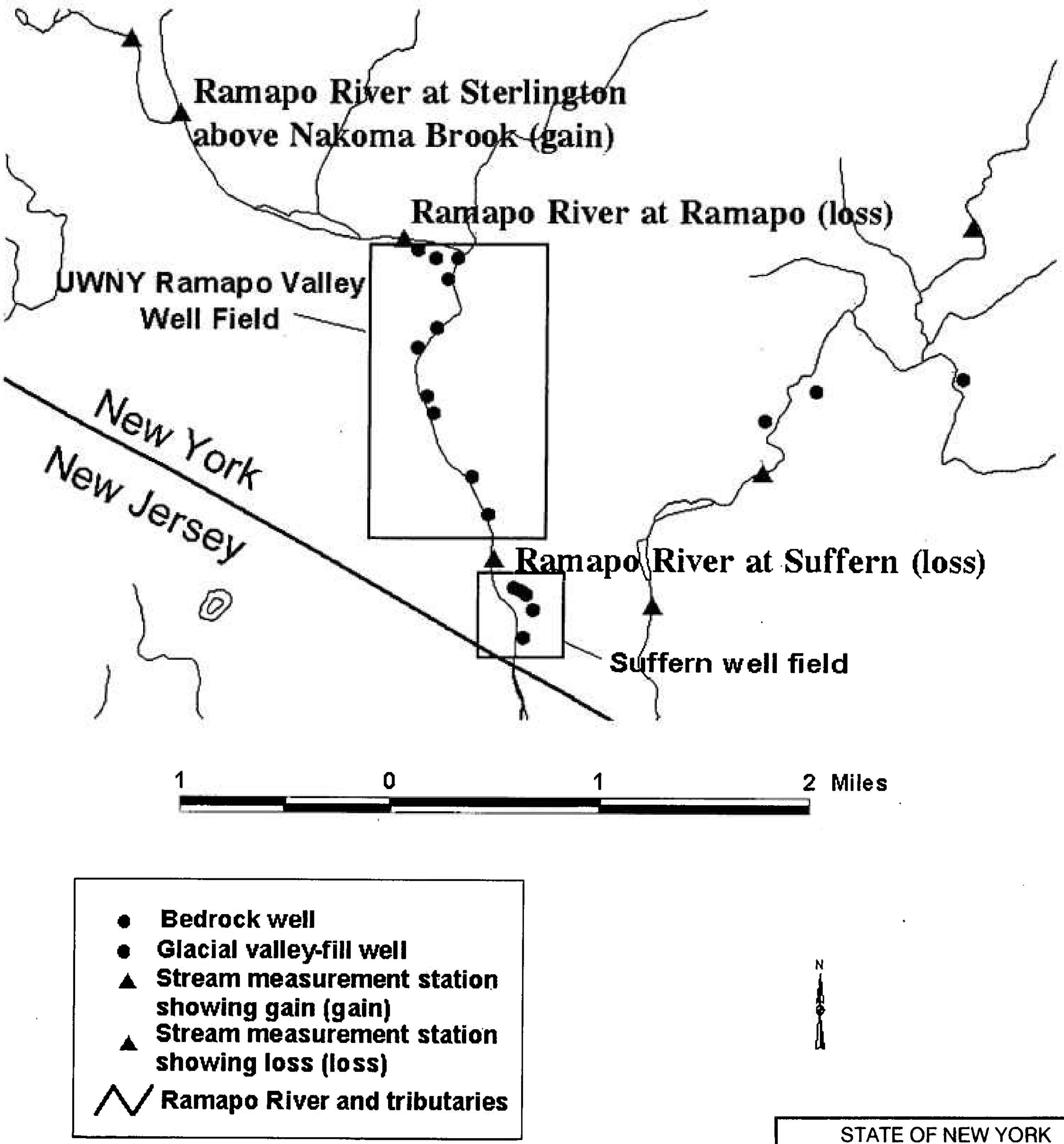
By

Attest:

Helen R. Kremer

SPRING VALLEY WATER COMPANY, INC.

By Walter T. Luking

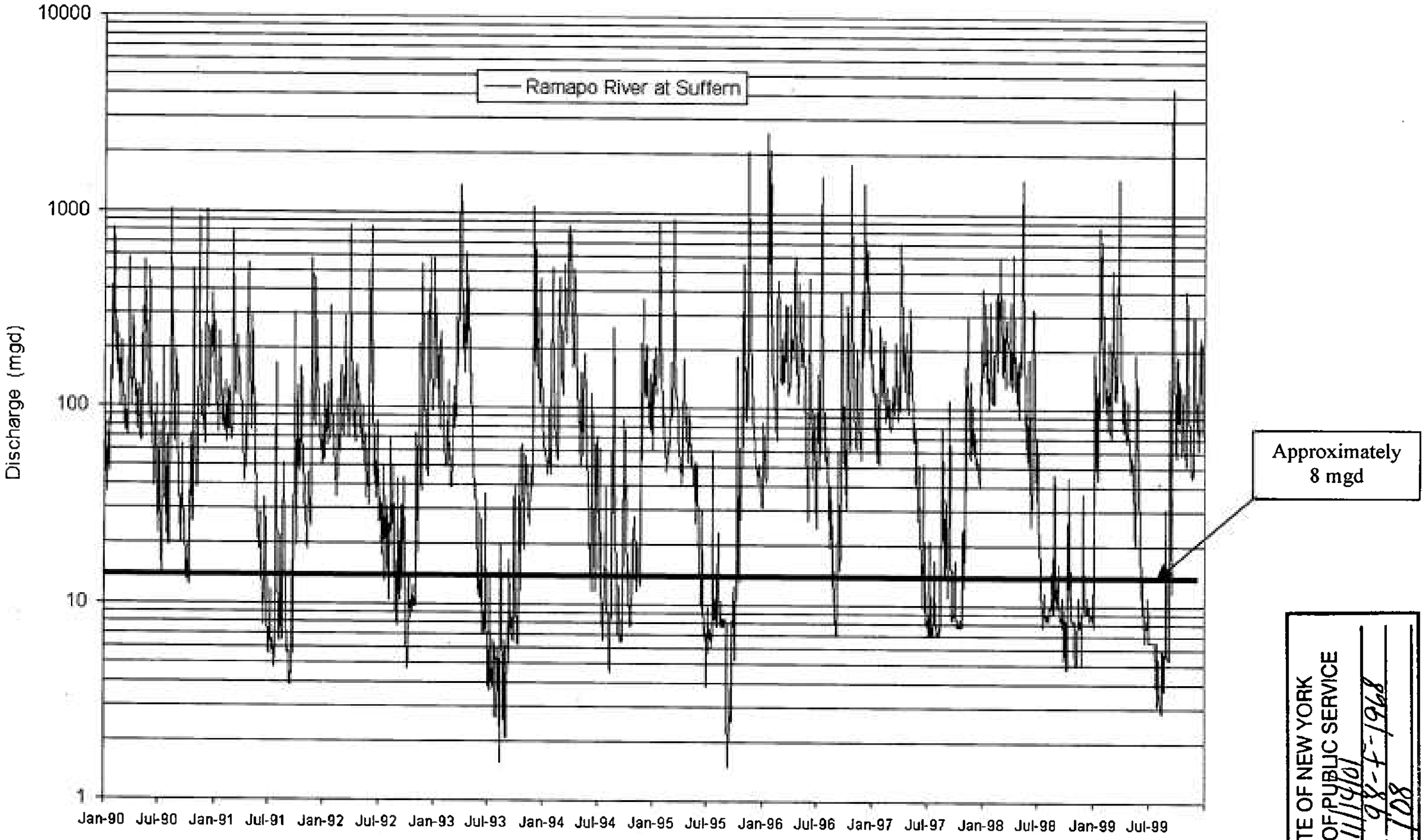


STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 107

Ex. NJDEP-38

Location of measurements stations near Ramapo Valley well field for USGS 1998 stream-flow study of Ramapo River in New York State

Streamflow Hydrograph at USGS Regulatory Gage (1990-99)

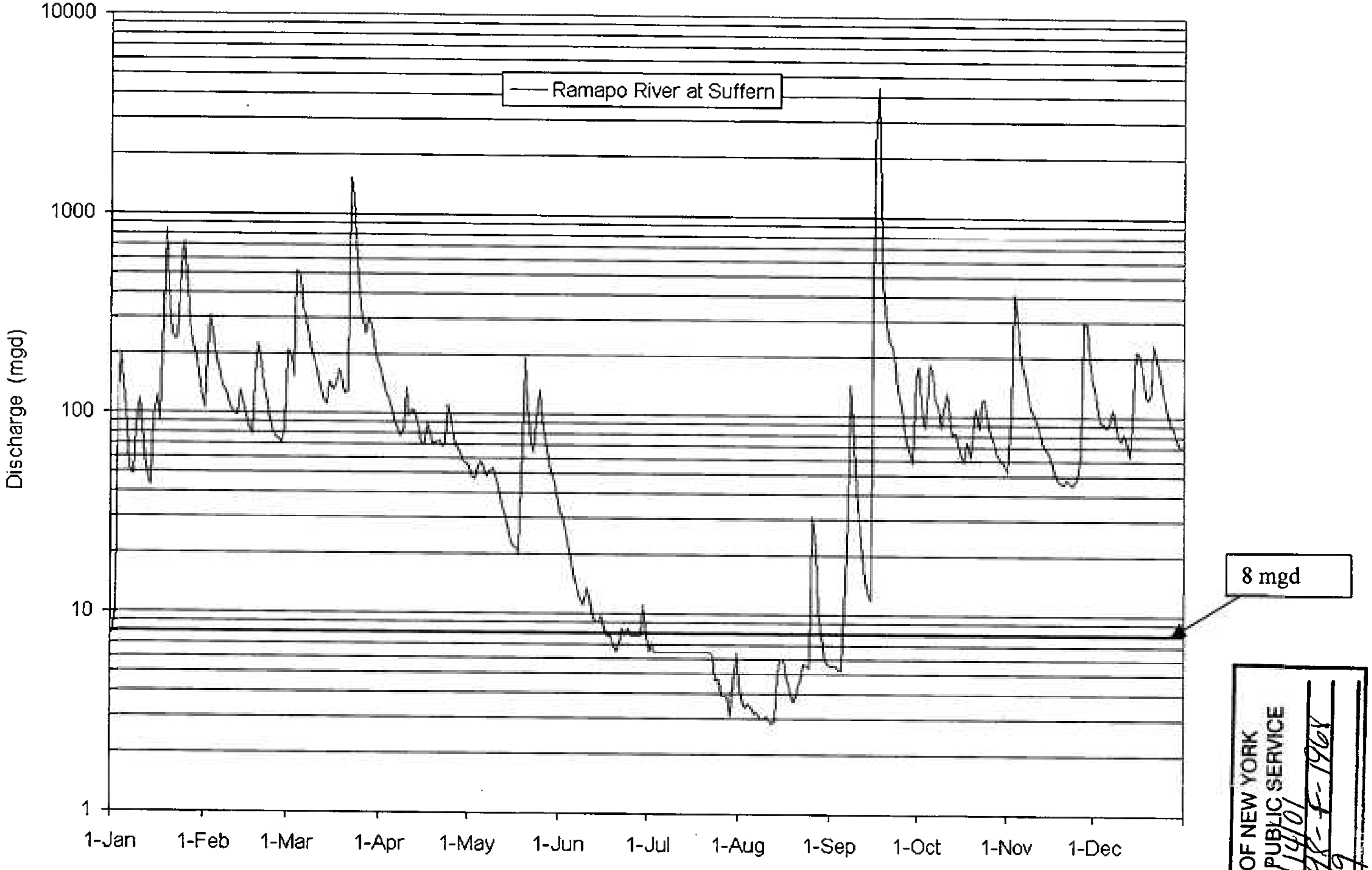


Daily average flow at USGS stream gage at Suffern, New York, 1990 to 1999.

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/19/01
CASE NO. 98-F-1968
EX 108

Ex. NJDEP-39

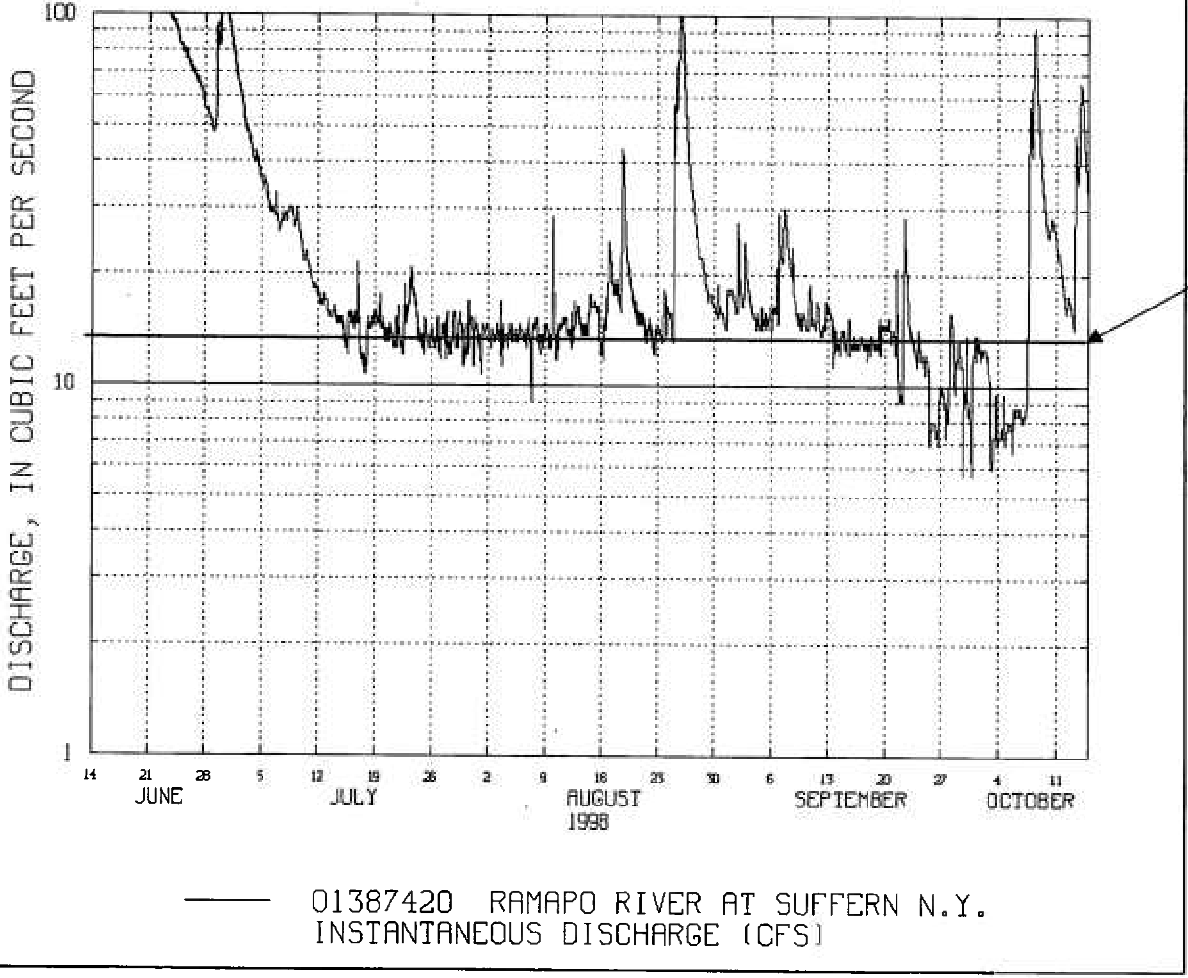
Streamflow Hydrograph at USGS Regulatory Gage (1999)



-Stream flow at USGS gage at Suffern, New York, 1999, in relation to 8 mgd passing flow

Ex. NJDEP-40

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 109



Approximately 8 mgd

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 97-W-1561
EX 110

Stream flow at USGS gage in Ramapo River at Suffern, New York, 1998, in relation to 8 mgd passing flow requirement.

Ex. NJDEP-41

Letter for UWNY to NYDEC asking for Emergency Modification of permit condition on 8 mgd minimum passing flow in 1999.

Ex. NJDEP-42

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 111

United Water

United Water New York
360 West Nyack Road
West Nyack, NY 10994
telephone 914 623 1500
facsimile 914 620 3311
mail replies to: 200 Old Hook Road
Harrington Park NJ 07640-1799

RC HEALTH DEPT.
ENV. HEALTH DIVISION
JUN 11 1999
RECEIVED

Via Facsimile and First Class Mail

June 9, 1999

Joseph Marcogliese, P.E.
New York State Department
of Environmental Conservation
200 White Plains Road
Tarrytown, NY 10591-5805

Re: Water Supply Application No. 6507
Ramapo Valley Well Field
Application for Temporary Emergency Modification

Dear Mr. Marcogliese:

On behalf of United Water New York ("UWNY"), I am requesting that the Department provide emergency authorization pursuant to 6 NYCRR Section 621.12 for a temporary modification to the above-referenced permit.

The recent severely hot weather conditions and lack of rainfall in Rockland County have resulted in low flow conditions in the Ramapo River. As of today, river flow had dropped to 11.2 MGD. Under these circumstances, UWNY would normally augment the river flows by operating its wells 99 and 100 to waste directly into the river for purposes of flow augmentation. Since these wells are in close proximity to the regulatory weir in Suffern, they are effective for river flow augmentation.

However, due to the recent spill of trichlorofluoromethane ("R-11") in close proximity to the Ramapo Valley Well Field, UWNY does not believe it is prudent at this time to run wells 99 and 100 wells to waste into the river. This is based on aquifer. UWNY has been continuously operating its wells 84 and 85 to waste into the River to attempt to capture the plume of R-11 contamination and prevent it from moving in the direction of other wells. If wells 99 and 100 were run to waste at this time, there would be risk that the plume would move in that direction, which also would bring it closer to Village of Suffern wells.

Therefore, UWNY requests that the bypass requirement at the Suffern weir be temporarily modified from a daily average of 8.00 MGD, with no set restrictions on UWNY pumping, to the following:

> UWNY will be required to cease all pumping from the subject wells if the flow of the Ramapo River as measured at the Suffern gauging station is at or below 4 million gallons per day. If the flow is between 4 and 8 million gallons per day, UWNY shall be required to restrict its pumping of the Ramapo Valley Well Field as follows:

Daily Average River Flow Between	Maximum UWNY Pumping from Ramapo Valley Well Field
7.5 - 8 MGD	8 MGD
7 0 - 7.5 MGD	7.5 MGD
6.5 - 7MGD	7 MGD
6 - 6.5 MGD	6.5 MGD
5.5 - 6 MGD	6 MGD
5 - 5.5 MGD	5.5 MGD
4.5 - 5 MGD	5 MGD
4 - 4.5 MGD	4.5 MGD

UWNY requests that this modification be instituted on a temporary basis for a 14-day period effective June 10, 1999 through June 23, 1999.

UWNY has consulted with the Village of Suffern, which has no objection to this request. United Water New Jersey has also given its consent to this application.

Please contact me at (201) 767-2886 if any additional information is required.

Thank you for your consideration of this request.

Very truly yours,

Carla E. Hjelm
dp

Carla E. Hjelm
Corporate Attorney

cc: Mayor Andrew C. Haggerty, Village of Suffern
Thomas Micelli, Rockland County Health Department
Robert Oberthaler, New Jersey Department of Environmental Protection

NYDEC emergency authorization of modification of 8 mgd passing flow at Suffern to 4 mgd in 1999 drought, July 28, 1999 letter to Ms. Carla Hjelm from Alexander Ciesiuk, Region 3, NYDEC.

Ex. NJDEP-43

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 112

DECEMBER 8, 1980

MEETING FILE COPY

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

---X

In the Matter of the SPRING VALLEY WATER COMPANY, INC., Relative to Summary Abatement Order and Notice Dated October 17, 1980 and Temporary Modification of Water Supply Applications #6507 and #2189

ORDER

---X

I, Robert F. Flacke, Commissioner of the Department of Environmental Conservation of the State of New York, having found after reading and filing the affidavit of William H. Lee, my designated Emergency Drought Coordinator, which is hereto attached, and due deliberation having been had, in accordance with my decision of November 21, 1980 in relation to this matter, it is

ORDERED:

THAT the Spring Valley Water Company maintain the rate of the releases from Lake DeForest Reservoir at a flow which will maintain a flow of 7.75 million gallons per day in the Hackensack River below the intake of the Village of Nyack until another order is issued. .

THAT the Spring Valley Water Company lower the rate of withdrawals from Lake DeForest Reservoir to the minimum necessary for Rockland County.

THAT the Spring Valley Water Company pump as much water as possible, but in no event more than 8.00 mgd, from the Ramapo Valley well field to meet water supply demands in its service area when the flow in the Ramapo River is between 3 mgd and 8 mgd at the Suffern gauge.

Service hereof shall be made upon Respondents by telephone or by delivering a copy hereof to its offices or to the offices of its attorney or attorneys, which manner of service, in my judgment will reasonably notify the Respondents.

Robert F. Flacke, Commissioner
New York State Department of
Environmental Conservation

By:
M. Peter Lanahan, Jr.
First Deputy Commissioner

Dated: December 8 , 1980

TO: Spring Valley Water Company, Inc.
360 West Nyack Road
West Nyack, New York 10994

Hearing File
Copy

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
---X

In the Matter of the SPRING VALLEY WATER COMPANY, INC., Relative to Summary Abatement Order and Notice Dated October 17, 1980 and Temporary Modification of Water Supply Applications #6507 and #2189

AFFIDAVIT

---X

WILLIAM H. LEE deposes and says:

1. I am the Drought Emergency Coordinator designated by Commissioner Robert F. Flacke of the New York State Department of Environmental Conservation. I have a bachelor's degree in Civil Engineering and a master's degree in Engineering Mechanics specializing in hydraulics. I have a Professional Engineering License in the States of New York and Massachusetts. I have worked in the area of water resources and water supply for over twenty years.

2. I submit this affidavit in support of an order to manage the waters of Lake DeForest Reservoir and the Ramapo Valley well field operated by the Spring Valley Water Company pursuant to the Department decision dated November 21, 1980 in the matter of Spring Valley Water Company, Inc., relative to Summary Abatement Order and Notice dated October 17, 1980 and Temporary Modification of water supply applications #2189 and #6507.

3. I have reviewed the actual inflow into Lake DeForest Reservoir for the last several months and resultant net storage level, flowage conditions in the Ramapo River, operation of the Spring Valley Water Company rock wells and its overall system and the relative needs of the upstream and downstream users of the Hackensack River. I found that the reservoir storage level in

Lake DeForest Reservoir was at 1.608 billion gallons at midnight of December 7, 1980, and the average net inflow to Lake DeForest Reservoir for the last two weeks in November 1980 was about 24 million gallons a day and about 7 mgd for the first week in December. Meanwhile, the average flow in the Ramapo River at Suffern gauge was 24.6 million gallons a day on December 7, 1980.

4. Based on the guidelines provided in the Department decision and on the information above, I recommend that the Spring Valley Water Company maintain the rate of releases from Lake DeForest Reservoir at a flow necessary to maintain a flow of 7.75 mgd in the Hackensack River below the intake of the Village of Nyack, lower the withdrawal from Lake DeForest Reservoir as much as possible for Rockland County, and pump the Ramapo Valley well field as much as possible, but not to exceed 8 mgd, when the flow in the Ramapo River is between 3.00 mgd and 8.00 mgd at the Suffern gauge.

William H. Lee

William H. Lee

Subscribed and sworn to before me
this 8th day of December, 1980.

Pamela V. Smith

PAMELA V. SMITH
Notary Public, State of New York
Qualified in Columbia County
Commission Expires March [illegible], 1988
[illegible]

August 19, 1995 letter from Ralph Manna Jr., NYDEC,
to Carl H. Grossman, Spring Valley Water Company

Ex. NJDEP-44

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 113

New York State Department of Environmental Conservation

21 South Putt Corners Road
New Paltz, NY 12561-1696
(914) 255-5453

Henry G. Williams
Commissioner

August 19, 1985

REC'D
AUG 22 [illegible]
WATER RESOURCES

Mr. Carl H. Grossman
Spring Valley Water Company
360 West Nyack Road
West Nyack, New York 10994

Spring Valley Water Co., Inc.--41st Appl.
RE: Ramapo Valley Well Field
WSA No. 6507
5th Modifying Decision*

Dear Mr. Grossman:

I have considered your written requests of July 25, 1985 and August 14, 1985. In view of the drought emergency circumstances and the precedent established in Commissioner Flacke's Temporary Modification Decision of November 21, 1980, I am hereby amending your permit to provide similar temporary relief from condition B of the original approval.

Accordingly, the applicable Ramapo River flow restriction from the 1980 Decision remains three million gallons per day. Below that, pumping of the well field is to be terminated. All other permit conditions of the original approval and the Modifying Decision remain as written, except as modified herein.

All reports specified in Recommendation D of the 1980 Decision shall be submitted to Mr. Edward Karath, Chief of Water Management, NYSDEC, 50 Wolf Road, Albany, New York 12233-0001, and to me at this address.

This temporary relief shall be in effect through January 31, 1986. Should the drought and low flow conditions persist, some further temporary extension will be considered.

If you have any questions on your obligations under this temporary modification, please do not hesitate to contact me. Thank you for your cooperation.

Respectfully,

Ralph Manna Jr.

Ralph Manna, Jr.
Regional Permit Administrator
Region 3

RM/ar
cc: P. Keller
C. Manfredi
E. Karath
S. Dean
1980 Parties

* Numbering of modifying decisions corrected by G.G. Behn, 8/26/85. GB

September 11, 1995 letter from Harry Russo, UWNY, to Commissioner Michael D. Zagata, NYDEC.

Ex. NJDEP-45

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 114

United Water

United Water New York
360 West Nyack Road
West Nyack, NY 10994
telephone 914 623 1600
facsimile 914 620 3311
mail replies to: 200 Old Hook Road
Harrington Park NJ 07640-1799

September 11, 1995

VIA FAX and FEDERAL EXPRESS

Commissioner Michael D. Zagata
State of New York
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233

Re: **Water Supply Application No. 2189**
Lake Deforest Reservoir
Water Supply Application No. 6507
Ramapo Valley Well Field
Application for Reinstatement of Temporary Modifications

Dear Mr. Zagata:

United Water New York (previously "Spring Valley Water Company") provides the public water supply for most of Rockland County, New York. The persistent deficiency of precipitation in this region has resulted in conditions that prompted the Rockland County Commissioner of Health, in accordance with the Sanitary Code of Rockland County, to declare a Stage II Water Emergency for all of Rockland County. A copy of that Declaration dated September 1, 1995 is attached hereto.

In response to a prior drought which occurred during 1980, the Department of Environmental Conservation, by Decision dated November 21, 1980, In re Spring Valley Water Company, Inc. Relative to Summary Abatement Order and Notice Dated October 17, 1980, and Temporary Modification of Water Supply Application No. 6507 - Ramapo Valley Well Field and Water Supply Application No. 2189 - Lake DeForest Reservoir, and the subsequent Order dated December 29, 1980, authorized temporary modifications to the minimum release and bypass restrictions of the above referenced permits.

Lack of normal rainfall, which long term weather forecasts indicate will continue, together with low stream flows, have created water supply emergency conditions which again require a temporary modification of the above referenced permits in order to protect and conserve the limited water resources available to serve the people of Rockland County. Despite augmenting the Ramapo River with over 350 million gallons of water from various sources (in accordance with recommendations of and with the approval of your Department), maintenance of the 8.00 MGD bypass requirement could not be met, and, therefore, in accordance with our Water Supply Application 6507, the entire Ramapo Valley Well Field (authorized withdrawal 14.00 MGD) was shut down and taken out of service at 4:00 A.M., Wednesday, September 6, 1995. In addition, our DeForest Reservoir is currently at 44.3% capacity, significantly below the norm of 62% at this time. Based on below normal precipitation predictions for the remainder of 1995, DeForest Reservoir will not refill next spring for the 1996 summer season without extraordinary measures being taken. This would continue into next year the severe stress on the water supply situation being experienced in Rockland County.

Accordingly, United Water New York requests reinstatement of the following relaxation of the release and bypass requirements of the above referenced permits:

That the Lake DeForest minimum release be changed from 7.75 MGD to a requirement that:

> United Water New York be allowed to maintain the rate of the releases from Lake Deforest Reservoir at a flow which will maintain a flow between 4.00 and 7.75 MGD in the Hackensack River below the intake of the Village of Nyack until a further Order is issued; and

That the bypass requirement at the Suffern gauge be changed from 8.00 MGD to a requirement that:

> United Water New York be allowed to pump as much water as possible, but in no event more than 8.00 MGD, from the Ramapo Valley Well Field to meet water supply demands in its service area when the flow in the Ramapo River is between 3.00 MGD and 8.00 MGD at the Suffern gauge, until a further Order is issued.

Both these modifications were fully considered and initially authorized by the Order dated December 29,1980 during that previous drought. In addition, the same temporary modifications to the Ramapo Valley Well Field bypass requirements now being requested were authorized by Letter dated August 19, 1985, during the drought emergency situation which existed in that year.

The New Jersey Department of Environmental Protection has been advised of this situation and the fact that actual gauge flows in the Ramapo River have dropped to below 1.1 MGD since United Water New York has stopped production from its well field and augmentation from other surface and groundwater sources. It is in the best interest of all downstream users that additional augmented flows, albeit at a reduced amount, begin at the earliest point in time; granting the permit modifications will allow such augmentation to commence again. United Water New Jersey, the only New Jersey purveyor impacted by the change in the DeForest releases, fully supports this application.

Please contact Michael Barnes, Director-Operations of United Water New York Inc., at (914) 623-1500, or Pen Tao, Director-System Planning of United Water New Jersey at (201) 767-2840, if you require any further information with respect to the operating conditions which make this Application necessary. Please contact the undersigned at (201) 767-2816 or Carla Hjelm, Esq., Corporate Attorney-Rates & Regulations of United Water New York, at (201) 767-2886, with regard to any procedural or legal aspects of this Application.

In view of the full exploration of the appropriateness of these temporary modifications when they were initially authorized by an Order of the Department issued after a full public hearing on them, United Water New York respectfully submits that the temporary reinstatement of these modifications at this time can be considered minor; i.e, they do not constitute a material change in the conditions of the above referenced permits nor the natural flow characteristics of the waterways.

United Water New York therefore urges that the Department of Environmental Conservation act expeditiously in the public interest on this request to preserve the integrity of the water supply and grant this Application.

Very truly yours,

Harry A. Russo
Corporate Counsel

HAR\eob
Enclosure
cc: Gary Spielmann, Executive Deputy Commissioner, NYS DEC
Lou Concra, Regulatory Services, NYS DEC
Dan Campbell, Regional Affairs, NYS DEC

N. G. Kaul, Director-Water, NYS DEC
Warren Lavery, NYS DEC
George Danskin, NYS DEC
Cesare J. Manfredi, NYS DEC
Margaret Duke, NYS DEC
The Honorable Harold A. Jerry, Jr., Chairman, NYS PSC
Mr. Philip Teumim, Director-Energy & Water, NYS DPS
Commissioner Barbara DeBuono, NYS Dept. of Health
Commissioner Marvin Thalenberg, M.D., Rockland Co. Health Dept.
The Honorable C. Scott Vanderhoef, Rockland Co. Executive
The Honorable Joseph A. Holland, NYS Senate
The Honorable Alexander J. Gromack, NYS Assembly
The Honorable Nancy Calhoun, NYS Assembly
The Honorable Samuel Colman, NYS Assembly
Mayor George Parness, Suffern, New York
Leonard Cooke, Chairman, Village of Nyack
Commissioner Robert C. Shinn, Jr., New Jersey DEP (FEDERAL EXPRESS)

DaKane - aa

RECEIVED
SEP 14 1995
WATER RESO

UnitedWater

United Water New York
200 Old Hook Road
Harrington Park, NJ 07640-1799
telephone 201 767 9300
facsimile 201 767 7018

cc: M Zagata
D Steinman
C Hanfords

Date: September 11, 1995

To: Commissioner Michael D. Zagata - NYS DEC

Fax # 518-457-7744

From: Harry A. Russo, Esq. - United Water New York

Subject: Application for Reinstatement of Temporary Modifications

\# of pages: 5 plus this cover

cc:

9/12.

Fax

SEP 13 1995

TV 05769 - Donald Distante response to NJDEP document request

Ex. NJDEP-46

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 115

Responses to
New Jersey Department of Environmental Protection
Document Request of April 27, 2001 (NJDEP-3)
Case No. 98-F-1968

Ramapo Energy Project

Request 8: Copies of any studies or analyses developed by or on behalf of United Water New York to support long-term or temporary lowering of required passing flows during periods of low flow in the Ramapo River.

Response:

After reviewing Company records, we did not find formal studies on this issue. The Company has never requested permanent lowering of the 8 MGD requirement for Ramapo Valley Well Field operations. All temporary requests were made during periods of drought, when the river was well below 8 MGD under natural conditions. It should also be noted that the term "required passing flows" only refers to the requirement that the Ramapo River flow be at 8 MGD when the Ramapo Valley Well Field is operating, and that there is no passing flow condition at other times.

Data Response Prepared By: Donald Distante

Date: May 9, 2001

Water release agreement between Spring Valley Water Company and Ramapo Land

Ex. NJDEP-47

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 116

WATER RELEASE AGREEMENT

AGREEMENT dated November 2 , 1990 between RAMAPO LAND CO., INC. ("Ramapo Land"), a corporation organized under the laws of the State of New York and having its principal office at Route 17, Sloatsburg, New York 10974, and SPRING VALLEY WATER COMPANY INCORPORATED ("Spring Valley"), a public utility corporation organized under the laws of the State of New York and having its principal office at 360 West Nyack Road, West Nyack, New York 10994;

WHEREAS, the decision of the New York State Department of Environmental Conservation ("DEC") on Spring Valley's application for permission to develop its Ramapo Valley Well Field, WSA No. 6507, dated September 15, 1976, directs cessation of pumping operations at said well field whenever the flow in the Ramapo River is below 8 million gallons per day as measured at the Suffern Gauging Station; and

WHEREAS, Spring Valley is desirous of obtaining certain rights from Ramapo Land to release water from Potake and Cranberry Ponds for the purposes of augmenting the flow of the Ramapo River to help assure the uninterrupted operation of the Ramapo Valley Well Field; and

WHEREAS, Ramapo Land has agreed, subject to obtaining the approval of the DEC or such other governmental authority or agency as may have jurisdiction with respect to the foregoing release, to grant to Spring Valley certain rights to release water from Potake and Cranberry Ponds (hereinafter referred to as the "Water Release Rights").

NOW, THEREFORE, in consideration of the premises and the mutual covenants herein set forth and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereby agree as follows:

SECTION 1. TERM

The term of this Agreement shall be for a period of ten (10) years (the "Term"). The Term shall commence on the date of closing.

SECTION 2. ANNUAL PAYMENT

In consideration for the Water Release Rights granted hereunder, Spring Valley agrees to make an Annual Payment to Ramapo Land as follows:

(a) Upon the date of closing, One Hundred Fifty Thousand Dollars ($150,000.00) in cash, certified, or cashier's check.

(b) Subject to the adjustment described in Section 3 hereunder, upon each anniversary date of the commencement of the Term, One Hundred Fifty Thousand Dollars ($150,000.00) in cash, certified or cashier's check.

SECTION 3. CONTRACT ADJUSTMENT

The Annual Payment shall be adjusted commencing with the Annual Payment due on the fifth (5th) anniversary of the commencement of the Term for the sixth (6th) year of the Agreement. The adjustment shall be based on one-half of the percentage increase, if any, in the Consumer Price Index ("CPI") over the first five (5) years of the Term, which increase shall be measured by subtracting the CPI as of July 1, 1990 from the CPI as of the last day of the fifty ninth month following the date of closing. It is agreed that the CPI s of July 1, 1990 is 138.4. If there has been an increase in the CPI, Ramapo Land shall notify Spring Valley in writing of such adjustment at least fifteen (15) days prior to the effective date of the adjustment. The notice shall state the amount of said adjustment and shall include all supporting workpapers. The notice shall also include the total amount of the Annual Payment required for the balance of the Term. Failure of Ramapo Land to give such notice shall not waive or defer the time or amount of any such payment due hereunder, but shall simply defer the time for Spring Valley to review the computation of Ramapo Land and its supporting papers.

CSV

SECTION 4. RENEWAL TERM

Upon the expiration of the Term, Spring Valley shall have the option to renew this Agreement for one (1) additional ten (10) year period (the "Renewal Term"). Spring Valley shall exercise this option to renew by providing Ramapo Land, its successor or assigns, with written notice of its intention to renew at least three (3) months prior to the expiration of the Term. In the event Spring Valley elects to renew the Agreement for said additional ten (10) year period, the Annual Payment shall be adjusted for the first through the fifth years of the Renewal Term and again for the sixth through the tenth years of the Renewal Term. In each case the Annual Payment under Section 2 plus any previous increases under Section 3 shall be adjusted for the percentage increase in the CPI over the respective previous five (5) year periods, which increase shall be measured in accordance with the requirements of Section 3 hereinabove.

SECTION 5. CLOSING

The closing shall take place within thirty (30) days of receipt by the parties of all of the approvals necessary pursuant to this Agreement, including those referred to in Section 10 hereunder.

SECTION 6. WATER RELEASE RIGHTS

Ramapo Land hereby grants to Spring Valley the right to release water from Potake and Cranberry Ponds for purposes of augmenting the flow of the Ramapo River in accordance with the decision of the DEC on Spring Valley's application for permission to develop its Ramapo Valley Well Field, WSA No. 6507, dated September 15, 1976, which would require the cessation of pumping operations at said well field whenever the flow of the Ramapo River fell below eight million gallons per day as measured at the Suffern Gauging Station. Any release of water pursuant to this Agreement, shall be in compliance with the Management and Operation Plan referred to in Section 8(c) and shall be subject, however, to the following limitations:

(a) No quantity of water shall be withdrawn that would have the effect of lowering the water level of Potake Pond below United States Geological Survey ("USGS") Elevation 612.1 and provided further that in no event shall the level of Potake Pond be lowered more than four and one-half (4.5) feet, as measured from the top of the dam spillway as it exists from time to time;

(b) No quantity of water shall be withdrawn that would have the effect of lowering the water level of Cranberry Pond below USGS Elevation 512.5 and provided further that in no event shall the level of Cranberry Pond be lowered by more than two (2) feet, as measured from the top of the dam spillway as it exists from time to time; and

(c) The withdrawal or release of any and all water from said ponds throughout the year shall be performed at a time and in a manner consistent with prudent management and conservation practices and in accordance with the requirements, if any, of the DEC, Army Corps of Engineers or any other governmental agency with jurisdiction thereof. In this regard, Spring Valley agrees to operate its Ramapo Valley Well Field in a manner consistent with its historical operating methods ~~and practices. Spring Valley shall~~ notify Ramapo Land of any deviations from its historical method of operation of its Ramapo Valley Well Field or of the Management and Operation Plan referred to in Section 8(c).

(d) The parties recognize that Ramapo Land, its successors and assigns, has and does retain the right to use the Potake and/or Cranberry Ponds for any and all purposes including recreational, fire protection and non-potable (as defined in the Management and Operation Plan) water supply purposes and that all rights conveyed hereunder are subject to any and all rights conveyed to any member of the Pierson Lakes Homeowner's Association, Inc. set forth in the Offering Plan of Pierson Lakes Homeowner's Association, Inc. and the declaration of covenants, easements and restrictions forming a part thereof as amended from time to time.

(e) Ramapo Land, its successors and assigns, shall not authorize any testing of its fire protection system from June to October (except in case of an emergency) without first ~~giving notice of same at least 24 hours~~ in advance to Spring Valley. Ramapo Land shall make available for inspection to Spring Valley any and all records maintained by Ramapo Land relative to the operation and maintenance of the fire protection system including leaks, discharges and testing of the system.

SECTION 7. OPERATION OF DAMS

(a) During the Term, and Renewal Term, if any, Spring Valley shall be responsible for the operation and maintenance, including ordinary and necessary repairs as described on Exhibit A attached hereto and made a part hereof, of the dams, spillways and appurtenances at Potake and Cranberry Ponds, provided however, Ramapo Land shall be required to perform the following repairs and improvements to the dams prior to the closing called for hereunder:

(i) install a one-foot barrier on the top of the dam on Cranberry Pond as shown in the drawing attached hereto as Exhibit B;

(ii) repair cracking in Bays 3, 5 and 8 of the Tivoli (Cranberry) Pond Dam;

(iii) provide supplementary support for the deck beam in Bay 5 of the Tivoli (Cranberry) Pond Dam as shown in the drawing attached hereto as Exhibit C; and

(iv) mitigate seepage flowing through or around buttresses and from Bay 1 into Bay 2 and from Bay 9 into Bay 8 of the Tivoli (Cranberry) Pond Dam.

If the improvements or repair work (the "Work") required of Ramapo Land pursuant to Subparagraphs (i) through (iv) above has not been completed by Ramapo Land prior to Closing, Spring Valley shall have the option of either terminating the Agreement pursuant to Section 10 or extending the time for Ramapo Land to perform the Work upon such terms and conditions as the parties shall agree.

Ramapo Land represents that, to the best of its knowledge, information and belief, the following repairs or maintenance are not currently required by the DEC: (i) raise the training walls at the Cranberry Pond spillway and regrade behind to expose the buried portion of the spillway; (ii) remove the sediment buildup upstream of the Cranberry Pond spillway; (iii) repair the 36" sluice gate at the Cranberry Dam; (iv) install an upstream gate valve on the 10" drain line through the Cranberry Dam; and (v) correct the reverse slope in the 3-foot diameter culvert in the Potake spillway ~~discharge channel.~~

(b) During the Term, the cost of any work or improvements to the Potake or Cranberry dams, spillways or appurtenances required or necessary to allow Spring Valley to release water from Cranberry or Potake Ponds and the cost of the operation and maintenance of the dams, spillways and appurtenances shall be borne entirely by Spring Valley. Notwithstanding this Paragraph (b), Ramapo Land shall be responsible for the cost associated with any extraordinary maintenance which may include work or improvements required solely to comply with any DEC or Army Corps of Engineers report or order (which work does not constitute maintenance or ordinary and necessary repairs) where such report or order does not arise out of or relate to Spring Valley's use of the dams, spillways or appurtenances or the exercise of its Water Release Rights pursuant to this Agreement. However, if the anticipated or actual expenses associated with any extraordinary maintenance to be performed either as a result of any DEC or Army Corps of Engineers report(s) or order(s) or otherwise, which is deemed by Spring Valley to be the responsibility of Ramapo Land, is in excess of $25,000.00 for any twelve month period, then Ramapo Land shall have the option of terminating this Agreement upon three months written notice (or such shorter period if ~~required by the DEC or Army Corps of~~ Engineers by virtue of any limitation in or resulting from such order on the ongoing use of the facilities for the retention or distribution of water on the Ramapo Land site referred to herein). Provided further that if Spring Valley elects to incur and pay the expenses in full and notifies Ramapo Land within the time set forth herein prior to the effective date of cancellation of the Agreement, then Spring Valley may exercise the right to incur that expense and continue this Agreement without any reduction in the Annual Payments otherwise due to Ramapo Land.

(c) Spring Valley shall be responsible for installing and maintaining equipment at Cranberry and Potake Ponds for the purpose of measuring the water level of each Pond. Such measurements shall be used in determining when the restrictions described in Section 6 above shall be imposed. Spring Valley shall also provide Ramapo Land on a daily basis with the "Spring Valley Water Company, Inc. Water Shed and River Gauge Report", which report will include the records of the Ramapo gauging and Suffern gauging stations reflecting the daily flow rate of the Ramapo River, the activity of the Ramapo Valley Well Field and the daily levels of Potake and Cranberry Ponds provided, however, that during the winter months when Spring Valley is not exercising its Water Release Rights under this Agreement, Spring Valley shall provide Ramapo Land the above information on a monthly basis.

(d) Spring Valley has or will inspect all the dams, spillways and appurtenances currently existing on the property of Ramapo Land comprising the existing water distribution system of Pothat Water Company and, upon Closing, same shall constitute an acceptance of all dams, spillways and appurtenances for the purpose of establishing the commencement of Spring Valley's operation and maintenance obligations assumed hereunder.

SECTION 8. CONSTRUCTION OF WATER RELEASE FACILITIES

(a) Spring Valley shall operate water release facilities at Cranberry and Potake Ponds. Ramapo Land shall grant Spring Valley the right to install siphons, drain lines, release pipes, stream gauging stations, flow control facilities, housing for vacuum pumps, telemetry equipment, energy dissipation structures, v-notch weirs or other related facilities ("Water Release Facilities") in the vicinity of Cranberry and Potake Ponds, provided such construction becomes necessary for the purpose of releasing water from the Ponds as permitted under this Agreement subject to the operating standards and practices contained in the Management and Operation Plan referred to in Section 8(c). Prior to Closing or during the Term, as the case may be, Ramapo Land agrees to execute, deliver and acknowledge any instruments of transfer and conveyance, in form satisfactory to counsel of both parties, which are necessary to transfer to Spring Valley, its successors or assigns, the right to construct and to repair, replace and maintain the Water Release

Facilities during the term of this Agreement. Any rights granted to Spring Valley by Ramapo Land herein shall cease upon the termination of this Agreement.

(b) Ramapo Land shall permit Spring Valley to install, or arrange for the installation of, utility services for the purpose of fully equipping the Water Release Facilities. Spring Valley shall be responsible for the installation of and payment for all utility services to be provided. Ramapo Land agrees to make available for Spring Valley's use existing pole lines, wire ways or spare conduits on a temporary basis until the installation of the underground electrical facilities required in connection with the proposed residential development of part or all of the surrounding lands by Ramapo Land. Once said underground facilities are installed or the existing pole lines are removed, whichever shall occur first, Spring Valley shall provide for its own use such underground electrical facilities as are necessary to support the Water Release Facilities.

(c) As part of the construction and operation of the Water Release Facilities at Cranberry and Potake Ponds, a written Management and Operation Plan (the "Plan") has been mutually adopted by the parties, a copy of which is annexed hereto as Exhibit "D". The parties recognize the noise level and other aesthetic implications of the proposed improvements shall be consistent with the development and enjoyment of the surrounding lands as an exclusive residential subdivision. All such improvements shall be located within ten feet of either side of the current pipelines set forth on a survey map attached hereto as Exhibit "E" unless otherwise agreed in writing by Ramapo Land. Such plan shall be submitted to Ramapo Land at least 30 days prior to the construction or alteration of any existing or future system or improvement. In connection with the placement of all improvements, at no time shall any improvement, pipe or other facility associated with the Water Release Facilities be placed in or on the lands of Ramapo Land, its successors or assigns, designated as a building lot on a Survey Map attached hereto as Exhibit "F" and shall only be placed in such common areas as designated thereon with the consent of the Pierson Lakes Homeowners Association.

(d) At the option of Ramapo Land, upon the termination of this Agreement, Spring Valley shall be required to remove any part or all of the improvements and alterations made by Spring Valley to the dams, spillways and appurtenances as well as the Water

Release Facilities constructed under the Agreement. If Ramapo Land elects to have any part or all of said improvements removed, then it shall notify Spring Valley, in writing, within 60 days of the termination of this Agreement, at which time the parties shall agree on a mutually satisfactory schedule for removal and return of the premises to the same condition as previously existed.

SECTION 9. INDEMNIFICATION AND INJUNCTIONS

(a) Ramapo Land, its successors and assigns, hereby assumes all risk of loss of or damage to any property whatsoever and injury to or death of any persons whomsoever, occurring by reason of, or in connection with or as a result of the Work and operations herebefore or hereafter performed by Ramapo Land, its successors and assigns at or around the ponds, and hereby agrees to indemnify, save harmless and release Spring Valley from and against any and all liability, loss, damage injury or death thus assumed, and from and against any and all claims, demands, actions, suits, judgments, costs, charges, fees (including reasonable attorney fees), damages, and expenses which may arise by reason of (i) the operation or activities by Ramapo Land in or around the ponds; or (ii) the breach by Ramapo Land of any of its obligations or covenants contained in this Agreement.

(b) Spring Valley, its successors and assigns, hereby assumes all risk of loss of or damage to any property whatsoever and injury to or death of any persons whomsoever, occurring by reason of, or in connection with or as a result of the Work or operations herebefore or hereafter performed by Spring Valley, its successors and assigns at or around the ponds, and hereby agrees to indemnify, save harmless and release Ramapo Land from and against any and all liability, loss, damage injury or death thus assumed, and from and against any and all claims, demands, actions, suits, judgments, costs, charges, fees (including reasonable attorney fees), damages, and expenses which may arise by reason of (i) the operation or maintenance of the dams, spillways and appurtenances, and construction operation and maintenance of the Water Release Facilities by Spring Valley, or (ii) the breach by Spring Valley of any of its obligations or covenants contained in this Agreement. In addition, and not by way of limitation, Spring Valley recognizes that if it fails to adhere to the Plan, such failure may result in damage to any or all of the ponds, dams, spillways and appurtenances and that Spring Valley will be responsible to Ramapo Land, its successors and assigns for the cost of any repair resulting therefrom.

(c) In addition to any other remedies available to the parties in law or in equity, the parties shall be entitled to restraint by injunction of the violation, or attempted or threatened violation, of any condition or provision of this Agreement, or to a decree specifically compelling performance of any such condition or provision.

SECTION 10. APPROVALS

This Agreement shall be subject to the approval of the DEC and any other regulatory agency having jurisdiction thereof. Ramapo Land shall cooperate with Spring Valley in obtaining DEC approval or any other regulatory approval, and if required by Spring Valley, shall join in any application made by Spring Valley to the DEC or any other regulatory agency.

SECTION 11. TERMINATION

(a) This Agreement may be terminated and abandoned at any time prior to the Closing Date:

(i) by mutual consent of Ramapo Land and Spring Valley; or

(ii) by Spring Valley in the event Ramapo Land fails to comply with its obligations under Section 7 of this Agreement with respect to completion of the Work.

(b) Adverse Effect

It is the intent of the parties hereto to perform water releases in a way that minimizes potentially adverse effect(s) to the ponds generally and more particularly to their recreational and aesthetic value. The parties recognize that the fundamental act of withdrawing water to the agreed levels from the Ponds will have some effect on the recreational and aesthetic value of the Ponds. Nevertheless, due to the uncertainty surrounding whether such releases might have an unusual effect beyond that reasonably anticipated to result from said releases, the parties agree that the following steps will be taken to identify and correct any problems arising therefrom. When a potentially adverse effect is noted other than the anticipated effect in the recreational and aesthetic value to the Ponds, Ramapo Land may request a determination (the "Report") to be made by a consultant fully qualified to make such findings and agreeable to both parties as to whether the potentially adverse effect: (i) has been caused principally by the water release activity; (ii) is likely to continue if water releases in the manner and/or at the level of the prior two years (or from inception if it has been less than two years from inception of this Agreement) are maintained or increased; and (iii) is or is not subject to remediation. Upon such a positive finding, the parties hereto shall immediately enter into discussions with the consultant to determine whether a modification can be made to the Plan or the release processes and/or equipment and whether the adverse effect being observed can be mitigated through such modification or through any other measure. The parties shall use their best efforts to create a plan to mitigate and/or remediate the potential adverse effects.

In the event that a plan approved by the consultant and Ramapo Land is not approved and adopted by Spring Valley within 45 days of its submission to Spring Valley or there is a determination by the consultant that the adverse effect cannot be mitigated, this Agreement may be terminated by Ramapo Land upon three (3) months written notice to Spring Valley.

If Ramapo Land terminates this Agreement pursuant to this Section during the first two years after closing, Ramapo Land agrees to reimburse Spring Valley for the undepreciated original cost of the Spring Valley's investment in the Water Release Facilities. Ramapo Land also agrees that if it terminates this Agreement at any time during the Term or any renewal thereof, that it will refund to Spring Valley a pro rata portion of the Annual Fee for the year of termination. For instance, if termination were to become effective after the fifth (5th) month of the year, Spring Valley would be entitled to a refund of seven-twelfths (7/12) of the Annual Fee for that year.

The parties acknowledge that the cost of any Report shall be paid for equally by the parties.

SECTION 12. NOTICE

All notices to be given hereunder shall be properly given if they are addressed

to Ramapo Land:

C. Scott Vanderhoef, President
Ramapo Land Co., Inc.
Route 17, P.O. Box 45
Sloatsburg, New York 10974

with a copy to:

Thomas A. Condon, Esq.
Birbrower, Montalbano,
Condon & Frank, P.C.
67 North Main Street
New City, New York 10956

to Spring Valley:

George M. Haskew, Jr., President
Spring Valley Water Company
200 Old Hook Road
Harrington Park, New Jersey 07640

with copy to:

Robert A. Gerber, Esq.
200 Old Hook Road
Harrington Park, New Jersey 07640

or such other address as either party may from time-to-time furnish to the other in writing for such purposes.

All notices shall be in writing and shall be mailed by certified or registered mail in an envelope, postage prepaid, addressed as above described, return receipt required.

SECTION 13. GOVERNING LAW

This Agreement and its validity, interpretation, performance, and enforcement shall be governed by the laws of the State of New York.

SECTION 14. ENTIRE AGREEMENT

This Agreement contains the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior under standings, if any, with respect thereto. This Agreement may not be modified, changed, supplemented or terminated unless in writing and signed by both parties.

SECTION 15. ASSIGNMENT

This Agreement shall bind and inure to the benefit of the parties hereto and their respective successors and legal representatives, but shall not be assignable by any party without the written consent of the other party which shall not be unreasonably withheld or delayed.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their duly authorized officers and have caused their corporate seals to be hereto affixed and attested as of the date first above written.

RAMAPO LAND CO., INC.

By________________________
C. Scott Vanderhoef, President

(Seal)

Attest:
Barbara Lewis
Secretary

SPRING VALLEY WATER COMPANY
INCORPORATED

By________________________
George M. Haskew, Jr., President

(Seal)

Attest:
Allan D. Shakley
~~Patricia Davidson~~ Allan D. Shakley
Assistant Secretary

STATE OF NEW YORK)
: ss:
COUNTY OF ROCKLAND)

On the 2nd day of November in the year 1990, before me personally came C. SCOTT VANDERHOEF, to me known, who, being by me duly sworn, did depose and say that he resides 158 Spook Rock Rd Montebello, New York ; and that he is the President of RAMAPO LAND CO., INC. the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

THOMAS A. CONDON
NOTARY PUBLIC, State of New York
No. 4503470
Qualified In Rockland County
Commission Expires July 31, 19 91

STATE OF NEW YORK)
: ss:
COUNTY OF ROCKLAND)

On the 2nd day of November in the year 1990, before me personally came GEORGE M. HASKEW, JR., to me known, who, being by me duly sworn, did depose and say that he resides 30 VAN EMBURGH AVENUE, HILLSDALE, NEW JERSEY ; and that he is the President of SPRING VALLEY WATER COMPANY INCORPORATED, the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

LUCILLE J. BEVILACQUA
NOTARY PUBLIC State of New York
NO. 4730106
RESIDING IN ROCKLAND COUNTY
COMMISSION EXPIRES 5/31/92

EXHIBIT A

MAINTENANCE, REPAIR WORK AND ADMINISTRATIVE RESPONSIBILITIES AT POTAKE AND CRANBERRY DAMS AND SPILLWAYS

1. Ordinary maintenance and administrative responsibilities to be performed by Spring Valley Water Company

   a. Repair animal burrows, depressions, tire ruts, and erosion occurring at both dams and spillways.

   b. Provide a regular program to cut grass and clear brush and trees at both dams and adjacent to and downstream of both spillways.

   c. Repair surface spalling which may develop in the concrete at Cranberry Dam and both spillways.

   d. Maintain rip-rap on upstream embankment face of Potake dam.

   e. Make yearly inspection of dams and spillways and document same.

   f. Provide early warning system and emergency action plan for downstream evacuation for both dams.

   g. Additional ordinary and necessary repairs and maintenance of a type and nature which is similar to or the same as the work described in paragraph a through f above.

2. Additional items to be performed by Spring Valley Water Company

   a. Install weir to monitor seepage at the right (west) abutment of Cranberry Dam.
   b. Regrade around the 12" outlet pipe downstream of Potake Dam.
   c. Install weir to monitor seepage at the embankment toe of Potake Dam.

RAMAPO LAND CO

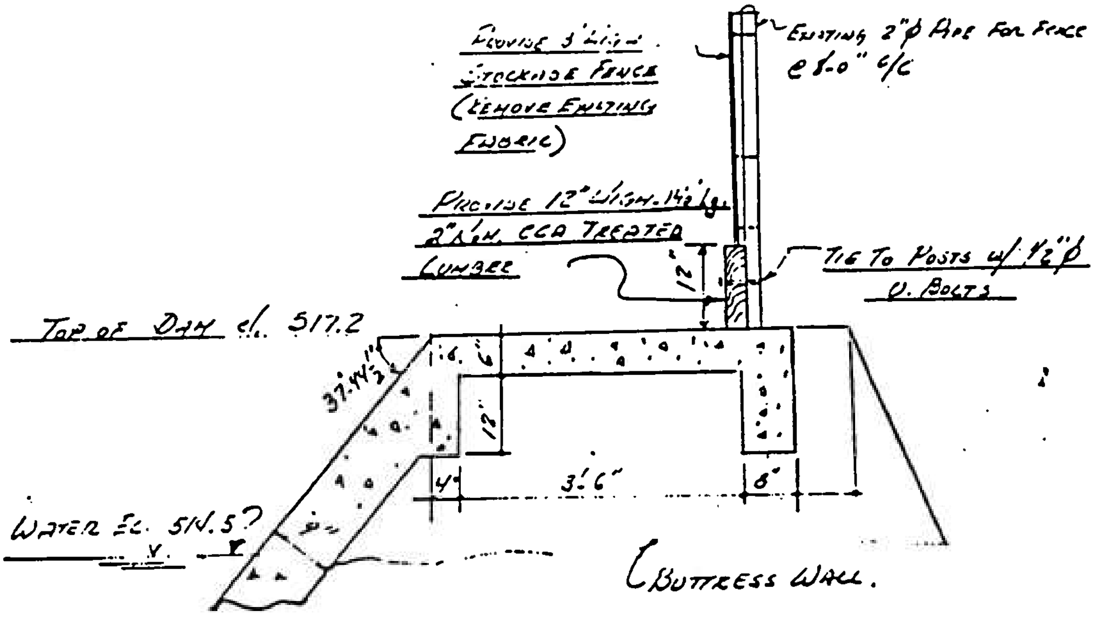
SLOATSBURG N.Y.

PROPOSED RAISING OF DAM
& SAFETY FENCE
CRANBERRY DAM.

BY. G. BASTUG P.E.

JUNE 18, 1989.

PAGE 1 OF 2



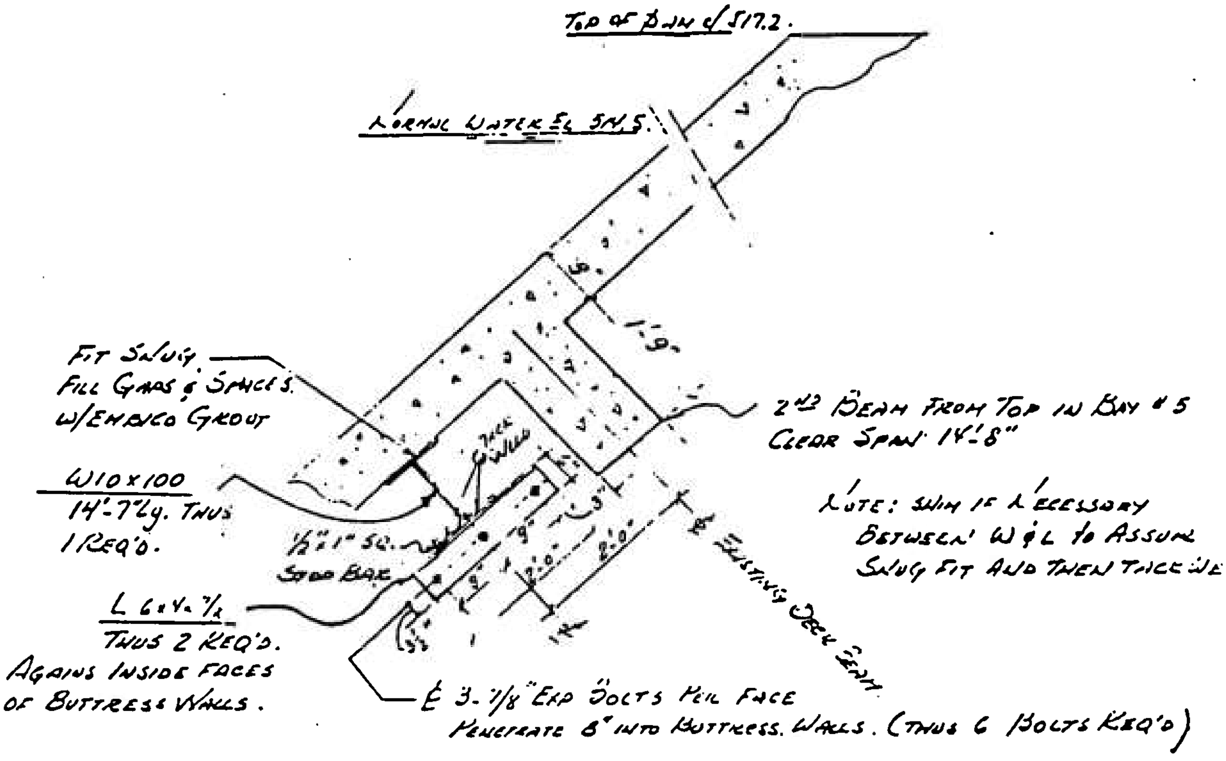
— CROSS SECTION @ TOP OF —
— EXISTING DAM —
SCALE 1" = 2'-0"

BY:

(REV. 1 TO DRW. 84-2 Sheet 1 OF 3)

G.M.G. ENGINEERING
C.M.G. CONSTRUCTION, INC.
476 LOOKOUT AVENUE
HACKENSACK, NEW JERSEY 07601
(201) 342-4568

PROPOSED SUPPLEMENTARY SUPPORT TO DECK 12', BAY #5 IN BETWEEN BUTTRESS WALLS.



— CROSS SECTION THRU DAM —

SCALE 1" = 2'-0"

(SEE DRAWING 84-2 SHEET 1 OF 3)

BY:

G.M.G. ENGINEERING
G.M.G. CONSTRUCTION, INC.
476 LOOKOUT AVENUE
HACKENSACK, NEW JERSEY 07601
(201) 342-4568

MANAGEMENT AND OPERATION PLAN FOR DIVERSION OF WATER FROM POTAKE AND CRANBERRY PONDS BY SPRING VALLEY WATER COMPANY INCORPORATED

I. General

A. This Management and Operating Plan was developed pursuant to Section 8 of the Water Release Agreement dated__________, 1990, between the Ramapo Land Company and Spring Valley Water Company for augmenting the flow in the Ramapo River to help assure the uninterrupted operation of the Ramapo Valley Well Field.

B. Because the water stored in the Potake and Cranberry Ponds is a finite resource, Spring Valley Water Company and Ramapo Land Company agree that the operation of the Ponds must be conducted in a manner that prudently seeks to avoid the unnecessary depletion of this water. In this regard, Spring Valley will use its best efforts to optimize the aesthetic value of the Ponds, to the extent that is possible while meeting its objective of ensuring the uninterrupted operation of the Ramapo Valley Well Field.

C. In accordance with the Water Release Agreement, Spring Valley Water Company is entitled to release water from Potake Pond and from Cranberry Pond. Such releases of water under the Agreement may be made at any time of year throughout the term of the Agreement so long as said releases are consistent with this management and operating plan including but not limited to the sequence of releases provision contained below.

II. Sequence of Releases by Spring Valley

Because Cranberry Pond is downstream of the Potake, the releases that will actually augment the flow of the Ramapo River are those made from the Cranberry Pond. The following is the intended sequence of releases from the ponds. It is understood that these steps will be used as a general guideline to meet the objective of best managing the stored water, but that some variations may occur in the actual levels that are achieved.

A. Withdraw the top four (4) inches of water from Cranberry Pond prior to releasing any water stored in Potake Pond into Cranberry Pond.

B. Once the top four (4) inches of water are withdrawn from Cranberry Pond, begin withdrawals from Potake and at a rate which closely matches the rate at which augmentation water is released from Cranberry Pond. The objective is to hold the level of Cranberry Pond at a point four (4) inches below its spillway. This will continue until Potake Pond has been drawn down twelve (12) inches.

C. Once the top twelve (12) inches of water are withdrawn from Potake Pond next withdraw up to two (2) more inches of water from Cranberry Pond, until Cranberry Pond has been reduced a total of six (6) inches, prior to releasing any further water stored in Potake Pond into Cranberry Pond.

D. Once the top six (6) inches of water are withdrawn from Cranberry Pond, again begin withdrawals from Potake at a rate which closely matches the rate at which augmentation water is released from Cranberry Pond. The objective is to hold the level of Cranberry Pond at a point six (6) inches below its spillway. This will continue until Potake Pond has been drawn down twenty-four (24) inches.

E. Once twenty-four (24) inches of water are withdrawn from Potake Pond next withdraw up to three (3) more inches of water from Cranberry Pond, until Cranberry Pond has been reduced a total of nine (9) inches, prior to releasing any further water stored in Potake Pond into Cranberry Pond.

F. Once the top nine (9) inches of water are withdrawn from Cranberry Pond, again begin withdrawals from Potake at a rate which closely matches the rate at which augmentation water is released from Cranberry Pond. The objective is to hold the level of Cranberry Pond approximately at a point nine (9) inches below its spillway. This will continue until Potake Pond has been drawn down four and one-half (4-1/2) feet.

Releases from Potake down into Cranberry Pond are to stop once the level falls to four and one-half (4-1/2) feet below the spillway.

G. Once Steps A through F are completed, water stored below the top nine (9) inches of Cranberry Pond would be released for augmentation purposes, with releases stopping once the level falls to two (2) feet below the Cranberry spillway.

III. Releases by Ramapo Land

The parties acknowledge that Ramapo Land, for recreational and aesthetic purposes may choose, in its sole discretion, to release water from Potake Pond into Cranberry Pond at a time when Potake Pond has already been reduced by the maximum amount allowed under the Agreement. This would have the effect of lowering Potake Pond below the limits imposed upon Spring Valley herein. In circumstances where Ramapo Land may choose to release any water from Potake Pond into Cranberry Pond, that water in turn may not be released from Cranberry Pond by Spring Valley until the level of Potake Pond has recovered to a level 6 inches above the point it was when Ramapo Land ceased its releases. At that time, Spring Valley will be allowed to release water stored in Cranberry Pond down to the level it had been when Ramapo Land had ceased its releases. For instance, if both Cranberry and Potake Ponds have been reduced to their minimum levels under the Water Release

Agreement and Spring Valley, therefore, is no longer allowed to release any water from the Ponds, then if Ramapo Land, for instance, elected to reduce the level of Potake Pond to a point 5 1/2 feet below its spillway and, as a result, the water in Cranberry Pond increased to a level of 1 foot below its spillway, the water in Cranberry Pond cannot be released until the level of water in Potake Pond has recovered to the minus 5 foot level. At that point in time, the water in Cranberry Pond above the minus 1 foot level would once again be available for release. The purpose of this clause is to allow Ramapo Land to make whatever adjustments in Potake Pond that it deems advisable in the best interest of Ramapo Land without then having the water which it released from Potake Pond into Cranberry Pond, released by Spring Valley. However, it is recognized that the level to which Cranberry Pond is raised as a result of Ramapo Land's releases establishes a new baseline level in Cranberry Pond, above which Spring Valley may draw once Potake Pond recovers by 6 inches. Once Potake Pond recovers to the level of minus 4 1/2 feet, Spring Valley will be entitled to release all water stored in Cranberry Pond above the minus 2 foot level in accordance with the procedures set forth in Section II, Sequence of Releases by Spring Valley, above. If Ramapo Land chooses to make such adjustments in the level of Potake Pond, Ramapo Land shall notify Spring Valley in advance.

IV. Common Use of Pipelines and Stored Water

The parties acknowledge the interest that each has stated during the development of this plan, relating to the use of the pipelines originating at the two ponds to transport water for their own purposes. Specifically, Spring Valley intends to release water from the pipeline originating at Potake Pond down into Cranberry Pond, and to release water from the Cranberry Pond pipeline into the Nakoma Brook to achieve the desired augmentation of flow in the Ramapo River. Ramapo Land intends to use both pipelines as a combined source to feed a fire pumping station it plans to construct at a site below the Cranberry Dam. The station will be equipped with pumps rated at 1.1 million gallons per day, and will pump stored water to fire hydrants in Ramapo Land's residential development in the event of a fire.

Spring Valley agrees to operate its water release facilities in such a manner to ensure that the required flow of 1.1 million gallons per day will be available to Ramapo Land's fire pumping station at all times.

Ramapo Land recognizes that the release of water from the pipelines by Spring Valley will result in a low or negative pressure in some sections of these lines, and that certain areas of their properties which were historically supplied with either domestic water supply or fire protection via the pipelines prior to the signing of the Water Release Agreement will not be receiving such service or protection as a result of these releases. Ramapo Land shall be solely responsible for re-establishing the water supply and fire protection to any of its properties so affected.

Ramapo Land retains the right to use water stored in the two ponds for non-potable water supply, including fire protection as needed during actual fires, for occasional testing or flushing of its fire protection system, and for other minor uses such as irrigation of new plantings. Non-potable uses shall not extend to any continual or high volume withdrawals by Ramapo Land.

V. Prior Right

Notwithstanding anything else to the contrary set forth herein, Spring Valley acknowledges and agrees that Ramapo Land has the prior right from both Cranberry and Potake Ponds, to release through its pipelines, no less than 750 gallons of water per minute at a gradient elevation of 497.0 USGS. Said gradient elevation must be available at the location of the present Filter House (also known as the "Chlorination House"). It is acknowledged by Spring Valley that the prior right set forth above must be maintained at all times for the proposed Fire Pump Station which is designed to meet the fire flow demand of the properties located in the Pierson Lake's development. Spring Valley's water release facilities shall be operated in a manner not to interfere with the foregoing fire flow rate and gradient requirements.

VI. Administration

A. Inspection of Facilities: Spring Valley will perform a yearly inspection of both dams, outlet works and spillways, prepare a report documenting their findings, and furnish Ramapo Land Co. a copy of the report. Spring Valley will accompany representatives of the New York Department of Environmental Conservation or other authorities having jurisdiction on their inspections of the dam facilities, review their findings, and provide the necessary response. Responsibility for any remedial work deemed necessary by such authorities will be in accordance with the terms of the Water Release Agreement.

Spring Valley will develop and implement an emergency action plan for each dam as required by the New York Department of Environmental Conservation.

B. Record Keeping: Spring Valley will install and maintain a staff gauge or other water level measuring equipment at both Potake and Cranberry Ponds, take reading of these levels, and provide Ramapo Land Company with these readings on a daily basis. Spring Valley will also provide Ramapo Land Company with daily figures for the Ramapo gauging and Suffern gauging stations reflecting the daily flow rate of the Ramapo River, and the combined pumpage from the wells in its Ramapo Valley Well Field. Provided, however, that during the winter months when Spring Valley is not exercising its water release rights under the said Water Release Agreement, Spring Valley shall provide Ramapo Land with this information on a monthly basis.

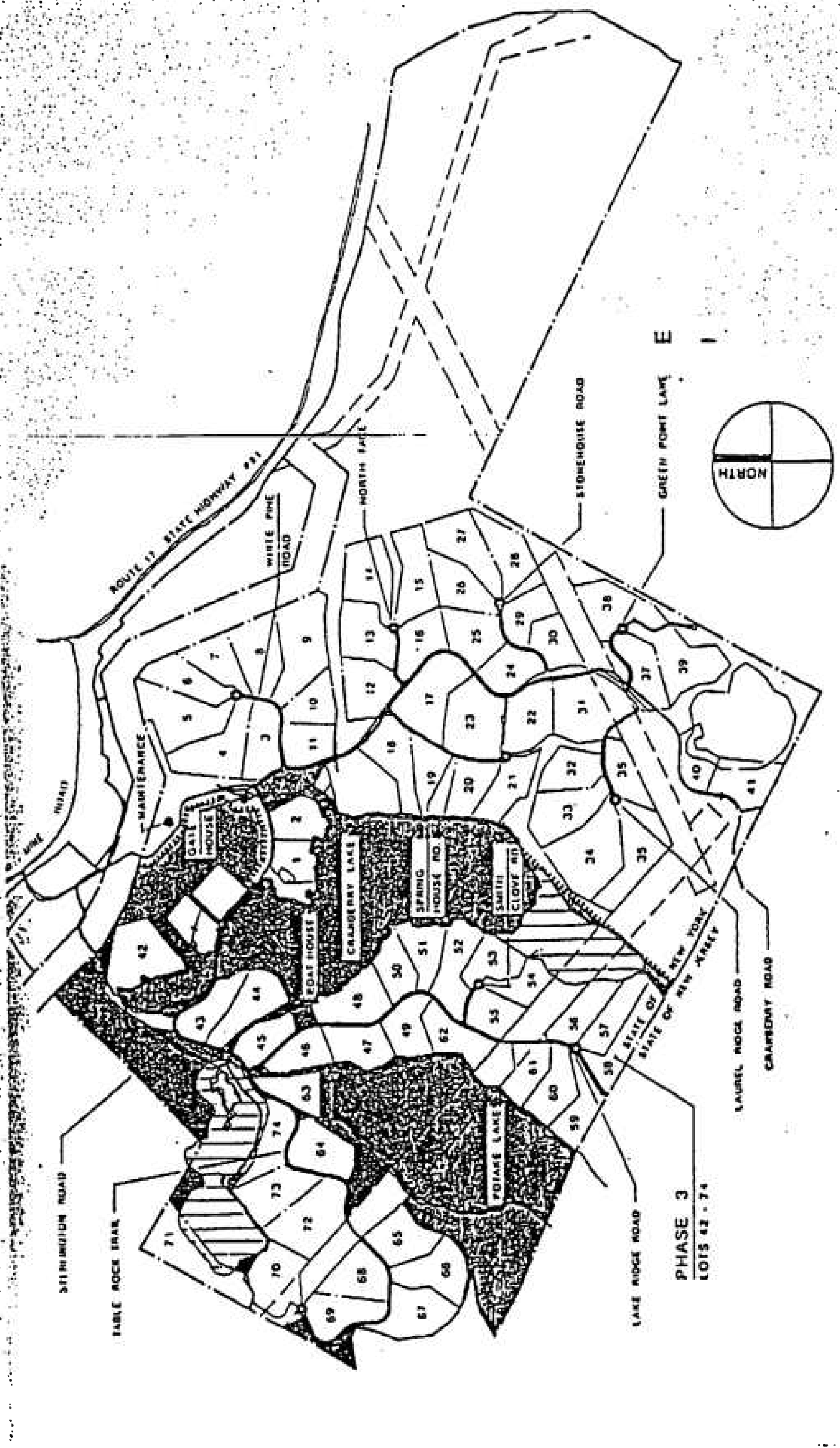
C. Spring Valley will provide a yearly report on the operating history of the ponds and the maintenance work performed at the ponds, dams and spillways, including the cost of this work.

D There shall be no change, alteration, deviation or modification of the Plan without the prior written agreement of Ramapo Land Company and Spring Valley Water Company.

EXHIBIT "E"

Spring Valley Water Company Incorporated, Drawing No. SV1-13/82-30, "Service Territory and Transmission Facilities, Pothat Water Company," dated December 1982 (actual drawing to be attached upon availability of prints).

EXHIBIT "F"


ROUTE 17 STATE HIGHWAY #94
WHITE PINE ROAD
NORTH TAIL
STONEHOUSE ROAD
GREEN POINT LANE
NORTH
E
MAINTENANCE
GATE HOUSE
CRANBERRY LAKE
SPRING HOUSE RD.
SMITH CLOVE RD.
BOAT HOUSE
POTAKE LAKE
STATE OF NEW YORK
STATE OF NEW JERSEY
LAUREL RIDGE ROAD
CRANBERRY ROAD
LAKE RIDGE ROAD
TABLE ROCK TRAIL
PHASE 3
LOTS 42 - 74

Operational Guidelines for Use of Pohat Lakes for Ramapo River Flow Augmentation

Ex. NJDEP-48

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 117

100 [illegible]

JS

SEADA file
(Ops Manual)
Appendix

REPORT ON

OPERATIONAL GUIDELINES FOR USE OF THE POTHAT LAKES FOR RAMAPO RIVER FLOW AUGMENTATION

Spring Valley Water Company

November, 1993

TABLE OF CONTENTS

SUMMARY

The Ramapo Valley Well Field is located in the Ramapo River Valley in Hillburn. It consists of 10 wells with a total pumping capacity of 13.8 mgd, which discharge through common piping to the Ramapo Valley Pumping Station. This pumping station discharges to a 30-inch transmission main, connecting the well field supply to all portions of the distribution system.

The well field is operated under a permit issued by the NYS Dept. of Environmental Conservation (DEC), which includes limitations on withdrawal based on minimum streamflow in the Ramapo River. The firm production of the well field on a yearly basis, is estimated at 8 to 10 mgd, based on the pumping capacity and these restrictions.

Although it should be possible to pump 13.8 mgd under ideal conditions and for short periods of time, the maximum day safe yield is limited to 11.8 mgd on a practical basis, assuming proper augmentation of the Ramapo River. Without low flow augmentation, or modification of the DEC operating permit, the theoretical maximum day safe yield is zero.

Company efforts to obtain flow augmentation culminated in an agreement with the Ramapo Land Company involving limited water rights to the Pothat lakes. The water company has rights to a predefined stepped discharge from the top 4.5 feet in Potake Pond and the top 2.0 feet in Cranberry Pond. Water is discharged from the lakes to "Nacoma Creek", a tributary of the Ramapo River. Releases from Potake Pond are through discharge piping to Cranberry first, and then to Nacoma Brook from Cranberry.

About 5 mgd production has been sustainable from Ramapo Valley during much of the very dry period of the past summer of 1993, utilizing both Pothat augmentation and direct discharge of well water to the river.

OPERATIONAL GUIDELINES

Studies of the hydraulics of the lake discharge facilities, Nacoma Brook and the Ramapo River were conducted this summer (1993) for the purpose of developing initial guidelines for the operation of Pothat augmentation of the Ramapo Valley Well Field. The operational guidelines presented in this report were developed to provide the information necessary for managing lake releases, and to maximize the utility of the storage in the Pothat lakes for low flow augmentation purposes.

Guidelines are presented in the following areas:

Stepped Lake Drawdown Schedule
Lake Discharge Curves
Time of Travel
Measurable Effects on Ramapo River Streamflows
Maximizing the Utility of Pothat Storage

Augmentation of the Ramapo River will be a key element in the summer production of the Ramapo Valley Well Field, and in turn a key element in Spring Valley's integrated supply source optimization for DeForest, the individual rock wells, Ramapo Valley, and Stony Point. The utility of Pothat storage will involve making the well field available to balance summer use of the well field with the other system supplies. This aspect of the use of Pothat flow augmentation will be further examined under the study of management of the total water resources of the Spring Valley system, planned for 1994.

This study of operational guidelines was undertaken as a cooperative team endeavor within the Operations Group, under the general direction of Pen Tao of the System Planning Division. It included the team effort of the following group:

Water Quality (T. Pagan, L. Fung, I. Tasky)
Water Quality Laboratory (S. Soong)
Spring Valley Operations & SCADA (R. Ofeldt)
Engineering (P. Federico)
System Planning (L. Chanin, L. Chae)

BACKGROUND AND INTRODUCTION

The Ramapo Valley Well Field is located in the Ramapo River Valley in Hillburn. It consists of 10 wells with a total pumping capacity of 13.8 mgd, which discharge through common piping to the Ramapo Valley Pumping Station. This pumping station discharges to a 30-inch transmission main, connecting the well field supply to all portions of the distribution system.

Operating Permit.

The well field is operated under a permit issued Sept. 15, 1976 by the NYS Dept. of Environmental Conservation (DEC), which includes the following limitations on withdrawal:

Ramapo River Flow at Regulatory Weir	Pumping Restrictions
>10 mgd	Monthly Average: 10 mgd maximum Daily Maximum: 14 mgd
>8 and <10 mgd	Daily Maximum: 8 to 10 mgd
<8 mgd	NO PUMPING

The firm production of the well field on a yearly basis, is estimated at 8 to 10 mgd, based on the pumping capacity and these restrictions.

Although it should be possible to pump 13.8 mgd under ideal conditions and for short periods of time, the maximum day safe yield is limited to 11.8 mgd on a practical basis, assuming proper augmentation of the Ramapo River. Without flow augmentation, or modification of the DEC operating permit, the theoretical maximum day safe yield is zero. Peak demand and low river flow are liable to occur simultaneously during warm weather.

The frequent occurrence of low flows in the Ramapo River in the warm season has limited the use of the well field in supplying the Company's peak demand. In the summer of 1981 for instance, Ramapo Valley was shut down for a total of 56 days. During the 1980-81 Drought, the Company applied for, and was granted, short-term modification of the DEC permit to allow pumping up to 8 mgd, so long as the river flow did not drop below 3 mgd.

Modifying Decision.

The effect of low river flow on the utility of the well field has led the Company, under the direction of the DEC, to study and pursue measures to improve its reliability. As a result of the 1980-81 drought conditions, a study of the Rockland County water supply situation was initiated by the DEC, leading to the "Rockland County Water Supply Study, Final Report", in June, 1982. The section on the Ramapo Valley Well Field centered on the large number of days during

1981-82 that river flow did not meet the 8 mgd minimum flow requirement. The report concluded that "corrective measures are needed to increase the reliability of the Well Field", and suggested that the "Company should conduct a detailed feasibility study .... in order to make the Well Field more reliable."

That suggestion was adopted by the DEC; a Modifying Decision was issued to the 1976 permit on November 1, 1982. The modifying decision called for a detailed feasibility study of alternative corrective measures to increase reliability -- with emphasis on low flow augmentation from upstream lakes or reservoirs.

The Company proceeded to explore Ramapo River low flow augmentation and operational methods. These included the use of "pumped-back" water from the well field to the river and releases from tributary lakes including:

a) Pothat Water Co. - Potake Pond, Cranberry Pond and Beaver Pond.

b) Tuxedo Park - Tuxedo Lake.

c) Palisades Interstate Park Commission - Lake Sebago and others.

The plans of the Company to improve the reliability of Ramapo Valley are outlined in the report on "Ramapo Valley Well Field Low Flow Augmentation Feasibility Study", June 1985.

The Company has conducted an extensive examination of the operational aspects of Ramapo Valley, utilizing a computer simulation model. The results of this examination are presented in "Evaluation of Ramapo Valley Well Field Management Techniques by RVAM Simulation", Leggette, Brashears & Graham, July, 1982. Historically, direct discharge (back-pumping) of well water to the river on a limited basis has been successful with well field yield limited to about 6 mgd.

Pothat Water Rights.

The most promising efforts for flow augmentation culminated in an agreement with the Ramapo Land Company involving limited water rights to the Pothat lakes. The water company has rights to a predefined stepped discharge from the top 4.5 feet in Potake Pond and the top 2.0 feet in Cranberry Pond. Water is discharged from the lakes to "Nacoma Creek", a tributary of the Ramapo River. Releases from Potake Pond are through discharge piping to Cranberry first, and then to Nacoma Brook from Cranberry. (See the attached sketch, Figure No. 1, for the augmentation scheme.)

The availability of the equivalent of about 190 mg storage from Pothat will allow augmentation of the river flow for a minimum of 20 days and will almost guarantee the reliability of the well field for peaking purposes. (Additional storage from other sources, could insure the availability of the well field for an entire summer drought period.)

OPERATIONAL GUIDELINES

Studies of the hydraulics of the lake discharge facilities, Nacoma Brook and the Ramapo River were conducted this summer for the purpose of developing initial guidelines for the operation of Pothat augmentation of the Ramapo Valley Well Field. The operational guidelines presented in this report were developed to provide the information (i.e. graphs, tables, charts) necessary for managing lake releases, and to maximize the utility of the storage in the Pothat lakes for low flow augmentation purposes.

Guidelines are presented in the following areas:

Stepped Lake Drawdown Schedule

Lake Discharge Curves

Time of Travel

Measurable Effects on Ramapo River Streamflows

Maximizing the Utility of Pothat Storage

Lake Drawdown Schedule

A guideline for the sequence of releases for alternately dropping the levels in the two lakes is described in the Water Release Agreement between Spring Valley and Ramapo Land. Direct releases to Nacoma Brook can be made from Cranberry Pond only; Potake Pond releases are tributary to Nacoma Brook through Cranberry. The intended sequence of releases is summarized as follows:

a. Drop Cranberry 4 inches.
b. Drop Potake 12 inches while maintaining Cranberry by passing Potake releases through Cranberry.
c. Drop Cranberry an additional 2 inches (to 6 inches total).
d. Drop Potake an additional 12 inches (to 2 feet total) while maintaining Cranberry level.
e. Drop Cranberry an additional 3 inches (to 9 inches total).
f. Drop Potake to 4-1/2 feet total below spillway, while maintaining Cranberry level.
g. Drop Cranberry to 2 feet total below spillway.

Appendix A lists the "Sequence of Releases by Spring Valley" as it is written in the Water Release Agreement, plus the depletion tables for the two lakes. Rainfall and evaporation will have a minor effect on lake levels. A limitation in the release capacity from Potake Pond may necessitate starting step (g.) above before step (f.) is complete.

Lake Discharge Curves

The discharge facilities for both lakes are shown in Appendix B. Lake release rates are controlled by knife gate valves at each of the two discharge structures.

To aid in controlling release rates from Cranberry Pond, a discharge curve for Cranberry Pond was developed utilizing flow measurements (Velocity x Area) at a stream control section 35 feet downstream from the discharge structure. This Cranberry discharge curve, graphing discharge (in mgd) vs. valve turns (or stem height) is presented on Figure No. 2.

Measurements were taken on August 3, 1993 for ten control valve positions, covering the full range of discharge flows. The head difference between the Cranberry water level and the knife gate control valve is about 22 feet; the inaccuracy due to the two foot variation in lake level is within 3%.

A similar discharge curve for Potake Pond should be developed over time, from operating experience over the range of lake levels. Unlike Cranberry, the release rates from Potake are effected by inlet control at low levels. Therefore, the release rates are a function of both the discharge valve setting and the lake level. Currently, Potake is at an extremely low level, preventing the creation of discharge curves for controlling lake release rates.

Time of Travel

The time of travel for flow released from Cranberry Pond to the various locations down to the Ramapo Valley Well Field has been estimated as follows:

Location	Time of Travel (Hours)
Cranberry Pond	0
Mouth of Nacoma Creek @ Ramapo R.	3-1/2
Ramapo Valley WF - Upper Weir (Monitoring)	5
Ramapo Valley WF - Lower Weir (Regulatory)	9

These are based on an analysis, utilizing streamflow measurements, presented in Appendix C.

The delay between release from Cranberry, and increased flow at the Ramapo Valley Well Field, is best illustrated utilizing time plots of SCADA flow data for the upper (monitoring) and lower (regulatory) streamflow measurement weirs. These plots are shown on Figures No. 3 and No. 4.

They illustrate the effect at the well field, after a continuous release of about 6-1/4 mgd was started at 12 noon on Friday, July 23, 1993, during a dry period. An increase in flow at the upper weir started around 5 PM (5 hours travel time) and stabilized at a high level by 1 AM on July 24 (13 hours travel time) [Figure No. 3]. Similarly, flow at the lower weir increased from the initial to the high stabilized flow over a period from 9 to 22 hours after the release from Cranberry was initiated [Figure No. 4].

Tracer tests of the stream hydraulics (i.e. continuity, travel time) were conducted on April 16 and July 21, 1993, using a fluorescent dye. Due to overriding operational restrictions, the dye tracing method alone, at this time, did not produce conclusive results. It took longer than expected to reach a steady-mixed-state for the dye in the Ramapo River. However, dye tracing did confirm the results obtained from direct flow velocity measurement, using a digital flow probe.

Measurable Effects on Ramapo River Streamflows

For the July 23 analysis, the measurable increases in streamflow at the well field are illustrated on Figures No. 3 and No. 4. The streamflows and movement to the groundwater are summarized as follows:

Location	Streamflow Due to Release (mgd)	Movement to Groundwater	Duration of Release
Cranberry Discharge	6-1/4 mgd	0%	-
Mouth of Nacoma Creek @ Ramapo River	5-3/4 mgd	8%	3.5 hr.
Ramapo Valley WF - Upper Weir (Monitoring)	3-1/4 mgd	48%	13 hr.
Ramapo Valley WF - Lower Weir (Regulatory)	2-1/2 mgd	60%	22 hr.

The movement between the surface water and the groundwater will vary with stream conditions. These numbers are conservative, in that they represent augmentation under extremely dry stream conditions.

The movement to the groundwater up to the mouth of Nacoma Creek is estimated at 8% or less. Of the roughly 5-3/4 mgd reaching the Ramapo River, about 3-1/4 mgd (56%) was lost to the groundwater between Nacoma Creek and the regulatory weir. This is in general agreement with Leggette, Brashears & Graham's modeling studies, which have indicated that about half the surface flow in the Ramapo is lost to the groundwater during dry conditions.

Maximizing the Utility of Pothat Storage

The availability of Pothat storage almost guarantees the availability of the Ramapo Valley Well Field to meet peak system demands. A preliminary analysis has been conducted in relation to meeting system peaks, based on providing flow augmentation to make Ramapo Valley available when system demand reaches 38 mgd or higher. Up to 38 mgd, system demand can be met by the production of DeForest and the individual system wells.

This system peaking/flow augmentation analysis is presented in Table No. 1. For the 14 years 1980 to 1993: there has been an average of 5.4 days per year where system demand exceeded 38 mgd; and the number of days where augmentation would be required to allow use of the well field (i.e. flow at regulatory weir <8 mgd) averaged about 28 days per year. System demand is graphed concurrently with flow at the regulatory weir for the months of May to October, 1980 to 1992, in Appendix D.

There were only 46 days during the 14-year period where both conditions (the need of the well field to meet system peak requirements, and the need for flow augmentation to allow use of the well field) were concurrent. Eleven of those days occured this past summer of 1993, which represents roughly a 1-in-5 year situation. This is, coincidentally, the first year that Pothat augmentation has been available.

About 5 mgd production has been sustainable from Ramapo Valley during much of the very dry period of the past summer of 1993, utilizing both Pothat augmentation and direct discharge of well water to the river. Pothat releases for low flow augmentation have been utilized for about 30 days during that period.

The utility of Pothat storage also involves making the well field available to balance summer use of the well field with the other system supplies. These aspects of the use of Pothat flow augmentation will be further examined under the study of management of the total water resources of the Spring Valley system, planned for 1994.

TABLE No. 1

SYSTEM PEAKING AND RAMAPO RIVER AUGMENTATION ANALYSIS

Year	No. of Days Total System Demand Exceeded 38 mgd *	No. of Days Ramapo River Flow < 8 mgd **	No. of Days that Both Conditions Occurred Together
1980	12	40	7
1981 ***	0	65	0
1982 ***	0	6	0
1983	3	31	2
1984	4	37	0
1985 ***	0	16	0
1986	0	3	0
1987	3	15	0
1988	21	55	13
1989	0	1	0
1990	0	0	0
1991	18	54	13
1992	0	7	0
1993	14	65 (E)	11
Average	5.4	28.3	3.3
Maximum	21	66	13

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* Equivalent of 38 mgd in the year 1993. Other years adjusted proportionately to demand.

** At regulatory weir (Ramapo River at Suffern).

*** Drought year restrictions.

(E) Estimated.

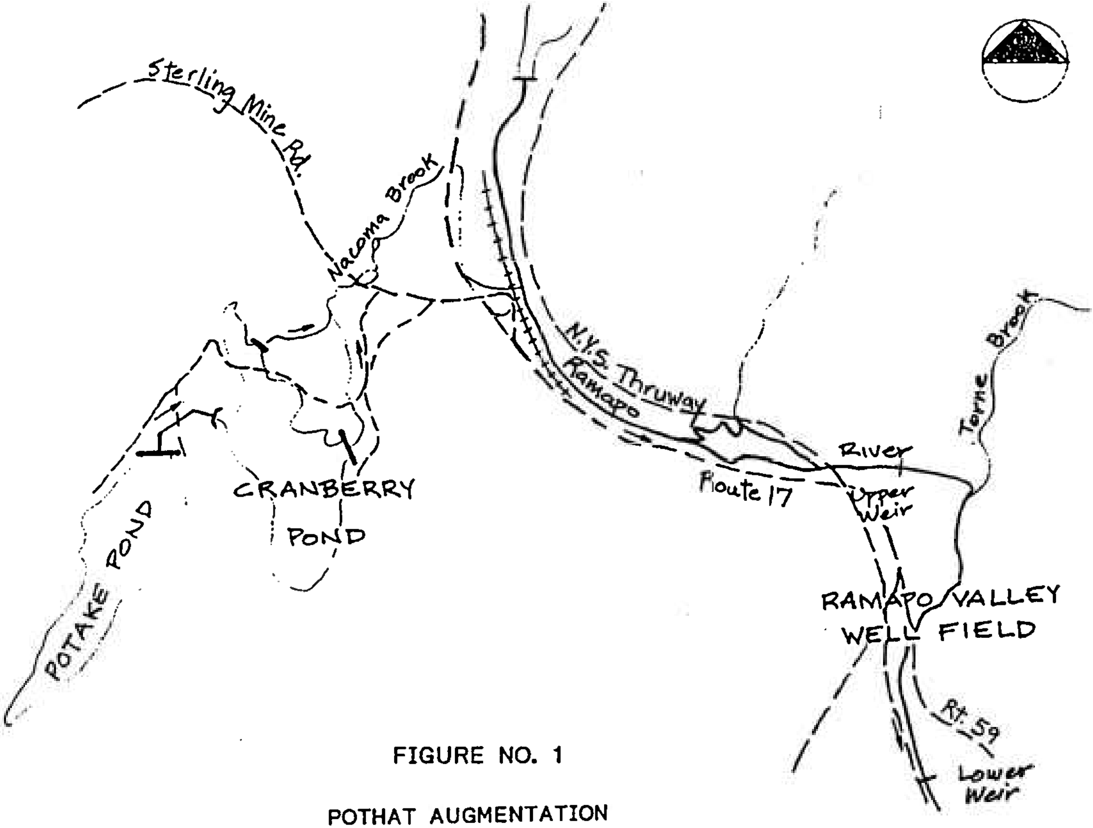


FIGURE NO. 1

POTHAT AUGMENTATION
OF THE RAMAPO VALLEY WELL FIELD

2/10/93
Scale: 1" = 2000'

SPRING VALLEY WATER COMPANY
CRANBERRY POND WATER RELEASE VALVE DISCHARGE CHART

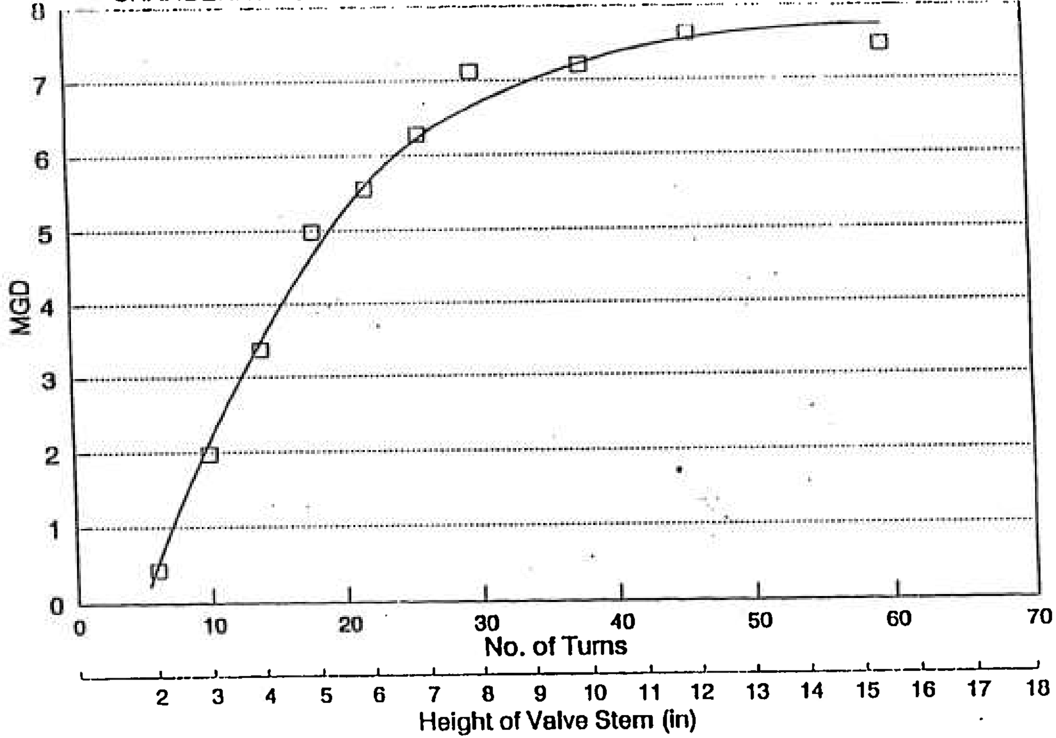


FIGURE NO. 2

FLOW AT RAMAPO VALLEY REGULATORY WEIR

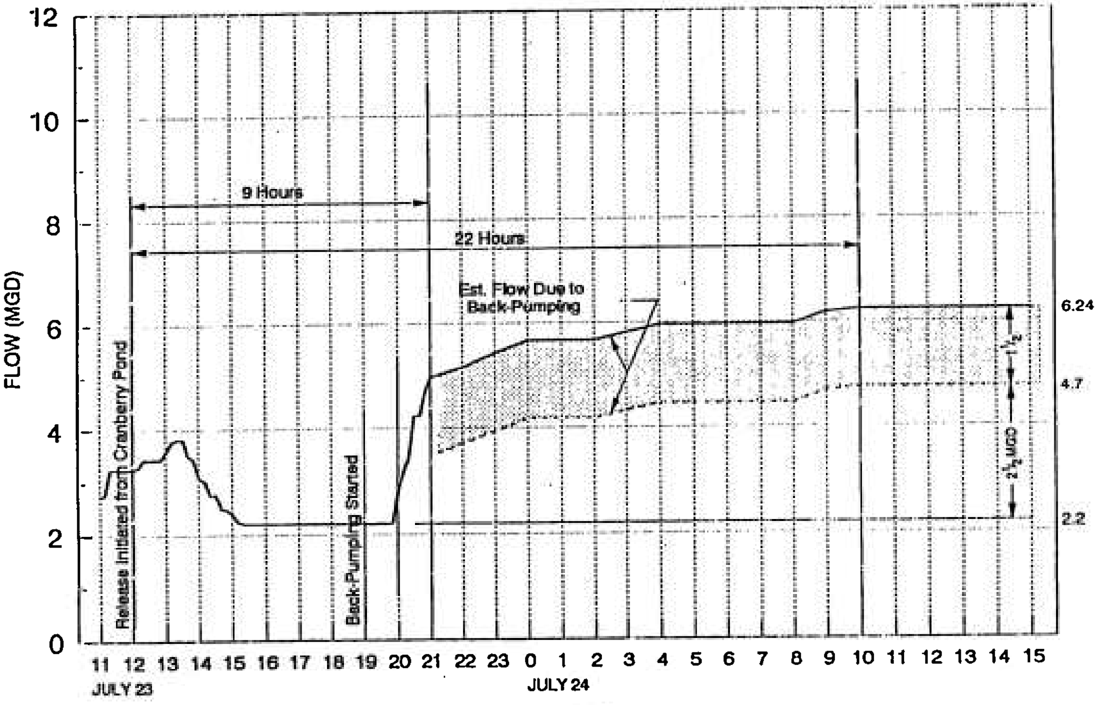


FIGURE NO. 4

FLOW AT RAMAPO VALLEY MONITORING WEIR

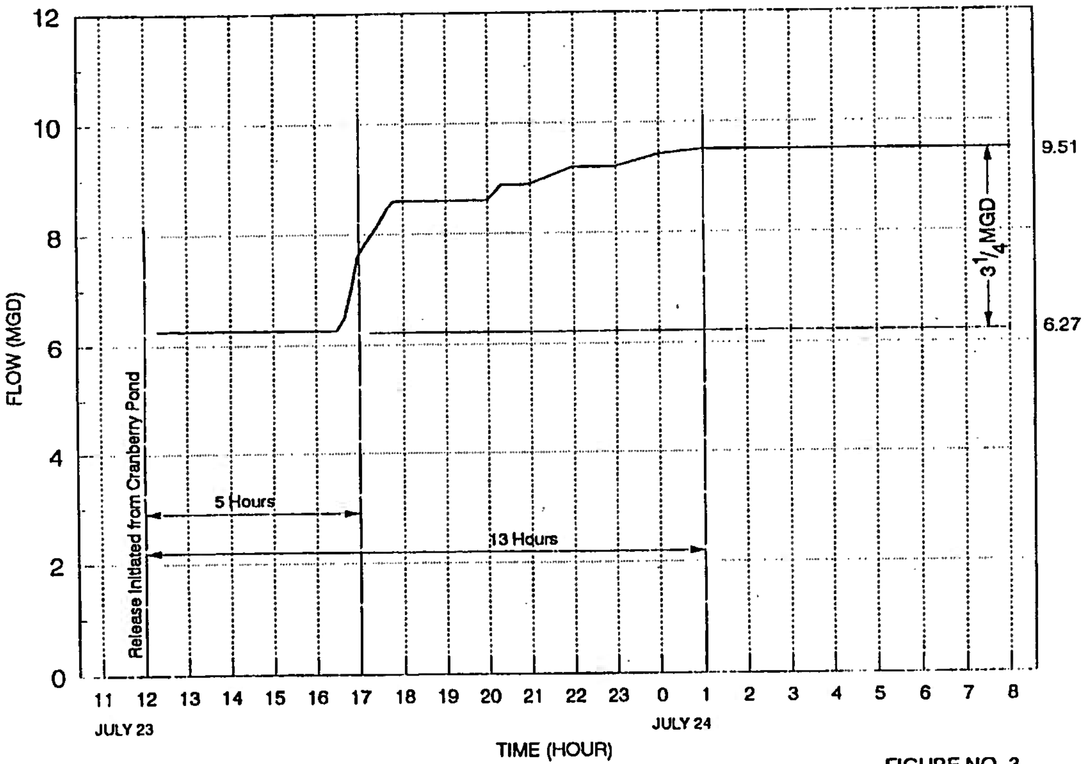


FIGURE NO. 3

APPENDIX A

SEQUENCE OF RELEASES BY SPRING VALLEY

DEPLETION TABLES FOR CRANBERRY AND POTAKE PONDS

FROM THE WATER RELEASE AGREEMENT

II. Sequence of Releases by Spring Valley

Because Cranberry Pond is downstream of the Potake, the releases that will actually augment the flow of the Ramapo River are those made from the Cranberry Pond. The following is the intended sequence of releases from the ponds. It is understood that these steps will be used as a general guideline to meet the objective of best managing the stored water, but that some variations may occur in the actual levels that are achieved.

A. Withdraw the top four (4) inches of water from Cranberry Pond prior to releasing any water stored in Potake Pond into Cranberry Pond.

B. Once the top four (4) inches of water are withdrawn from Cranberry Pond, begin withdrawals from Potake and at a rate which closely matches the rate at which augmentation water is released from Cranberry Pond. The objective is to hold the level of Cranberry Pond at a point four (4) inches below its spillway. This will continue until Potake Pond has been drawn down twelve (12) inches.

C. Once the top twelve (12) inches of water are withdrawn from Potake Pond next withdraw up to two (2) more inches of water from Cranberry Pond, until Cranberry Pond has been reduced a total of six (6) inches, prior to releasing any further water stored in Potake Pond into Cranberry Pond.

D. Once the top six (6) inches of water are withdrawn from Cranberry Pond, again begin withdrawals from Potake at a rate which closely matches the rate at which augmentation water is released from Cranberry Pond. The objective is to hold the level of Cranberry Pond at a point six (6) inches below its spillway. This will continue until Potake Pond has been drawn down twenty-four (24) inches.

E. Once twenty-four (24) inches of water are withdrawn from Potake Pond next withdraw up to three (3) more inches of water from Cranberry Pond, until Cranberry Pond has been reduced a total of nine (9) inches, prior to releasing any further water stored in Potake Pond into Cranberry Pond.

F. Once the top nine (9) inches of water are withdrawn from Cranberry Pond, again begin withdrawals from Potake at a rate which closely matches the rate at which augmentation water is released from Cranberry Pond. The objective is to hold the level of Cranberry Pond approximately at a point nine (9) inches below its spillway. This will continue until Potake Pond has been drawn down four and one-half (4-1/2) feet.

Releases from Potake down into Cranberry Pond are to stop once the level falls to four and one-half (4-1/2) feet below the spillway.

G. Once Steps A through F are completed, water stored below the top nine (9) inches of Cranberry Pond would be released for augmentation purposes, with releases stopping once the level falls to two (2) feet below the Cranberry spillway.

III. <u>Releases by Ramapo Land</u>

The parties acknowledge that Ramapo Land, for recreational and aesthetic purposes may choose, in its sole discretion, to release water from Potake Pond into Cranberry Pond at a time when Potake Pond has already been reduced by the maximum amount allowed under the Agreement. This would have the effect of lowering Potake Pond below the limits imposed upon Spring Valley herein. In circumstances where Ramapo Land may choose to release any water from Potake Pond into Cranberry Pond, that water in turn may not be released from Cranberry Pond by Spring Valley until the level of Potake Pond has recovered to a level 6 inches above the point it was when Ramapo Land ceased its releases. At that time, Spring Valley will be allowed to release water stored in Cranberry Pond down to the level it had been when Ramapo Land had ceased its releases. For instance, if both Cranberry and Potake Ponds have been reduced to their minimum levels under the Water Release

DEPLETION TABLE - CRANBERRY POND
OVERFLOW ELEVATION = 514.5' USGS

Depth Below Spillway (Feet)	USGS Elevation (Feet)	Internal Volume (MG)	Cumulative Volume From Overflow (MG)
0	514.5	0	0
0 to -0.1	514.4	3.28	3.28
-0.1 to -0.2	514.3	3.27	6.55
-0.2 to -0.3	514.2	3.26	9.81
-0.3 to -0.4	514.1	3.25	13.06
-0.4 to -0.5	514.0	3.24	16.30
-0.5 to -0.6	513.9	3.21	19.51
-0.6 to -0.7	513.8	3.19	22.70
-0.7 to -0.8	513.7	3.18	25.88
-0.8 to -0.9	513.6	3.17	29.05
-0.9 to -1.0	513.5	3.15	32.20
-1.0 to -1.1	513.4	3.10	35.30
-1.1 to -1.2	513.3	3.07	38.37
-1.2 to -1.3	513.2	3.04	41.41
-1.3 to -1.4	513.1	3.01	44.42
-1.4 to -1.5	513.0	2.98	47.40
-1.5 to -1.6	512.9	2.90	50.30
-1.6 to -1.7	512.8	2.87	53.17
-1.7 to -1.8	512.7	2.84	56.01
-1.8 to -1.9	512.6	2.81	58.82
-1.9 to -2.0	512.5	2.78	61.60
Withdrawals must be discontinued when Cranberry Pond drops to -2.0 Feet			
-2.0 to -2.1	512.4	2.76	64.36
-2.1 to -2.2	512.3	2.75	67.11
-2.2 to -2.3	512.2	2.72	69.83
-2.3 to -2.4	512.1	2.69	72.52
-2.4 to -2.5	512.0	2.68	75.20
-2.5 to -2.6	511.9	2.66	77.86
-2.6 to -2.7	511.8	2.63	80.49
-2.7 to -2.8	511.7	2.60	83.09
-2.8 to -2.9	511.6	2.57	85.66
-2.9 to -3.0	511.5	2.54	88.20
-3.0 to -3.1	511.4	2.42	90.62
-3.1 to -3.2	511.3	2.41	93.03
-3.2 to -3.3	511.2	2.40	95.43
-3.3 to -3.4	511.1	2.39	97.82
-3.4 to -3.5	511.0	2.38	100.20
-3.5 to -3.6	510.9	2.37	102.57
-3.6 to -3.7	510.8	2.37	104.94
-3.7 to -3.8	510.7	2.36	107.30
-3.8 to -3.9	510.6	2.35	109.65
-3.9 to -4.0	510.5	2.35	112.00

Spring Valley Water Co.
June 1993

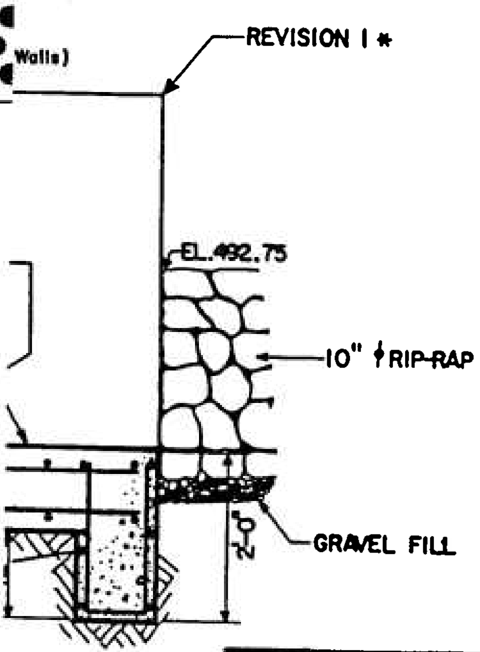
DEPLETION TABLE - POTAKE POND
OVERFLOW ELEVATION = 616.6' USGS

Depth Below Spillway (Feet)	USGS Elevation (Feet)	Internal Volume (MG)	Cumulative Volume From Overflow (MG)
0	616.6	0	0
0 to -0.1	616.5	3.05	3.05
-0.1 to -0.2	616.4	3.04	6.09
-0.2 to -0.3	616.3	3.04	9.13
-0.3 to -0.4	616.2	3.04	12.17
-0.4 to -0.5	616.1	3.03	15.20
-0.5 to -0.6	616.0	3.02	18.22
-0.6 to -0.7	615.9	3.01	21.23
-0.7 to -0.8	615.8	3.00	24.23
-0.8 to -0.9	615.7	2.99	27.22
-0.9 to -1.0	615.6	2.98	30.20
-1.0 to -1.1	615.5	2.98	33.18
-1.1 to -1.2	615.4	2.97	36.15
-1.2 to -1.3	615.3	2.96	39.11
-1.3 to -1.4	615.2	2.95	42.06
-1.4 to -1.5	615.1	2.94	45.00
-1.5 to -1.6	615.0	2.94	47.94
-1.6 to -1.7	614.9	2.93	50.87
-1.7 to -1.8	614.8	2.92	53.79
-1.8 to -1.9	614.7	2.91	56.70
-1.9 to -2.0	614.6	2.90	59.60
-2.0 to -2.1	614.5	2.90	62.50
-2.1 to -2.2	614.4	2.89	65.39
-2.2 to -2.3	614.3	2.88	68.27
-2.3 to -2.4	614.2	2.87	71.14
-2.4 to -2.5	614.1	2.86	74.00
-2.5 to -2.6	614.0	2.86	76.86
-2.6 to -2.7	613.9	2.85	79.71
-2.7 to -2.8	613.8	2.84	82.55
-2.8 to -2.9	613.7	2.83	85.38
-2.9 to -3.0	613.6	2.82	88.20
-3.0 to -3.1	613.5	2.82	91.02
-3.1 to -3.2	613.4	2.81	93.83
-3.2 to -3.3	613.3	2.80	96.63
-3.3 to -3.4	613.2	2.79	99.42
-3.4 to -3.5	613.1	2.78	102.20
-3.5 to -3.6	613.0	2.75	104.95
-3.6 to -3.7	612.9	2.75	107.70
-3.7 to -3.8	612.8	2.74	110.44
-3.8 to -3.9	612.7	2.73	113.17
-3.9 to -4.0	612.6	2.73	115.90
-4.0 to -4.1	612.5	2.71	118.61
-4.1 to -4.2	612.4	2.71	121.32
-4.2 to -4.3	612.3	2.70	124.02
-4.3 to -4.4	612.2	2.69	126.71
-4.4 to -4.5	612.1	2.69	129.40
Withdrawals must be discontinued when Potake Pond drops to -4.5 Feet			
-4.5 to -4.6	612.0	2.69	132.09
-4.6 to -4.7	611.9	2.68	134.77
-4.7 to -4.8	611.8	2.68	137.45

APPENDIX B

LAKE DISCHARGE FACILITIES

Walls)



NOTES

1. All pipe and fittings shall have mechanical joints with retainer glands.
2. All concrete to be min. $f_c = 3{,}500$ psi.
3. All reinforcement steel shall be Grade 60, $f_s = 24{,}000$ psi.
4. All elevations and dimensions to be verified by Contractor in the field.

DRAWING NO. SV3-M/89 8

SPRING VALLEY WATER COMPANY INCORPORATED
WEST NYACK, N.Y.

CONSTRUCTION OF WATER RELEASE FACILITIES
BELOW CRANBERRY POND DAM
TOWN OF RAMAPO, N.Y.

PLANS AND DETAILS

SCALE AS SHOWN   DATE DEC. 1989

BUDGET ITEM NO.	INVESTIGATION NO.	EXTENSION NO.

DRAWN BY YH	TRACED BY BP	CHECKED BY	APPROVED BY

20, 1993

APPENDIX C

MEMORANDUM ON CRANBERRY POND RELEASES

IC-3

Spring Valley Water Company INCORPORATED
(Interoffice Correspondence Only)

DATE: July 30, 1993

TO: Mike Barnes

FROM: Pen C. Tao

Pen C. Tao

SUBJECT: Cranberry Releases

On July 23, 1993, Mr. Ivan Tasky and I inspected the Cranberry Lake, Nacoma Brook, and Ramapo River areas. We investigated the stream channel conditions and measured the flow rates at the following locations. On that day, the RVWF was not in operation.

(I) Cranberry Lake and Water Release Facilities

- Time: 2:00 PM, bright sunshine, air temperature 87° F.
- The Cranberry Lake staff gage reading is 3.95 ft.
- Water release valve is partly opened. The valve was opened at noon time (12:00 PM), with stem position at 10" (fully opened position is 14.5") as reported by SV- Operations.
- A channel section, about 35 feet downstream from the outlet structure, is selected as flow measuring point. The effective channel width at this control section is 4.5 feet.
- At the control section the water depth is 9.7 inches, and the flow velocity is 2.7 ft/sec. They are the average values of three measurements along the control section.
- The measured flow rate is about 6.3 mgd.

(II) Nacoma Creek at Sterling Mine Avenue

- Time: 2:30 PM.
- The road culvert is 18 feet wide, the water depth and flow velocity are measured at 8 locations. The average water depth is 8.0 inches and the average flow velocity is 0.65 ft/sec.
- The measured flow rate is 5.1 mgd.

(III) Nacoma Creek at Ramapo River

- Time: 2:45 PM.
- No flows in the Nacoma Creek. The release from Cranberry Lake has not arrived at this point yet.

(IV) Ramapo River at the Monitoring (Upper) Weir

- Time: 3:00 PM. It is the natural flow condition in the Ramapo River. The release from the Cranberry Lake has not yet arrived at this point.
- The width of the weir (wetted portion) is 15 feet. The water depth at the center of the crest is 3.0 inches. The average of 11 flow velocity measurements along the crest is 2.96 ft/sec.
- The measured flow rate is 6.0 mgd. The SCADA reported flow rate at 3:00 PM is 6.27 mgd. The difference is -4.3%.

(V) Ramapo River at the Regulatory (Lower) Weir

- Time: 3:20 PM. It is the natural flow condition in the Ramapo River. The release from the Cranberry Lake has not yet arrived at this point. No pump of RVWF is in operation.
- The width of the weir (wetted portion) is 14 feet. The water depth at the center of the crest is 2.0 inches. The average of 14 flow velocity measurements along the crest is 2.96 ft/sec.
- The measured flow rate is 2.8 mgd. The SCADA reported flow rate at 3:20 PM is 2.20 mgd. The difference is 27%.

(VI) Nacoma Creek at Ramapo River, West Side of Railroad

- Time: 3:40 PM.
- The channel is 13 feet wide with 10.0 inches in depth (average of 7 measurements across the channel). The average of 7 flow velocity measurements is 0.88 ft/sec.
- The measured flow rate is 5.7 mgd. Note that at 2:45 PM, there was no flow at this location (see item # III).

Based on SCADA 10-minute interval records, the travelling time of the Cranberry Lake release is estimated as follows:

LOCATION	HOUR:MINUTE
Cranberry Lake	0:00
Mouth of Nacoma	3:30
Upper Weir - Ramapo	5:00
Lower Weir - Ramapo	9:00

Recommendations:

1. The Cranberry Lake water release valve rating table/curve can be established by counting number of terms (or length of the stem) of the valve opening and measuring the actual flow at the location as described in (I).

2. The security issue, i. e., preventing vandalism, of the Cranberry Lake release facilities needs to be addressed.

3. The staff gage at the upper weir in the Ramapo River is tilted 40 degrees toward downstream. It needs to be straightened.

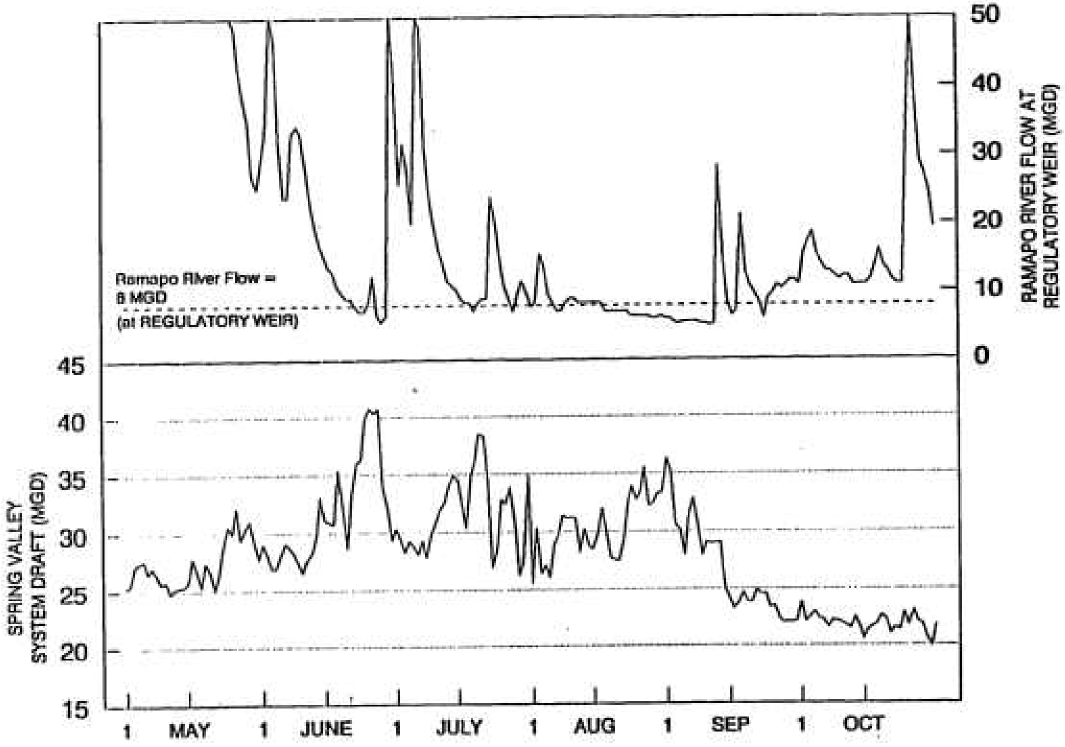
4. At the lower weir in the Ramapo River, the staff gage and the USGS gaging facilities are located at the right side (facing upstream) of the stream. There is a gravel island in the middle of the stream, divides the stream bed into two channels. The "moving water" is coming from the left channel. The right channel is practically a body of "sitting water". The accuracy of this gaging station, when at low flow stage, is questionable.

cc. R. Ofelt
P. Federico
T. Pagan
I. Tasky
F. DeMicco

APPENDIX D

SYSTEM DEMAND AND RAMAPO RIVER FLOW
(MAY TO OCTOBER, 1980 TO 1992)

1980


Ramapo River Flow =
8 MGD
(at REGULATORY WEIR)
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RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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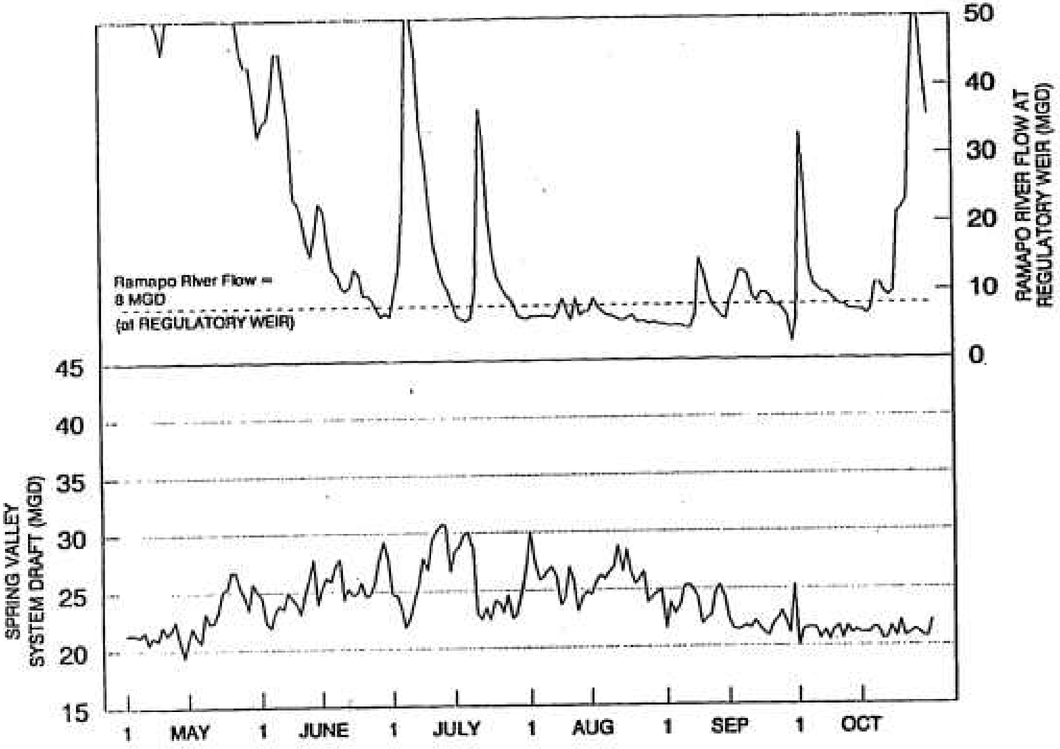
1981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RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
Ramapo River Flow = 8 MGD (at REGULATORY WEIR)
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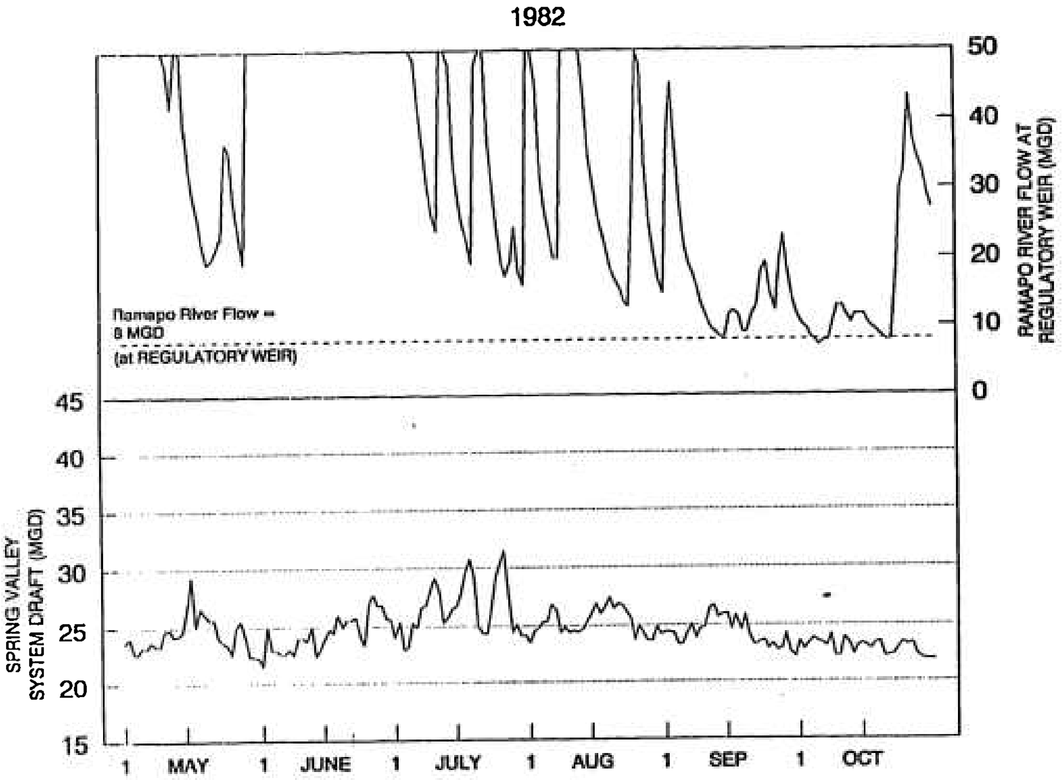
1982
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Ramapo River Flow = 8 MGD (at REGULATORY WEIR)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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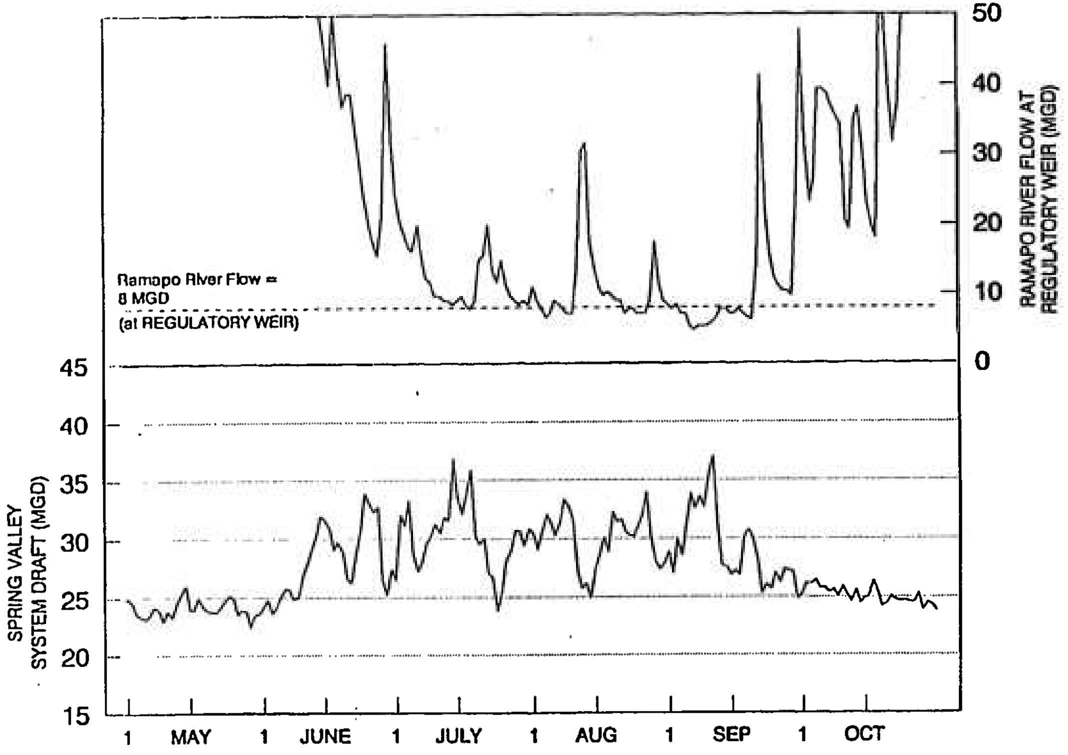
1983



Ramapo River Flow =
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(at REGULATORY WEIR)
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RAMAPO RIVER FLOW AT
REGULATORY WEIR (MGD)
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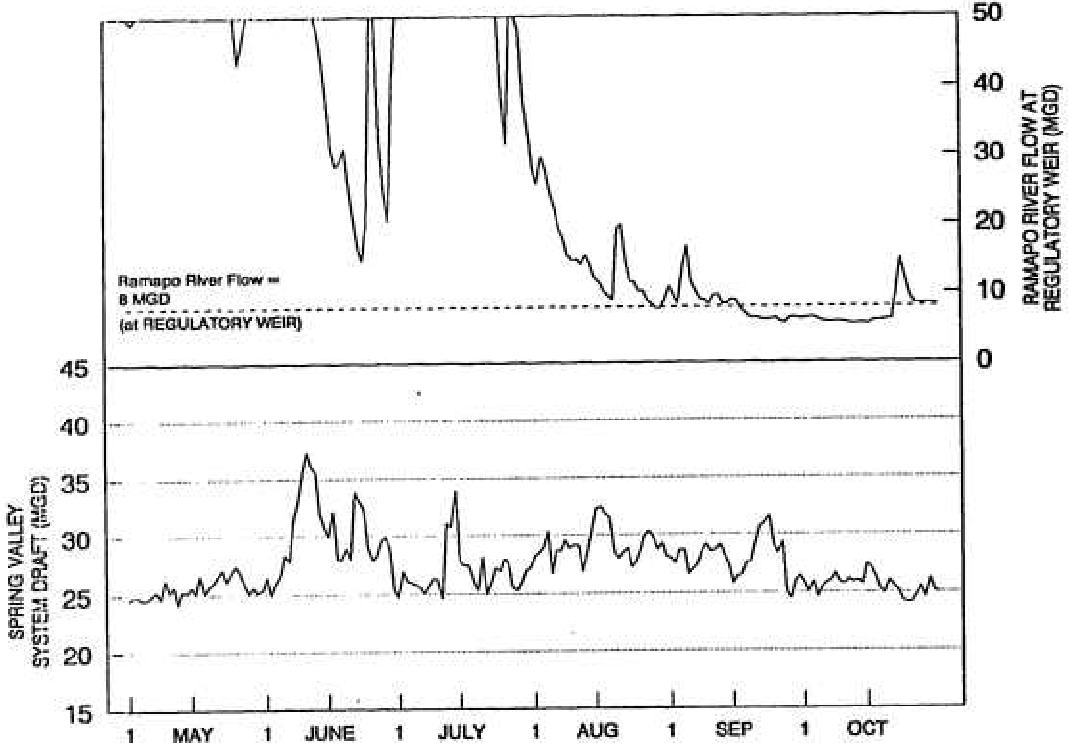
Ramapo River Flow =
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(at REGULATORY WEIR)
RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
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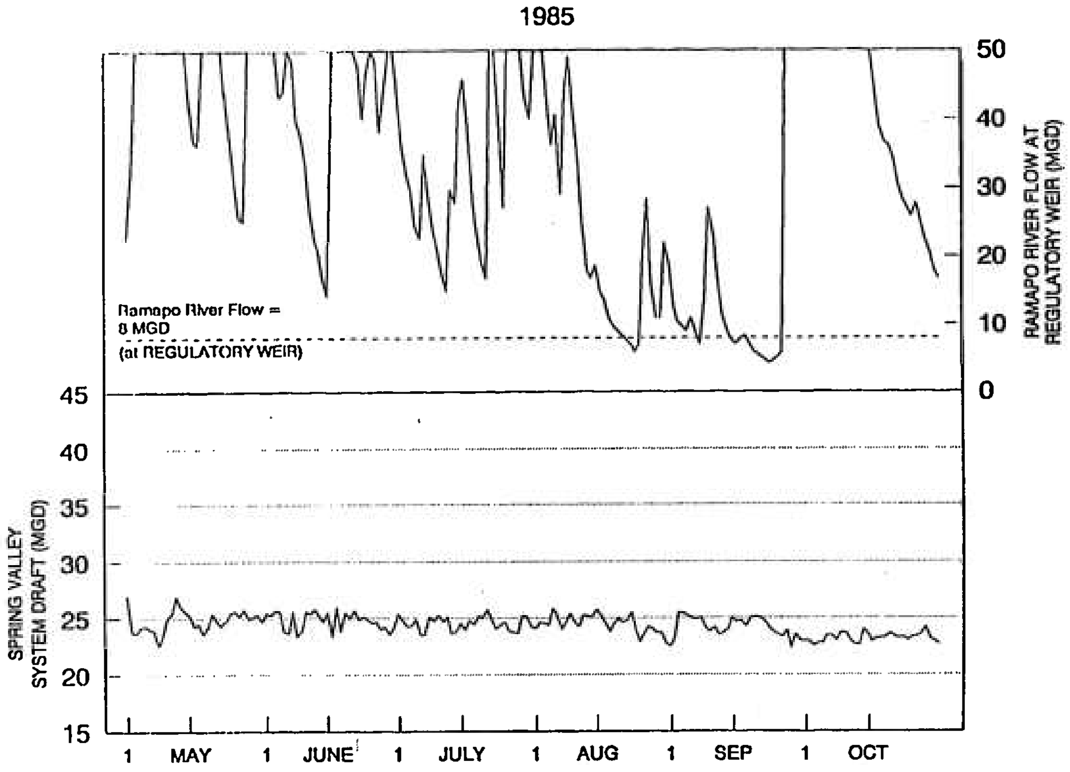
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RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
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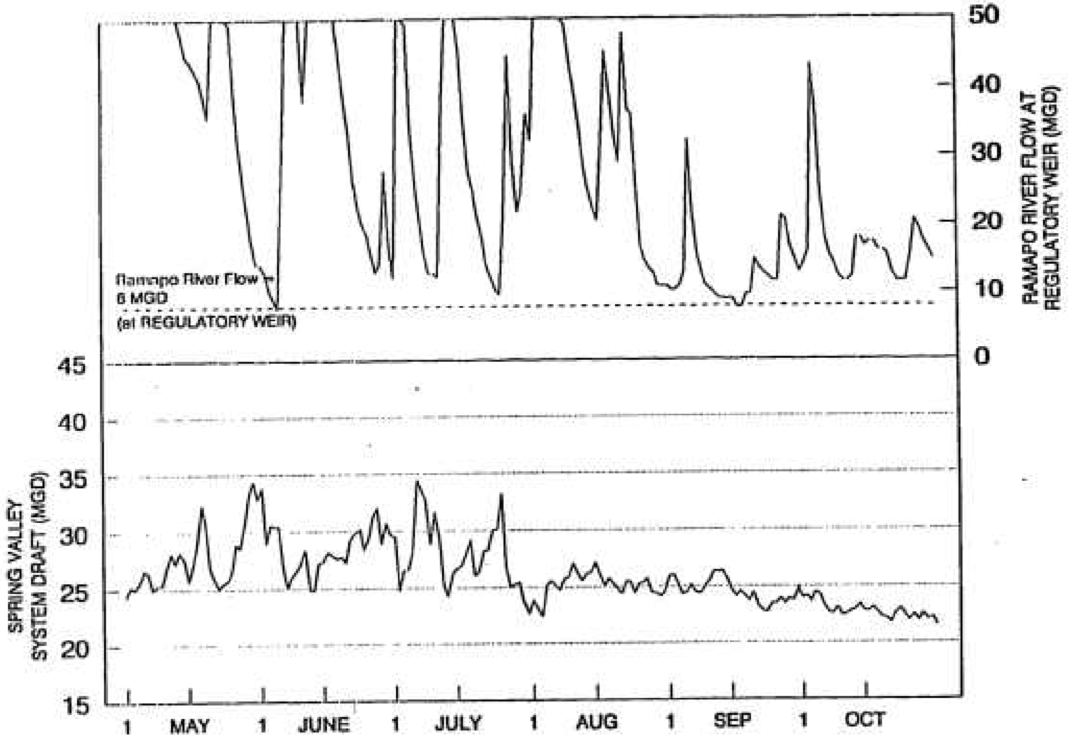
1986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RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
Ramapo River Flow = 8 MGD (at REGULATORY WEIR)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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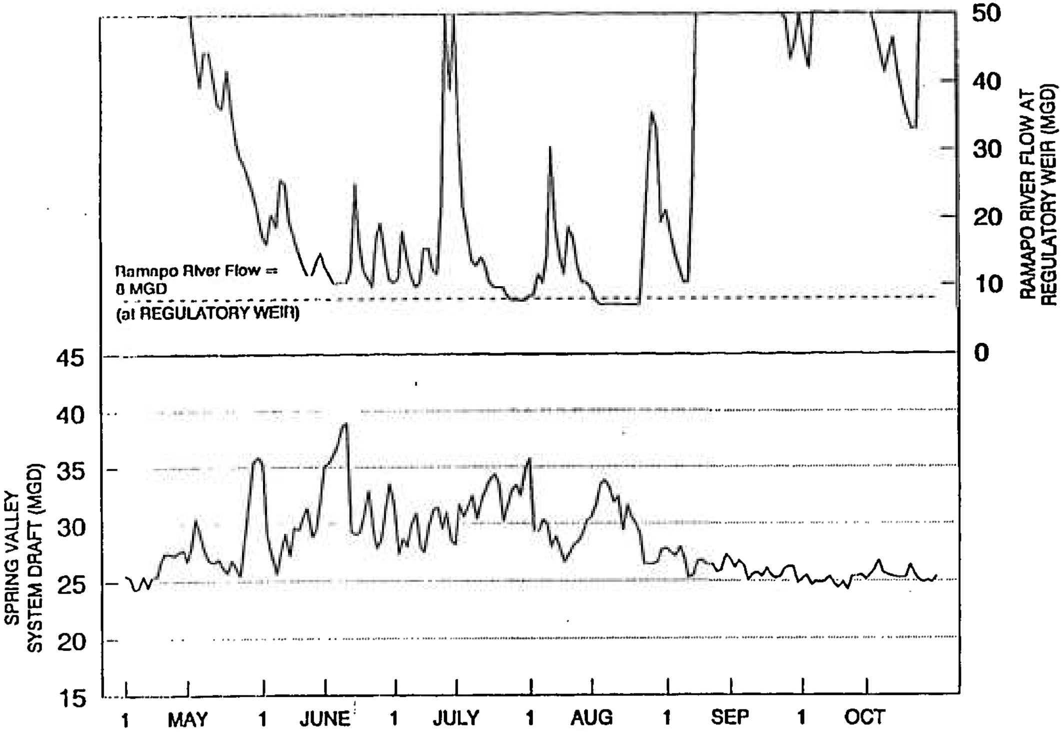
1987


Ramapo River Flow = 8 MGD (at REGULATORY WEIR)
RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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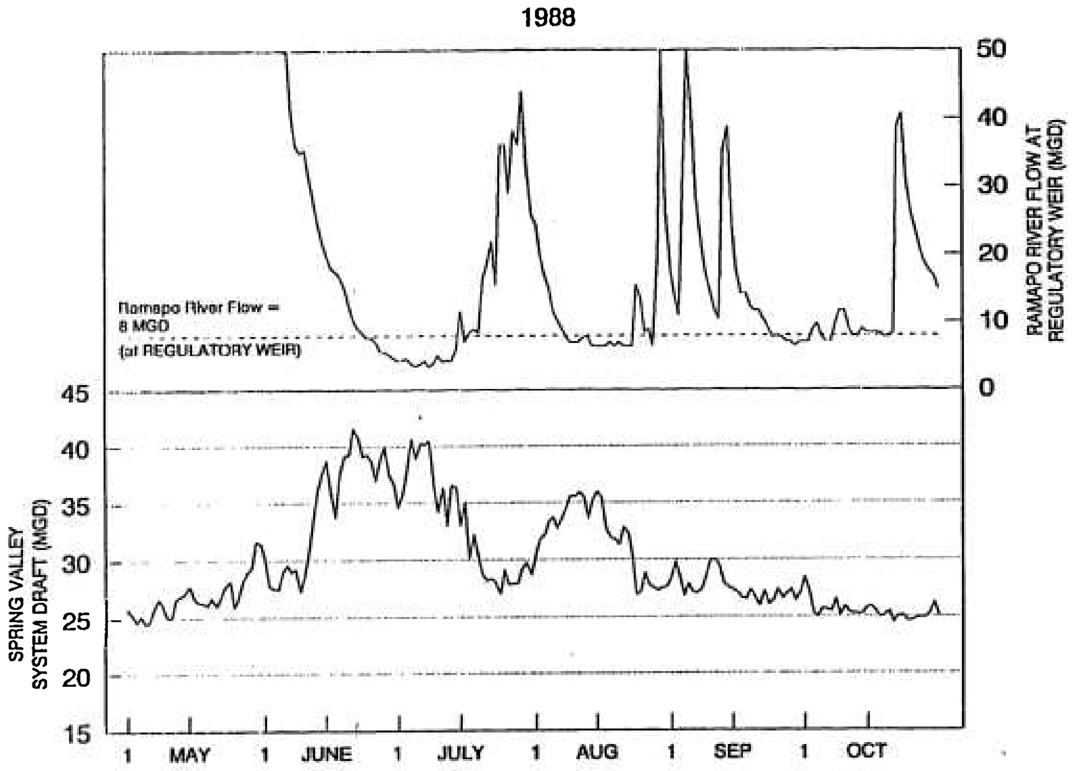
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(at REGULATORY WEIR)
RAMAPO RIVER FLOW AT
REGULATORY WEIR (MGD)
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SPRING VALLEY
SYSTEM DRAFT (MGD)
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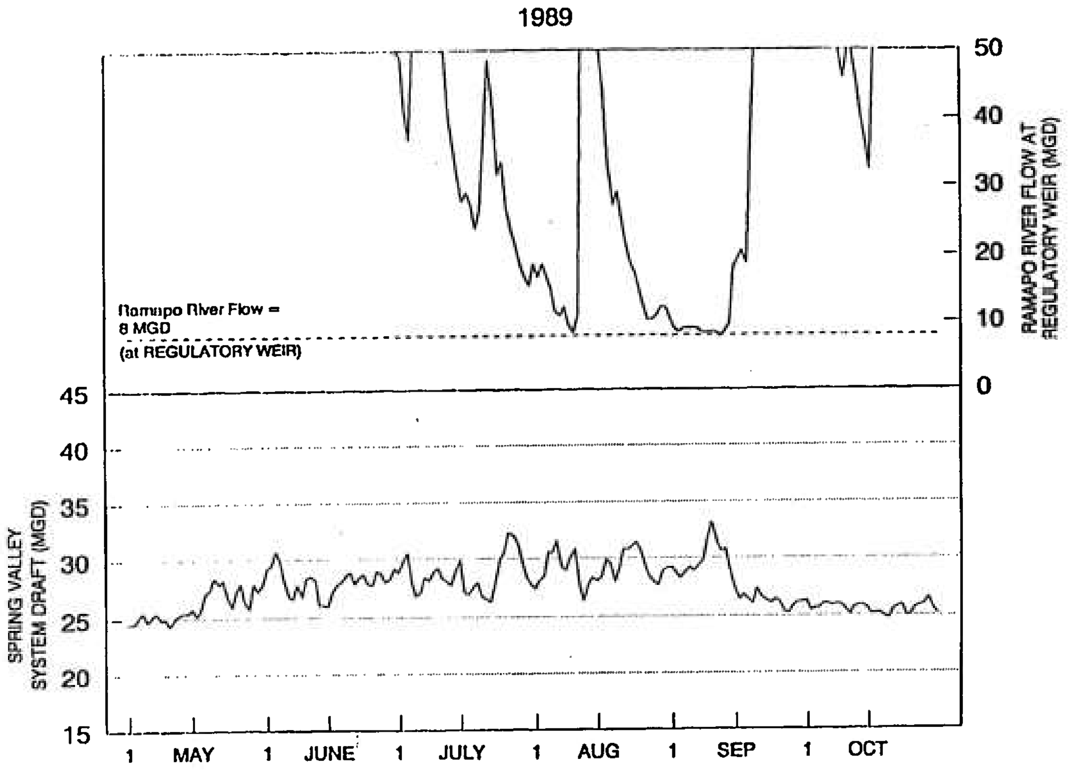
1989
Ramapo River Flow =
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(at REGULATORY WEIR)
RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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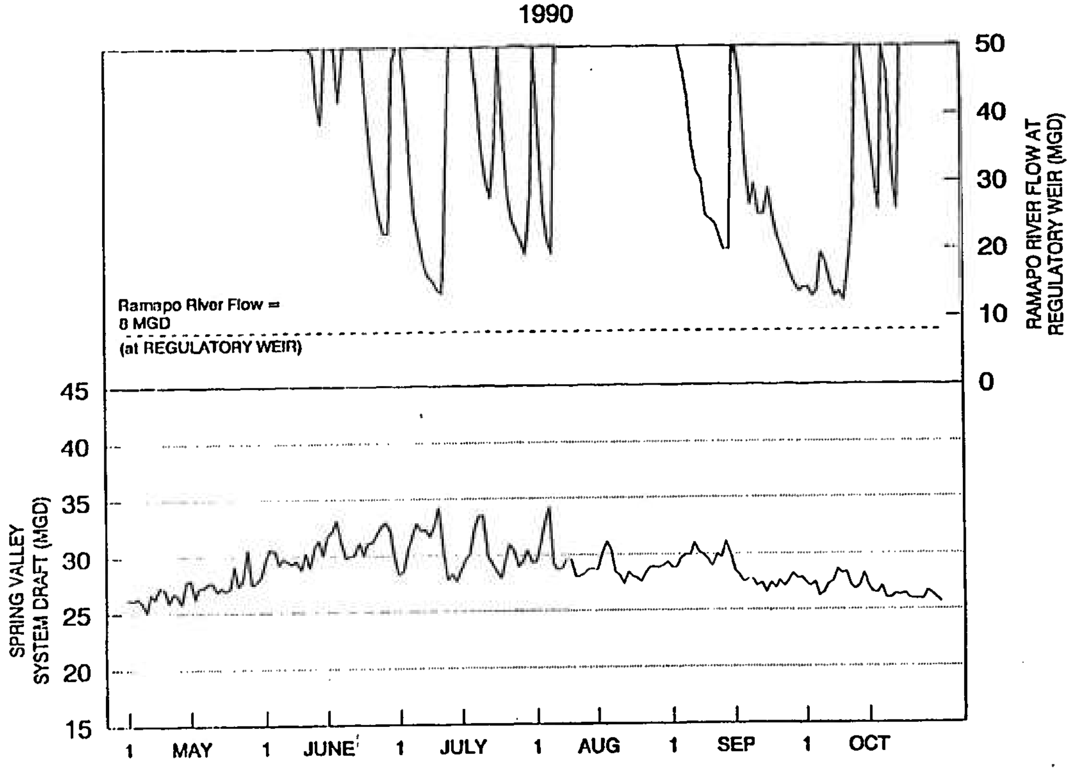
1990
Ramapo River Flow =
8 MGD
(at REGULATORY WEIR)
RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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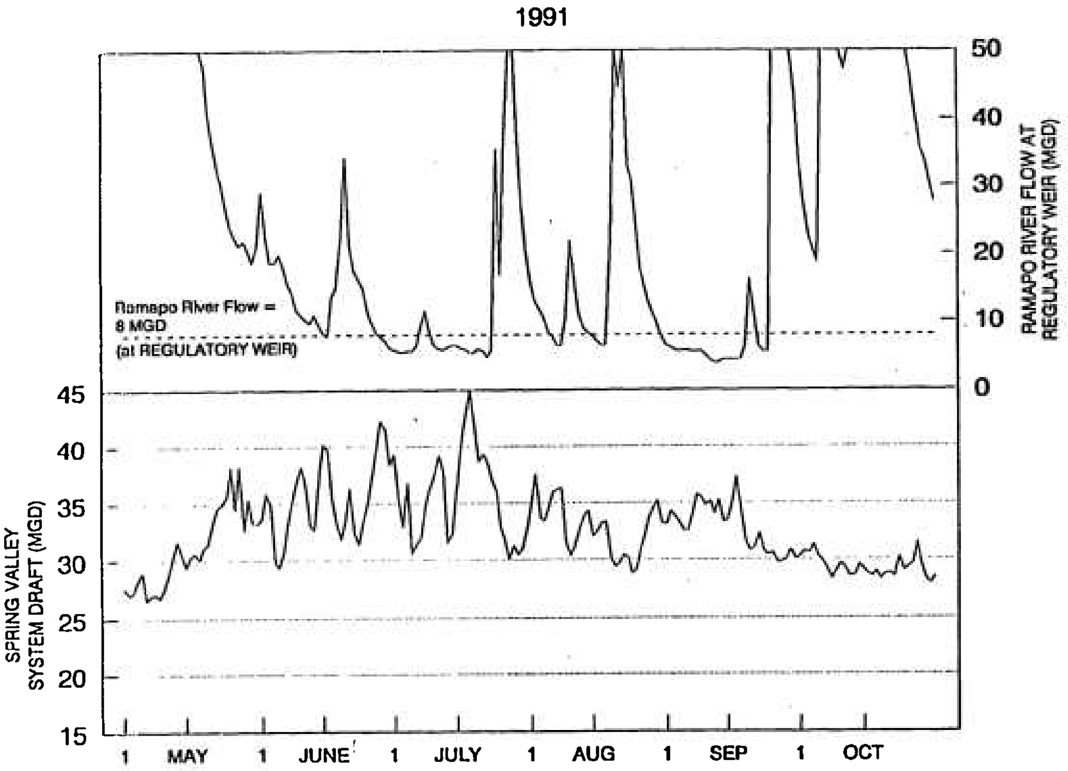1991
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(at REGULATORY WEIR)
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RAMAPO RIVER FLOW AT
REGULATORY WEIR (MGD)
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SPRING VALLEY
SYSTEM DRAFT (MGD)
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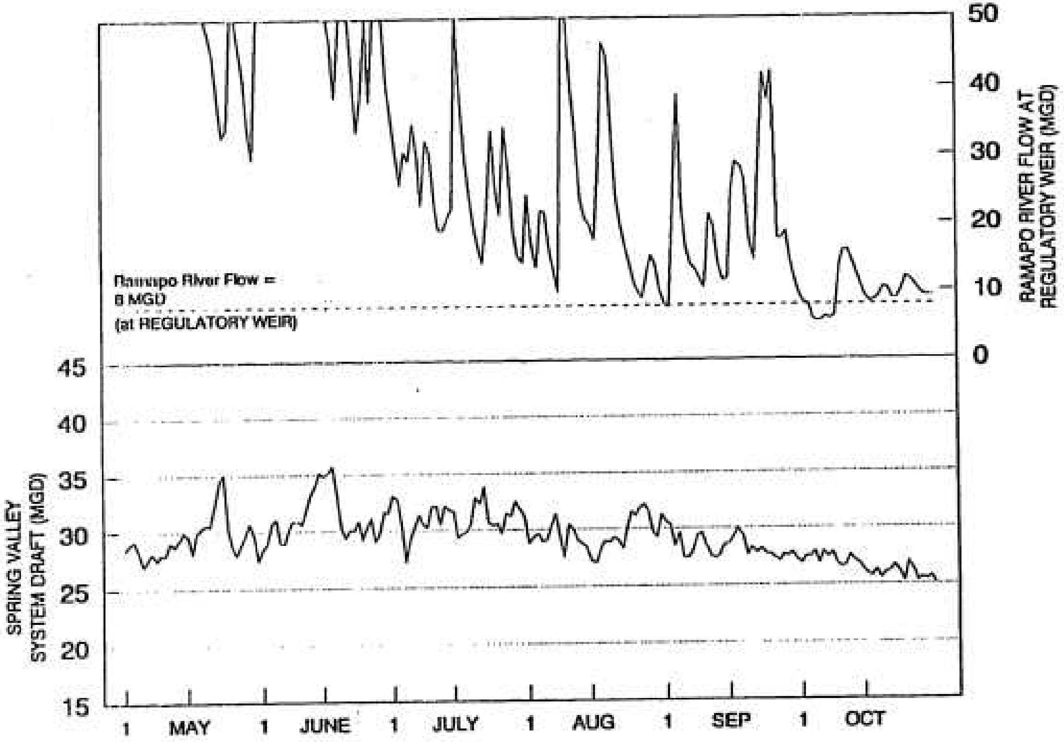

1992

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RAMAPO RIVER FLOW AT REGULATORY WEIR (MGD)
Ramapo River Flow = 8 MGD (at REGULATORY WEIR)
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SPRING VALLEY SYSTEM DRAFT (MGD)
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Responses to
New Jersey Department of Environmental Protection
Document Request of April 27, 2001 (NJDEP-3)
Case No. 98-F-1968

Ramapo Energy Project

Request 1: Copies of any Standard, Technical and Drought Operational Procedures utilized by United Water New York in the operation of all wells and surface water sources (including lakes and reservoirs) in the full drainage area of the Ramapo River as it enters New Jersey.

Response:

United Water manages its water resources based on many parameters. As demand increases, resources are brought on line to maintain pressure and water in storage tanks. Due to the complexity of the United Water New York system, no one procedure can address these various parameters.

Report on Operational Guidelines for Use of Pothat Lakes for Ramapo River Flow Augmentation dated November 1993 is attached.

Data Response Prepared By: Donald Distante

Date: May 9, 2001

Ramapo Energy discovery response CR-28, May 11, 2001

Ex. NJDEP-49

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 118

LAW OFFICES
BEVERIDGE & DIAMOND, P.C.
15TH FLOOR
477 MADISON AVENUE
NEW YORK, NY 10022-5802
(212) 702-5400
TELECOPIER (212) 702-5450

STEPHEN L. GORDON
(212) 702-5410
sgordon@bdlaw.com

May 11, 2001

<u>Via US Mail</u>

John F. Klucsik, Esq.
Devorsetz, Stinziano, Gilberti, Heintz & Smith, P.C.
555 East Genesee Street
Syracuse, NY 13202

Re: Case No. 98-F-1968
Ramapo Energy Limited Partnership Project

Dear Mr. Klucsik:

Enclosed please find Ramapo Energy Limited Partnership's responses to CR-6 through CR-28.

If you have any questions, please do not hesitate to contact me at this office.

Sincerely,

Stephen L. Gordon

Enclosures

cc: Article X Active Parties (w/enc)

N:\19\64\5010\LTR\mum klucsik2.wpd

Case No. 98-F-1968
Ramapo Energy

Discovery Responses (CR-28)
May 11, 2001

CR-28

Response:

United Water's September 2000 Master Plan uses the assumption that 300 million gallons of surface water supply will be available to augment flow in the Ramapo River. With this quantity of water, it is projected that the Ramapo Valley Well Field (RVWF) can produce 8 mgd during dry summer conditions without pumping aquifer water to the River. This would result in a net increase in production capability of 3 mgd. Currently, UWNY has 190 MG of surface water augmentation supply but it is UWNY's intention to increase this quantity in accordance with the Master Plan.

The CR-28 interrogatory refers to an increase of 2 mgd due to the use for potable supply of the two contaminated wells after treatment. To help clarify this statement, since 1995, UWNY has pumped water from up to four RVWF wells to limit migration of the contaminant plume to other wells and to augment flow in the Ramapo River. Even with some wells not in service (i.e., for potable water production), UWNY's physical pump capacity exceeded 8 mgd. However, physical pump capacity does not constrain the yield of the RVWF, rather the available augmentation supply is the constraint. For this reason, UWNY is attempting to increase its surface water augmentation supplies. Furthermore, in March 2001, UWNY completed its installation of an air stripper treatment unit at the RVWF. This unit treats all ten wells that comprise the RVWF. Therefore, it is now no longer necessary to pump wells to the Ramapo River to manage the contamination plume since water from those well can now be treated and used in United Water's system.

For further clarification, from 1996 through 2000 UWNY produced an average of 7.7 mgd from the RVWF. Of this amount, 1.3 mgd was used for plume control and augmentation and 6.4 mgd was potable production. For the reasons stated above, it will no longer be necessary to discharge wells to the Ramapo River to manage the contamination plume. However, until the flow augmentation provisions of UWNY's Master Plan are implemented, it will be necessary to discharge some wells to the Ramapo River during summer dry conditions. Although the total physical capacity of the pumps is approximately 11 mgd, with current augmentation supplies (including pumping aquifer water to the Ramapo River) the reliable yield during summer dry conditions is only 5 mgd. Hence, the need to increase augmentation supplies. UWNY has been seeking to increase augmentation supply well before the Ramapo Energy Project (REP) proposed construction of a plant in Torne Valley. Even with a reliable yield of 5 mgd during summer dry conditions, the REP will not adversely affect the reliability of the RVWF. REP is planning two actions that offset any impact on potable water supplies. These include construction of three storage tanks with a combined capacity of 9 MG of potable water storage and contribution of $1.34 million that UWNY intends to use to increase supply capacity. It is UWNY's understanding, from REP representatives, that the capacity of these tanks is sufficient to provide water needs for three months, independent of UWNY. As summer peak demand periods last for several weeks, at worse, the water usage needs of the plant would have no impact on UWNY's supply capability.

Response
Prepared By: Donald Distante

N:\19\64\5010\plg\response to CR 28.wpd

riods, a significant portion of the water released from Lake Tiorati is lost due to infiltration and evapotranspiration as water travels along this 8-mile streambed. Although these losses have not been quantified, practical experience indicates that less than 50% of the water released from Lake Tiorati reaches the Stony Point WTP during dry weather.

4.2 Groundwater

4.2.1 Sand and Gravel Wells

The primary well field in this category is the Ramapo Valley Well Field (RVWF) consisting of 10 wells located in the Village of Hillburn, Town of Ramapo, NY along the bank of the Ramapo River (see wells 84, 85 and 93-100 on Figure 4-1). Wells 84 and 99 are currently inactive due to trichlorofluoromethane contamination of a portion of the aquifer. UWNY is in the process of adding an air-stripping unit to these wells to remove this contamination prior to use as a potable supply. The wells are drilled in deposits of stratified drift to depths ranging from approximately 75 to 125 ft. The water contained in these deposits is referred to as the Ramapo Valley Aquifer, which is designated at the federal and state level as a sole source or primary public water supply aquifer, which means that it is utilized for supplying potable water and, if contaminated would create a significant hazard to public health (See 57 Fed. Reg. 39201, August 28, 1992; 591 NYCRR Section 591.2). The wells are highly productive and range between approximately 500 to 1,400 gpm.

Each of the 10 wells pumps to a central location, the Ramapo Valley Pump Station, where sodium hypochlorite and a corrosion inhibitor are added prior to being pumped to the distribution system. As specified in NYSDEC WSA No. 6507, flow in the Ramapo River, as measured at the Suffern Gauge (USGS No. 01387420) must be greater than 8.0 mgd in order to use RVWF. The maximum allowable usage of RVWF is a daily maximum of 14 mgd.

When RVWF is active, UWNY maintains river flow greater than 8 mgd by releasing water from Cranberry and Potake Ponds, for which a water release agreement exists.

Ex. NJDEP-50

This agreement with the owner of the Ponds, the Ramapo Land Company, allows UWNY to release water from the upper 2 ft of Cranberry Pond and the upper 4.5 ft of Potake Pond, which flows into Cranberry Pond. Figure 4-1 shows the location of these Ponds relative to RVWF. When available water in these Ponds is depleted, UWNY can re-direct water pumped from RVWF to the river to maintain greater than 8 mgd of river flow. While this may help keep the well field active, it significantly decreases its production capability and is only effective in the fall and winter as a sole augmentation source. A general rule-of-thumb is that UWNY can sustain about 5 mgd of production during dry periods by using Potake and Cranberry Ponds as well as RVWF pump-back to the Ramapo River. When river flow is high, and with all wells active, the practical pumping limit is approximately 11.8 mgd. Table 4-1 summarizes the production capacity of each of UWNY's wells.

In recent years, in cooperation with the Palisades Interstate Park Commission (PIPC), UWNY has released water from several lakes in Harriman Park (Primarily Lake Sebago and Pine Meadow Lake). UWNY developed a mathematical model of the Lake Sebago and Pine Meadow Lake watersheds to evaluate a minimum release that would not impact the primary purpose of these lakes, which is for recreation. UWNY has suggested the following release schedule to PIPC, which is under review:

- Pine Meadow Lake: 0.5 mgd in June through October
- Lake Sebago: 1.5 mgd in July, August and September ; 1.0 mgd in October and November

For the last three years UWNY has made releases from these lakes in a manner consistent with recreational usage objectives of PIPC. The above releases are intended to improve baseflow conditions in the Ramapo River, which should make augmentation releases from Potake and Cranberry Ponds more effective (i.e., less in-stream losses). UWNY continues to discuss these releases with PIPC with the goal of establishing a mutually beneficial public/private agreement that will ultimately benefit the residents of Rockland County by improving the reliability and yield of RVWF. As will be discussed further in

TABLE 4-1 WELL STATUS SUMMARY

[illegible]l Station	Drought Safe Yield (1) (gpm)	Average Day Capacity (2) (gpm)	Aquifer Description	Comments
FD-10 SV LOW				
SPRING VALLEY 1A	530	600	Bedrock	
SPRING VALLEY 3			Bedrock	Interference with Well 17; capac. is approx. 180 gpm
SPRING VALLEY 4	290	315	Bedrock	
SPRING VALLEY 6	440	450	Bedrock	
SPRING VALLEY 17	450	475	Bedrock	
RKILL 8			Bedrock	Out-of-service - MTBE
NANUET 13	450	460	Bedrock	Low VOC; peak use only
NANUET 14			Bedrock	Out-of-Service - VOC Contamination
AUVELT 15			Bedrock	Out-of-Service - Coliform & VOC
TAPPAN 16	180	240	Bedrock	
TAPPAN 20			Bedrock	Interference with Well 16
RDONIA 19	160		Bedrock	Peak use only - high manganese
RMONDS 21	100		Bedrock	Peak use only - entrained air
PEARL RIVER 22	70	100	Bedrock	Entrained Air
NEW CITY 23	225		Bedrock	Low pH -peak use only
EMONT 25			Sand & Gravel	Out-of-Service - iron, manganese, VOC
ESEL 32	200	215	Bedrock	
ORGE 64	350	365	Bedrock	
WOOD 66	240		Bedrock	
LAKE SHORE 73	400	410	Bedrock	
WEST GATE 79	135	135	Bedrock	
TKE 83	150	170	Bedrock	Occasional Total Coliform - peak use only
SUBTOTAL	4370	3935		
SUBTOTAL (MGD)	6.29	5.67		
FD-20 RAMAPO HIGH				
NEW HEMPSTEAD 18	520	600	Bedrock	
[illegible]EMPSTEAD 24	600	700	Bedrock	
[illegible] 25	320	340	Bedrock	
[illegible] 27	700	1000	Sand & Gravel	
RAMAPO 29A	550	900	Sand & Gravel	
LA 28	550	670	Bedrock	Entrained Air
LA 106			Bedrock	Out-of-Service - entrained air - Treat in 2001
MONSEY 30	220	235	Bedrock	
MONSEY 31A	190		Bedrock	GAC Filter added in 1998 - VOC
POMONA 37			Bedrock	Interference with Well 38
POMONA 38	310	255	Bedrock	
CATAMOUNT 42A	235	250	Sand & Gravel	
CATAMOUNT 54A	230	245	Sand & Gravel	
NOTTINGHAM 55	350	400	Bedrock	
WILLOW TREE 56	500	800	Bedrock	Entrained Air
GRANDVIEW 67	180	200	Bedrock	
GRANDVIEW 76	200	200	Bedrock	
CHERRY LANE 66	320	350	Bedrock	
[illegible] 72	450	470	Bedrock	Low VOC -peak use only
SUBTOTAL	6425	7715		
SUBTOTAL (MGD)	9.25	11.11		
FD-33 Haverstraw				
RMONT 44				Out-of-service - VOC
FD-40 THIELLS				
GARNERVILLE 46			Bedrock	Out-of-Service - Total Coliform
THIELLS 50	25	25	Bedrock	
THIELLS 51	225	235	Bedrock	
SUBTOTAL	250	260		
SUBTOTAL (MGD)	0.36	0.37		
FD-35 SV HIGH				
SADDLE RIVER 53	400	410	Bedrock	
[illegible]ACK 65	450	500	Bedrock	Low VOC & Entrained Air - peak use only
[illegible]ROOK 69	400	440	Bedrock	Low VOC - peak use only
CHWOOD 70	140	165	Bedrock	
ECKERSON 71	200	200	Bedrock	Entrained Air

TABLE 4-1 WELL STATUS SUMMARY

Well Station	Drought Safe Yield (1) (gpm)	Average Day Capacity (2) (gpm)	Aquifer Description	Comments
ERSON 82	170	200	Bedrock	Entrained Air/Low VOC - peak use only
SUBTOTAL	1760	1915		
SUBTOTAL (MGD)	2.53	2.76		
RVWF				
RVWF 84			Sand & Gravel	1250 gpm after Air Stripper added in 2000
RVWF 85	680	(3)	Sand & Gravel	
RVWF 93	650	750	Sand & Gravel	
RVWF 94	550	615	Sand & Gravel	
RVWF 95	250	350	Sand & Gravel	
RVWF 96	600	650	Sand & Gravel	
RVWF 97	700	770	Sand & Gravel	
RVWF 98	725	790	Sand & Gravel	
RVWF 99			Sand & Gravel	950 gpm after Air Stripper added in 2000
RVWF 100	1100	(3)	Sand & Gravel	
SUBTOTAL	3472	3925		
SUBTOTAL (MGD)	5.00	5.65		(4)
TOTAL	16277	17750		
TOTAL Groundwater (mgd)	23.44	25.56		
Deforest WTP (mgd)	17.00	10.00		
Total System Capacity (mgd):	40.44	35.56		

Note: Wells included under drought safe yield but not in Average daily yield are not dependable year-round due to interference and/or water quality constraints

[illegible]pated available yield during drought conditions. Based on practical experience

2 Long-term rate of supply that will not adversely effect the condition (quantity and quality) of an aquifer.

3 In order to prevent adverse dispersion of the trichlorofluoromethane plume, Wells 85 and 100 are not being used day-to-day After the air stripper is complete, these wells could be operated more frequently

4 Total supply of RVWF is not cumulative due to interaction with Ramapo River flow, which is regulated by NYSDEC Current drought safe yield is 5.0 mgd due to river flow limitations

Chapter 7, UWNY is seeking to purchase Potake Pond and to increase the amount of water available for augmentation in order to increase the yield from RVWF. The total volume of water contained in Potake Lake is approximately 800 MG, of which 300 MG is estimated to be sufficient for augmentation purposes. This is discussed further in Chapter 7.

Over the last several years, UWNY representatives have had discussions with representatives from the Village of Tuxedo Park regarding the possibility of augmentation releases from Tuxedo and We-Wah lakes. The combined volume of these lakes is approximately 4.0 billion gallons. Although a water release agreement has not been established, UWNY continues to discuss this possibility with Village representatives periodically.

UWNY also operates four wells in the stratified drift of the Mahwah Valley Aquifer. These wells yield between approximately 200 to 1,400 gpm and are drilled to depths between approximately 80 to 120 ft. Table 4-1 indicates the yield of each of these wells. One other well drilled into sand & gravel is Piermont 25, which is currently inactive due to MTBE contamination.

4.2.2 Bedrock Wells

UWNY has 46 wells that are drilled into bedrock. These types of wells, which are generally deeper than sand and gravel wells, are referred to as rock wells or bedrock wells. Currently, 40 of these wells are active. Six (6) wells are inactive due to entrained air, contamination or other water quality constraints. As will be discussed in Chapter 7, UWNY has plans to reactivate some of these wells by adding treatment. Successful drilling of a well in this geological formation is primarily dependent on whether a water-bearing fissure is found.

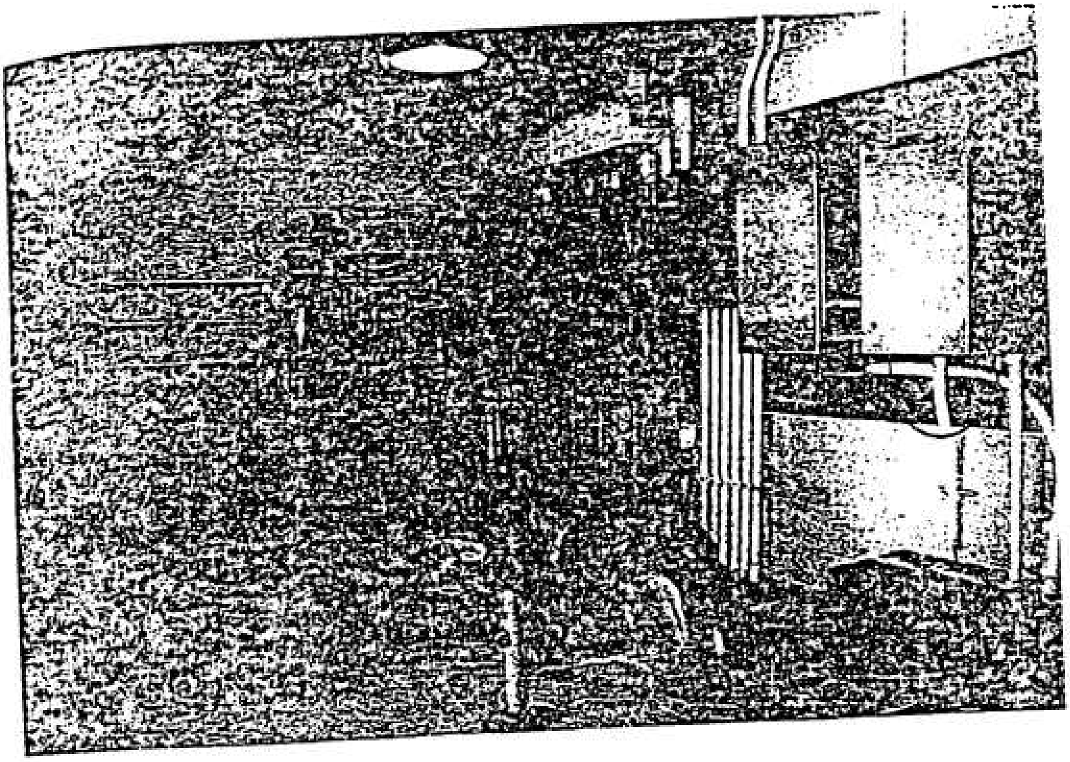


Photo2: Typical Well House Interior

Table 4-1 provides the yield of each of the active Bedrock wells. The typical interior of a UWNY pump station is shown in Photo 2.

4.2.3 *Summary*

UWNY has 52 active wells located throughout Rockland County within two types of aquifers (Sand/Gravel and Bedrock). Nine (9) wells are inactive due to contamination and/or entrained air. The wide distribution of wells throughout the County affords UWNY great flexibility in operations and is one reason for the inherent reliability of the system. An event that helped highlight this reliability was Hurricane Floyd. During this severe 1/200-yr. rain event several wells were inundated by flooded rivers and several wells were not functioning due to power outages. Nevertheless, due to the wide distribution of wells as well as other operational factors, UWNY kept service active to all customers throughout the emergency.

As will be discussed further in Chapter 7, UWNY has plans to re-activate several of the currently inactive wells by building various types of treatment. Although a significant amount of groundwater capacity will be re-introduced into the system over the next several years, UWNY can not rely solely on groundwater to supply future growth in the County. This is due to physical limitations of aquifer yield, interference between wells and contamination; the latter two are anticipated to continue as Rockland County continues to develop. Therefore, while groundwater will remain a significant portion of the overall supply, it will be necessary to construct new surface water supply capability to meet future demands for water.

4.3 *Emergency Interconnections*

There are 14 interconnection points between UWNY and adjoining systems. For all but two interconnections, pressure in the UWNY system is greater than that in the adjacent pressure district and therefore it would be necessary to use a portable pumping unit at each location in order to import water during an emergency. Figure 4-2 shows the location of these various interconnections and indicates whether pumping is required.

Rockland County drought regulations, Article V

Ex. NJDEP-51

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 120

ARTICLE-V

MANDATORY WATER CONSERVATION MEASURES

SECTION I

If, in the event the precipitation within the Rockland County Health District for the immediately preceding four calendar months is 40% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County Water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, the Commissioner of Health may declare a Stage I water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage I water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

1. Serving of water at a service food establishment except at the specific request of a patron.

2. The use of water for ornamental purposes including but not limited to fountains, artificial waterfalls and reflecting pools.

3. The use of water for flushing of sewers or hydrants except as deemed necessary for the public health and safety.

ARTICLE-V

4. The use of potable water for the non-agricultural irrigation, watering or sprinkling of any lawn except as set forth herein.

   a. Lawn irrigation, sprinkling or watering shall be permitted on the odd days of the month, only at premises that have odd numbered street addresses.

   b. Lawn irrigation, sprinkling or watering shall be permitted on the even days of the month, only at premises that have even numbered street addresses.

   c. For the purposes of the provisions of these sub-paragraphs, a premises without a street numbered address shall be considered to have an even numbered street address.

SECTION II

If, in the event the precipitation within the Rockland County Health District for the immediately preceding six calendar months is 40% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County Water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, or the water level of

ARTICLE-V

Lake DeForest falls under the Curve A, as set forth in the attached Schedule I, for three months, the Commissioner of Health may declare a Stage II water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage II water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

1. The use of water as set forth in Section I of this Article.
2. The use of water for washing of paved surfaces including, but not limited to streets, roads, sidewalks, driveways, garages, parking areas, tennis courts and patios.
3. The use of potable water for watering or sprinkling any portion of a golf course except for greens.
4. The use of potable water for non-agricultural irrigation, watering or sprinkling of lawns or flower gardens.
5. The use of water for non-commercial washing or cleaning of automobiles, trucks, trailers or any other vehicles, except for emergency vehicles.

ARTICLE-V

SECTION III

If, in the event the precipitation within the Rockland County Health District for the immediately preceding nine calendar months is 40% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County Water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, or the water level of Lake DeForest falls under the Curve A, as set forth in the attached Schedule I for six months, the Commissioner of Health may declare a Stage III water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage III water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

1. The use of water as set forth in Section I and Section II of this Article.
2. The use of water or steam for the cleaning of buildings or any other structure's exterior.
3. The use of water for the operation of ice skating rinks.

ARTICLE-V

4. The use of water for the commercial washing or cleaning of automobiles, trucks, trailers or any other vehicle by facilities which do not recycle water.

5. The use of water for the filling or the operation of a swimming pool, partly artificial swimming pool, bathing beach or any swimming facility not under permit pursuant to Part 6 of the New York State Sanitary Code.

6. The use of potable water for the non-agricultural irrigation, watering or sprinkling of landscaped areas, trees, shrubs or other outdoor plants and golf course greens.

7. The use of water from any stream, creek or other surface water supply which is tributary to Lake DeForest, the Stony Point Reservoir, Pothat Lake, or the Ramapo River.

SECTION IV

If, in the event the precipitation within Rockland County Health District for the immediately preceding twelve calendar months is 35% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County Water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, or the water level of Lake DeForest falls under the Curve B, as set forth in the attached Schedule I, for two months, the Commissioner of Health may declare a Stage IV water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage IV water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

1. The use of water as set forth in Section I, Section II, Section III, of this Article.
2. The use of water in a residence in excess of 50 gallons per resident per day.
3. The use of potable water for agricultural, commercial or industrial purposes in excess of the agricultural, commercial or industrial user's average daily consumption for the preceding twelve calendar months. When the daily average consumption for the agricultural, commercial or industrial user is not available, the average daily water consumption of the user for the 90 days immediately preceding the declaration of a Stage III emergency shall be used.
4. The use of water for the filling or the operation of any swimming pool, partly artificial swimming pool, bathing beach or any other swimming facility. This prohibition shall include but not be limited to the use of water for the filling or the operation of any swimming facility under the control of any governmental authority within the Rockland County Health District.

ARTICLE-V

SECTION V

The Commissioner of Health may, upon receipt of a written application and a fee as prescribed by the Commissioner of Health, or upon his own initiative, grant a variance from any of the prohibitions of the use of water as prescribed herein when, in his opinion, such a variance would be in the general public interest and would not unnecessarily endanger the public health and safety. Any party aggrieved by any determination of the Commissioner of Health herein may appeal such determination to the Rockland County Board of Health within ten days of such determination by submitting to the Secretary to the Rockland County Board of Health a notice of appeal as prescribed by the Commissioner of Health.

SECTION VI

If, in the event the Commissioner of Health declares a Stage I, Stage II, Stage III or Stage IV water emergency as set forth herein, the community water supplies within the Rockland County Health District who serve in excess of 2,000 people shall daily report to the Commissioner of Health their daily water production, the status of their water resources and any operational difficulty impairing the community water supply's water production capabilities.

SECTION VII

If, in the event the Commissioner of Health declares a Stage III or Stage IV water emergency as set forth herein, no new water supply resource or facility may be constructed or developed without written approval from the New York State Department of Environmental Conservation or, the written approval of the Commissioner of Health. This prohibition shall include but not be limited to the impoundment of any stream, creek, reservoir or other surface body of water, the creation or development of any water reservoir and the construction of any well.

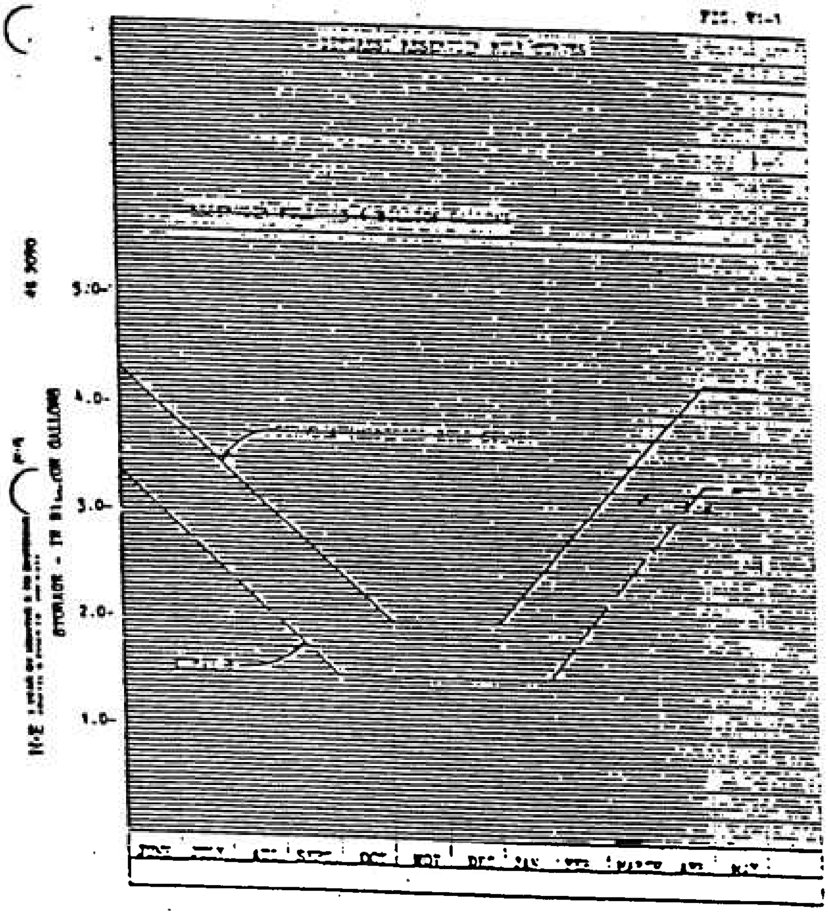
SECTION VIII

Notwithstanding any other provision of this article to the contrary, a community water supplier within the Rockland County Health District which serves in excess of 2,000 people, shall monthly report to the Commissioner of Health its water production, the status of its water resources, rain gauge measurements, and any operational difficulties impairing the community water supplier's water production capabilities and such other information as is requested by the Commissioner of Health.

ARTICLE-V SCHEDULE I

See page 20

SCHEDULE I



United Water New York Response to Rockland County Information Request, Prepared by Donald Distante, TV00466.

Ex. NJDEP-52

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 121

Case 99-F-1164

United Water New York Response to Rockland County Information Requests

Request:

5. Over the past five years (1995-2000), has the National Weather Service or any other governmental or private entity determined that drought conditions exist within the United Water service area or the area in which United's ground water or surface water resources are located, if so describe:

(a) the entity that made the determination;
(b) the nature of the determination, when was it made, and how long the determination applied;
(c) the area affected, and
(d) the water resources within the affected area.

Response:

Drought Stage Declaration by Rockland County Health Department	Date of Declaration	Comments
Stage II	9/1/95	Lifted 11/1/95
Stage I	7/13/99	Lifted Stage II on 9/11/99
Stage II	7/22/99	Lifted Stage I on approx. 9/20/99

The area affected by these drought declarations was all of Rockland County. The drought stage declaration results in water use restrictions that decrease the demand on UWNY's water resources. All resources are affected as UWNY's water supply/distribution system is interconnected.

Prepared by: Donald Distante
Date: March 9, 2001

From USGS testimony. Hydrograph showing 7 consecutive day low flow at stream gage near Mahwah

Ex. NJDEP-54

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 123

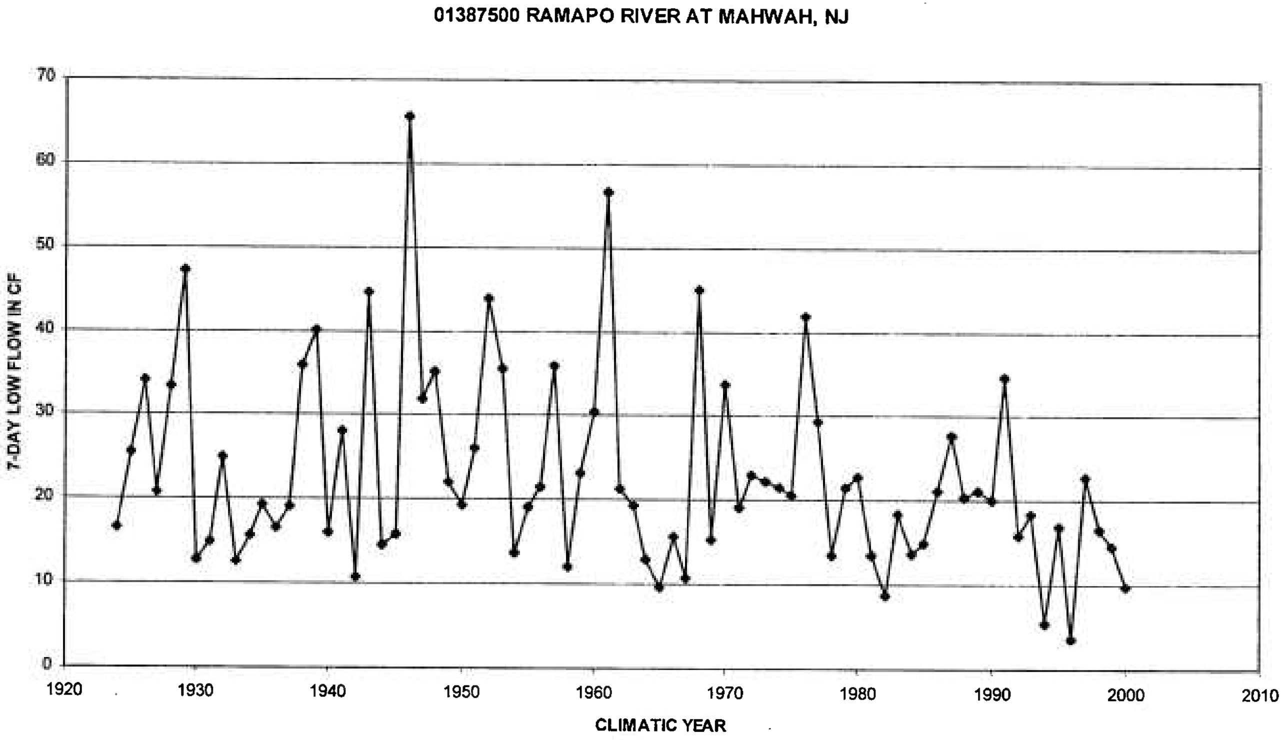
Owner	*Well Field(s)*	*Wells*	*Total pumpage 1999*
Mahwah Township	Ford	Ford 1 through 4	
	Ramapo River	Wells 16, 17, 19	3.24 mgd
Ramsey Borough	Ramapo Reservation	TW-2 and TW-3	2.01 mgd*
Oakland Borough	Soons	Soons 6, 7, 8	
	Bush	Bush 4 and 5	
	Borough	Well 9	
		Spruce Street	1.45 mgd
Total valley fill pumpage in basin in New Jersey			**6.7 mgd**

** - Permitted maximum allocation as of 2000*

1999 Pumpage for Public Supply Wells Drawing from Valley Fill Aquifer in New Jersey in Close Proximity to the Ramapo River

Ex. NJDEP-56

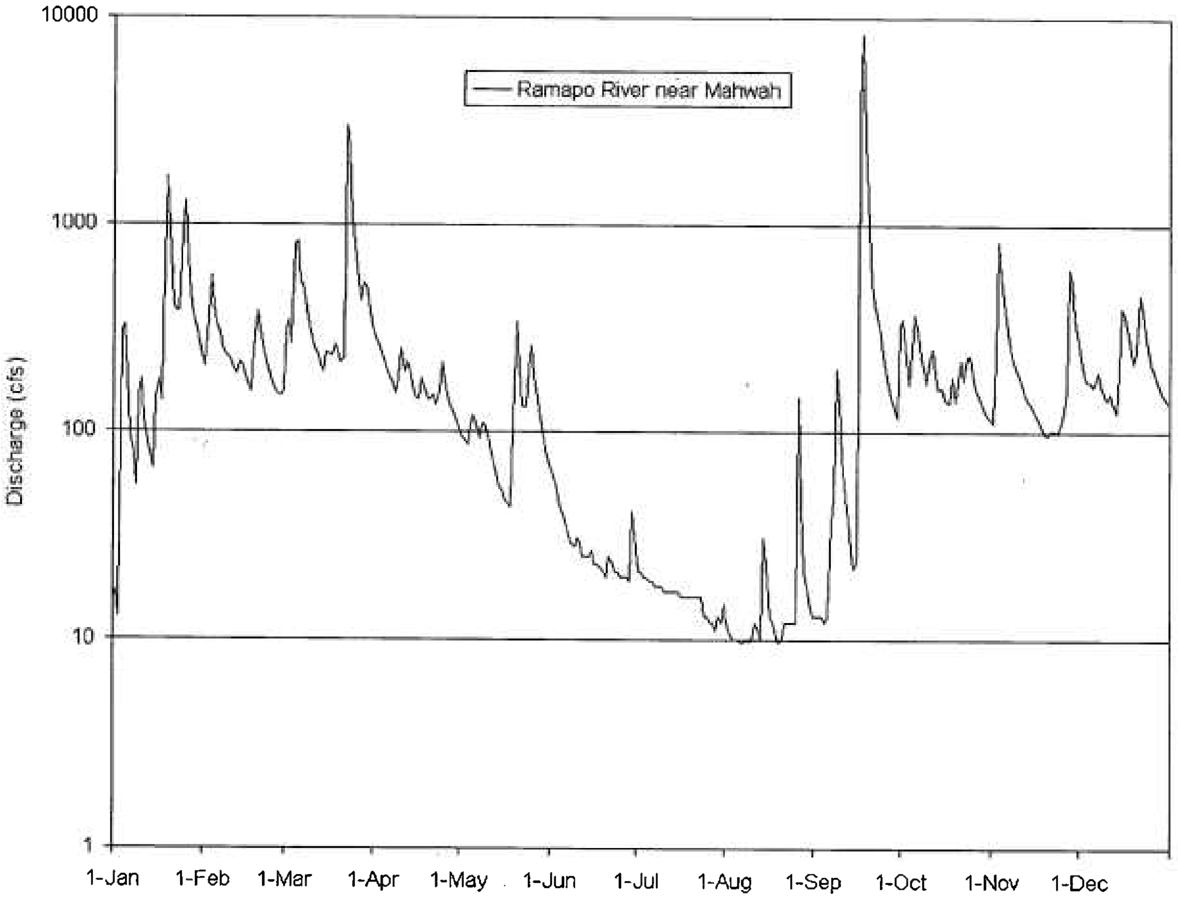
STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 125



. Flow in Ramapo River at USGS stream gage near Mahwah for 7 lowest consecutive days each year over period of record.

Exh 126 & 127 missing

Streamflow Hydrograph at USGS Gage (1999)

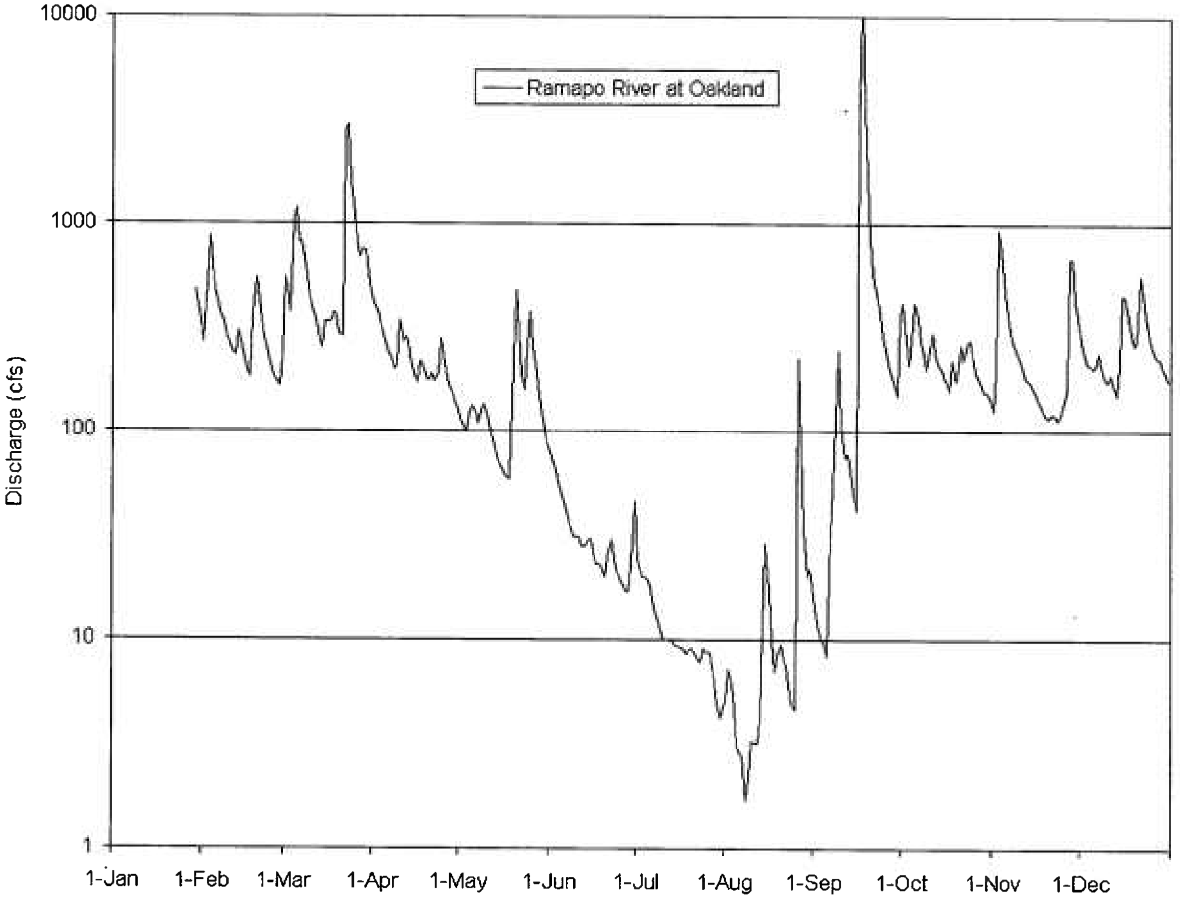


Ex. NJDEP-59

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/19/01
CASE NO. 98-F-1968
EX 128

- Stream flow at USGS gage near Mahwah, New Jersey, 1999

Streamflow Hydrograph at USGS Gage (1999)



STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 129

- Stream flow at USGS stream gage at Oakland, New Jersey, 1999.

Ex. NJDEP-60

Ramsey Borough NJDEP Water Allocation Permit showing 8 mgd passing flow requirement at Mahwah.

Ex. NJDEP-61

OF NEW YORK
DEPT OF PUBLIC SERVICE
DATE 11/14/01
CASE NO 98-E-1968
EX 130

Jen

State of New Jersey
Department of Environmental Protection
WATER SUPPLY ELEMENT
CN 426
TRENTON, NEW JERSEY 08625-0426
TEL.# 609-292-7219
FAX.# 609-292-1654

ristine Todd Whitman
overnor

Robert C. Shinn, Jr.
Commissioner

The Borough of Ramsey
33 North Central Avenue
Ramsey, New Jersey 07446
Attn: Mayor John L. Scerbo

Dear Mayor Scerbo:

Re: Water Allocation Permit No. 5076

Enclosed is a permit dated APR 24 1995 issued pursuant to the Water Supply Management Act, N.J.S.A. 58:1A-1 et seq. This permit is to divert water for public supply from 14 Passaic formation wells in the Borough of Ramsey and 2 Stratified Drift wells in the Township of Mahwah, Bergen County.

Please be advised that as you are responsible for complying with the terms and conditions of the enclosed permit you should review them thoroughly. Failure to comply with any or all of the terms and conditions could result in penalties and/or revocation of the permit.

Within 20 calendar days following your receipt of this permit you may submit a request for an adjudicatory hearing to contest the conditions of this permit. Regulations regarding the format and requirements for requesting an adjudicatory hearing may be found in N.J.A.C. 7:19-2.13.

To request a hearing, the permittee must complete the enclosed Tracking Form and supply all the information specified in Part III of the Tracking Form. A copy of the completed, signed and dated Tracking Form, together with all of the information required by Part III of the Tracking Form, including attachments where specified, must be submitted to:

1.
Richard McManus, Director
New Jersey Department of Environmental Protection
Office of Legal Affairs
CN 402
Trenton, New Jersey 08625

2. Richard H. Kropp, Bureau Chief (without attachments)
New Jersey Department of Environmental Protection
Water Supply Element
Bureau of Water Allocation
CN 426
Trenton, New Jersey 08625

Very truly yours,

Richard Kropp, P.E.
Bureau Chief
Bureau of Water Allocation
Water Supply Element

JEM:bu

Enclosure

CERTIFIED MAIL NO.

c: Bureau of Water Allocation
Bureau of Safe Drinking Water
Metro Region Enforcement Element

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION
CN 426, Trenton, N.J. 08625-0426

PERMIT*

The New Jersey Department of Environmental Protection grants this permit in accordance with your application, attachments accompanying same application, and applicable laws and regulations. This permit is also subject to the further conditions and stipulations enumerated in the supporting documents.

Permit No.: 5076

Issuance Date: APR 24 1995

Effective Date: APR 24 1995

Expiration Date: May 1, 2005

Name and Address of Applicant:
The Borough of Ramsey
33 North Central Avenue
Ramsey, NJ 07446

Location of Activity/Facility:
Mahwah Township
Bergen County

Type of Permit: Water Allocation Diversion

Statute(s): N.J.S.A. 58:1A-1

This permit grants permission to:

To divert water for public supply from 14 Passaic formation wells in the Borough of Ramsey and 2 Stratified Drift wells in the Township of Mahwah, Bergen County.

This permit is subject to the following Specific and General Conditions:

A) <u>WATER DIVERSION SOURCES</u>

1. Water may be diverted under this modified permit for public water supply from the following sources at the maximum rates specified below:

Groundwater

Well Permit No.	Well Name or Designation	Pump Capacity (gpm)	Aquifer
4300040	1 (N. Central Ave. No. 1)	250	Passaic
4300041	2 (N. Central Ave. No. 2)	150	Passaic
2304125	3 (Elbert St.)	125	Passaic
2301883	4 (Darlington Ave.)	200	Passaic
4300087	5 (Brookfield)	125	Passaic
2300881	6 (Woodland Station)	250	Passaic
4300042	7 (East Oak St.)	120	Passaic
4300043	8 (Orchard St.)	200	Passaic
2301882	9 (Martis Ave.)	200	Passaic
4300088	10 (Airmount Ave.)	100	Passaic

Approved by the authority of:

Steven Nieswand, Administrator
Water Supply Element

Richard H. Kropp
Richard Kropp, P.E. Chief,
Bureau of Water Allocation

4/24/95
Date

* *The word permit means "approval, certification, registration, etc."*

(GENERAL CONDITIONS ARE ON THE REVERSE SI

DEP-007 (BWA 4/95)

2301881	11 (E. Crescent Ave. No. 1)	200	Passaic
2303767	12 (E. Crescent Ave. No. 2)	100	Passaic
2304126	13 (Dixon St.)	125	Passaic
2304818	14 (Spring St.)	225	Passaic
	15 (TW-3)	800	Stratified Drift
	16 (TW-2)	600	Stratified Drift

B) ALLOCATION

2. The total diversion from the above sources shall not exceed the allocations and pumping rates from the specified wells under the following basin restrictive pumping scenarios:

Ramapo Basin Allocation:

> The total diversion from Well Nos. 1-6 and 14-16 shall not exceed 61.35 MGM from July 1 through August 31 and 41 MGM from September 1 through June 30 at a maximum rate of 2725 gpm.

Ho-Ho-Kus Basin Allocation:

> The total diversion from Well Nos. 7-13 shall not exceed 46.65 MGM at a maximum rate of 1045 gpm.

3. The total diversion from the above sources shall not exceed 848 MGY.

) INITIAL PERMIT REQUIREMENTS

4. Well Nos. 15 and 16 are presently permitted as "test" wells. The designated use of these wells must be changed from "test" to "public community" prior to their use as such. This will require the approval of the Bureau of Safe Drinking Water and the subsequent requisition of new well permits from the Bureau of Water Allocation.

5. At a minimum, each flow meter shall be calibrated every five years.

6. The permittee has adopted and shall implement to the satisfaction of the Department, a continuous program to encourage water conservation in all types of use within the area served by the permittee. An update to the existing plan shall be submitted to the Bureau of Water Allocation in July 1996 and every other year thereafter on the actions taken pursuant to this program and the impact thereof.

7. The permittee shall submit and be prepared to implement, to the satisfaction of the Department, a drought or water supply emergency plan. Such plan is to be submitted to the Bureau of Water Allocation within 90 days of issuance of this permit.

8. At a minimum, two permanent observation wells one at TW-2 and the other near TW-3 shall be monitored in order to document the water usage/water level relationship and to monitor the ambient conditions of the shallow aquifer near the Ramapo River, in the Wetlands adjacent to the wells. Both of these wells shall be equipped with a continuous recording device. Existing monitoring wells installed for the aquifer tests performed on test wells 2 and 3 may be utilized to monitor the effects of pumping on the wetlands and surrounding shallow aquifer. The well locations, recording device location, frequency of measurements, recording device type, recording device maintenance and data reporting schedule shall be determined by the Bureau of Water Allocation and the permittee. The permittee shall be responsible for the construction, maintenance and if necessary eventual sealing of the observation wells. The permittee shall contact the Bureau of Water Allocation within 90 days of the issuance of this permit to make arrangements for compliance with the above within six months of issuance of this permit.

9. The permittee shall design and implement a water level monitoring program to monitor the effects of pumping on the Ramapo River. This plan shall be submitted to the Bureau for approval within 60 days of the issuance date of the permit. The permittee is not permitted to divert water from the proposed wells prior to the Bureau's approval and Ramsey's implementation of the plan..

D) MONTHLY PERMIT REQUIREMENTS

10. The monthly diversion each month from each well shall be recorded and reported quarterly on form DWR-017B under Permit No. 5076.

11. Wells shall be constructed so that static water level (depth to water) can be determined at any time. Static water level and total head measurements for each pumping well and the newly required shallow monitoring wells shall be recorded monthly and reported quarterly on form DWR-017B under Permit No. 5076. Total head shall be calculated by subtracting the static water level from the land surface elevation above sea level. Measurements shall be made when the well pump has been shut down for a recovery period of at least 12 hours. If the well cannot be shut down for the required period, it must be noted on the form either the number of hours that the well was shut down or that the reading is a pumping level.

E) ANNUAL REQUIREMENTS

12. The permittee shall submit water conservation plan update as outlined in Item C.6. above.

F) GENERAL REQUIREMENTS

13. All diversion sources shall be metered with a totalizing flow meter.

14. All wells shall be equipped with a metal tag showing the well permit numbers listed in Item A above or have the permit numbers painted on the casings.

15. The pumping equipment capacity shall not be increased without prior approval from the Bureau of Water Allocation.

16. All new services shall be metered in accordance with all applicable laws, regulations or codes including, but not limited to, the Water Supply Management Act.

17. All existing services shall be metered.

18. Water charges for each service connection shall be based in part on metered usage.

19. The permittee shall investigate valid complaints by users of wells or surface water supplies within the zone of influence of its diversions to determine what impact the diversions have had on such wells or surface water supplies. A report on these investigations shall be forwarded to the Bureau of Water Allocation. Any well or surface water supply which becomes damaged, dry, has reduced capacity, reduced water quality or is otherwise rendered unusable as a water well or surface water supply system as a result of the permittee's diversions shall be repaired or replaced at the expense of the permittee. Work shall be in accordance with all State, County and Municipal construction standards for potable water. The Department of Environmental Protection will make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and will determine how to resolve any problems resulting from the diversion.

20. The Department may modify, suspend or terminate this permit, after due process, for violations of permit conditions, N.J.S.A. 58:1A-1, N.J.A.C. 7:19-1 et seq., any orders issued by the Department, or when in the public interest.

21. The permittee is subject to such initial, modification and annual fees as may be prescribed by the regulations.

22. The permittee shall have the right to apply at any time for modification of this permit by submission of the appropriate application forms. The permittee may informally discuss the terms and conditions of this permit at any time with the Bureau of Water Allocation. An application for renewal shall be filed 3 months prior to the expiration date.

23. In addition to the specific management requirements cited above, and when so directed by the Department, the permittee shall comply with applicable portions of the Water Supply Management Rules (N.J.A.C. 7:19-6 et seq.) to include the determination of dependable yield; unaccounted-for water; rehabilitation; system pressure and storage; interconnections; and operation of interconnections.

24. The permittee shall obtain approval from the Bureau of Safe Drinking Water before using the diversion from Wells 15 (TW-3) and 16 (TW-2) for public water supply.

25. The permittee is not permitted to withdraw water from Well Nos. 15 and 16 when the passing flow in the river, as measured at the U.S.G.S. Gauging Station in Mahwah, is below 8 MGD [12.32 Cubic Feet per Second (CFS)].

G) <u>PERMIT EXPIRATION</u>

26. This permit shall expire on May 1, 2005.

Resume of Robert J. Canace

Career Goals

Contribute to the field of hydrogeology my practical geologic and hydrologic skills and observations. Employ hydrogeologic concepts to solve problems relating to water resources evaluation, ground-water contamination, geologic hazards, and environmental planning.

Education

Rutgers University-Newark College of Arts and Sciences (NCAS): 1974-1975, nine (9) graduate credits toward Masters of Science in Geology.

Rutgers University-NCAS: 1973-1975, Bachelor of Arts in Geology.

Fort Lewis College, Durango, Colorado: June to July 1974, Geology Field Camp, San Juan Mountains, Southwestern Colorado.

Newark College of Engineering: 1970-1973, 75 credits in undergraduate engineering (transferred to Rutgers University)

Professional Experience

Section Chief,, **Bureau of Ground-Water Resources Evaluation, New Jersey Geological Survey, Division of Science, Research & Technology (Division of Water Resources), New Jersey Department of Environmental Protection, Trenton, New Jersey (2000 to Present):**

Direct Hydrogeology Section programs and manage staff of 11 professionals. Conceive, plan and execute project work plans and budgets. Interview and hire staff for all programs. Conduct regional ground-water investigations. . Develop and employ hydrologic models for determining sustainable water resource development. Develop and publish aquifer-testing protocols. Guide regulatory and planning agencies with water-resource evaluation. Assess hydrogeology and environmental hazards associated with karst. Conduct and analyze aquifer tests in all hydrogeologic settings. Site community supply wells based on hydrogeologic conditions and findings of geophysical studies. Develop, employ and review hydrogeologic models. Assist department in establishing water-resource policies. Provide expert testimony.

Supervising Geologist (Acting Section Chief), Bureau of Ground-Water Resources Evaluation, New Jersey Geological Survey, Division of Science, Research & Technology (Division of Water Resources), New Jersey Department of Environmental Protection, Trenton, New Jersey (1982 to 2000):

Direct Hydrogeology Section programs and manage staff of 11 professionals. Conceive, plan and execute project work plans and budgets. Interview and hire staff for all programs. Conduct regional ground-water investigations. . Develop and employ hydrologic models for determining sustainable water resource development. Develop and publish aquifer-testing protocols. Guide regulatory and planning agencies with water-resource evaluation. Map carbonate formations and assess hydrogeology and environmental hazards associated with karst. Conduct and analyze aquifer tests in all hydrogeologic settings. Site community

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supply wells based on hydrogeologic conditions and findings of geophysical studies. Provide expert testimony.

Principal Geologist, Bureau of Ground-Water Management, Division of Water Resources, New Jersey Department of Environmental Protection, Trenton, New Jersey (1982).

Mapped carbonate rock formations in northern New Jersey and evaluated their hydrologic properties. Conducted geophysical investigations of aquifers and ground-water contamination sites. Sited wells for individuals and municipalities. Involved in planning and program development. Responded to geologic hazards. Assisted planning agencies in understanding and employing water-resources information.

Senior Geologist, Bureau of Ground-Water Management, Division of Water Resources, New Jersey Department of Environmental Protection, Trenton, New Jersey (1980-1982).

Mapped carbonate rock formations. Developed guidelines for alternate septic systems. Reviewed applications for alternate septic systems. Developed guidelines and technical standards for alternate design septic systems. Sited wells for communities and individuals.

Geologist Trainee, Bureau of Ground-Water Management, Division of Water Resources, New Jersey Department of Environmental Protection, Trenton, New Jersey (October 1979-June 1980).

Utilized ground-water model to review septic systems for subdivisions in the Pinelands. Review alternate design septic systems.

Senior Geologist, Division of Environmental Science, Essex County Park Commission, Livingston, New Jersey (1977-1979).

Design and construction of Dinosaur Museum and Park. Public education programs. Development of geology interpretive trails. Review of County development projects from the standpoint of geology and water impacts

Teacher, Maplewood-South Orange Board of Education, Essex County, New Jersey (1975-1977).

Taught science and math curricula.

Researcher, Inform, New York, New York (1976).

Conduct research on private sector involvement in development of alternate sources of energy. Wrote chapter in book summarizing project.

Research Intern, New Jersey Public Interest Research Group, South Orange, New Jersey (1975-1976).

Conducted research and published on the impact of the Tocks Island Dam, impact of cooling towers at nuclear power plants, and other technical environmental issues.

<u>Training</u>

Aquifer Test Design and Analysis (NWWA Association of Ground-Water Scientists and Engineers): 1987, Somerset, New Jersey (1 week). Theoretical and practical considerations in the design and analysis of aquifer tests.

Concepts in Ground-Water Modeling (USGS-WRD): 1986, Trenton, New Jersey (1 week). Theoretical concepts of ground water models. Ground-water model design. Presented lecture on geologic considerations in ground-water modeling.

Isotope Hydrology (NWWA Distinguished Speakers Series): 1984, San Diego, California (4 days). Fundamental concepts in isotope geochemistry and hydrogeology. Current developments and practical problems in applying isotopes to ground water.

Theory of Aquifer Tests (Dan Raviv Consultants): 1983, Trenton, New Jersey (1 week). DEP-sponsored course in theory of aquifer tests. Analysis of aquifer-test data.

Well-Logging Course (USEPA): 1981, Philadelphia, Pa. (1 week). Interpretation of bore hole geophysical logs.

Ground-Water Concepts (UOP Johnson Division): 1980, New York, New York (1 week). Fundamental concepts in ground-water hydrology and water-well completion and testing.

Honoraria/Memberships

Phi Beta Kappa Society, Herbert Woodward Scholar-Rutgers University, Award for Engineering Excellence-Consulting Engineers Council of New Jersey (Ground-water supply investigation, glacial buried valleys of northern New Jersey), Project Team of the Year Award-Project Team of the Year Association/Delaware Valley Chapter (Northern New Jersey Observation Well Network), President-Ridge and Valley Conservancy, Inc. (1992-Present), Chairman-Frelinghuysen Township Planning Board (1990-Present), Chairman-Warren County Environmental Commission (1998), Member-Warren County Agricultural Development Board (1998-Present) National Water-Well Association, Geological Society of America

Interests

Hiking, Biking, Swimming, Gardening, Bird Watching, Music, Auto Repair, Carpentry, History.

References

Available upon request.

Publications

Canace, Robert, Monteverde, Donald, and Serfes, Michael, 1996. Karst hydrogeology of the Shuster Pond area, Hardwick Township, Warren County, NJ, in Karst Geology of New Jersey and Vicinity, Richard Dalton and James Brown, ed., XIII Annual Meeting of the Geological Association of New Jersey, Whippany, NJ, Oct. 11 & 12, 1996.

Canace, Robert, Stanford, Scott, and Hall, David, 1990, Hydrogeologic framework of the middle and lower Rockaway River basins, Morris County, New Jersey, New Jersey Geological Survey Report Series GSR-33, Trenton, New Jersey.

Canace, Robert and Hutchinson, Wayne, 1989 Bedrock topography and profiles of valley-fill deposits in the Ramapo River valley, New Jersey, New Jersey Geological Survey Geologic Map Series 88-6, NJ Department of Environmental Protection, Trenton.

Canace, Robert and Richard Dalton, 1984. A geological survey's cooperative approach to analyzing and remedying a sinkhole related disaster in an urban environment, in, sinkholes: their geology, engineering and environmental impact, proceedings of the first multidisciplinary conference on sinkholes, Florida Sinkhole Research Institute, College of Engineering, University of Central Florida, Orlando, Florida, October 15-17, 1984.

Andres, Kari G. and Robert Canace, 1984. Use of electrical resistivity technique to delineate a hydrocarbon spill in the Coastal Plain of New Jersey: a case study, in petroleum hydrocarbons and organic chemicals in ground water-prevention, detection, restoration-a conference and exposition, Houston, Texas, November 5-7, 1984.

Hoffman, Jeffrey L., and Canace, Robert, 1986, Two-part pump test for evaluating the water-supply capabilities of domestic wells, New Jersey Geological Survey Ground-Water Report Series No. 1, NJ Department of Environmental Protection, Trenton.

Fischer, J.A., R.W. Greene, R.S. Ottoson, and R. Canace, 1985. Geotechnical engineering in doline terrain, in, proceedings of the 38th Canadian geotechnical conference, Alberta, Canada, September 25-27, 1985.

Markewicz, Frank J., Richard Dalton, and Robert Canace, 1981. Stratigraphy, engineering and geohydrologic characteristics of the Paleozoic carbonate formations of northern, New Jersey, in design and construction of foundations on the carbonate formations of New Jersey and Pennsylvania, conference, Civil and Engineering Department, New Jersey Institute of Technology, June, 1981.

APPENDIX H-2

United Water New York Response to New York State Department of Public Service Water Supply Stipulations

Ex. NJDEP-104

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CASE NO. 98-F-1968
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United Water New York

Response to New York State Department of Public Service

Water Supply Stipulations

Ramapo Energy Project
Town of Ramapo, Rockland County
New York

Submitted by: Donald F. Distante, P.E.
July 18, 2001
United Water Management & Services
Engineering and Planning Department
200 Old Hook Road
Harrington Park, NJ

5. *an identification of the water supply source or sources to be used by the Project, including an analysis of the available capacity of the water supply source in terms of quantity, quality, and pressure and an analysis of the impacts of such water usage during normal and drought periods on other users of the water supply source, and an identification of all infrastructure requirements necessary to serve the Project, including distribution piping, mains, pumps, storage, or additional supply;*

Response: It is United Water New York's (UWNY) understanding that the proposed plant will require approximately 23 million gallons of potable water per year. This figure is based on the information contained in the August 21, 2000 letter from G. Marchmont to J. Glozzy. Peak usage by the proposed plant during the summer period would be approximately 60,000 gpd. During the non-summer period maximum daily usage would be 150,000 gpd. For comparison purposes, the average annual usage of water by the proposed plant is equivalent to the usage of approximately 250 single-family residential homes. From 1996 through 2000, UWNY added an average of approximately 875 such homes per year as customers. For further comparison, the proposed summer consumption of 60,000 gpd is approximately 0.2 % of UWNY's annual average demand of 29 mgd. Further, in its Addendum No. 2 filed with the Siting Board on June 21, 2001, the applicant has indicated that if it adopts a zero discharge facility, its demand will be further reduced to 43,000 gpd (p. 24). This would further reduce the impacts as set forth above.

Background: UWNY serves approximately 68,000 customers located in Rockland County, New York. Average demand is 29 mgd and peak demand is 45 mgd. Approximately 67% of supply is provided from 55 wells located throughout the county. The remaining 33% is supplied from Lake DeForest, a surface water source located in the Hackensack River watershed. Ten (10) wells are located along the Ramapo River and these provide approximately 30% of the total supply.

UWNY is regulated by the New York State Public Service Commission (NY PSC) and must adhere to many water supply permits issued by the New York State Department of Environmental Conservation (NY DEC).

UWNY's distribution system consists of approximately 1000 miles of pipeline, 14 tanks, 13 booster stations and 24 pressure reducing valves. The system is interconnected throughout enabling water to be pumped amongst various pressure districts. UWNY operates the entire system remotely from a System Control and Data Acquisition (SCADA) facility located in West Nyack, NY. The distribution system is well reinforced internally to allow potable water to be pumped throughout the county. For the Torne Valley region, when supply from the wells located along the Ramapo River is temporarily curtailed, water can be pumped from the Lake DeForest treatment plant. However, this can only be done for a short period of time (i.e., several days) due to hydraulic constraints. Figure 1 provides a general schematic of the major water supply and distribution features of UWNY's system.

Interconnections with adjacent water companies are available to the east with the village of Nyack and to the south with United Water New Jersey. These can be used during emergencies to help ensure a sufficient supply of water for the region.

System Capacity: The total capacity of UWNY's supply, after completion of the Viola 106 well project this summer, will be approximately 42 mgd. Recent peak demands are approximately 45 mgd. For short periods of time (approximately 3 consecutive days) UWNY can supply such peak demands by using system storage. Figure 2 shows UWNY's water supply plans to meet existing and projected peak demands. As indicated, UWNY's annual average capacity exceeds annual average demand. Projects are primarily planned to increase peak capacity to meet system demands during summer peak usage periods. Figure 2 includes water usage estimates from RELP and Bowline 3. According to recent information from Sithe Energies, the proposed Torne Valley Station would not use water from UWNY for process needs.

The primary source of potable water to the proposed project is the Ramapo Valley Well Field (RVWF). Production from this facility is permitted as shown in Table 1 below.

Table 1

Ramapo River Flow at Gage 01387420 (mgd)	*RVWF Pumping Restrictions (mgd)*
> 8	Monthly avg: 10 Daily Maximum: 14
≤ 8	NO PUMPING

When the Ramapo Pump Station is active, at least 8 mgd must be maintained in the Ramapo River. Both NY DEC and the New Jersey Department of Environmental Protection agreed upon this minimum bypass flow which applies only when RVWF is active. By using surface water and groundwater sources, UWNY has the ability to maintain at least 8 mgd in the River most of the time. Surface water releases from Potake and Cranberry Ponds are the primary means to augment flow in the Ramapo River. Groundwater pumped from RVWF is also used to maintain at least 8 mgd in the River. The Palisades Interstate Park Commission has also allowed limited releases from two lakes in the Ramapo River watershed to help keep the flow above 8 mgd during periods of drought. However, during sustained dry periods in the summer and fall, it is periodically impossible to maintain this flow given the available augmentation sources. Therefore, UWNY has had to periodically shutdown RVWF until flow in the Ramapo River increases.

UWNY is currently attempting to purchase Potake Pond in order to increase augmentation supply. This proposed project is shown on Figure 2. Current augmentation supply from both Cranberry and Potake Ponds combined is 190 MG. Potake Pond contains approximately 700 MG of water. UWNY estimates that an augmentation volume of approximately 300 MG would be required to reliably operate RVWF at its permitted allocation during drought periods. This estimate is based on use of a water supply model developed by UWNY and independently reviewed by the consulting engineering firm of Lawler, Matusky & Skelly Engineers. UWNY's Master Plan also includes other supply projects, which provide a sufficient diversity so that if one project is not approved, another could be accelerated to take its place.

The above information briefly describes the water supply capacity for the UWNY system and addresses the key projects to correct limitations of RVWF. The key question is, however, what impact would RELP have on UWNY's water system? As mentioned above, UWNY has excess capacity to meet annual average demands. The current annual average capacity is 38 mgd, compared to annual average demand of 29 mgd. Therefore, RELP's planned maximum usage of 150,000 gpd during the non-summer period poses no problem to UWNY. To eliminate impacts on UWNY's system during the summer peak usage period, RELP has committed to construct three 3-MG tanks onsite for a total combined storage of nine (9) MG. After consideration of fireflow needs, RELP estimates that 8.25 MG would be available for supply to the facility. According to RELP, this quantity of water is sufficient to supply the water consumption needs of the proposed plant for 60 days, independent of supply from UWNY. Therefore, during non-drought periods, when UWNY has excess capacity, these tanks would be replenished, and during periods of dry weather or drought, Ramapo Energy would have the flexibility to operate without taking water from UWNY. As UWNY currently experiences water supply limitations only during short periods (i.e., generally for less than two weeks during severely dry summer periods), the 8.25 MG of storage at the proposed plant would offset any impacts on water usage during periods of severely dry weather. For further clarification regarding UWNY's system, if UWNY increases its supply capacity, as shown in Figure 2, then sufficient production capacity would exist to supply RELP throughout the year, even during summer peak usage periods. Nevertheless, the 8.25 MG of storage would be beneficial during very severe droughts or during other unforeseen water emergencies.

As a general benefit to UWNY's supply capacity, RELP has agreed to contribute $1,340,000 to be used towards construction of supply projects. UWNY will use these funds to construct or obtain water supply resources for the benefit of the Rockland County community. Additionally, RELP will contribute $300,000 specifically earmarked for water system improvements to benefit the Torne Valley Area. UWNY intends to use these funds to build projects to increase the efficiency of the current volume of releases from Potake Pond. Such projects include automated valves and a pipeline leading directly from Potake Pond to a tributary of the Ramapo River. Such projects will be beneficial to the overall supply capabilities in Rockland County.

Furthermore, Ramapo Energy has made an additional commitment regarding water usage during periods when the Rockland County Health Department declares that the County must adhere to conservation measures. This includes a commitment to eliminate water withdrawals from UWNY's system during Stage II or higher droughts.

Water Quality and Pressure: All of UWNY's potable supply meets and often surpasses all health and safety standards set by the Environmental Protection Agency (EPA), the New York State Department of Health (NY DOH) and the Rockland County Department of Health (RC DOH). Appendix A contains UWNY's Consumer Confidence Report for 1998. This report summarizes the various standards and the range of results for UWNY's potable supply.

Specific water quality requirements by RELP that are less than agency standards would need to be met by additional onsite treatment within the proposed plant. The additional water demand on UWNY's system will not result in any water quality changes to UWNY's potable supply.

Water will be supplied to Ramapo Energy via UWNY's 30-inch pipe located in Route 59/17 near the intersection of Torne Valley Road. Currently, the Rockland County Solid Waste Management Authority ("RC SWMA") owns a 16-inch line running up Torne Valley Road near the proposed site. Subject to Ramapo Energy obtaining an agreement with the RC SWMA and UWNY for the use of this line, Ramapo Energy would obtain water service by tapping this 16-inch line in Torne Valley Road. If such approvals were not obtained then an alternative route would need to be established.

The elevation of UWNY's 30-inch pipe at the intersection of Torne Valley Road and Rt. 59/17 is 291 ft (relative to NGVD 1929). Pressure in this pipe is directly controlled by the RVWF pump station, which produces a gradient ranging from 690 to 757 ft. The resulting range of pressure available in UWNY's 30 inch main is 172 psi to 202 psi. The anticipated overflow elevation of RELP's water tanks is 750 ft. The high elevation of the site relative to UWNY's available pressure gradient will require a booster pump system to obtain adequate service. RELP would be responsible to design, build, own and operate a system to UWNY specifications to provide adequate service.

Given the planned improvements to UWNY's supply system and the proposed onsite storage of 9 MG, the operation of RELP would not have any discernible effect on UWNY's system pressures.

<u>Distribution piping, mains, pumps and storage:</u> It will not be necessary for UWNY to construct any distribution piping, mains or pumps to serve RELP. Ramapo Energy will be installing its own piping and pumps and is planning to construct sufficient storage to support operational variations and fire flow requirements. UWNY is planning to install a meter to record water consumption by RELP.

6. *a cumulative analysis of the available capacity of the water supply source in terms of quantity, quality, and pressure and an analysis of the impacts of such water usage during both normal and drought periods on other users of the water supply source, assuming simultaneous operation of the Project and the proposed Torne Valley Station, assuming both are using the same source of water supply, based on DPS Staff's proposed methodology of a proportional ratio based on the proposed megawatt sizes of the two projects being used to estimate inputs for the other project for this analysis, and the impact of the projects on excess infrastructure capacity, including distribution piping, mains, pumps, storage, or additional supply;*

Response: According to the Article X application filed by Sithe Energies, the Torne Valley Station (TVS) would have peak usage of 79,000 gpd. However, recently, Sithe has proposed plans to construct a peaking-only power plant that would have no process water usage requirements. Figure 2 shows the cumulative effect on water supply of the two power plants that have had their Article X application accepted as complete. Since the usage of the proposed Bowline 3 plant is greater than that of Sithe's (i.e., 180,000 gpd peak summer usage for Bowline 3 versus 79,000 gpd for TVS, as specified in their Article X application), the supply scenarios shown in Figure 2 are sufficient for this analysis. The figure demonstrates that given UWNY's planned water supply projects that water supply would be sufficient to serve the needs of the proposed power plants.

The 30-inch main in Rt. 17/59 is designed to carry the available production of RVWF (i.e., 14 mgd maximum day). The maximum withdrawal proposed by RELP is 150,000 gpd and by the reduced TVS project is negligible. Currently, this transmission pipe serves the areas north of Torne Valley Road. As maximum demands in this area are only several mgd, the existing pipe has ample capacity to serve the needs of the proposed power plants. Thus, as planned usage represents approximately 1% of the pipe carrying capacity, UWNY does not anticipate any effect on other customers receiving water from the same line. Furthermore, UWNY does not anticipate any significant impacts on system pressure due to the combined demands of both plants. The Item 5 response above regarding water quality also applies to both plants operating simultaneously. UWNY does not anticipate that the usage from the both plants operating simultaneously will have any effect on potable water quality.

8. *an identification and evaluation of other reasonable mitigation measures, including the use of alternative technologies, potential alternative supply sources including on-site sub-surface wells, water storage, and offsetting water conservation, regarding water supply impact, and including a contingency plan for periods of drought or water emergency describing thresholds for water use curtailment;*

According to the August 21, 2000 letter from G. Marchmont to J. Glozzy, Ramapo Energy will construct three 3-MG storage tanks. As discussed in the response to Item 5, such storage is capable to supply the proposed project for 60 days, independent of supply from UWNY. To ensure that the storage tanks are available for their intended purpose, they should be filled by June 1 of each year. UWNY has ample supply and transmission capacity to fill the tanks prior to the summer dry periods. As discussed in the response to Item 5, RELP has made a commitment to Rockland County that during a Stage II or higher drought that withdrawals from UWNY's system would be reduced to zero.

19. *a map based on publicly available information showing all areas within a one mile radius of the Project site delineating all groundwater aquifers and groundwater recharge areas, and identifying groundwater flow direction, groundwater quality, and the locations, depth, yield and use of all public and private groundwater wells or other points of extraction of groundwater, and including delineation of wellhead and aquifer protection zones.*

Response: The attached figure in Appendix B from Leggette, Brashears & Graham, Inc. provides the location of wells within a one mile radius of the facility, aquifer delineation and wellhead protection areas. Naturally occurring groundwater flow in the Ramapo Valley Aquifer is generally from the valley sides and upgradient portions of the drainage basin towards the Ramapo River and downgradient extent of the aquifer to the South. The flow direction may locally vary (e.g., be reversed) in the vicinity of pumping wells that tap the aquifer. The yield of Well 95, the location of which is indicated in Appendix C, is 500 gpm. The depth of this well is approximately 95 ft.

20. *an analysis and evaluation of all reasonably potential impacts created by the construction or operation of the Project on groundwater quality and quantity in the project area, including potential impacts on public and private water supplies and wellhead and aquifer protection zones,* ***and including an analysis of current aquifer capacity, amounts withdrawn by current users, amounts expected to be withdrawn by the Project, estimated amounts needed for future growth, for day, evening and night hours, Project impacts on groundwater recharge, and an estimate of the anticipated zone of influence for any proposed groundwater withdrawal;***

Response: This response deals primarily with aquifer capacity and amounts withdrawn by current users, as the applicant would address the other issues. Because the aquifer is hydraulically connected to the Ramapo River, capacity is based on flow in the river. When flow in the Ramapo River is greater than 8 mgd, the aquifer capacity is 10 mgd (monthly average) and 14 mgd (maximum day). When river flow is less than or equal to 8 mgd, the well field may not operate. This last restriction is to ensure that flow in the Ramapo River at the USGS gauge in Suffern (01387420).is maintained at 8 mgd or greater. Table 2 summarizes average production from the Ramapo Valley Well Field in 1997 and 1998 (i.e., amounts withdrawn by current users):

Table 2

	Ramapo Valley Well Field Production (mgd)			
Month	**1997**	**1998**	**1999**	**2000**
Jan	6.84	4.17	6.77	7.84
Feb	6.76	7.36	9.38	7.35
Mar	6.67	7.57	0.85[*]	8.14
Apr	6.96	7.58	6.74	8.68
May	7.43	7.48	5.86	7.73
Jun	7.61	8.50	6.07	7.57
Jul	7.17	7.90	5.56	7.86
Aug	6.28	5.65	4.34	7.71
Sep	6.78	5.09	4.84	7.43
Oct	6.16	4.12	5.25	7.49
Nov	7.58	3.32	7.43	7.22
Dec	8.21	4.90	8.28	6.79

[*] Wellfield shutdown for maintenance

21. a cumulative analysis and evaluation of all reasonably potential impacts created by the construction or operation of the Project on groundwater quality and quantity in the project area, including potential impacts on public and private water supplies and wellhead and aquifer protection zones, and including an analysis of current aquifer capacity, amounts withdrawn by current users, amounts expected to be withdrawn by the Project, estimated amounts needed for future growth, for day, evening and night hours, Project impacts on groundwater recharge, and an estimate of the anticipated zone of influence for any proposed groundwater withdrawal, assuming simultaneous operation of the Project and the proposed Torne Valley Station, assuming both are using the same source of groundwater supply, which may be based on DPS Staff's proposed methodology of a proportional ratio based on the proposed megawatt sizes of the two projects being used to estimate inputs for the other project for this analysis;

Response: Cumulative impacts on groundwater quantity and quality assuming the construction and operation of both plants will be addressed by the applicant. UWNY's response regarding aquifer capacity and current amounts withdrawn is addressed in Item 20 above.

AL71125.2

Figure 1

UNITED WATER NEW YORK

MAJOR FEATURES MAP

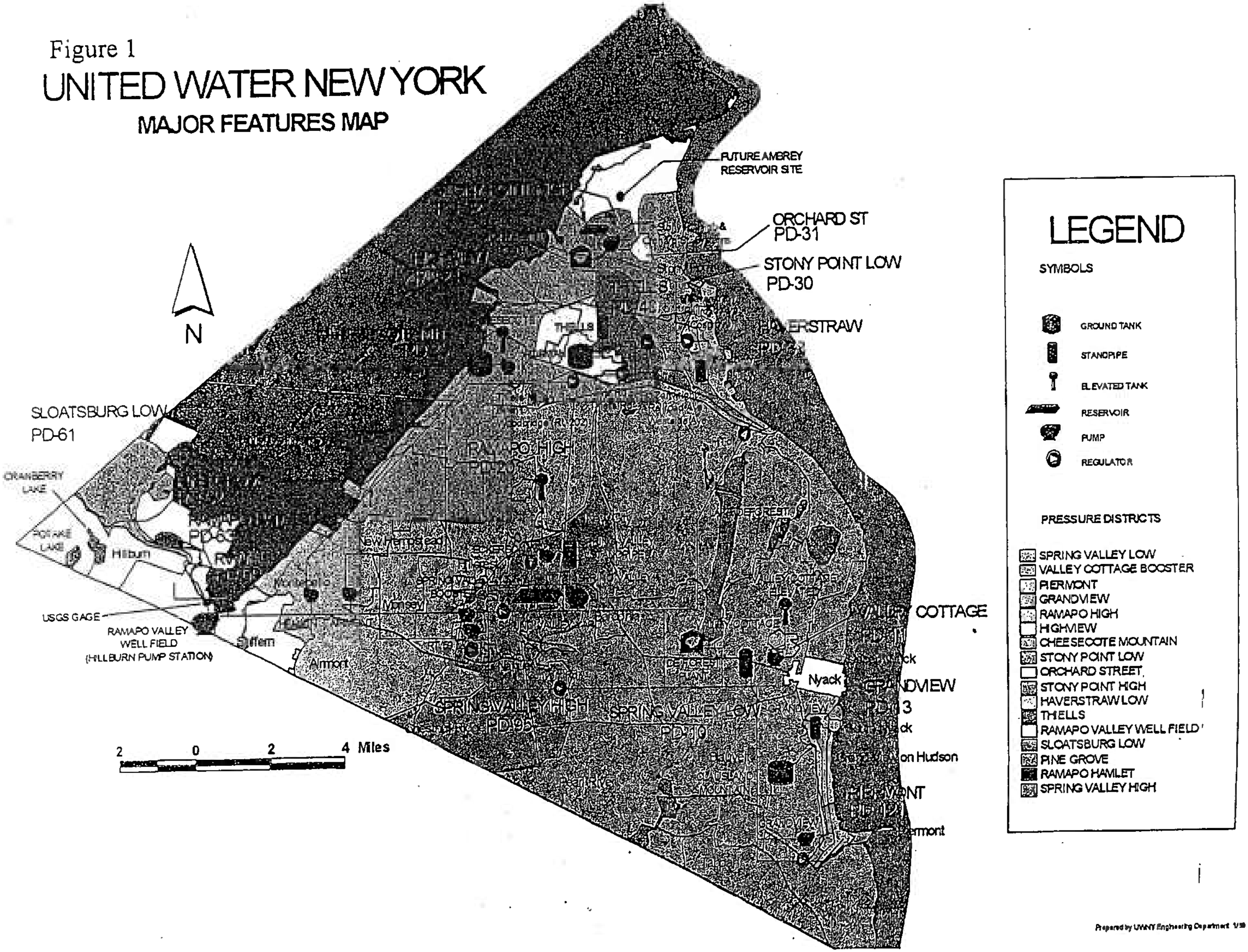


Figure 2: Water Supply Plan (April 2001 Revision)

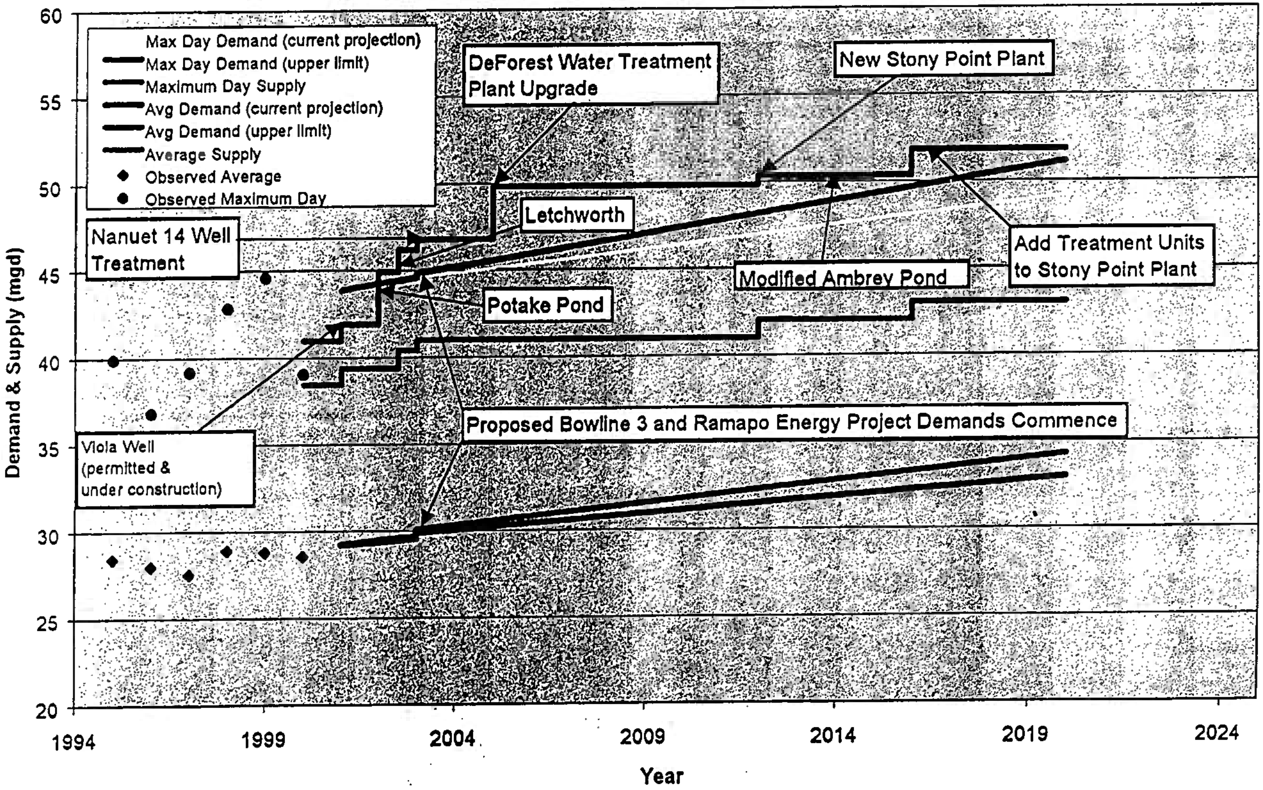
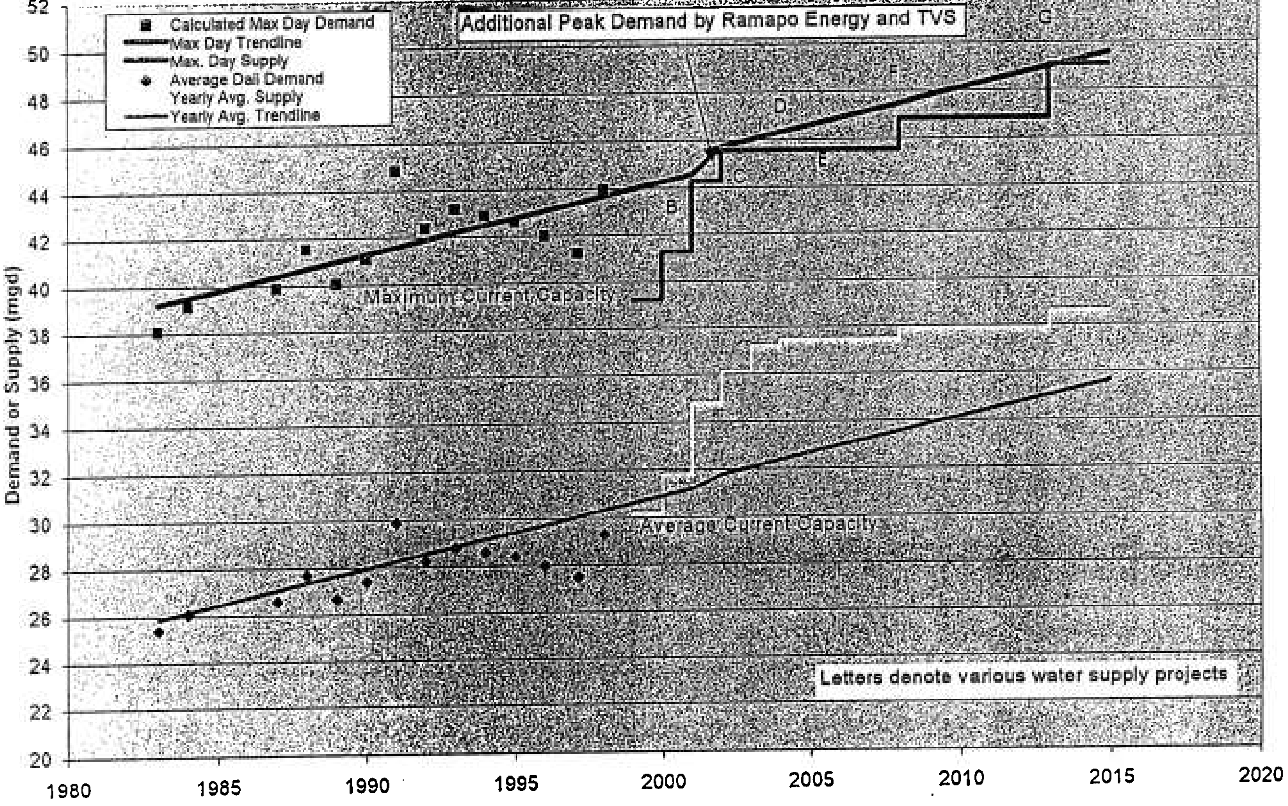


Figure 3: Cumulative Effect of Ramapo Energy and TVS on UWNY's Water Supply Plan



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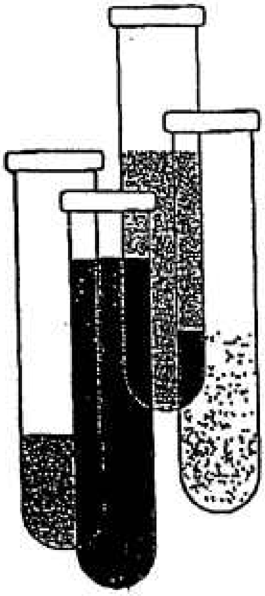
Appendix A

United Water New York Consumer Confidence Report

United Water

United Water New York
360 West Nyack Road
West Nyack, NY 10994



Important Information!

- Your water meets or surpasses all state and federal regulations for safe drinking water.
- Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguien que lo entienda bien.

Dear Customer

At United Water our goal is to provide you with water that meets or surpasses all the standards for safe drinking water. These health and safety standards are set by the United States Environmental Protection Agency (EPA), the New York State Department of Health (NYDOH) and the Rockland County Department of Health (RCDOH). Our United Water team works hard to provide you and your family with top quality water and premier service 24 hours a day, 365 days a year.

As part of this commitment, we regularly test water samples to be sure that your water meets the safety standards. And we're proud to let you know that it did during 2000. All the test results are on file with the NYDOH, the agency that monitors and regulates drinking water quality in our state. Both the EPA and the NYDOH require water suppliers to mail an Annual Water Quality Report to customers on an annual basis. This report provides important information about your drinking water. It shows how your drinking water measured up to government standards during 2000. Please read it carefully and feel free to call us at 845 623 1500 if you have any questions about your water or your service. You can call the EPA Safe Drinking Water Hotline at 800 426 4791, the NYDOH at 518 402 7713 or the RCDOH at 845 364 2608. If you have specific questions about water as it relates to your personal health we suggest that you contact your health care provider.

We also have a Customer Advisory Panel which meets regularly to share their suggestions and thoughts about our service. If you would like them to address a topic that interests you, please write them at the above address.

Annual Water Quality Report 2000

Health Note

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA Safe Drinking Water Hotline at 800 426 4791.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infections by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at 800 426 4791.

About the Treatment Process

We treat both groundwater and surface water to remove impurities. Our laboratory regularly tests the quality of the water before, during and after the treatment process. We monitor it for dozens of substances and detected those listed on the Water Quality Table. We also monitor for turbidity which is a measure of the cloudiness of water. We monitor it because it is a good indicator of the effectiveness of our filtration system. Our job is to provide you and your family with water that meets all government standards for health and safety. The treatment process differs depending upon whether the water is from our wells or the Lake DeForest Water Treatment Plant.

Lake DeForest Water Treatment Plant

Physical treament includes (in order) traveling screens, aeration, flocculation, sedimentation and filtration (dual media). Chemical treatment includes potassium permanganate (prior to traveling screens), anionic polymer (prior to aeration), alum (prior to flocculation), sodium hypochlorite (prior to flocculation, prior to filtration and post-filtration) and polyphosphates (post-filtration). Sodium hypochlorite is added to protect against microbiological contamination, and sodium hydroxide and polyphosphates are added to reduce corrosion of metal piping and plumbing.

Supply from Wells

All wells are treated with sodium hypochlorite for disinfection and polyphosphates for corrosion control. Certain wells receive additional treatment through granular activated carbon filtration, aeration, and/or ultraviolet disinfection.

Bottled Water or Tap Water?

Rivers, lakes, reservoirs, springs and wells are sources for both tap water and bottled water. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals. In some cases this includes radioactive material. The water can also pick up substances resulting from the presence of animals or human activity. Contaminants that may be present in source water include: microbial contaminants; inorganic contaminants; pesticides and herbicides; organic chemical contaminants; and radioactive contaminants.

In order to ensure that the water is safe to drink, the State and the EPA prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The State Health Department's and the FDA's regulations establish limits for contaminants in bottled water which must provide the same protection for public health. So what's the bottom line? If bottled and tap water meet the standards, they are both safe to drink. However, your tap water is substantially less expensive than bottled water.

Information Collection Rule monitoring - 1998

Substance	MCLG	MCL	Average Result	Range of Results	Violation	Likely Source
Chlorate**ug/l	NA	NA	291.8	153.1 to 527.1	No	Disinfection process
HAA5* ug/l	NA	NA	17.7	1.6 to 67.7	No	Disinfection process
HAN*ug/l	NA	NA	6.1	1.5 to 15.5	No	Disinfection process
HK*ug/l	NA	NA	2.4	ND to 8	No	Disinfection process
CP* ug/l	NA	NA	0.4	ND to 1.3	No	Disinfection process
CH* ug/l	NA	NA	5	ND to 29.5	No	Disinfection process
TOX* ug/l	NA	NA	131.5	10.2 to 609.1	No	Disinfection process
Disinfectant residual* mg/l (2000)	NA	NA	0.56	ND to 3.7	No	Disinfection process

*Distribution System

**Entry Point

Secondary Standards - Related to the aesthetic quality of drinking water.

Substance	MCL	Average Result	Range of Results	Violation	Likely Source
Aluminum ug/l	NA	81	ND to 379	No	Treatment process
Chloride mg/l	250	70	14 to 184	No	Naturally occurring, runoff
Color CU	15	4	3 to 15	No	Naturally occurring
Corrosivity	Non-corrosive	Non-corrosive	Non-corrosive	No	Treatment process
Hardness (as CaCO3) mg/l	NA	187	59 to 384	No	Naturally occurring
Iron ug/l	300	14	ND to 233	No	Naturally occurring
Manganese ug/l	300	12	ND to 175	No	Naturally occurring
Odor TON	3	1	NA	No	Naturally occurring
pH units	6.5 to 8.5	7.8	6.5 to 8	No	Treatment process
Sodium mg/l	NA	26	5 to 73	No	Naturally occurring, runoff
Sulfate mg/l	250	25	24 to 25	No	Naturally occurring
Total Dissolved Solids mg/l	NA	283	107 to 542	No	Naturally occurring
Zinc mg/l	5	ND	ND to 0.9	No	Naturally occurring

Definitions for the Drinking Water Quality Table

AL (Action Level) is the concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

CU (Color Unit)

MCL (Maximum Contaminant Level) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology.

MCLG (Maximum Contaminant Level Goal) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Micrograms per liter (ug/l) – parts per billion (ppb) = one part of liquid in one billion parts of liquid.

Milligrams per liter (mg/l) – parts per million (ppm) = one part of liquid in one million parts of liquid.

Nanograms per liter (ng/l) = parts per trillion – one part of liquid in one trillion parts of liquid.

NA (Not Applicable)

ND (Non-detect) - Laboratory analysis indicates that the constituent is not present.

NTU (Nephalometric Turbidity Unit) is a measure of turbidity, the clarity of the water. Turbidity in excess of 5 NTU is just noticeable to the average person. High turbidity can hinder disinfection.

pCi/l (picoCuries per liter) is a measure of radioactivity in water.

Primary Standards are drinking water regulations for substances that are health related. Water suppliers must meet all primary drinking water standards.

Secondary Standards are drinking water standards that do not have an impact on health. These reflect aesthetic qualities such as taste, odor and appearance. Secondary standards are recommendations, not mandates.

TON (Threshold Odor Number)

TT (Treatment Technique)

90th percentile - 90 percent of system samples must be at or below this level.

Radon Information

Radon is a naturally-occurring radioactive gas found in soil and outdoor air that may also be found in drinking water and indoor air. Some people exposed to elevated radon levels over many years in drinking water may have an increased risk of getting cancer. The main risk is lung cancer from radon entering indoor air from soil under homes. In 1999, we analyzed our water for radon. You can contact The Rockland County Department of Health at 845 364 2608 for more information on radon or you can call the New York State Radon Program at 1 800 458 1158 or the EPA Radon Hotline at 1 800 SOS Radon.

Conservation

United Water New York encourages its customers to use water wisely. As part of a public service project with the New York State Public Service Commission and the Department of Environmental Conservation, the company offers a comprehensive water conservation program to help customers save money and conserve our natural resources.

During the hot summer months, there is a higher demand for water supply. By cutting down on outdoor water use during these peak times in the summer season, our customers can reduce their water bills and help delay the need for building costly new supply facilities.

ET Program

Every day people in our community pour millions of gallons of water onto their lawns and landscaping in an effort to keep them green and healthy. As the temperatures rise, more and more water is pumped onto the grass and plants. United Water introduced the ET Lawn Watering Program in 1994 to educate customers about how much water they need to apply to their lawns to keep them healthy and green.

ET is short for EvapoTranspiration, which involves measuring the loss of water from the soil through evaporation and loss of moisture from plant life through transpiration. Every day, United Water sets the ET number by keeping track of such weather data as humidity, temperature, solar radiation, wind and rainfall. The company works with the Rockland Climatic Center to gather the weather data and with Cornell University to calculate the daily ET number.

The ET number is published daily during the summer months in the Rockland Journal News and it's also available on the ET Hotline at 845 620 3355.

Xeriscape Landscaping

Landscaping can demand up to 50 percent of the water used from home consumption during the growing season. A xeriscape garden, which emphasizes wise planning of terrain, plantings and horticultural techniques to make the most efficient use of water, can create savings for customers and the environment because it reduces landscape watering.

A xeriscape garden is a perfect example of how customers can reduce their outdoor water use while preserving a beautiful, natural landscape for future generations. Contrary to what some people believe, a water-wise garden doesn't necessarily feature rocks, cacti or dull colors. It can display an exciting variety of trees, flowers and shrubs such as Rockland home owners have come to expect in their suburban landscapes.

Customers are invited to visit our xeriscape demonstration gardens. For more information please call 845 623 1500.

United Water Website

Come visit us at www.unitedwater.com/uwny

Facts and Figures

United Water New York's public water system identification number is NY0003673. We provide service to more than 265,000 people in most of Rockland County. About 70 percent of our water supply is from various wells located throughout Rockland County and the remaining 30 percent is surface water supply from the Lake DeForest Reservoir. In 2000, United Water produced 10,447 million gallons (MG) of water and sold 8,774 MG. We determined that 1,673 MG or 16 percent of the water we produced is non-revenue producing water. This is water lost due to leaks, main breaks, under-registering meters, fire fighting, hydrant flushing, and theft of service.

The New York Public Service Commission sets water rates to cover the costs of providing service. The average residential customer uses approximately 3,000 cubic feet of water (22,440 gallons) per quarter, or approximately $476 annually (including taxes). A typical dollar pays for system improvements, operations and maintenance, taxes, interest and debt, dividends and reinvestment and depreciation costs.

About Your Water Quality

United Water New York's water system complied with all requirements of the United States Environmental Protection Agency, New York State Department of Health and Rockland County Department of Health during 2000. As the State regulations require, we routinely test your drinking water for numerous contaminants. These contaminants include: total coliform, turbidity, inorganic compounds, nitrate, nitrite, lead and copper, volatile organic compounds, total trihalomethanes, and synthetic organic compounds. The Water Quality Table shows which compounds were detected in your drinking water.

Detailed analytical testing information concerning each of United Water's sources is included in a supplement to this statement. This information is available for review at the Finkelstein Memorial Library, 24 Chestnut Street, Spring Valley, New York 845 352 5700. Additionally, a copy of the supplement may be reviewed by contacting United Water New York's Customer Service Department at 845 623 1500, option 1.

About Your Water Supply

On average about 43 inches of rain fall each year in the Hackensack River Watershed, which is the source of our surface water supply. Our supply includes both groundwater from Rockland County wells and surface water from the Lake DeForest Water Treatment Plant. Groundwater filters naturally through the layers of the earth. It is then stored in deep, porous rocks called "aquifers." Surface water is water from reservoirs, rivers, lakes and streams. This type of water, unlike groundwater, is stored on the earth's surface.

Wells 84 and 99 (two of ten wells at the Ramapo Valley Well Field) were removed from service during 2000.

To Serve You Better

At United Water we constantly strive to serve you better. During 2000, we added 42,310 feet of new water distribution pipe to improve the reliability of your service. We also commenced construction of an aeration facility at the Ramapo Valley Well Field. A new ultraviolet disinfection unit was added at the Blauvelt Well in order to improve water quality. In addition, updates to our existing SCADA (Supervisory Control and Data Acquisition) computers enable us to more carefully monitor our water system.

Appendix B

Rockland County Health Department Water Emergency Restrictions

ARTICLE V

MANDATORY WATER CONSERVATION MEASURES

5.1.0 - Declaration Of Policy

It is hereby declared to be the health policy of the Rockland Health District to assure that potable water is available to the citizens of Rockland County under the conditions of below average precipitation.

5.2.0 - Stage I Water Emergency

In the event the precipitation within the Rockland County Health District for the immediately preceding four calendar months is 40% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County Water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, or revisions thereto, the Commissioner of Health may declare a Stage I water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage I water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

5.2.1 Serving of water at a service food establishment except at the specific request of a patron.

5.2.2 The use of water for ornamental purposes including but not limited to fountains, artificial waterfalls and reflecting pools.

5.2.3 The use of water for flushing of sewers or hydrants except as deemed necessary for the public health and safety.

5.2.4 The use of potable water for the non-agricultural irrigation, watering or sprinkling of any lawn except as set forth herein.

5.2.4.1 Lawn irrigation, sprinkling or watering shall be per- mitted on the odd days of the month, only at premises that have odd numbered street addresses.

5.2.4.2 Lawn irrigation, sprinkling or watering shall be per- mitted on the even days of the month, only at premises that have even numbered street addresses.

5.2.4.3 For the purposes of the provisions of these sub-paragraphs, a premises without a street numbered

5.3.6.3 The use of water for outdoor showers or sprinklers.

5.3.6.4 The use of potable water for the non-agricultural irrigation, watering or sprinkling of landscaped areas,
trees, shrubs or other outdoor plants, except for water- ing by hand.

5.3.6.5 The use of water for the commercial washing or cleaning of automobiles, trucks, trailers or any other vehicles by facilities in excess of five days per week.

5.3.6.6 The use of water for water-cooled air-conditioning units, except during such times as specifically authorized by the Commissioner of Health in writing.

5.4.0 - Stage III Water Emergency

In the event the precipitation within the Rockland County Health District for the immediately preceding nine calendar months is 40% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, or revisions thereto, or the water level of Lake DeForest falls under the Curve A, as set forth in the attached Schedule I for six months, the Commissioner of Health may declare a Stage III water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage III water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

5.4.1 The use of water as set forth in Part 5.2.0 and Part 5.3.0 of this Article.

5.4.2 The use of water or steam for the cleaning of buildings or any other structure's exterior.

5.4.3 The use of water for the operation of ice skating rinks.

5.4.4 The use of water for the commercial washing or cleaning of auto- mobiles, trucks, trailers or any other vehicle by facilities which do not recycle water.

5.4.5 The use of water for the filling or the operation of a swimming pool, partly artificial swimming pool, bathing beach or any swimming facility not under permit pursuant to Part 6 of the New York State Sanitary Code.

5.4.6 The use of potable water for the non-agricultural irrigation, watering or sprinkling of landscaped areas, trees, shrubs or other outdoor plants and golf course greens.

5.4.7 The use of water from any stream, creek or other surface water supply which is tributary to Lake DeForest, the Stony Point Reservoir, Pothat Lake, or the Ramapo River.

5.5.0 - Stage IV Water Emergency

In the event the precipitation within Rockland County Health District for the immediately preceding twelve calendar months is 35% below the twenty year average for the same period as taken from the rain gauge at Lake DeForest Reservoir, as set forth in the Interim Report, Rockland County Water Supply Study, dated January 1981, of the New York State Department of Environmental Conservation, or revisions thereto, or the water level of Lake DeForest falls under the Curve B, as set forth in the attached Schedule I, for two months, the Commissioner of Health may declare a Stage IV water emergency if, in his opinion, such a declaration is necessary to protect the public health and safety. During a Stage IV water emergency as declared by the Commissioner of Health, the following uses of water shall be prohibited:

5.5.1 The use of water as set forth in Parts 5.2.0, 5.3.0, and 5.4.0 of this Article.

5.5.2 The use of water in a residence in excess of 50 gallons per resident per day.

5.5.3 The use of potable water for agricultural, commercial or indus- trial purposes in excess of the agricultural, commercial or industrial user's average daily consumption for the preceding twelve calendar months. When the daily average consumption for the agricultural, commercial or industrial user is not available, the average daily water consumption of the user for the 90 days immediately preceding the declaration of a Stage III emergency shall be used.

5.5.4 The use of water for the filling or the operation of any swimming pool, partly artificial swimming pool, bathing beach or any other swimming facility. This prohibition shall include but not be limited to the use of water for the filling or the operation of any swimming facility under the control of any governmental authority within the Rockland County Health District.

5.6.0 - Reporting On Water Status

5.6.1 In the event the Commissioner of Health declares a Stage I, Stage II, Stage III or Stage IV water emergency as set forth herein, the community water supplies within the Rockland County Health District which serve in excess of 2000 people shall daily report to the Commissioner of Health their daily water production, the status of their water resources and any operational difficulty impairing the community water supply's water production capabilities and such other information as is required by the Commissioner of Health.

5.6.2 Notwithstanding any other provision of this Article to the contrary, a community water supplier within the Rockland County Health District which serves in excess of 2000 people, shall monthly report to the Commissioner of Health its water production, the status of its water resources, rain gauge measurements, and any operational difficulties impairing the community water supplier's water production capabilities and such other informa- tion as is requested by the Commissioner of Health.

5.7.0 - Approval For New Water Resources During Emergency

In the event the Commissioner of Health declares a Stage III or Stage IV water emergency as set forth herein, no new water supply resource or facility may be constructed or developed without written approval from the New York State Department of Environmental Conservation or, the written approval of the Commissioner of Health. This prohibition shall include but not be limited to the impoundment of any stream, creek, reservoir or other surface body of water, the creation or development of any water reservoir and the construction of any well.

5.8.0 - Variance

The Commissioner of Health may, upon receipt of a written application and a fee as prescribed by the Commissioner of Health, or upon his own initiative, grant a variance from any of the prohibitions of the use of water as prescribed herein when, in the Commissioner's opinion, such a variance would be in the general public interest and would not unnecessarily endanger the public health and safety.

Appendix C

Map of Groundwater Resources/Features Within One-Mile Radius of Ramapo Energy Project Site

Case: 98-F-1968

RAMAPO ENERGY LIMITED PARTNERSHIP

DIRECT TESTIMONY

OF

GUY MARCHMONT

CHRISTOPHER REIN

SARAH WOODHOUSE

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 133

Ex. NJDEP-105

Revised July 30, 2001
(Margin lines show last set of revisions)

Q. Please state your names, titles, affiliations, and addresses.

A. My name is Guy Marchmont and I am Vice President of Project Development at American National Power, Inc. ("ANP"). My business address is 65 Boston Post Road West, Suite 300, Marlborough, Massachusetts 01752.

A. My name is Chris Rein and I am employed by Environmental Science Services, Inc. ("ESS") as a Project Manager/Senior Environmental Engineer. My business address is 272 West Exchange Street, Suite 101, Providence, Rhode Island 02903.

A. My name is Sarah Woodhouse, and I am Vice President of the Community and Governmental Relations Division at Environmental Futures, Inc. My business address is 530 Atlantic Avenue, Boston, Massachusetts 02210.

Q Mr. Marchmont, what are your duties of employment?

A. I am responsible for managing the development of new electric generating facilities for ANP from inception through financial closing. In this role, I participate in the negotiation of project contracts and the development of input data for and review of the financial analyses. I interface with regulatory agencies, community leaders, politicians, contractors, consultants, local residents, and lenders through project development. I also monitor project budgets and schedules and participate in the project financing and closing. I am currently acting as project manager for the Ramapo Energy Limited Partnership ("Ramapo Energy") project (the "Project"). Ramapo Energy's general partner, ANP Ramapo Energy Company, is a subsidiary of ANP.

Q. How are you qualified to perform your employment duties?

A. I have held my current position with ANP for nearly four years. Prior to my current position, I was employed by U.S. Generating Company as Senior Project Development Manager from July 1990 to September 1997. In that role, I was responsible for managing the development of new electric generating projects. I managed the initial development activities for the 1080MW Athens Generating Project in New York and participated in the development of the original Article X regulations. In addition, I was actively involved in various aspects of other projects, including new acquisitions, investment in merchant plants and the development of concepts and proposals for repowering existing facilities with Pressurized Fluidized Bed Combustion technology. From January 1987 to July 1990, I was employed by Stone & Webster Engineering Corp., initially as a Project Manager and then as Senior Vice President of Engineering and Project Development. At Stone and Webster, I provided various engineering, marketing, administrative, and development services for a number of electric generating and cogeneration plants.

From 1970 to 1976 and 1977 to 1987, I was employed in various capacities by Burns and Roe, a firm that specialized in the design, engineering and construction of power generation facilities. I have also been employed by Curtiss-Wright Corp. (1976-1977), Amertap (1968-1970) Stone & Webster Engineering Corp. (1967-1968), Montreal Engineering Co. (1965-1967), English Electric Co., Ltd. (1958-1965).

I received a diploma in Mechanical Engineering from the Rugby College of Engineering Technology, England in 1963. I am licensed as a chartered engineer and a member of the Institution of Mechanical Engineers in the United Kingdom.

Q. Does your curriculum vitae, which is attached as Exhibit MMW-1, fairly and accurately represent your experience with respect to the development of independent power projects?

A. Yes.

Q. Mr. Marchmont, please describe your role in the Ramapo Energy Project ("Project").

A. As project manager, I am directly responsible for the development of the Project. In that role, I oversee all aspects of the Project as it proceeds.

Q. What portion of the Application is your testimony supporting?

A. My testimony directly supports Sections 1, 2, 3 and 8 of the Application but also generally supports all other sections of the Application.

Q Mr. Rein, what are your duties of employment?

A. I provide consulting services specializing in air quality permitting and multi-disciplinary environmental projects such as the siting of electric generating facilities. I manage complex permitting projects requiring comprehensive environmental impact analysis, and water discharge, air, and solid waste permits. I also have certain company management responsibilities related to my role as a Principal. As Project Manager with ESS, I participate in a variety of projects for clients, including the siting and permit/certificate approval process for electric generating facilities. My design and permit experience includes the management of multi-discipline permitting processes. These management tasks involve working with the design teams, reviewing preliminary and finished work products and incorporating the material into the overall permitting process. I have also assisted in the preparation of environmental impact studies, due diligence for land acquisition, and regulatory permitting for federal, state, and local permits in Massachusetts, Rhode Island, Connecticut, and New York.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science Degree in Resources Management from the State University of New York, College of Environmental Science and Forestry. I have taken post-graduate studies in Mechanical Engineering. I have over 16 years of professional experience related to my employment duties. I was the Project Manager for the Athens Generating Company project, which recently received an Article X Certificate.

Q. Does your curriculum vitae, which is attached as Exhibit RFG-1, fairly and accurately represent your experience?

A. Yes.

Q. Mr. Rein, please describe your role in the Ramapo Energy Project (AProject@).

A. ESS was retained by the Applicant to locate the Energy Facility Site and prepare the Article X Application to the Siting Board. I acted as Project Manager and Principal in charge of ESS's role in preparing the Application, providing oversight for various aspects of the Project and assisting in the technical review of the air quality impact analysis. I helped coordinate the preparation of environmental studies for the Application as required by the negotiated Stipulations. I oversaw the progress of those environmental studies from initiation to completion, including final results, and impact and mitigation identification. I interfaced with the Applicant, legal counsel and the equipment vendors, as necessary, during the Pre-Application process.

Q. What portion of the Application is your testimony supporting?

A. My current testimony supports Sections 1, 2 and 3 of the Application.

Q. Ms. Woodhouse, what are your duties of employment?

A. I manage the Community and Government Relations Division at Environmental Futures, Inc. ("EFI"), which specializes in strategic management, marketing and communications services for environmental and energy sector clients. I specialize in conducting community relations, communications, government relations and regulatory affairs consulting for a variety of private sector clients. My responsibilities include the creation of the annual division business plan in coordination with the corporate business plan for EFI, including the development, oversight and execution of all marketing and division development activities. My responsibilities also involve management of and participation in all aspects of client projects, including staff management, to ensure delivery of superior work product to fulfill clients needs.

Q. How are you qualified to perform your employment duties?

Revised July 30, 2001
(Margin lines show last set of revisions)

A. I received a Bachelors of Arts Degree in Biology and Environmental Science from Colby College in 1984. I received a Masters Degree in Urban and Environmental Policy from Tufts University in 1991.

Q. Does your curriculum vitae, which is attached as Exhibit MMW-3, fairly and accurately represent your experience with respect to your employment duties as they relate to this project?

A. Yes.

Q. Ms Woodhouse, please describe your role in the Project.

A. EFI was retained by Ramapo Energy to develop a Public Involvement Plan ("PIP"), which is designed to encourage early and continued participation by stakeholders and those who may be affected by or are interested in issues associated with the siting, certification, construction, and operation of the Project. Ramapo Energy's continuing goal is to create a broad level of awareness about the Project. The PIP was tailored to ensure that the concerns, needs and values of various stakeholders are identified prior to key Project decisions, so that these decisions can reflect, to the extent practical given environmental, financial, legal and technical constraints, the views of these stakeholders.

Q. What portion of the Application is your testimony supporting?

A. My testimony supports Section 3 of the Application.

Q. Please describe the nature of the Project.

The Project is described in detailed in Sections 1 and 2 of the Application. The Project will be a state-of-the-art, high efficiency, combined cycle electric generating plant ("Energy Facility") consisting of four Alstom Power GT-24 combustion turbine generators ("CTG"), four heat recovery steam generators ("HRSGs"), and four steam turbine generators, configured in four distinct single-shaft power trains, as well as associated facilities and systems. The nominal electrical capacity of the Energy Facility will be approximately 1100 megawatts ("MW").

The Energy Facility will be designed so that a portion of the steam from the HRSG may be injected into the combustion turbine to augment the power output from a single train by 20 MW, thereby increasing the output of the Energy Facility to 1180 MW.

United Water New York ("UWNY"), a public water supply company that supplies water to most residents and industry in Rockland County, has executed an agreement with the Applicant whereby UWNY will supply potable water to the Energy Facility for use in the Project's process and potable water systems. The Applicant has since executed an amendment to the water supply agreement reducing the Project water supply by 60%. The water will be provided from a number of groundwater and surface water supply sources within UWNY's regional system. Subsequent to that amendment, the Applicant has committed to installing a zero discharge system whereby process wastewater will be recycled/reused. The zero discharge system will further reduce the Energy Facility's daily average water supply needs to approximately 45,500 gallons, which includes 120 hours of steam augmentation operation. With the ZLD system the project's annual consumption is estimated to be 16.6 million gallons. However, if at some future time, the RCSWMA decides to accept the Applicant's offer to supply the RCSWMA with wastewater for non-potable uses, then the project's consumption could increase to 23 million gallons per year. The Applicant will accept Certificate conditions limiting the annual consumption of water provided the conditions allow for the additional consumption to accommodate RCSWMA potential needs.

The sole fuel supply for the Energy Facility will be a natural gas pipeline owned and operated by the Algonquin Gas Transmission Company ("Algonquin"). Supporting interconnects for the facility include:

- The gas pipeline from the Algonquin pipeline to the Energy Facility ("Gas Interconnect");
- An interconnection between the Energy Facility and Consolidated Edison's ("Con-Ed") transmission system; and
- The water supply and wastewater discharge pipelines from the water and sewer mains located on Torne Valley Road to the Energy Facility ("Water/Wastewater Interconnect").

The electrical interconnection initially proposed for the Project was an underground double circuit 345 kV generator lead from the Energy Facility to the Con-Ed Ramapo Substation ("Electric Interconnect"). This option would necessitate the temporary needs to approximately 45,500 gallons, which includes 120 hours of steam augmentation operation. With the ZLD system the project's annual consumption is estimated to be 16.6 million gallons. However, if at some future time, the RCSWMA decides to accept the Applicant's offer to supply the RCSWMA with wastewater for non-potable uses, then the project's consumption could increase to 23 million gallons per year. The Applicant will accept Certificate conditions limiting the annual consumption of water provided the conditions allow for the additional consumption to accommodate RCSWMA potential needs.

The sole fuel supply for the Energy Facility will be a natural gas pipeline owned and operated by the Algonquin Gas Transmission Company ("Algonquin"). Supporting interconnects for the facility include:

- The gas pipeline from the Algonquin pipeline to the Energy Facility ("Gas Interconnect");
- An interconnection between the Energy Facility and Consolidated Edison's ("Con-Ed") transmission system; and
- The water supply and wastewater discharge pipelines from the water and sewer mains located on Torne Valley Road to the Energy Facility ("Water/Wastewater Interconnect").

The electrical interconnection initially proposed for the Project was an underground double circuit 345 kV generator lead from the Energy Facility to the Con-Ed Ramapo Substation ("Electric Interconnect"). This option would necessitate the temporary disturbance of the Torne Brook. In Addendum No. 2, an over ground loop-in/loop-out alternative was proposed that would utilize the existing transmission infrastructure passing directly adjacent to the Project site and thereby avoid the need to disturb the Torne Brook. (Alternative Electric Interconnect"). Both the Electric Interconnect and Alternative Electric Interconnect are feasible and would have similar impacts on the electric transmission system. However, the Applicant believes that the Alternative Electric Interconnect should be approved because of the additional environmental benefits that can be realized.

Because a zero discharge system will be implemented to address process wastewater, and the Applicant plans to truck away sanitary wastewater, a wastewater pipeline is not necessary. However, the Rockland County Sewer District No. 1 service area has recently been expanded to include an area in which the Project site is located. Thus, the Applicant plans to install a dry pipe for sanitary waste during construction (i.e., when the water supply line is being installed) at least out as far as Torne Valley Road so that sanitary wastewater can be directed to the Rockland County Sewer District No. 1 system when infrastructure becomes available.

Q. Are the reliability and feasibility of the gas turbine equipment addressed in the Application?

A. Yes. Section 2.4.3 addresses these issues.

Q. Where is the Project located?

A. The Project will be on a parcel of land ("Site" or "Energy Facility Site") located within a planned industrial zone in Torne Valley, in the Town of Ramapo, Rockland County, New York. The Site consists of approximately 62 acres of located off Torne Valley Road. The Site is currently undeveloped land consisting primarily of wooded upland containing bedrock outcrops and boulders. Multiple high capacity electric transmission lines and their associated rights-of-way are located to the north and west of the Site. Harriman State Park is located to the east of the Site. Beyond the right-of-way to the west are Rockland County's co-composting facility and materials recycling facility, Rockland County's transfer station, and the Town of Ramapo Landfill. The landfill is no longer operational and has been capped.

The land to the south and north of the Site (beyond the existing right-of-way) is undeveloped land and is under private ownership. The Site is uniquely situated for development as an electrical generating station. The Consolidated Edison ("Con-Ed") Ramapo Substation is located approximately 400 feet to the west of the Site. Furthermore, the Algonquin gas pipeline is located approximately 3,000 feet to the south of the Site. The Applicant has agreed to dedicate the unused portion of the Site, approximately 36.7 acres, as a wildlife preserve.

Q. How will the electrical output from the Energy Facility be sold?

A. The Energy Facility's electrical output will be sold in the emerging competitive electrical markets that are currently being developed under the auspices of the New York State Public Service Commission ("NYSPSC") and the Federal Energy

Regulatory Commission. The Energy Facility will not seek to recover its costs from ratepayers through traditional rate of return regulation. Rather, it will operate as a merchant plant and compete with other suppliers to sell its electrical output. Accordingly, the Energy Facility will promote and contribute to competition in the electric markets.

American National Power, Inc. ("ANP") is a wholly owned subsidiary of International Power PLC ("IP"), a leading worldwide electricity generating company. IP was created from the demerger of National Power PLC and has 6,400 megawatts (MW) in operation, 4,500 MW under construction, and approximately 8,000 MW in advanced development.

ANP is engaged in the development, acquisition, ownership and operation of electricity generating plants in North America. ANP has interests in four operating plants throughout the United States with a combined output of approximately 1,055 MW. In addition, ANP has four projects under construction with a combined output of approximately 3,900 MW, representing an investment of more than $1 billion. For each of these projects ANP has formed a project-specific entity to be a vehicle to manage ANP's interests. In most cases the legal structure of these entities is a Limited Partnership registered in Delaware. For the Ramapo Energy Project ANP has formed the Ramapo Energy Limited Partnership, the general partner of which is another ANP affiliate, ANP Ramapo Energy Company.

ANP intends to have the operation and maintenance of projects currently under construction performed by an affiliate of ANP, ANP Operations Company, through a contract with the project-specific entity. For over three years this contractual arrangement has been implemented successfully at ANP's project in Milford, Massachusetts. ANP intends to use the same approach for the Ramapo Energy Project.

ANP has offices in Houston, Texas and Marlborough, Massachusetts. ANP develops projects by managing the development process with its own staff and contracting for the required services with independent consultants. The development activities of the Ramapo Energy are being managed out of the Marlborough, Massachusetts office. Today ANP is a company of 200 corporate and plant operation staff.

Combining the services, expertise, and resources of ANP, and its affiliates, will allow Ramapo Energy to compete with other energy companies in the market, which will benefit customers.

Q. Are you familiar with the Declaratory Ruling issued by the NYSPSC on August 25, 1999, in Case No. 99-E-0089 ("Declaratory Ruling")?

A. Yes.

Q. Does Ramapo Energy believe that the Energy Facility will be operating in a competitive market with other energy companies and therefore meets the requirement of an approved procurement process consistent with the most recent State Energy Plan.

A. Yes. In the Declaratory Ruling mentioned before, the NYSPSC found that "competition in the electricity supply market is an approved procurement process because it is an electric capacity procurement process approved as reasonably consistent with 1998 State Energy Plan. Pursuant to PSL § 164(1)(e)(2) and 16 NYCRR § 1001.5(a), Ramapo Energy will operate as a merchant plant in the competitive electric markets, and will promote and contribute to competition. Ramapo Energy requests that the Siting Board, pursuant to PSL § 168(2)(a)(ii), make a finding that the Energy Facility was selected pursuant to an approved procurement process.

Q. Please summarize the Public Involvement Program undertaken by Ramapo Energy to satisfy 16 NYCRR § 1000.3.

A. In compliance with the requirements of 16 NYCRR § 1000.3, a comprehensive PIP was developed to inform stakeholders and other interested members of the public about the details of the Project and its potential impacts, and invite them to comment on the Project's design, and environmental analyses of the Project's impacts. Ramapo Energy retained EFI to develop the PIP and spearhead its implementation. EFI is a highly respected public relations consulting firm that specializes in environmental issues. The PIP incorporates all of the elements required by regulation, as well as other elements designed to ensure that stakeholders' concerns, needs, and values are identified prior to key Project decisions. These decisions reflect, to the greatest extent practical in light of environmental, financial, legal, and technical constraints, the views of the various stakeholders.

The elements of the Ramapo Energy PIP are informal consultation, pre-filing formal consultation, notification, and planned activities. They were and will be implemented to provide the public with the earliest possible opportunity to become involved in the Project's development. The elements are summarized in Section 1.6 of the Application, and discussed in detail in Section 3 of the Application.

Q. What, if any, Project decisions were influenced by the concerns of stakeholders through the PIP?

A. Several key Project decisions were influenced by concerns raised by area residents and involved agency staff during public meetings, stipulations discussions, and individuals contacts. These decisions include:

- The Energy Facility was reoriented from its original configuration to address agency and residents' concerns with respect to Site preparation and visual impacts. Specifically the reorientation:
  1. Reduced the average base elevation of the Project's components by approximately 70 feet thereby reducing the Project's visibility.
  2. Increased the average on-Site buffer zone between the Energy Facility and the Harriman State Park from 200 feet to roughly 260 to over 900 feet.
  3. Moved the Energy Facility from the topographic high point of the Site, providing additional buffer and reducing visual impact to Harriman State Park.
  4. Utilized terracing to reduce the volume of cut and fill material.
  5. Rerouted the Electric Interconnect to reduce the amount of new cleared ROW required (subsequently, the Alternative Electric Interconnect was proposed which eliminates the need for a new cleared ROW altogether).

- The Applicant committed to fueling the generation plant by only natural gas and not storing or using bulk fuel oil on the Site.
- The Applicant reduced the stack heights from 213-feet to 180-feet thereby further reducing the Project's visibility and (potentially) the requirement for stack lighting.
- The Applicant will contribute $1.6 million to UWNY for its sole use in improving the water supply service to its Rockland County customers, offsetting, in part, water usage at the Project.
- The Applicant has minimized the water consumption and out of basin transfer of wastewater requirements of the Project by utilizing air-cooled technology and incorporating a zero liquid discharge system.(ZLD)
- The Applicant has subsequently proposed the Alternative Electric Interconnect to eliminate the need to disturb the Torne Brook stream bed and for a new cleared ROW.

In addition, and as demonstrated throughout this Application, numerous design and siting features were incorporated into the Project to address specific concerns of the involved regulatory agencies.

Q. Have alternative technologies been considered?

A. Yes. The current industry standard for large-scale (>50 mW) electric energy generation is combined-cycle combustion turbine generation primarily fueled by natural gas. This industry trend is evidenced by the large number of proposals for new generation over the past several years in New York and the New England states. Almost exclusively, the technology proposed for both energy efficiency and environmental benefit is combined cycle combustion turbine generation. This power generating technology is the one that Ramapo Energy and its affiliates have the most experience with and the technology that it believes will bring the greatest benefit to the region.

To support its strategy of building environmentally sound, energy efficient generating plants, Ramapo Energy has selected a reputable, dependable supplier of Energy Facility engineering and equipment. Alstom Power is that vendor and is a long-established provider of the equipment and engineering services. Thus, the choice of the power block, and, to some extent, cooling and emissions control systems, are dependent on Alstom's standards for design of combined cycle generating projects. The manufacture of large combustion turbines has a long lead time and turbines of the size required for an 1100 MW Energy Facility are in great demand. Thus, ANP has established a business relationship with Alstom that allows ANP to successfully develop new electric generating facilities in a manner that is consistent with the competitive demands of the industry. Thus, ANP and the Ramapo Energy Limited

Partnership have chosen to design this Energy Facility around a power block based on Alstom's GT-24 combustion turbines.

As discussed in Section 2.0 of the Application, Ramapo Energy has chosen to use dry cooling technology to eliminate excess thermal energy from the facility. Dry cooling

technology uses air-cooled condensers to remove the heat from steam used to generate electricity in the combined cycle generating process. Air-cooled condensers were chosen primarily to minimize the amount of water required to operate the Energy Facility and eliminate the creation of water vapor plumes associated with water cooled systems. The availability and use of water is a critical issue in the Ramapo community, and the potential impact of using water as the alternate technology to cool the Energy Facility is far greater, on balance than the somewhat larger land requirements necessary to accommodate the air cooled condensers. Even with the choice of dry cooling technology, the Ramapo Energy Project will require the clearing of less than 36 acres of industrially–zoned land during construction.

With respect to reasonable alternate technologies for emissions control systems, the Ramapo Energy Project must meet the requirements of 40 CFR Part 52.21 and 6 NYCRR Part 231.2. 40 CFR Part 52.21 requires that an applicant evaluate alternate emission control technologies and to select that which represents the Best Available Control Technology (BACT). Similarly, 6 NYCRR Part 231.2 requires that an applicant evaluate alternate emission control technologies and to select that which represents the Lowest Achievable Emission Rate (LAER). The BACT and LAER emission control technology evaluations required by those regulations are discussed in both Section 4.2.2 and Appendix E-1.

A dry-cooled facility does have a lower plant efficiency (range of 1 to 2 percent less efficient) than a wet-cooled facility. Similarly, a dry-cooled facility is also more expensive. Dry-cooling is the most expensive cooling technology, and for an 1100 mW facility this technology adds roughly $40 to $50 million to the facility construction cost. A dry system is also more complex and costly to operate and maintain than a wet-cooled system for the same sized facility. Even considering these higher incremental costs, dry-cooling remains the right choice for the Ramapo Energy Project because, given the proposed project location, dry-cooling will minimize the environmental impact of the facility.

Because the BACT/LAER requirements of the applicable air quality regulations dictate the method of selection of air pollution control technologies, the consideration of costs for pollution control systems is limited. With respect to controlling emissions of NO_x and VOC, these pollutants must be controlled to LAER. The LAER selection, by regulatory definition, is determined independent of cost. Thus, no incremental costs are provided. BACT is required for emissions of SO_2, PM and CO. In the case of SO_2 and PM, the firing of natural gas fuel without any add-on contract is recognized as BACT. SO_2 and PM emissions are so low when firing natural gas that the use of add-on controls would result only in increased cost without any commensurate environmental benefit. For emissions of CO, the incremental cost of between $10,000 and $51,000 per ton provided in Appendix E-1 is generally recognized to be beyond BACT requirements. The Applicant has agreed to install a CO catalyst at the Energy Facility.

Q. Is Ramapo Energy a "private applicant" as that term is defined in 16 NYCRR § 1000.2(o)?

A. Yes. Ramapo Energy does not have the power of eminent domain.

Q. Does Ramapo Energy own, or have under option, any other parcels of land in New York State?

A. No. However, ANP, Ramapo Energy's parent, has entered into an option agreement to purchase one parcel of property located on eastern Long Island. This property is not a reasonable alternative to the Energy Facility site. ANP intends to develop the Long Island site as a separate electric generation facility. The Long Island site, if it is developed as an electric generation facility, will be connected to a different transmission system, and therefore it will be impractical to service the same customers as Ramapo Energy's Energy Facility. Finally, the Long Island site is not large enough to accommodate the size of the proposed Energy Facility in this Application. Thus, the Long Island site is not a reasonable alternative site to the proposed Site and has not been addressed in the Application.

Q. Does Ramapo Energy own or control any emissions sources at any major facility, as that term is defined in 6 NYCRR § 231-2.1(b)(17), in New York State?

A. No.

Q. What security funds or insurance will be in place or obtained during construction and operation of the Energy Facility?

A. During construction, the Applicant will post, or cause its construction contractor to post, insurance coverages consistent with industry standards, including builders' risk insurance, general liability, auto liability and workers' compensation. During operation, the Applicant will have in place insurance coverages typical for a power generation facility including broad form property, boiler and machinery insurance, general liability, and workers' compensation.

Q. How does Ramapo Energy propose to address the financial resource and decommissioning requirements of 16 NYCRR § 1001.7(b)(2) and (3)?

A. In the event the Applicant permanently abandons the Project, the Applicant will agree to pay for costs associated with the removal of all above ground personal property located in the Project Area that could not reasonably be used for any industrial purpose. The funding for such costs would be provided as follows:

- Commencing with the construction of the Energy Facility, the Applicant will post, or cause to be posted, a letter of credit in favor of the Town of Ramapo in the amount of $500,000 for the first year of construction;
- This amount will be increased to $1,000,000 for the second year of construction; and
- Further increased to $1,500,000 for the remainder of the construction period.

The letter of credit will expire upon the commencement of commercial operation of the Energy Facility.

The Project will be designed for a useful operating life of 40 years. It is likely that after 40 years the Project will undergo significant refurbishment to maintain its competitive position in the market, since power generation technology is anticipated to advance. The decision to cease operations permanently and decommission the Project will be solely at the discretion of the Applicant. The main criterion for reaching such a decision will be the failure of the Project to continue to be economically viable.

The plan for the restoration/decommissioning will be to dismantle the Energy Facility, remove it from the Site, remove the foundations, and return the area to a clean, graded, and seeded lot. The intent will be to return the site to a greenfield condition, while maintaining the terraced profile of the topography. Once the equipment and foundations have been removed, the excavated areas will be filled, and topsoil will be spread over the entire disturbed Site. The Site will then seeded to minimize erosion. Returning the land to a "greenfield" condition will maximize the value of the land for future development consistent with the Ramapo and Rockland County master plan and zoning at the time of decommissioning.

To provide funds for the restoration/decommissioning of the plant, the Applicant proposes to establish a Decommissioning Account, which will be funded on an annual basis by the Applicant during the life of the plant. The Applicant expects that the establishment, use, and disposition of a Decommissioning Account will be subject to an agreement between the Applicant and the Town of Ramapo. Such an agreement will ensure that these funds will be used solely for the restoration/decommissioning of the Project regardless of whether or not the Applicant is the owner at that time. The Applicant expects to deposit $75,000 into the Account each year. Assuming a five percent (5%) interest rate, the funds available for restoration/decommissioning are projected as follows:

• After 20 years	$1,863,000
• After 30 years	$4,025,000
• After 40 years	$9,515,000

It is expected that upon the decision to cease operations permanently, the aboveground portion of the plant will be offered for sale, for at least its scrap value. The expectation is that the purchaser will be responsible for dismantling and removal of the plant from the Site. The Applicant or the existing owner will be responsible for the removal of the foundations, backfilling, and seeding. Since the residual value of the plant will decrease over the years, it is reasonable to expect that less income will be generated from the sale of the plant, thus requiring more funds from the Decommissioning Account. As noted previously, the Decommissioning Account provides for this eventuality.

Q. Has the "no action" alternative to the Project been considered.

A. Yes. 16 NYCRR § 1001.2(c) requires the Applicant to address the "no-action" alternative to the Project. In the event the Project is not constructed, consumers will not benefit from the increased competition in the electric generation market that would otherwise take place. Ramapo Energy currently has an option to purchase the Energy Facility Site (approximately 62 acres), which was originally part of a 1,492-acre parcel. The current owner of the larger parcel, Stone Industries, Inc., has submitted an application to NYSDEC for a mining permit. In the event that the Applicant does not receive approval to construct the Energy Facility, the option to purchase the Site will not be exercised. If the option is not exercised, Stone Industries may seek to include the Site in its mining permit application. Otherwise, it is anticipated that the Site would be developed for other industrial purposes consistent with existing zoning.

Q. What effort has been made to incorporate public and agency concerns, environmental stewardship and good engineering practice into the location and design of the Energy Facility?

A. As noted previously, the Project design was heavily influenced by the input received during the extensive ten month pre-application consultation process. The thirteen Stipulations required Ramapo Energy to conduct studies that drove the identification of potential impacts, and the analysis and recommendation of mitigation measures. Throughout the entire development of the Project, the Applicant has made diligent efforts to incorporate public comment, regulatory agency concerns and good engineering practice into Project decisions.

For example, the Project's layout on the Energy Facility Site is dictated to a large degree by the protection of wetlands and other resources, including Harriman

State Park. This balance is illustrated by the selection of the area in which the Energy Facility Site is located. The Project Area is an excellent location for the proposed Energy Facility because the existing infrastructure of a natural gas pipeline, electric transmission facilities, and water supply obviate the need to build extensive new facilities and their associated environmental impacts. The Energy Facility design and layout was revised, among other things, to respond to public and agency concerns and to minimize the potential impacts on other nearby resources such as Harriman State Park.

Other changes described earlier were also prompted, in large part, in response to concerns raised by the public, involved agencies and other interested parties.

As the certification process proceeds, Ramapo Energy will continue consult with the public and all interested parties to improve its Project to develop and construct a competitive and reliable electric generating facility that minimizes potential environmental and other impacts, complies with applicable environmental and design standards, and is compatible with public health and safety.

Q. In your opinion, does the Application describe the Project's probable environmental impact, including predicable adverse and beneficial effects on the environment and ecology, public health and safety, aesthetics, scenic, cultural, recreational resources, air and water quality, required infrastructure, and marine and terrestrial wildlife.

A. Yes, sections 4 through 18 in the Application, as well as the information provided in Addendum No. 1 and Addendum No. 2, discuss all of these issues in detail.

Q. In your opinion, based upon the information in the Application, will the construction or the operation of the Energy Facility and its associated facilities have any significant impacts to the public health and safety or the environment?

A. No, if the mitigation measures proposed by the Applicant are implemented.

Q. In your opinion, does the Project, as proposed, minimize adverse environmental impacts in light of existing technology?

A. Yes.

Q. Is the Project designed to operate in compliance with applicable federal, state, and local laws.

A. Yes, with the exception of certain local zoning requirements discussed in Section 9.3.3 of the Application materials that cannot be satisfied in light of engineering restraints. These requirements include:

- a bulk regulation imposing a maximum height of 45 feet for all structures, unless exempted;
- a bulk regulation requiring the Site to have a minimum street frontage of 100 feet. This waiver [illegible] access road for dedication;
- a local performance standard restricting construction the noise levels;
- a local zoning code based on outdated noise measurement technology.

Ramapo Energy requests the Siting Board waive these requirements as unreasonably restrictive pursuant to its authority under PSL § 168(2)(d).

Q. In your opinion, is the Project compatible with public health and safety?

A. Yes, for the reasons set forth in sections 4 through 18 of the Application and the other documents submitted for the record.

Q. In your opinion, is the Project in the public interest?

A. Yes. Ramapo Energy's Energy Facility will be highly efficient, operate on clean burning natural gas, use to state-of-the-art design and pollution control technology, and promote competition in the emerging electric generating market.

Q. Does this conclude your testimony at this time?

A. Yes it does.

Case: 98-F-1968

RAMAPO ENERGY LIMITED PARTNERSHIP

DIRECT TESTIMONY

OF

JEFFREY HERSHBERGER

SARAH FALDETTA

DOUGLAS RUDENKO

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 6/14/01
CASE NO. 98-F-1968
EX 134

Ex. NJDEP-106

Revised July 31, 2001
(Margin lines show last set of revisions)

Q. Please state your names, titles, affiliations, and addresses.

A. My name is Sarah Faldetta, and I am a Senior Project Manager and Senior Environmental Scientist with Environmental Science Services, Inc. ("ESS"). My business address is 888 Worcester Street, Wellesley, Massachusetts 02482.

A. My name is Jeffrey Hershberger, and I am a Project Manager at ESS. My business address is 888 Worcester Street, Wellesley, Massachusetts 02482.

A. My name is Douglas Rudenko, and I am Northeast Regional Manager and Manager of Technical Services for Vibra-Tech Engineers, Inc. ("Vibra-Tech"). My business address is 109 East First Street, Hazleton, Pennsylvania 18201.

Q Ms. Faldetta, what are your duties of employment?

A. My principal responsibilities at ESS relate to planning and implementing geologic and groundwater investigations and remedial actions, and permitting of wetland, coastal, and utility-related development projects in New England and New York.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Arts Degree in Geology and English from Havard/Radcliffe College in 1976. I received an M.B.A. in Business Administration from the University of Houston in 1983. I received a Masters Degree in Geology from Boston University in 1988. I have over 17 years of professional experience in geology and environmental sciences.

Q. Does your curriculum vitae, which is attached as Exhibit FHRD-2, fairly and accurately represent your experience with respect to geology and hydrogeology?

A. Yes.

Q Mr. Hershberger, what are your duties of employment?

A. My employment responsibilities relate aquifer hydraulics as related to groundwater flow and contaminant transport, aquifer remediation, aquifer yield, capture zone modeling for remedial design and wellhead protection, and analysis of the fate and transport of contaminants in the subsurface including development of conceptual site models of hydrogeology and contaminant distribution. I have also been responsible for the performance and field management of subsurface investigations, multi-media sampling events, and aquifer testing programs.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science Degree in Geology from Juniata College in 1985. I received a Masters Degree in Geology from the University of Massachusetts, in 1992. I have 12 years of experience in geology and hydrogeology.

Q. Does your curriculum vitae, which is attached as Exhibit FHRD-1, fairly and accurately represent your experience with respect to the study and evaluation of site geology and hydrology?

A. Yes.

Q. Mr. Rudenko, what are your duties of employment?

A. I am a Senior Geophysicist and Manager of the Technical Services Group at the corporate headquarters of Vibra-Tech in Hazleton, Pennsylvania. As manager of this group I directly oversee 4 full-time and 3 part time employees. My responsibilities include the management and planning of all geophysical investigations including budgetary monitoring, major technical decisions, scheduling and staff management.

A. I supervised a blasting investigation at the Site in accordance with Stipulation No. 8. I assisted in the preparation of the report on that investigation. That report is summarized in Section 5 of the Application.

Q. What section of the Application does your testimony support?

A. Our testimony supports Sections 5 and 7 of the Application.

Q. Please describe the geologic and tectonic setting of the Project Area.

A. The geological and tectonic setting of the Project Area is described in detail in Section 5.2.1 of the Application. The complex bedrock geology of southeastern New York contains the signatures of repeated ancient tectonic plate collisions, which have occurred over the past one billion years. The ancient northeast-trending Ramapo fault, which is located a minimum of approximately 1.25 miles southeast of the Energy Facility Site, is thought to have originally formed during one of the oldest stages of movement, about one billion years ago in the Proterozoic era.

Q. Is the geological and tectonic setting suitable for construction and operation of the Project?

A. The fault appears to have reactivated during subsequent periods of tectonic activity in the Paleozoic and Mesozoic eras, the last movement being approximately 200 million years ago. However, there is no evidence of current or recent movement along the Ramapo fault. Based on information described in Section 5 of the Application, the geological and tectonic setting is suitable for construction and operation of the Project.

Q. Please describe the bedrock geology of the Project Area.

Bedrock geology is described in Section 5.2.2 of the Application. The bedrock within the Project Area is composed of massive resistant crystalline granitic bedrock. It has been classified as granitic gneiss and amphibole hornblende granite. Bedrock cores collected to north and west of the Site were classified as granitic and biotite gneiss.

Results of the subsurface investigation, as well as field observations along the Access Road and Interconnects, indicate that bedrock at the Site is largely massive competent gray to greenish gray granitic gneiss/granite. Intervals of coarse-grained pinkish gray amphibole granite were also encountered in the cores. These lithologies are generally consistent with the published regional mapping. Figure 5.7 in the Application, a 1:600 scale bedrock map, shows the predominant bedrock type within the study area. A map entitled "Inferred Depth to Top of Rock" is included as Figure 5.6 in the Application. Depth to bedrock data obtained during the geotechnical field program and contouring between the subsurface locations indicate depth to rock is shallowest in the central and southern portions of the Site, increasing to the north to more than 33 feet of glacial sand and gravel at boring B-1. Cut and fill estimates are discussed in Section 5.3.2 in the Application.

A total of 19 bedrock cores were submitted for geotechnical laboratory analysis of rock strength and characterization parameters. Analyses included water content, total unit weight, strain at peak tests, and strength tests including Point Load, Unconfined Compression, and Direct Shear analyses. Results and a summary table are included in Appendix F-3.

Results of these analyses indicate the granitic gneiss/granite is very dense and very hard across the Site. The Rock Quality Designation (RQD) from the rock cores indicate generally excellent quality rock. The RQD generally improves with depth, due to lower degree of weathering, fracturing and generally greater bedrock competency at depth. The frequency of bedrock fractures were also observed and logged from the rock cores. The number of natural fractures (not including mechanical fractures due to handling) ranged from 0 to 3 per foot, and were typically 0 to 1 fracture per foot.

No evidence of faulting was observed in the rock cores taken during the geotechnical investigation, although the investigations were not intended to address the seismo-tectonic activities at the Site.

The combined hardness, generally high RQD, and low number of fractures indicated the bedrock is suitable for foundation construction for the Energy Facility. Final Site elevations can be effectively achieved through blasting in these types of competent rocks. The blasted rock can then be crushed and processed on-site for use as engineered fill and/or as riprap for slope protection.

Q. Please describe the surficial geology of the Project Area.

A. Glacial kame deposits, glacial till and bedrock outcrops exist within the Project Area. Unconsolidated units in the vicinity of the Project Area include thin discontinuous layers of relatively impermeable glacial tills, generally in the eastern and southern portions of the Site, and sand and gravel deposits, which tend to thicken to the west of the Project Area. Stream-associated alluvial deposits are within or adjacent to Torne

Brook and surrounding or adjacent wetlands. Due to the steep slopes, colluvial deposits of angular sand and gravel are also found across the Project Area. Field observations indicate poorly sorted fine sand and gravel deposits up to 33+ feet thick on the northwestern portion of the Site; these deposits thin to the south and east. A thin veneer of glacial till was encountered to the south and east. Alluvial deposits are adjacent to Torne Brook and wetlands.

Q. Are the bedrock geology and surfical geology suitable for the construction and operation of the Energy Facility?

A. Yes. The geology will support construction activities and operations in Project Area.

Q. Please describe the soils within the Project Area.

A. A map delineating the different soil types on the Energy Facility Site and other off-site areas that will be disturbed can be found in Figure 5.4 of the Application. Soils disturbed within the Energy Facility Site will consist primarily of Charlton fine sandy loam (ChC) with small areas of Alden silt loam. There are also small areas of Chatfield-Rock outcrop complex (CoC, CoD).

Disturbed areas in the Electric Interconnect primarily consist of approximately 0.5 acres of ChC soils and 0.10 acres of Udorthents, smooth (Us). Soils mapped along the Site Access Road and Water/Wastewater Interconnects include approximately 2 acres of ChC soils. The Gas Interconnect will traverse approximately 1 acre of CoC soils and 0.5 acres of CoD soils. Project Area soils and their characteristics, including infiltration, are described in Section 5.2.4 of the Application.

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Q. Are the soils within the Project Area suitable for construction and operation of the Project?

A. Yes. Soil descriptions, properties and limitations including the suitability for construction and the infiltration capacity for each soil type are included in Table 5.2. The recently completed geotechnical program included laboratory analysis of 25 soil samples from eight locations on the Site, at varying depths. Laboratory tests conducted on soils included analyses of water content, liquid limit, plastic limit, USCS soil classifications, sieve results, hydrometer analyses, organic content, bulk compaction tests (ASTM D698 and D1557), and the California Bearing Ratio Test. Geotechnical laboratory results and a summary table are included in Appendix F-3. The results from the comprehensive geotechnical program indicate the overburden soils on the Site are suitable for use as fill. These materials are predominately granular, well graded and have low plasticity, rendering them suitable as construction materials for the Project.

The Project's major equipment components, structural foundations, roadbed bases and other load-bearing features will be constructed primarily on engineered fill derived from crushed, graded blast rock mixed with granular overburden soils, as necessary. The engineered fill will generally be placed and compacted over in-situ competent bedrock to achieve finished grades. The fill will be designed, constructed and placed in accordance with applicable engineering standards and best management practices, to provide long-term stable support for Project components.

Some existing subsoils, which are composed of glacially deposited sands, gravel and compacted till, may be retained in place on the northwestern and western portions of the Site. Engineered fill may be placed over these subsoils, as needed, to achieve the finished elevations. Analytical geotechnical results indicate these subsoils are suitable for use as engineered fill. Some moisture conditioning of these materials may be required during construction, for optimum compaction.

The sequence of construction activities involving soils is as follows. Following installation of erosion control at the limits of work, existing vegetation will be cleared, grubbed and removed from within the construction footprint. Existing surface soils may then be used as a blast blanket during blasting of the underlying bedrock, based upon the judgement of the blasting contractor. Surficial soils will then be removed and stockpiled on the Site, as needed, for later landscaping uses.

A discussion of any dewatering that may be necessary is included in Section 7.0 of the Application, Groundwater, Water Supply and Use. Impacts and mitigation measures are described in Section 5.4 of the Application.

The region of New York State incorporating the Project Area has not been mapped for landslide susceptibility. However, because most of the thin overburden soils will be removed, allowing the structures of the Energy Facility to rest upon bedrock, the risk of soil landslides will be minimal. Because the topography slopes up to the east above the Energy Facility, structural controls will be designed, placed, and maintained to reduce the potential risk of landslides affecting the Energy Facility, where appropriate. Controls will also be designed, placed, and maintained to reduce the risk of slope instability receptors that are downslope from the Energy Facility.

Q. Has a map delineating slopes on the Energy Facility Site been created?

A. Yes. Plans showing existing slopes at intervals required in Stipulation 8 is shown in Figures 5.5, 5.8, 5.9, and 5.10. Areas of steepest slopes (35 percent and greater) are found primarily along the northeast boundary and in the east central portion of the Site. The Energy Facility will be constructed generally southwest of these areas, on slopes that now range from 8 to 35 percent.

Q. Are geologic faulting and regional seismology addressed in the Application?

A. Yes. Geologic faulting and regional seismology are addressed in Sections 5.2.6 and 5.2.7, respectively.

The Ramapo fault is located a minimum of 1.25 miles southeast of the Energy Facility Site. This fault is one of a series of northeast-trending faults within the three-mile-wide Ramapo fault zone bordering the Newark Basin, a Mesozoic rift basin to the east of the Project Area. Historic seismic activity in southeastern New York has been attributed to possible fault movement in the Ramapo fault zone. However, a detailed analysis by the United States Geological Survey ("USGS") of cored bedrock and recent unconsolidated sediments at a number of locations spanning the Ramapo fault and other area border faults of the Newark Basin have not confirmed recent or current movement on the Ramapo fault. The last recognizable movement on the southeasterly-dipping fault was interpreted as normal fault movement (downthrown to the east) which occurred during the Mesozoic. Review of data did not indicate faulting more recent than Mesozoic.

No mapped faults are shown as traversing the Project Area on the maps reviewed. Although no definitive evidence of faulting was noted on maps across the Project Area, logs of subsurface rock cores collected as part of two previous studies in the vicinity of the Site showed some fractured zones, especially in shallow bedrock near the contact of glacial overburden sediments. Rock cores obtained from the borings that encountered bedrock during the Project's geotechnical subsurface program contained some zones of fracturing, due primarily to breaks during coring.

Some fractures were silt-filled, but no significant mineralization or abrupt lithology changes were observed. The rock cores were largely competent, and consisted of granitic gneiss with some zones of coarse-grained granite.

New York State can be represented as divided into four seismic zones, A through D, based upon estimates of effective peak acceleration expected from a seismic event with a one in ten probability of being exceeded in 100 years. Areas in Zone A have the lowest estimated effective peak acceleration; areas in Zone D have the highest. The Project Area is located in Zone C.

In the relatively tectonically inactive eastern United States, the causal association of seismicity with current activity on known faults is rarely established. As previously discussed, USGS studies have confirmed no evidence of Quaternary or more recent fault movement in the Ramapo fault system.

The Project Area is located within an approximately 20-mile-wide zone which has experienced a moderate frequency of low-level earthquake activity. The activity appears to be centered along the northeasterly-trending Ramapo fault, a minimum of 1.25 miles southeast of the Site. Shallow, low-magnitude earthquakes have tended to occur west of the Newark Basin, while higher magnitude and deeper events have occurred east of the Ramapo fault in New Jersey and Westchester, New York.

In the tectonically active western United States, major earthquake source areas are associated with certain known active faults. In the eastern United States, however, known faults are often the results of past tectonics and may not be currently active. Predictions of future seismic events east of the Rocky Mountains is typically based upon the probabilistic method, which relies on the size and frequency of past observed earthquakes in the area. Therefore, an analysis of historic seismicity within a 50-mile radius of the Energy Facility Site (the "Seismic Study Area") was conducted, to assess previous earthquake occurrences, frequency, and size in the vicinity of the Project Area. No historic earthquake epicenters have been reported or recorded above Modified Mercalli (MM) Intensity III or Richter magnitude 2.0 within five miles of the Energy Facility Site, based upon a review of earthquake epicenter locations on a published New York State Geological Survey map and recorded locations between 1980 and March 1999 reported by the USGS National Earthquake Information Center.

Eight epicenters have been reported or recorded between five and ten miles of the Site, including five events at Modified Mercalli Intensity of III, one event at Intensity IV on January 15, 1992, and two events at Intensity V. The first of the two events at Intensity V occurred in 1951, with an epicenter located 10 miles northwest of the Site. The second occurred in 1978 with an epicenter located 9 miles south of the Site.

The closest earthquake reported as damaging was the Tarrytown, New York earthquake, which occurred in 1874. The epicenter of this event was mapped as approximately 16 miles southeast of the Energy Facility Site, according to a New York State Geological Survey Map entitled Damaging Earthquakes in New York State and Adjacent Areas. The 1874 event had an Intensity of VI and an estimated magnitude of 4.8.

The largest earthquake epicenters reported or recorded within the 50-radial mile seismic Study Area were five intensity VI events, including the 1874 event. The four other events occurred between 40 and 50 miles south to southwest of the Site. Two of the events were reported as occurring in 1737 and 1884; the remaining two were undated on the map.

Q. Are geologic faulting and regional seismology suitable for construction and operation of the Project?

A. Yes. The Project will be designed, constructed, and operated in accordance with applicable earthquake-related provisions in the codes and standards cited in Section 5.4.

Q. Does the Application address the cut material or spoil to be removed from the Site and the fill material to be brought to the Site?

A. Yes. Cut and fill materials are discussed in Section 5.3.2 of the Application.

Q. Has any geotechnical investigation been conducted at that Site?

A. Yes. A comprehensive geotechnical field investigation was conducted to determine suitability of on-site soils and bedrock for construction of the Project, identify engineering requirements, determine the foundation support needs for the equipment, and develop criteria to be used for the design of the Energy Facility. The geotechnical program included the advancement of 13 borings and installation of 8 groundwater observation wells across the Energy Facility Site. Locations are shown on Figure 5.2. Boring information is summarized in Table 5.1. Boring logs are included in Appendix F-1.

Results of geotechnical laboratory analyses of 19 bedrock cores indicated the very dense, very hard granitic gneiss/granite bedrock on the Site is suitable for foundation construction of the Energy Facility.

Laboratory analyses of 25 soil samples indicated the soils above bedrock are suitable for use as fill. The soils are predominately granular, well graded and have low plasticity, rendering them suitable as construction materials for the Project. Laboratory testing data summary tables and analytical results for soils and rock, respectively, are included in Appendix F-3 in the Application.

Q. Will blasting be required during Project construction?

A. Yes. Blasting associated with the Project is discussed in Section 5.3.3 of the Application. The Applicant intends to conduct blasting with minimal disturbance to sensitive receptors identified in the vicinity of the Project Area. To establish guidelines to meet this objective, a Ground and Air Borne Vibration Monitoring Plan (the "Monitoring Plan") has been prepared for the Applicant by Vibra-Tech. The Monitoring Plan is supplemented by additional information provided in Section 3 and Exhibit 4 of Addendum No. 2. The transportation, storage, possession, handling and use of explosives for the Project will be conducted in accordance with all applicable local, state and federal regulations and guidelines. A qualified blasting contractor will be retained, with field operations supervised by a full-time experienced blaster-in-charge who will be responsible for executing the blasting plan. The blaster-in-charge will be licensed to operate in the State of New York. Principal effects include ground vibration and air overpressure. The effects of blasting are addressed in Section 5.3.3.2 of the Application.

Q. Have any locations potentially sensitive to blasting operations at the Site been identified?

A. Yes. In accordance with Stipulation No. 8, the following potentially sensitive locations have been identified in the vicinity of the blast area:

- Rockland County MRF and Co-Composting Facility
- Con-Ed Ramapo Substation
- Nearby overhead electrical transmission lines
- Algonquin underground gas pipeline
- Torne Brook Farm (nearest residence)
- Cap, leachate collection system, and underlying bedrock at closed Ramapo Landfill

- Timber rattlesnake dens and basking areas
- Ramapo Fault

Blasting will be performed to minimize risk of damage at these locations.

Q. Are the protection of structures and environmental concerns due to blasting addressed in the Application?

A. Yes. These issues are addressed in Section 5.3.3.3 of the Application. Ground vibration thresholds have been established though government, industry and academic studies to be protective of various types of above ground and in-ground structures. Threshold damage for aboveground structures is defined by the United States Bureau of Mines as the loosening of paint, creation of small plaster cracks or lengthening of pre-existing plaster cracks.

Unlike above ground structures, underground structures such as pipelines, wells and landfills, are unable to respond to ground motion with their own unique motion and are limited to the movement of the medium around them. Therefore, if no permanent deformation of the surrounding medium occurs, the in-ground structure cannot sustain any damage. Permanent deformation is typically limited to a cone around the borehole. Cratering or physical displacement of a feature such as an underground pipeline can occur, but adherence to the applicable criteria will prevent this from occurring. Therefore, no impact to belowground structures, including the cap, leachate collection system and underlying bedrock at the closed and capped Ramapo Landfill are expected.

The Monitoring Plan sets ground vibration and air overpressure control criteria to protect aboveground and underground structures near the perimeter of the Site.

If Project blasting operations exceed 80 percent of the control limits at the respective structures for any single axis measured of any blast. blasting activities will cease until corrective actions are taken to reduce vibration intensity.

Two additional areas of concern with regard to the blasting to be conducted at the Site are the Ramapo Fault and the Timber Rattlesnake habitat. The closest Timber Rattlesnake den is located in excess of 2,700 feet from the limits of the blasting area and will not be affected by the blasting. An ecological investigation of Timber Rattlesnakes within Torne Valley conducted in 2000 verified the absence of den sites on the Site. The Ramapo Fault has been addressed previously.

Q. What pre-blasting activities will take place?

A. Prior to any blasting activity, the Applicant will conduct a pre-blast condition inspection of the following aboveground residential and industrial structures:

- The Rockland County MRF and Co-Composting Facility
- Nearest Residence (Torne Brook Farm and outbuildings)
- Con-Ed Ramapo Substation
- Base of nearest Overhead Electrical Transmission Line Tower

A blasting plan will be submitted to the Town official designated by local regulation at least three weeks prior to the first blast. The plan will contain full details of the proposed drilling and blasting patterns. Details of the pre-blasting inspection and blasting plan are provided in Section 5.3.3.4, <u>and in Addendum No. 2</u>. Charge sizes and limits will not be specified in the plan. but will be determined by the blaster-in-charge based upon field conditions. Because an undercharged hole can produce as much vibration as an overcharged hole, the blaster will retain flexibility to adjust charges size to adapt to field conditions while adhering to the vibration limits imposed to protect the various types of surrounding structures, as previously discussed.

The Applicant will conduct Project blasting operations in accordance with all applicable regulations and safety guidelines, in coordination with designated local officials, and in a manner that minimizes disturbance and risk to the general public and identified sensitive receptors. These estimates are provided to allow for consideration of the range of blasting activity that may be required. In order to maximize worker and public safety, and minimize potential environmental impacts, a detailed blasting plan will be prepared by the construction contractor prior to beginning construction, following review of site conditions. The plan will be submitted to the Town Engineer. In general, blasting operations will conform to the following:

Location of blasting operations are shown on the attached Figure 5.12, Preliminary Location of Rock Blasting, which indicates the area of rock excavation, excavation and removal necessary to achieve the finished grades.

Charge sizes and limits: As stated in the Application and the Ground and Air Borne Vibration Monitoring Plan in Appendix F-2, charge sizes and limits will be determined by the selected blasting contractor based upon field conditions. It is important to grant the blasting contractor the flexibility to exercise his judgment, based upon site-specific conditions and the type of equipment the contractor sizes and limits will not be specified in the plan, but will be determined by the blaster-in-charge based upon field conditions. Because an undercharged hole can produce as much vibration as an overcharged hole, the blaster will retain flexibility to adjust charges size to adapt to field conditions while adhering to the vibration limits imposed to protect the various types of surrounding structures, as previously discussed.

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Charge sizes and limits: As stated in the Application and the Ground and Air Borne Vibration Monitoring Plan in Appendix F-2, charge sizes and limits will be determined by the selected blasting contractor based upon field conditions. It is important to grant the blasting contractor the flexibility to exercise his judgment, based upon site-specific conditions and the type of equipment the contractor utilizes. Detailed field operations will be planned and managed to limit vibrations at the identified nearby sensitive receptors, and safeguard on-site personnel and the general public.

It is anticipated that charge sizes will range from one pound to 500 pounds per blast. There are several sensitive receptors of concern that have different vibration limits and these receptors will be at various distances from a respective blast. Depending upon the situation, it may preferable to use a larger charge size with fewer blasts, or it may be preferable to use a smaller blast size resulting in more blasts. A competent blaster will adjust the charge size based upon the proximity of the blast to a sensitive receptor and the vibration limit for that receptor.

Quantity of discrete blasts: The total expected quantity of rock in the cut areas is estimated at 379,000 CY. Assuming a maximum 40-foot cut depth and a drill hole diameter of 3 inches, a typical spacing and burden would be 5 feet by 5 feet, if the explosive ammonium nitrate and fuel oil (ANFO) were utilized. This would yield approximately 37 CY per 40-foot hole. An estimated total of 10,243 holes of 40-foot depth would be required to yield 379,000 CY. An estimated production rate of 55 to 110 holes per day is reasonable. The total estimated quantity of discrete blasts would be 93 to 380, using the assumptions above if an estimated 1 to 4 blasts per day were performed at a rate of 110 holes per day, or an estimated 1 to 2 blasts per day were performed at a rate of 55 holes per day.

Alternatively, if a 6-inch diameter drill hole were utilized. a typical spacing and burden would be 9 feet by 9 feet if ANFO were utilized. This would yield an estimated 120 CY per 40-foot hole. An estimated total of 3,158 holes of 40-foot depth would be required to yield 379,000 CY. The total estimated quantity of discrete blasts would be 28 to 117, assuming 110 holes per day broken up by 1 to 4 discrete blasts per day, or 55 holes per day broken up into 1 to 2 blasts per day.

As indicated above, the quantity of discrete blasts is a function of the volume of rock to be blasted and the blast design. The foregoing analysis reflects estimates of blast size and the quantity of rock produced by blasting. The actual quantity of discrete blasts will depend on a number of factors, most notably site specific conditions encountered as the blasting program proceeds. The blast design parameters that would control this include the number of holes, depth of the holes, hole diameter, type(s) of explosives used, spacing and burden. These parameters will be determined by the selected blasting contractor, upon evaluating the project and developing the project specifications.

Hours of blasting: During the blasting phase of Project site preparation, blasting is anticipated to occur intermittently during the daylight hours, between 7:00 a.m. to 5 p.m. Blasting times will be further specified during site preparation activities, in coordination with the on-site Project engineer, the blasting contractor and the designated local official.

Transportation, storage and handling: Transportation, storage and handling of explosives will be conducted in compliance with all applicable state and local regulations, as well as appropriate federal safety guidelines. In the State of New York, this matter is carefully regulated under the New York State Industrial Code Rule 39. The federal agency responsible for regulating the possession, storage and transportation of explosives is the U.S. Bureau of Alcohol. Tobacco and Firearms. Pertinent regulations and guidelines are attached as Appendix F-4.

Use of blasting mats: Blasting mats are one of several techniques used to control flyrock, which occurs when a blast is improperly designed or loaded. Flyrock can also be caused by geologic conditions not detected prior to the shot. Causes of flyrock are listed on pages 13 and 14 of Appendix F-2. Flyrock will be minimized through proper burden, stemming and placement relationships (design of each shot). If additional flyrock controls are needed, blasting mats or soil cover will be used to reduce flyrock, to safeguard on-site personnel, the general public and nearby structures.

Coordination with local safety officials: The Project blasting program will be coordinated with local officials and conducted in accordance with local ordinances, as well as applicable state and federal regulations and safety guidelines. At least two weeks prior to the first blast, the blasting contractor will submit a detailed blasting plan to the township engineer or other designated local official, for review. The final blasting plan will contain details of the proposed blasting patterns, as described in the Application, Appendix F-2, and Exhibit 4 of Addendum No. 2. Hours of blasting operations and blast warning procedures will be coordinated with the designated local official.

Regarding compensation for damages, ANP will require the blaster to maintain adequate Comprehensive General Liability insurance including Completed Operations and Explosion, Collapse and Underground (XCU). The insurance shall name Ramapo Energy Limited Partnership and Alstom Power as additional insured on a primary and non-contributing basis.

Q. Will any notification prior to and monitoring during blasting take place?

A. Yes. Notification and monitoring will take place in accordance with Sections 5.3.3.5 and 5.3.3.6 of the Application. The following locations will be monitored during blasting:

- The Rockland County MRF and Co-Composting Facility
- Nearest Residence (Torne Brook Farm and outbuildings)
- Con-Ed Ramapo Substation
- Base of nearest Overhead Electrical Transmission Line Tower
- Algonquin Gas Pipeline (underground)
- Landfill Cap or Leachate Collection System (closest feature)

Q. What activities will occur after blasting?

A. A post-blast inspection of the same structures that were inspected prior to blasting will be conducted. Pre-blast and post-blast condition inspection reports will be compared. Any alleged damage due to the blasting program will be reviewed based upon the results of the vibration monitoring program, pre/post blast inspection reports, and specific information from the blasting logs. Compensation to the owner will be based upon the outcome of this review.

Q. You mentioned earlier that additional information concerning blasting was provided in Addendum No. 2.

A. That is correct. The Applicant was required to submit a blasting plan as part of its June 21, 2001 submission. The plan is included as Exhibit 4 to Addendum No. 2. The blasting plan provides additional information concerning the blasting that will occur at the Site. The plan provides additional information concerning monitoring during blasting, including vibration criteria used to protect nearby locations of concern. This criteria will ensure that these locations, and areas beyond are protected. The plan also provided additional information regarding the blast design, and the range of options that will be utilized during blasting. The plan also provides specifics concerning the products that are anticipated to be used for blasting. Importantly, the blasting materials will be entirely consumed during detonation, ensuring that there will be no residual materials in the borehole or on the Site.

Q. What measures will be undertaken to ensure the integrity of the Project?

A. The Project was located on the site specifically to address DPS' request to avoid a specific rock outcrop to the east. This outcrop will be enhanced to create a replacement basking area as mitigation for Timber Rattlesnakes. Because of the location of the outcrop, the only area where the Energy Facility will fit without disturbing it is on the western section of the property. The final layout of the buildings is constrained within this area.

The Project will be designed, constructed, operated, and maintained to be compatible with on-Site topographic, geological and regional seismic conditions. Analysis of bedrock on the Site indicates that it is competent and stable; rock parameters will be further verified prior to construction. The Project will be designed and constructed in accordance with applicable New York State Building Codes, applicable Uniform Building Codes and American National Standards Institute (ANSI)/American Society of Civil Engineers (ASCE) standards, other applicable local, state, and federal regulations and requirements, and good engineering practices.

The Project buildings and structures will be designed, constructed, operated, and maintained in accordance with applicable provisions contained in the Uniform Building and to withstand earthquake ground motions as prescribed by applicable portions of Section 9 entitled "Earthquake Loads" of the ANSI and ASCE Standard for Minimum Design Loads for Buildings and Other Structures (ANSI/ASCE, 7-95). The primary objective of these standards and provisions is to safeguard against major structural failure and loss of life in the event of an earthquake, not to limit damage or maintain function.

Approximately 27.1 acres of the 62-acre (44 percent) of the Energy Facility Site will remain undisturbed and forested. An existing forested buffer, with widths ranging from 200 to 700 feet, will be maintained between the Site and Harriman State Park.

Development of the Project will result in approximately 25.3 acres of permanent alteration on the Energy Facility Site. Placement of the Energy Facility on the lowest and most accessible portion of the Site will minimize clearing of forested areas and disturbance of soils between the Facility and the Park.

Q. What measures, if any, are proposed to address geologic, soil and seismicity impacts during Project construction?

A. Site preparation will include clearing and grubbing, drilling and blasting of bedrock where needed, crushing and grading of blast rock, and on-site reuse of suitable materials. The unsuitable and excess material will be transported to a suitable off-site location, likely for reuse in construction.

Heavy construction equipment will play a major role in performing the earthwork at the Site, and will include scrapers, bulldozers with rock teeth, excavators, loaders, compactors, and crushers. Different fill materials produced during the earthwork operation will be stockpiled separately within the Project Area. These stockpiles will be protected against erosion through the design and implementation of appropriate erosion and sediment control plans.

To reduce the risk of erosion and sedimentation, construction will be conducted in accordance with best management practices and techniques described in applicable NYSDEC guidance documents, as described in Section 8.0, Stormwater, Wastewater, and Solid Waste. Erosion control measures that may be implemented based upon Site-specific conditions include continuous siltation barriers between construction activities and downgradient wetland areas, slope breakers, mulch and temporary vegetative or synthetic cover. An erosion control plan will be developed prior to and implemented during construction. Prior to removal of vegetation, erosion and sedimentation controls will be installed downgradient of areas to be disturbed on the Site and along the Interconnects, as discussed in Sections 6.0, Vegetation and Terrestrial Ecology and 8.0,

Stormwater, Wastewater, and Solid Waste.

Overburden (soils and unconsolidated sediments) and bedrock will be removed on the Energy Facility Site to create the terraced construction site. Because most of the thin overburden soils will be removed, allowing the structures of the Energy Facility to rest upon bedrock, the risk of soil landslides will be minimal. Appropriate controls will be designed and constructed to reduce the risk of upslope materials affecting the Project and downslope areas.

Impacts to soils due to construction of the Electric and Gas Interconnects will be temporary. Soils will be seeded and revegetation will be monitored to ensure adequate stabilization of soils.

The blasting criteria established will protect the integrity of the cap, leachate system and underlying bedrock of the closed and capped Ramapo Landfill. Other construction activities will have no affect on the Landfill remediation. Blasting and other construction activities will not affect seismic activity associated with the Ramapo Fault, which is located a minimum of 1.25 miles southeast of the Site.

A final SPCC plan will be prepared and submitted as a compliance filing prior to construction, to reduce the risk and minimize the potential impact to soil, surface water or groundwater from an accidental spill of oil or hazardous materials during construction and operation. Spills that may occur will be remediated according to applicable laws and best management practices.

Q. What measures, if any, are proposed to address geologic, soil and seismicity impacts during Project operation?

A. Erosion and sedimentation impacts during operation will not be significant. Stormwater runoff will be managed as described in Section 8.0. A Stormwater Pollution Prevention Plan ("SWPPP") will be filed as a compliance filing. The operation of the Project will have no effect on soils, overburden and bedrock in the Project Area. Bedrock on the Site appears competent and stable to support long term operation of the Project.

Operation of the Project will not effect the cap, leachate system and underlying bedrock at the closed Ramapo Landfill. Project operation will have no effect on the low level of seismic activities associated with the Ramapo Fault, which is located at least 1.25 miles southeasterly of the Energy Facility. A review of historic earthquakes which have occurred within 50 miles of the Project Area indicates no epicenters above Modified Mercalli Intensity III or Richter Magnitude 2.0 have been recorded or reported within five miles of the Energy Facility Site through March 15, 1999.

The Project will be operated and maintained to be compatible with on-Site topographic, geological and regional seismic conditions.

Q. In your opinion, will the potential impacts relating geology, soils and seismology be addressed through the mitigation measures described previously?

A. Yes.

Q. Please describe Section 7 of the Application.

A. This section describes Project water supply and infrastructure requirements, water supply sources, existing groundwater resources and uses within a one mile radius of the Site, potential impacts to available water supply including cumulative impacts assuming simultaneous operation of the Project with the proposed Torne Valley Station, and Project mitigation of potential impacts. In Addendum No. 2, the Applicant proposed to incorporate a zero discharge system, which will allow the Project to recycle and reuse process wastewater that otherwise would have to be disposed. This reuse of wastewater will further reduce the Project's water supply needs. We will address the implications of incorporating a zero discharge system later in our testimony. The regional and local hydrogeologic setting in the vicinity of the Project Area is described, focusing on regional aquifers, availability and consumptive use of groundwater resources and groundwater quality.

Q. Please describe the regional setting of the Project Area.

A. The Project Area is located within the Y-shaped Ramapo River-Mahwah River Basin (the Basin), which drains an area of 161 square miles. The Ramapo River, located approximately one mile southwest and downgradient from the Site, originates near Monroe in Orange County, New York and flows southeasterly crossing the state line into New Jersey near Mahwah, where it converges with the Mahwah River approximately 2.5 miles south of the Site. The Ramapo River flows into the Pompton then Passaic Rivers in New Jersey, discharging into Newark Bay and the Atlantic

Ocean. The Project Area is contained in a 93-square mile drainage basin occupied by the Ramapo River and its tributaries.

In the vicinity of the Project Area, the river flows through the Ramapo River Valley, which contains an irregular belt of glacially derived stratified drift deposits, of an average width of approximately one half a mile. These unconsolidated sands and gravels paralleling the Ramapo River serve as unconfined groundwater aquifers producing potable water for the region, and are part of the Ramapo River Basin Aquifer System ("Aquifer"). The system includes the highly productive groundwater aquifers within the valleys of the Ramapo River and the Mahwah River (to the east of the Project Area) within New York and New Jersey.

Bedrock wells in the region generally yield significantly lower volumes of water than wells in the Aquifer; and therefore the region relies primarily on water contained in the Aquifer.

The unconsolidated Aquifer has been designated as a Sole Source Aquifer System ("SSA") by the EPA. The SSA designation was based upon the aquifer meeting the technical requirements for a SSA as follows:

1. More than 50 per cent of the drinking water for the aquifer service area (Rockland County and parts of northern New Jersey) is supplied by the Aquifer.

2. There are no economically feasible alternative drinking water sources that could replace the Aquifer.

NYSDEC has also designated the portion of the Aquifer in New York as a Primary Water Supply Aquifer, which is defined as a highly productive aquifer that is used as a source of water supply by major public-supply systems.

It should be noted that the Project Area is not included within the boundaries of the Aquifer, as mapped by USGS and the New York Department of Health. The Energy Facility Site is located a minimum of 0.5 miles northwest and upgradient of the aquifer boundary.

Q. Please describe the groundwater resources in the vicinity of the Project Area.

A. The Project Area is not within the mapped Aquifer or wellhead protection area ("WHPA") boundaries. The Project Area is within the Torne Valley watershed, which contributes water and recharge to the Ramapo Valley Aquifer. The northwestern portion of the Energy Facility Site contains high permeability material which function as recharge and storage areas for Torne Brook

No groundwater supply wells are currently located within the Project Area. Six groundwater monitoring wells were installed in November 1999 within the footprint of the Energy Facility, as discussed in Section 5.0. A subsequent subsurface program completed in early 2000 included advancement of an additional six borings and installation of two groundwater monitoring wells across the Energy Facility Site. Elevations of groundwater measured in November 1999 ranged from 543 to 627 feet, as shown on Table 7.1. Depths of groundwater below existing ground surface ranged from 30 feet in the central portion of the Site to 3 feet below ground surface near the wetlands on the west boundary of the Site.

Groundwater wells located within one mile of the Site included four wells at Torne Brook Farm, located approximately 0.9 mile southwest of the Site. These wells were identified as PW-1, 9-OS, P-I and 9-R in a letter from URS Greiner Woodward Clyde dated August 16, 1999 to the Rockland County Department of Health. The PW-1 well notation may refer to the private supply well servicing Torne Brook Farm. OS was noted as an overburden/shallow well, I as a well of intermediate depth, and R as a bedrock well. These wells may be a cluster of groundwater monitoring wells associated with the capped and closed Ramapo Landfill. No information was found regarding the depth, yield or water quality of these wells at the Rockland County Planning Department or Department of Health offices visited in September 1999. No information was found pertaining to these wells in 1998 during a review of records at NYSDEC Region 3 offices at New Paltz, New York or in the computerized listing of authorized water supplies reviewed at the NYSDEC Division of Water in Albany. No information was found regarding the depth, yield or water quality of this well at the Rockland County Planning Department or Department of Health offices visited in September 1999. No information was found pertaining to this well in 1998 during a review of records at NYSDEC Region 3 offices at New Paltz, New York or in the computerized listing of authorized water supplies reviewed at the NYSDEC Division of Water in Albany. However, reference was found in NYSDEC records to a wastewater discharge permit issued to an apartment complex named Torne Brook Farms Apartments. The apartment complex utilizes nine septic tanks for wastewater, under SPDES permit No. 021-8634. No further information was found.

The nearest of the ten Ramapo Valley Well Field (RVWF) wells (RVWF 95) is located approximately one mile southwest of the Site.

A number of groundwater monitoring wells are located west and southwest of the Site, and are associated with regular monitoring of the closed and capped former Ramapo Landfill, under USEPA's Record of Decision for the landfill. A leachate collection system is also collecting groundwater emanating from beneath the former landfill. This leachate is piped to the RCSWMA for treatment.

Q. Were alternative sources of potable water investigated?

A. Yes. The Applicant has evaluated other potential sources of water supply to the Project, including water from bedrock and overburden within the Project Area. Available information indicates that these potential sources are unlikely to supply sufficient water to service the Project. As an alternative, the Applicant has focused on reducing the water supply requirements of the Project by adopting air cooled technology, designing significant on-Site storage to minimize water demands during periods of restrictions on the RVWF, and recycling some of the steam cycle blowdown stream.

The Precambrian crystalline rocks in western Rockland County have low storage capacities and are not a source of large groundwater supplies. Groundwater in crystalline bedrock is typically contained in fractures, joints or interstitial spaces enlarged by surface weathering. The rugged topography in the area indicates that the bedrock is quite resistant to weathering, fracturing and erosion. In locations where fractures in the rock are connected to sources of recharge from adjacent surface water bodies, moderate yields may be possible from properly constructed and developed bedrock wells.

Little information is available on bedrock well yields in the vicinity of the Site, as the area is sparsely settled and most area drinking water is obtained from the Aquifers adjacent to the Ramapo River. A review of over 500 selected well records installed in Rockland County as of 1959 indicate that only approximately 10 per cent were installed in Precambrian granite or gneiss as the principle geologic unit. Average well yields of these wells was relatively low, at 21 gallons per minute ("gpm"). Most of the wells were used as private domestic supplies, although several commercial or institutional supplies were reported.

No lakes, ponds, or vernal pools are located on the Site. Drainage across the south side of the Site enters Candle Brook, which flows intermittently. Surface drainage from the north side of the Site enters Torne Brook. Both brooks are tributaries of the Ramapo River, but neither constitutes a sufficient source of water for the Project. In addition, these brooks and the permeable sediments immediately around them recharge the downgradient Aquifer, as well as provide ecological benefits, as discussed in Section 6.0, Vegetation and Terrestrial Ecology.

Upland stratified drift deposits in the regional area are of minor importance as aquifers. Results of a preliminary subsurface geological investigation at the Site indicate saturated thickness of such deposits is limited and it is unlikely that sufficient shallow groundwater is available in this upland area to service the Project.

Q. Please describe groundwater quality and flow direction in the vicinity of the Project Area.

A. Within the Project Area, no environmental concerns that could affect surface or groundwater quality have been identified. No record of previous structures or indications of former industrial uses in the Project Area have been found, based upon a review of local, county and state regulatory records. Forest growth indicates the Project Area was previously logged. Existing surface water quality on the Site is discussed in Section 6 of the Application.

Groundwater obtained regionally from fractures within the Precambrian gneiss, which is found on the Site, is typically low in dissolved solids, soft to moderately hard, and is acidic to neutral, with pHs ranging from 5.2 to 7.2. Groundwater from Quaternary sands and gravels contains moderate amounts of dissolved solids, is generally moderately hard, and is neutral to slightly alkaline, with pHs ranging from 6.8 to 7.7.

Groundwater is being collected at the closed and capped Ramapo Landfill, located downgradient of the Project Area, and is discharged to the Rockland County Sewer District No. 1 treatment plant located on the Hudson River. Results of groundwater investigations at the landfill indicate groundwater flow direction in the overburden and within the bedrock is generally to the west and southwest, away from the Project Area.

Naturally occurring groundwater flow directions within Torne Valley and the Ramapo Valley Aquifer are generally from the valley sides and upgradient portions of the drainage basin towards the Ramapo River. Flow direction may vary locally in the vicinity of wells pumping within the aquifer. Groundwater elevations on the Project Area are mapped on Figure 7.4 in the Application. Groundwater flow directions are perpendicular to the contours, and indicate groundwater flow generally down slope to the west across the Site.

Q. Please describe the Energy Facility's potable water usage requirements, including consideration of incorporating the zero discharge system into the design of the facility.

A. As discussed above, a zero discharge system (ZLD) was not initially incorporated into the design of the Project. The Application, including the water balance diagram, does not reflect the use of this system. The system is described in Addendum No. 2.

The Project utilizes cooling technology that uses air instead of water. By utilizing this technology, both water demand and the volume of wastewater generated will be significantly reduced compared to similar-sized projects utilizing wet cooling technology. The Applicant has entered into an agreement with UWNY to provide funding to UWNY for the purpose of increasing supply and potable water storage. The agreement reflects contributions based on an estimated annual Project demand of 23 MG.

A water balance diagram showing water requirements under different operating conditions is presented in Table 8.2 in the Application. A revised water balance diagram, entitled Table 8.2.1, is provided to reflect the use of a zero discharge system. Under base load operation with steam augmentation average water consumption is estimated to be 45,500 gpd with a peak requirement of 166,300 gpd. The annual consumption of 23 million gallons noted in Table 8.2.1 includes 120 hours of steam augmentation operation.

With the ZLD system, the average and peak water consumptions under base load operation are estimated to be 21,700 gpd.- The Project's peak use will be met by combining water supplied by UWNY, water taken from the 9 MG of on-Site storage and the recovery of process wastewater through the use of the ZLD system. Water will be stored for Project use in three 3-MG aboveground water tanks to be located on the Site. These tanks will be refilled during off-peak flow demands, in coordination with UWNY, to minimize impacts.

A total of 750,000 gallons of stored water will be reserved for fire suppression needs. The on-Site fire pumps will be capable of delivering a maximum of 2,000 gpm. This would supply four hydrants operating simultaneously with 500 gpm each. Therefore, with 750,000 gallons of on-Site storage dedicated to fire suppression, more than 6 hours of water supply would be available at maximum flow conditions for fire protection.

Q. Water used by the Project will be vented to the atmosphere through the stacks or discharged to the ZLD system for recycling and reuse.. Estimated volumes are shown on Table 8.2.1, as a supplement to Addendum No. 2.. Are the impacts relating to the Project due water emergency restrictions addressed in the Application?

A. Yes. During a water emergency, restrictions on water usage are determined according to Rockland County Health Department Article V regulations, entitled Mandatory Water Conservation Measures. A copy is included in Appendix H-2.

The Project will be subject to and operate in accordance with all water use prohibitions identified in these regulations. Impact to Project operations would occur during a Stage IV emergency, which prohibits all commercial and industrial establishments from using water in excess of the user's average daily consumption for the preceding 12 calendar months. During the summer of 1999, a Stage II was issued by the Rockland County Health Department, which restricted watering of lawns, washing of paved surfaces and non-commercial washing of vehicles, as described in Appendix H-2. During water restrictions or other emergencies, 9-MG storage capacity on-Site will be used as the supply source for the Project.

Q. Has the Applicant made any commitments with respect to Rockland County Health Department's water restrictions?

A. Yes, the Project will not take any water from UWNY during a Stage II Drought Alert.

Q. How long would the facility be able to operate without accepting water from UWNY using available water storage?

A. Assuming a daily consumption during normal operation of 21,700 gpd, the stored amount will support operations for 54 weeks using the ZLD system. Even if 60 hours of steam augmentation is assumed, the stored amount will support operations for 25 weeks using the ZLD system.

Q. Please describe Project's design as it relates to water storage capacity.

A. Three 3-MG tanks will be installed at the Energy Facility. Two tanks will be used to store raw water received from UWNY. The third tank will store demineralized water for use as make-up for the steam cycle. Portable trailer-mounted demineralizers will be used to treat the raw water and will be removed from the Energy Facility Site for off-site regeneration and back washing.

Q. Will dewatering occur at the Energy Facility?

A. Dewatering may be required at the foundation excavations. The water will be discharged to the stormwater management system described in Section 8 in the Application. During design, additional groundwater information will be obtained to determine if dewatering will be necessary during operation of the Project. If applicable, dewatering controls will be designed, constructed, operated and maintained in accordance with applicable engineering standards and practices.

Q. Please describe the distribution, piping, pressure and storage systems that will be used at the Energy Facility.

A. Water will be supplied to the Project through UWNY's existing 30-inch pipe located in Route 59/17 at the intersection of Torne Valley Road. Currently, the RCSWMA owns a 16-inch line running up Torne Valley Road, which ties into an existing 8-inch servicing the MRF and Co-composting facilities. The Applicant expects to obtain an agreement with RCSWMA and UWNY to tie into this 8-inch line. A new 8-inch water supply line will then be constructed by the Applicant along the Project access road, in the same trench as the wastewater interconnect. to minimize impacts. The wastewater line would only be put in place for future use to discharge sanitary wastewater when sewer service becomes available. In the event that agreement with the RCSWMA is not forthcoming, the water supply line would be extended along Torne Valley Road directly to the UWNY line. UWNY and the Applicant will each install meters to record Project water consumption. UWNY, the Town of Ramapo and Rockland County will not construct any distribution piping, mains or pumps to serve the Project.

An area has been set aside on the Site for the possible later installation of a storage tank to be used by UWNY.

Q. Please describe the impacts of the Projects with respect to groundwater, water supply and water use, and any mitigation, in any, proposed to address such impacts.

A. The Project has been designed to reduce overall consumptive water use to the extent feasible, primarily through incorporation of air-cooled technology and wastewater recycling. UWNY, which operates an extensive interconnected system of groundwater and surface water supplies servicing much of Rockland County, has contracted to supply the Project. The Project's estimated annual water use of 16.6 MG (assuming use of the ZLD system) represents approximately -0.15 percent of the total supply produced in 1998 by UWNY.

The Applicant has consulted and coordinated with UWNY, NYSDEC Region 3 and Rockland County personnel to develop a water supply plan for the

Project that has no adverse impacts on the regional water supply system. The plan includes significant on-Site storage facilities to reduce water requirements during periods of water restrictions within the County. The Applicant also intends to provide significant capital contributions to UWNY. These financial resources will be dedicated to improving the efficiency of existing water supply resources, as well as assisting in the development of additional water supplies for the benefit of the UWNY customer base. (See Attachment to Agreement between UWNY and Applicant within Appendix H-1.)

Following analysis of the Project's normal and peak requirements and the existing water supply resources in Rockland County, and subject to the terms of its agreement with the Applicant, UWNY has concluded that construction and operation of the Project will have no adverse impact on UWNY's water resources, supply and distribution system, or customers. Given the anticipated development of water supply projects funded by the Applicant, UWNY has indicated it can meet Project water needs through efficient use of its existing system, while maintaining the required flow volumes in the Ramapo River.

Due to its proximity, it is expected that the existing Ramapo Valley Well Field will supply the primary portion of water for the Project. These groundwater wells penetrate the unconsolidated Aquifer adjacent to the Ramapo River at the base of Torne Valley. No groundwater or surface water will be withdrawn to service the Project from Torne Valley and adjacent upland recharge areas. The Project will have no impact on groundwater recharge or quality, as stormwater on the Site will be detained to remove solids then re-directed into the watersheds on the Site, as described in Section 8.0, Stormwater, Wastewater, and Solid Waste.

The Applicant will construct three 3-MG aboveground storage tanks on the Site. This water will be used during water restrictions imposed by Rockland County, to minimize impacts on UWNY's system during potential drought periods. The Applicant will coordinate refilling of the tanks with UWNY, to reduce impacts.

To improve water supplies in Rockland County, the Applicant has agreed to contribute $1,340,000 to UWNY, payable within 15 days following the start of construction of the Energy Facility. This contribution would be used to support the following system enhancement projects as noted in UWNY's letter dated February 8, 2001 made part of the Amendment to Agreement dated March 15, 2001:

1. Nanuet 14 Well – Remove contamination
2. Viola Well – Remove entrained air
3. DeForest Water Treatment Plant – upgraded

According to UWNY's Master Plan, these three projects will result in an increase in the system's water supply of 1.5 mgd and an increase in its peak capacity of 3 mgd. Thus, the implementation of these projects will completely-offset the impacts of Project usage. The Applicant will also make an additional $300,000 contribution targeted to improve water supply for the Torne Valley area, which may include improving the efficiency of releases of water to augment flow in the Ramapo River

In summary, after implementing the mitigation measures discussed previously, the Project will not have any adverse impact on the area's water supplies. Overall, the mitigation provided by the Applicant will help to improve the water supply for the customers of UWNY.

Q. Does this conclude your testimony at this time?

A. Yes.

Case: 98-F-1968

RAMAPO ENERGY LIMITED PARTNERSHIP

DIRECT TESTIMONY
OF
DONALD DISTANTE

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/19/01
CASE NO. 98-F-1968
EX 133

Ex. NJDEP-107

Q. Please state your name, title, affiliation and address.

~~A.~~A. My name is Donald Distante, and I was employed as a Project Manager in the Engineering Department at United Water New York ("UWNY") at 360 West Nyack Road, West Nyack, New York 10994. In March of 2000 I transferred to United Water Management and Services~~. My current title is~~ (200 Old Hook Road, Harrington Park, New Jersey 07640) as Senior Planner. I recently transferred back to UWNY as Manager of Engineering, my current title.~~ and my business address is 200 Old Hook Road, Harrington Park, New Jersey 07640.~~

Q. Mr. Distante, what are your duties of employment?

A. I prepare master plans for ~~all of~~ United Water's regulated water and wastewater companies. I prepared the September 2000 Master Plan for UWNY and have worked on water service studies concerning the power plants proposed for construction in Rockland County. I provide technical expertise to legal counsel concerning various interbasin water transfer and environmental issues that would impact UWNY's ability to supply potable water. As Manager of Engineering at UWNY, my primary responsibility is to manage capital projects.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science Degree in Natural Resources from Cornell University in 1981. I received a Masters Degree in Environmental Engineering from Manhattan College in 1986. I have worked in water-related engineering applications for fifteen years.

Q. Does your curriculum vitae, which is attached as Exhibit DFD- 1 ~~FHRD-4~~, fairly and accurately represent your experience with water supply issues within UWNY's jurisdiction.

A. Yes.

Q. Mr. Distante, please describe your role in the Project.

A. I reviewed Ramapo Energy's proposal to receive its water supply for the proposed Energy Facility. I assessed the feasibility of UWNY's system to supply the volumes of water requested for the Energy Facility. I also reviewed Ramapo Energy's Article X Application with respect to potable water related items.

Q. What section of the Application does your testimony relate to?

A. My testimony relates to Section 7 of the Application.

Q. Please describe the regional potable water supply.

A. UWNY produces potable water from groundwater and surface water sources in Rockland County, in accordance with New York State Department of Environmental Conservation ("NYSDEC") permits and New York State Department of Health regulations. UWNY is a waterworks corporation regulated by the New York State Public Service Commission. UWNY serves approximately 68,000 residential, commercial and industrial customers in Rockland County.

Approximately 70% of UWNY's water supply comes from fifty-five wells located throughout Rockland County. The remaining 30% comes from Lake DeForest, a surface water reservoir located in the Hackensack River Watershed. The water sources are connected within UWNY's regional water supply and distribution system. None of UWNY's systems are isolated from the rest of the distribution system. Interconnections are also available with adjacent water companies, such as Nyack to the east and United Water New Jersey to the south. In the event that one supply source is not available, water can be distributed from other sources into the area where the supply is not available. Further details of UWNY's system are included in Appendix H-2 (Revised July 18, 2001).

For the year 1998, UWNY produced 10,550.2 million gallons ("MG") of water and sold 9,064.5 MG. The balance was non-revenue producing, including water used in fire fighting and hydrant flushing, and water lost due to leaks, main breaks or improper metering. The total average UWNY system capacity is approximately thirty million gallons per day ("mgd"). Sustainable maximum production capability is approximately forty-one mgd. System capacity was recently increased due to the addition of two well projects. UWNY is currently constructing a new supply project, Viola Well 106, that will add approximately one mgd of supply by the summer of 2001. At that time, sustainable maximum production capability will increase to approximately forty-two mgd. ~~Furthermore,~~ Figure 2, ~~in Appendix H-2 is outdated and is replaced by the attached revised Figure~~ Water Supply Plan (April 2001 Revision), which is included in revised Appendix H-2, ~~. This revised figure~~ shows the current capacity of UWNY's system and reflects updated demand projections.

Q. Based on your education and experience, do you have an opinion as to whether the Project will have an adverse impact on UWNY's ~~the region's~~ potable water supply?

A. Yes.

Q. What is your opinion?

A. The Project will not have an adverse impact on UWNY's ~~the region's~~ potable water supply.

Q. Please explain.

A. UWNY has contracted to provide water to service the Project in accordance with its tariff. A copy of the contract is included in Appendix H-1. For clarification, the Agreement between UWNY and Ramapo Energy, dated November 12, 1999, was amended on March 15, 2001 due to a decrease in the anticipated water usage by the proposed plant. A copy of this amendment was filed as an update to Appendix H-1 on June 21, 2001. This change in water usage was specified in an August 21, 2000 letter from G. Marchmont to J. Glozzy and indicated that the total annual usage would be reduced by 60%, from sixty MG to twenty-three MG. Furthermore, the letter indicated that daily withdrawals during the summer months (June, July and August) would be limited to 60,000 gpd and that total onsite water storage would be approximately nine MG. According to information from G. Marchmont, 8.25 MG would be available to the project for water usage. The remaining 0.75 MG is reserved for fire-fighting usage. In addition, G. Marchmont stated that this quantity of storage is sufficient to operate the project (including sixty to seventy hours of steam augmentation) for three months, independent of UWNY. The estimated twenty-three MG contracted to be supplied to the Project annually is approximately 0.2% of UWNY's 1998 annual production. Based upon operations at base load with steam augmentation, the maximum amount of water required by the Project is expected to be twenty-three MG per year. Considering the ability of the plant to store water for use during peak water demand periods and considering the fact that UWNY has ample water supply capability, except for short periods during very dry summers, it is my conclusion that the Project will not have an adverse impact on the region's potable water supply~~.~~. Further, in its Addendum No. 2 filed with the Siting Board on June 21, 2001, the applicant has indicated that if it adopts a zero discharge facility, its demand will be further reduced to 43,000 gpd (p. 24). This would further reduce the effects as set forth above.

Q. Please describe the Ramapo Valley Well Field ("RVWF").

A. Due to its proximity, the RVWF will supply most of the water to the Project. Information on the distribution system, available capacity, water quality, analysis of potential impacts and mitigation of Project usage are included in UWNY's revised report in Appendix H-2.

UWNY operates the RVWF, which includes ten wells penetrating the unconsolidated Aquifer, adjacent to the Ramapo River near the confluence of Torne Brook. The well field is approximately one mile southwest of the Project Site. The well field is designated as a public community water supply, and contributes approximately 30% of UWNY's total water supply to Rockland County. The maximum permitted withdrawal from these ten wells is a daily maximum of fourteen mgd and a monthly average of eight to ten mgd, dependent on available river flow. The average production by the RVWF for 1996 through 2000 was 7.7 mgd. However, this production includes a portion of flow that was pumped to the Ramapo River to both augment flow and to help control the dispersion of a contaminant plume. For the same period, the average potable water production was 6.4 mgd. In March of 2001, UWNY completed construction of two air stripper towers to treat Freon-related contamination in the Ramapo Valley Aquifer. These air strippers treat water from all ten of the RVWF wells. With this treatment unit, it is no longer necessary to pump well water to the Ramapo River for the purpose of controlling the contaminant plume.

The RVWF's sand and gravel aquifer is connected hydraulically to the Ramapo River, which is designated by NYSDEC as a Class A water body, indicating the water may be used for drinking purposes. The RVWF and Aquifer boundaries coincide with the Wellhead Protection Area ("WHPA").

The water pumped from the RVWF is derived from induced infiltration. Estimated well yields from existing individual RVWF water supply wells range up to a maximum yield of approximately two mgd for an individual well. Well depths at RVWF range from seventy to one hundred and twenty-five feet.

UWNY's water production at the RVWF is regulated by permit so that at least eight mgd of flow in the Ramapo River must be present when the well field is active, as measured at a nearby gauging station. NYSDEC and the New Jersey Department of Environmental Protection ("NJDEP") established this minimum river bypass flow volume as a condition to operation of the RVWF to protect downstream ecology and river uses. UWNY uses surface water and/or groundwater augmentation to maintain the river flow volumes during summer and early fall, when river flows are low. Such augmentation is necessary to allow continued withdrawals from the RVWF. Surface water releases from Potake and Cranberry Lakes are the primary means to augment flow in the river. Groundwater from RVWF is also sometimes used to augment flow. UWNY is not required to maintain the 8 mgd flowby if it is not operating the RVWF.

For example, p~~P~~roduction volumes from 1997 through 2000 at RVWF (including pumping to the Ramapo River to control contaminant dispersion) have been below permitted allocations. See Table 2, revised Appendix H-2. Furthermore, UWNY has never violated its water supply permit conditions at RVWF. The permitted allocation of the RVWF is sufficient to serve the Project; however, UWNY cannot use all of its permitted allocation due to constraints based on Ramapo River flow. Nevertheless, with improvements to be paid for by the applicant that will increase the quantity of water available for flow augmentation in the Ramapo River and otherwise improve the reliability of UWNY's system, the impacts of the Project's usage will be offset. In addition, the onsite storage of 8.25 MG of useable water will buffer the water consumption demand of the project during summertime peak demand periods. UWNY is evaluating additional potential augmentation supplies to ensure that the RVWF is kept in service even during drought scenarios.

Q. Please describe the quality of UWNY's potable production.

A. In 2000~~1998~~, UWNY's potable production met all health and safe drinking water standards set by United States Environmental Protection Agency ("EPA"), the New York Department of Health ("NYDOH") and the Rockland County Department of Health ("RCDOH"). Analytical results are summarized in an attachment to revised

Appendix H-2. Project water supply requirements will not result in any water quality changes to UWNY's potable supply.

Q. Will operation of the Project affect UWNY's water system pressures?

A. The operation of the Project is expected to have no discernible effect on UWNY's water system pressures. The elevation of UWNY's 30-inch pipe at the Route 59/17 intersection with Torne Valley Road is 291 feet. Pressure in this pipe is directly controlled by the RVWF pump station, which produces a gradient ranging from 690 to 757 feet. The resulting range of pressure available in UWNY's 30-inch main is 172 psi to 202 psi. The anticipated overflow elevation of the Project storage tanks is 750 feet. The high elevation of the site relative to UWNY's available pressure gradient will require a booster pump system to obtain adequate service. The Applicant will design and build a booster system to provide adequate service.

~~Q.Is the current distribution piping adequate to allow concurrent operation of the Project and the proposed Torne Valley Station Project?~~

~~A.The existing 30-inch main in Rt. 17/59 is designed to carry the available fourteen mgd maximum permitted production at RVWF. Combined peak supply to the two plants represents less than 1than 1% of the pipe carrying capacity. UWNY anticipates no effect on other customers receiving water from the same line, nor are significant impacts on system pressure or potable water quality anticipated.~~

Q. Does this conclude your testimony at this time?

A. Yes.

Case: 98-F-1968

RAMAPO ENERGY LIMITED PARTNERSHIP

DIRECT TESTIMONY

OF

JANET BERNARDO

GUY MARCHMONT

WILLIAM HEINS

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/14/01
CASE NO. 98-F-1968
EX 136

Ex. NJDEP-108

CASE: 98-F-1968

BERNARDO/MARCHMONT/HEINS

Revised July 31, 2001

(Margin lines how last set of revisions)

Q. Please state your names, titles, affiliations, and addresses.

A. My name is Janet C. Bernardo, and I am employed by Environmental Science Services,, Inc. ("ESS") as a Senior Civil Engineer. My business address is 888 Worcester Street, Wellesley Massachusetts 02482.

A. My name is Guy Marchmont and I am Vice President of Project Development at American National Power, Inc. ("ANP"). My business address is 65 Boston Post Road West, Suite 300, Marlborough, Massachusetts 01752.

A. My Name is William Heins and I am a Sales Manager with Ionics, Inc. My business address is 3006 Northup Way, Bellevue, Washington 98004.

Q. Ms. Bernardo, what are your duties of employment?

A. As Senior Civil Engineer with ESS, I manage and participate in a wide variety of site design and permitting projects, including office, commercial and residential properties. These projects include zoning analysis, building and parking layouts, drainage and utility design, subsurface disposal system design, traffic impact analysis, construction details, and specifications.

Q. How are you qualified to perform your employment duties?

A. I received a Bachelor of Science Degree in Civil Engineering from the University of Lowell in 1984. I have experience in local and state permitting and have served as the reviewing consultant for various Massachusetts communities. I am also a Registered Professional Engineer in Massachusetts and New York State.

Q. Does your curriculum vitae, which is attached as Exhibit BM-1, fairly and accurately represent your experience with respect to the study and evaluation of stormwater, wastewater and solid waste issues and traffic impacts?

A. Yes.

Q Mr. Marchmont, what are your duties of employment?

A. I am responsible for managing the development of new electric generating facilities for ANP from inception through financial closing. In this role, I participate in the negotiation of project contracts and the development of input data for and review of the financial analyses. I interface with regulatory agencies, community leaders, politicians, contractors, consultants, local residents, and lenders through project development. I also monitor project budgets and schedules and participate in the project financing and closing. I am currently acting as project manager for the Ramapo Energy Limited Partnership ("Ramapo Energy") project (the "Project"). Ramapo Energy's general partner, ANP Ramapo Energy Company, is a subsidiary of ANP.

Q. How are you qualified to perform your employment duties?

A. I have held my current position with ANP for over two years. Prior to my current position, I was employed by U.S. Generating Company as Senior Project Development Manager from July 1990 to September 1997. In that role, I was responsible for managing the development of new electric generating projects. I managed the initial development activities for the 1080MW Athens Generating Project in New York and participated in the development of the original Article X regulations. In addition, I was actively involved in various aspects of other projects, including new acquisitions, investment in merchant plants and the development of concepts and proposals for repowering existing facilities with Pressurized Fluidized Bed Combustion technology. From January 1987 to July 1990, I was employed by Stone & Webster Engineering Corp., initially as a Project Manager and then as Senior Vice President of Engineering and Project Development. At Stone and Webster, I provided various engineering, marketing, administrative, and development services for a number of electric generating and cogeneration plants.

From 1970 to 1976 and 1977 to 1987, I was employed in various capacities by Burns and Roe, a firm that specialized in the design, engineering and construction of power generation facilities. I have also been employed by Curtiss-Wright Corp. (1976-1977), Amertap (1968-1970) Stone & Webster Engineering Corp. (1967-1968), Montreal Engineering Co. (1965-1967), English Electric Co., Ltd. (1958-1965).

I received a diploma in Mechanical Engineering from the Rugby College of Engineering Technology, England in 1963. I am licensed as a chartered engineer and a member of the Institution of Mechanical Engineers in the United Kingdom.

Q. Does your curriculum vitae, which is attached as Exhibit MMW-1, fairly and accurately represent your experience with respect to the development of independent power projects?

A. Yes.

Q. Mr. Heins, what are your duties of employment?

A. As Sales Manager with Ionics RCC, I am responsible for the process design development and technical and commercial sales activities associated with RCC Brine Concentrator and Zero Liquid Discharge (ZLD) systems.

Q. How are you qualified to perform your employment duties?

A. I have been employed at Ionics RCC for 10 years, starting in 1991, holding various positions in process engineering and technical sales. I have been responsible for the process design and/or technical sale of approximately 15 zero liquid discharge systems, including two systems identical in size to the potential Ramapo zero discharge system. I have a degree in Chemical Engineering from the University of Wisconsin Madison, which I received in 1985.

Q. Does your curriculum vitae, which is attached as Exhibit HEINS-1, fairly and accurately represent your experience with respect to the development of independent power projects?

A. Yes.

Q. Ms. Bernardo, please describe your role in the Project.

A. I assisted in the preparation of Sections 8 and 10 of the Application, which relate to stormwater, wastewater, and solid waste issues and traffic impacts, respectively.

Q. Mr. Marchmont, please describe your role in the Ramapo Energy Project ("Project").

A. As project manager, I am directly responsible for the development of the Project. In that role, I oversee all aspects of the Project as it proceeds.

Revised July 31, 2001
(Margin lines how last set of revisions)

Q. Mr. Heins, please describe your role in the Project.

A. The Applicant has retained Ionics RCC to design and install a Zero Discharge Liquid System for the Project to recycle and reuse process wastewater. I oversee and coordinate Ionics RCC's efforts to provide these services to the Applicant.

Q. What portion of the Application is your testimony supporting?

A. Section 8, which relates to stormwater, wastewater and solid waste, as required by Stipulation 12 (Water Resources), paragraphs 9 through 17 relating to wastewater, paragraphs 41 and 42 relating to the construction/operation of stormwater runoff, and paragraph 43 referencing erosion control.

Q. Please describe the stormwater analysis that was conducted for the Project.

A. Techniques to prevent stormwater contamination, including the evaluation of mitigation measures and a preliminary plan for the collection and treatment of stormwater runoff is also described in Section 8.2 of the Application.

The Project will result in the permanent alteration of approximately 35.5 acres of mature woodland.

The stormwater analysis for the Project included in this Section 8.0 addresses the following;

- Characterization of changes in runoff quantity and identification of proposed mitigation techniques.

- Temporary BMPs to be employed during construction on the Energy Facility Site and Interconnects to minimize erosion and sedimentation of adjacent wetlands and waterways.

- Identification of Best Management Practices ("BMPs") to be implemented to minimize the effects of the Project on stormwater runoff quality.

Q. What are the existing hydrological conditions in the Project Area watershed?

A. The regional watershed is described in detail in Section 8.2.2.1 of the Application.

Regionally, the Site is located within the Ramapo River Basin. The Ramapo River originates near Harriman, New York and flows southeasterly crossing the state line into New Jersey near Mahwah. Torne Brook, which intersects the northwest corner of the Site, flows into the Ramapo River approximately one (1) mile southwest of the Site. The drainage area of Torne Brook at the Ramapo River is approximately 2.79 square miles (1785 acres) in size. The total length of Torne Brook is 3.3 miles.

Torne Brook forms at the confluence of a number of unnamed small tributaries originating within the Harriman State Park north of the Site. From the headwaters, Torne Brook flows southwest through the northwest corner of the Site to a triple barrel culvert under the northerly entrance to the Con-Ed Ramapo Substation.

Approximately 500 feet downstream of the substation, Candle Brook joins Torne Brook by flowing through a culvert under Torne Valley Road.

The upper reaches of the Torne Brook watershed are mostly undeveloped, forested parkland whereas the lower watershed has been substantially developed (Con-Ed Ramapo Substation, Rockland County MRF and Co-Composting Facility, Rockland County Transfer Station and a closed landfill). Overall, Torne Valley consists mostly of steep-sloped hillsides that tend to concentrate runoff quickly resulting in a "flashy" condition, wherein runoff discharge rises quickly in response to intense rainfall and diminishes quickly after the rainfall ceases. Offsetting the steep slopes, however, is the predominance of Charlton and Chatfield Hydrological Soils Group (HSG) B. These soils which are moderate to well drained and thereby promote infiltration of rainfall and limit runoff.

Land uses in the vicinity of the Site consist of commercial/industrial to the west and undeveloped heavily vegetated woodland to the north, south and east.

Q. Please describe the hydrology of the Energy Facility Site.

A. The proposed Energy Facility Site is located approximately one mile upstream of the confluence of Torne Brook and the Ramapo River. The Site straddles the drainage divide between Torne Brook and Candle Brook, which is a tributary to Torne Brook. The Site has moderate to steep terrain with slopes ranging from 5 to 35 percent. The Site is predominately undeveloped woodland with a minor area of managed brush located within the Con-Ed ROW along the westerly limits of the site. Runoff within the proposed limits of disturbance is conveyed to either Torne Brook or Candle Brook via un-discerned sheet flow or rills along the slopes.

Runoff from the southerly half of the site is conveyed to one of two wetland areas that are tributaries to Candle Brook. Wetland "A", located to the south of the Site, forms the headwaters of Candle Brook and receives runoff from the southeasterly portion of the Energy Facility Site. Wetland "J", located within the Con-Ed ROW, receives runoff from the southwesterly portion of the Site. Flows from Wetland "J" are conveyed to Candle Brook through a 30-inch high by 42-inch wide reinforced elliptical concrete pipe under the Rockland County Facilities Access Road. Runoff from the northerly half of the Site is conveyed directly to Torne Brook which passes through the northwesterly corner of the Site or to an un-named intermittent tributary to Torne Brook flowing from east to west along the northerly limits of the Site. The confluence of the un-named tributary with Torne Brook is located in the northwest corner of the Site.

Soil on the Energy Facility Site is mapped as Charlton fine sandy loam with 2 to 15 percent slopes. Charlton soils are considered well drained, HSG B, with permeability rates of greater than six inches/hour. The surface layer consists of dark brown fine sandy loam to a depth up to approximately five inches. The subsoil stratum consists of brown gravelly loam at 5 to 25 inches and yellowish brown gravelly loam at 25 to 38 inches below the surface. Below 38 inches, the substratum consists of dark yellow brown very gravelly sandy loam. The erosion hazard for Charlton soils within this slope class is moderate.

A small portion of the Site lies in the 100-year Flood Hazard Zone "A." No regulatory floodway has been established along Torne Brook. The Federal Emergency Management Agency (FEMA) does not publish regulatory flood elevations for Zone "A" areas. As such, the limits of the 100-year flood plain within the Site limits were established by overlaying the Flood Insurance Rate Map (FIRM) on project base mapping. The resulting 100-year floodplain limits are shown on Drawing C-1, Existing Site Conditions, in Appendix A.

Q. Please describe the hydrological evaluation that was conducted for the Project.

A. A detailed hydrologic analysis, utilizing the National Resource Conservation Service ("NRCS") TR20 Model, was applied to the entire watershed of Torne Brook in order to estimate existing rates of peak discharge, gage the impact of Project development, and design runoff control measures to mitigate runoff discharge at various locations downstream of the Project. The object of this analysis was to design on-Site extended detention basins that would not result in higher discharge rates and consequentially higher flood stages along Torne Brook. The analysis was conducted in accordance with the "Stormwater Management Guidelines for New Development," Division of Water Technical and Operations Guidance Series (5.1.8) published by the New York State Department of Environment Conservation dated April, 1990.

The analysis evaluated the hydrologic impacts of the Project at five representative locations within the Torne Brook watershed. The five locations are noted below.

1) The culvert from Wetland "J" under the Rockland County Facilities Access Road;

2) Torne Brook at the triple culverts under Torne Valley Road near the Con-Ed Ramapo Substation Access Road;

3) Torne Brook below its confluence with Candle Brook;

4) Torne Brook at the USGS Gage site; and

5) Torne Brook at its confluence with the Ramapo River.

Q. What were the results of the hydrological analysis?

A. As detailed in Section 8.2.3 of the Application, the results of the hydrologic analysis indicate that the Project will not result in an appreciable increase in discharge or flood stage along Torne Brook. At all five analysis locations the 10-year and 100-year storm post-development peak discharge rates will be less than existing rates. The post-development discharge rates (+/- 1 cubic feet per second ("cfs")) will be nearly the same as existing during the 2-year storm.

Q. In your opinion, will the Project produce any significant stormwater runoff impacts?

A. No. The Project will not result in an impact to the flood storage or conveyance capacity of Torne Brook.

The Project will utilize two extended detention basins to limit post-development peak discharges levels at or below existing discharge rates for the 2-, 10- and 100-year storm events. The basins were designed to attenuate site runoff through the utilization of a multi-stage outlet structure consisting of a small low level orifice, a larger mid-level orifice, a rectangular weir above and an overflow spillway on top.

The location of the two basins are shown on Drawing C-2, Site Plan, in Appendix A. Drawing C-8, Detention Basin Details, in Appendix A provides details of the outlet structure box for each basin.

Work within the 100-year floodplain is limited to construction of the Access Roadway (alternative access route only) and underground Electric Interconnect. Given the Interconnect will be underground no adverse impact to the flood flow capacity of the brook will result. If the Alternative Electrical Interconnect is approved by the Siting Board, there will be no impacts at all because, as discussed in Addendum No. 2, this option takes advantage of existing over ground infrastructure passing directly adjacent to the Project Site. No trenching is required for the Alternative Electric Interconnect. -.

Q. How does the Applicant intend to minimize water quality impacts due to the Project?

A. The Project will employ a number of temporary and permanent Best Management Practices ("BMPs") to protect the existing wetland and water resource areas of the State of New York. The "Stormwater Management Guidelines for New Development, Division of Water Technical and Operations Guidance Series ("TOGS") (5.1.8) published by the New York State Department of Environment was used as the foundation for developing the drainage design and selecting both permanent non-structural and structural BMPs. The New York Guidelines for Urban Erosion and Sediment Control, published by the State of New York Urban Soil Erosion Control Committee dated, April 1997 was used for developing a Erosion and Sedimentation

Control Plan to minimize construction related water quality impacts. The Project's Stormwater Management Plan ("SMP") includes non-structural approaches for source controls and pollution prevention, as well as structural measures for impact minimization and mitigation. The SMP employs appropriate water quality and quantity controls to protect surface and groundwater resources as well as adjacent properties due to increased impervious areas on the site. A final Erosion and Sedimentation Control Plan will be submitted as a compliance filing.

Q. Please describe the intent of the drainage system.

A. The intent of the proposed drainage system is to collect runoff from building roofs and pavement areas with a system of catch basins with deep sumps and hoods. Runoff will be conveyed from the catchbasins through a closed conduit drainage system to one of two extended detention basins. The extended detention basins will be equipped with sediment forebays, sumps, and water quality pools to enhance the basins pollutant removal capabilities. Additionally, the outlets to the sediment forebays will be equipped with containment valves which will enable the Project to contain within the basin any potentially hazardous spills, thereby preventing release to downstream receiving waters. Detention Basin No. 1 will discharge to a grass-lined channel via a pipe under the Site Access Road. The grass-line channel will convey flows from the pipe outfall to Torne Brook. Detention Basin No. 2 will discharge via a pipe to Wetland "J".

Q. Please describe the temporary BMPs to implement sedimentation and erosion controls during Project construction

A. The Erosion and Sedimentation Control Plan developed for the Project denotes the locations and methods which will be employed to minimize construction related water quality impacts. The plan outlines the permanent and temporary measures that will be implemented to minimize impacts from erosion and sedimentation to adjacent wetland resource areas and adjacent undisturbed land areas. Appendix I-4, Construction Sequence and Methodology, provides additional information regarding efforts that will be employed to further minimize construction related impacts. The New York Guidelines for Urban Erosion and Sediment Control, April 1997 was used as a guide for developing the plan. Specific details depicting materials and installation methods for the various devices prepared at the Site will be provided as a compliance filing. All erosion control measures will be inspected and maintained by the Contractor during construction operations. Temporary erosion controls will be removed from the site after permanent site stabilization is achieved.

Q. What permanent BMPs are proposed for the Project?

A. As detailed in Section 8.2.4.2 of the Application, permanent BMPs will consist of (1) a Spill Prevention, Control and Countermeasure Plan and Stormwater Pollution Prevention Plan ("SPCC/SWPP Plan"), (2) hooded catch basins with sumps, (3) extended detention basins, culvert outlet protection, a grassed swale, and wooded buffers.

Q. Please describe the SPCC/SWPP Plan proposed for the Project.

A. A preliminary SPCC/SWPP plan has been developed for the proposed Energy Facility Site. The Plan identifies potential sources of pollutants in discharges from the Energy Facility Site and outlines BMPs to minimize pollutants from entering the waters of the State of New York. The Plan is intended to guide future compliance with the terms and conditions outlined in the EPA Multi-Sector General Permit for Steam Electric Power Generating Facilities Sector, and the requirements of the SPCC Regulations. This plan incorporates the requirements of the regulations outlined in 40 CFR 122 (National Pollutant Discharge Elimination System ("NPDES")) and 40 CFR 112 (Oil Pollution Prevention). A formal and approved plan for operation of the Energy Facility is required for as-built conditions and must be approved prior to delivery of potentially hazardous compounds or oils to the site. The plan presented here will form the basis of these two plans which will be incorporated into a compliance filing. The preliminary SPCC/SWPP plan is provided in Appendix I-1.

Q. Please describe the hooded catch basins with sump systems.

A. Stormwater from paved surfaces will be collected in deep sump catch basins with hooded outlets. Catch basin sump systems are effective pollution control devices for removal of large particulate and adsorbed pollutants. Catch basins with sumps and hooded outlets are designed to trap sediment particles and floating contaminants, which are the largest constituents of the pollutant load in urban runoff. Regular maintenance and cleaning of catch basins will be performed to assure adequate performance of these structures.

Q. Please describe the extended detention basins incorporated into the Project design as a BMP.

A. The Stormwater Management Guidelines for New Development requires control of the first flush (first ½-inch of runoff) to mitigate the impacts to water quality from runoff associated with land clearing, grading and construction activities. The Guidelines summarize in descending order of preference the stormwater management practices that should be used to control the first flush. These practices are: (1) infiltration, (2) retention, and (3) extended detention.

Extended Detention Basins were selected as the preferred method for controlling the first one-half inch of runoff from building roofs, pavement surfaces and portion of the Site enclosed by the Perimeter Road. Infiltration and retention techniques were evaluated and determined to be impractical due to site limitations and/or secondary adverse impacts to the surrounding environment. Infiltration practices in the form of subsurface disposal systems and surface infiltration basins were considered for control of the first-flush. Physical constraints such as high groundwater elevations, shallow bedrock through the southerly portion of the Site and steep slopes prevent the proper siting of infiltration facilities at the Energy Facility. A further concern with the use of infiltration was the potential introduction of pollutants through spills to the groundwater without providing pretreatment. Retention techniques although feasible, were discounted since these devices could have adverse thermal impacts on Torne and Candle Brooks, both identified as having characteristics of a cold water fishery.

An extended detention basin is a conventional basin, which has been designed to temporarily store collected runoff in a holding area prior to release into a waterway. Settling is the primary pollutant removal mechanism associated with extended detention. As such, the degree of removal is dependent on whether a given pollutant is in particulate or soluble form. Removal is likely to be high if a pollutant is a particulate, where as limited removal can be expected for soluble pollutants. Removal of soluble pollutants can be enhanced in the lower stage of the basin by providing a sump or permanent pool. The concentration of soluble pollutants is reduced through the biological activity of vegetation within the sump or permanent pool. The sump/permanent pool also provides an added value in that it protects sediment deposits from resuspension during large storm events.

Two extended detention basins will be employed to mitigate water quality impacts from the proposed project and to mitigate stormwater quantity impacts. The detention basins will collect and treat the runoff from roofs and pavement surfaces as well as the entire portion of the site enclosed by the Perimeter Road. The resulting drainage area being treated by the basins is approximately 26.7 acres (75 % of the 34.9 acres of alteration). The remaining portions of the site not treated by the extended detention basins is limited to the riprap embankment slopes for the Site Access Road and Perimeter Road. Runoff from the embankment slopes, which are not expected to contribute significantly to pollutant loads from the Site will be treated with the adjacent wooded buffers (see below).

A 10-foot wide access path has been provided along one side of the detention basin berm to facilitate access for maintenance of the outflow control structures, containment valves and removal of accumulated sediment. The basins will be accessed from the Site Access Road at point between both basins. The sideslopes of the basins leading to the access path as wells as the flow control structures is 4:1 to allow construction equipment un-inhibited access.

Runoff entering the basins will be pretreated in sediment forebays which have been integrated into the extended detention basins. The forebays will reduce discharge velocities entering the basin allowing settling of particulants. The forebay is separated by a low berm with riprap sideslope protection. The forebays are sized to hold the ½-inch of runoff from the basins tributary drainage area. An 8-inch diameter pipe installed through the berm will allow runoff to exit the forebay. Runoff in excess of ½-inch will pass over the riprap berm to the extended detention basin. The invert of the outlet pipe will be above the bottom of the forebay to create a sump/permanent pool to trap soluble pollutants as well as potential spills. The 8-inch outlet pipe will be equipped with a valve to seal off the sediment forebay thereby preventing any contaminant from passing downstream to Torne or Candle Brook, in the event of a spill at the Energy Facility.

Q. Please describe the culvert outlet protection proposed for the Project.

A. Culvert outlet protection will be provided downstream of all drainage outfalls and will consist of riprap armorment. The riprap will protect the areas around the outlets of the pipe or culvert and downstream receiving channel from erosion. Additionally, all outlet pipes from the extended detention basins will have a flared-end section to further reduce erosion potential.

Q. Please describe the grassed waterway that will be associated with Drainage Basin No. 1.

A. A Grassed waterway will be constructed to convey runoff from the outfall pipe of Detention Basin #1 to Torne Brook. The waterway will be planted with an erosion control mixture of native grasses, forbs and wildflowers designed to colonize moist, recently disturbed sites that are subjected to flowing water with moderate velocities. The banks of the swale will be planted with native shrubs capable of withstanding moderate water flow velocities to stabilize the banks and provide shade to the swale channel. The cross-section of the swale will be trapezoidal with a four-foot bottom width and 4:1 side slopes to prevent erosion as runoff enters the swale. The maximum slope in the swales is 2.0% thereby limiting velocities to less than 2.5 feet per second for 10-year design flows from Detention Basin No. 1.

Q. Please describe the wooded buffers to be used as a BMP.

A. Runoff from the embankment sideslopes adjacent to the Site Access Road and Perimeter Road will discharge to un-disturbed wooded buffers at the toe of slope. Wooded buffers provide filtration of stormwater, slow velocity of runoff, prevent erosion, control dust and provide shade.

Q. Has the Applicant developed a preliminary BMP Operation and Maintenance Plan ("O&P Plan").

A. Yes. The preliminary O&M Plan is described in Section 8.2.5 of the Application, and sets forth maintenance and monitoring of BMPs and BMP maintenance responsibilities.

Q. In your opinion will the project result in any significant adverse impacts relating to wastewater.

A. No.

Q. Please describe existing conditions in the Project Area as they relate to wastewater.

A. The Project is located adjacent to the Co-Composting Facility. Currently there is an 8-inch PVC sewer main located within the Rockland County Facilities access road approximately 750 feet from the Project Access Road with the Rockland County Facilities access road. The MRF and the Co-Composting Facility have separate septic tanks located adjacent to their buildings to contain the solids prior to the discharging of the liquid effluent to the 8- inch PVC main. The 8-inch sewer main continues across the Co-Composting Facility and intersects Torne Valley Road at station 96 + 23 discharging into a drop manhole.

The 8-inch PVC sanitary sewer line continues along Torne Valley Road through 14 manholes to station 59 +20. The minimum slope of the 8-inch pipe is 0.5% and the capacity of the 8-inch sanitary sewer pipe is 652,782 gallons per day. At station 59+20 an 8-inch ductile iron pipe discharges the wastewater into a 20'6" by 10'0" pump pit with three pumps. A 240,000 gallon steel, round, holding tank is connected to the pump pit for emergency overflow.

The three pumps force the wastewater through a one-mile length of 6-inch force main from the pump pit to an 8-inch force main which discharges into an 8-inch PVC gravity sewer main owned by the Town of Ramapo. The 8-inch gravity pipe discharges into the Lake Street Pump Station owned by the Rockland County Sewer District No. 1.

Conversations with the Rockland County Solid Waste Management Authority indicate that there are no anticipated concerns with the Project connecting to the 8-inch sewer main at the Co-Composting facility and discharging at the Lake Street Pump Station. On October 22, 1998 the Rockland County Solid Waste Management Authority passed resolution No. 68 which gave the Project conceptual approval to use the authorities sewer line, (Appendix I): The Resolution states in part, "Whereas, the Executive Director has investigated and determined that there is excess capacity in said sewer lines and that the Authority's interest would not be diminished if National were granted the right to use said sewer line."

Q. What does the Applicant propose to do with wastewater generated at the Site?

Revised July 31, 2001
(Margin lines how last set of revisions)

A. As indicated in Table 8.2.1 to Addendum No. 2, the average process wastewater produced at the Energy Facility during normal baseload operation is approximately 17,300 gal/day. The maximum wastewater produced is 57,200 gal/day when the plant operates for 18 hours a day, 6 days a week.. Ramapo Energy initially proposeds to discharge all wastewater generated by the Project to the Municipal Sewer System. However, it now appears unlikely that the Project will be able to secure the approvals necessary to hook up to the Municipal Sewer system. As a result, the Applicant explored different alternatives to deal with wastewater, which are described in Addendum No. 2:

- Since the wastewater amount is so small, it is feasible to have the wastewater trucked away for off-site disposal at a licensed facility. This option would require approximately 5 truck trips per day during normal operation, based on the revised wastewater totals for the Project provided with Errata No. 5, and Table 8.2.1 provided to supplement Addendum No. 2..
- The wastewater could be routed to the Rockland County Solid Waste Management Authority's (RCSWMA) facilities to meet the process (non-potable) water needs of the RCSWMA's Co-Composting and Materials Recycling Facilities. This option gives the RCSWMA the opportunity to lessen its withdrawals of potable water from UWNY. Thereby, the RCSWMA would benefit financially because Ramapo Energy would supply its process wastewater to the RCSWMA free of charge and the Project's water use would be indirectly mitigated because the

RCSWMA's withdrawal of potable water from the UWNY system would be reduced.

- Ramapo Energy could install a Zero Liquid Discharge system (ZLD) into the plant. Most approaches to this design convert most of the wastewater into a clean water stream for on-site reuse. Some systems reduce the remaining amount into a non-hazardous solid, suitable for disposal in a landfill. Others rely on additional demineralization, the regeneration of which will be accomplished off-site. Either one of these options has the benefit of recovering up to 99% of the process wastewater flow as clean water and thus, would reduce the plant's consumption during normal baseload operation to an average of 21,700 gallons a day, as shown in Table 8.2.1 supplementing Addendum No. 2, which accounts for the ZLD system. This is 55% of the average water consumption presented in the revised water balance diagram provided with Errata No. 5. In addition, this option eliminates the out-of-basin transfer issue related to process wastewater flow and completely eliminates the need for a connection to the sewer. Sanitary wastes would be collected on-site in a holding tank of approximately 5000 gallons in size and removed on a regular basis by a licensed contractor for disposal. Removal of sanitary wastes would require approximately 1 truck trip per day based on the sanitary wastewater amounts provided with Errata No. 5. It is anticipated that sanitary wastes could eventually be directed to the expanded Rockland County Sewer District #1 system when infrastructure becomes available.

The latter two alternatives are preferred because there would be no out-of-basin transfer of process wastewater. However, because the RCSWMA has not approved the diversion of wastewater to its facilities, the Applicant will install a ZLD system.

Q. Please describe the ZLD System.

A. Ionics RCC has prepared an engineering report which provides the details of the ZLD system that will be utilized for the project. The system will be designed to process an average flow of 50,000 gallons per day of wastewater or 37 gallons per minute. The wastewater stream is directed to an Evaporator Feed Tank where the pH is adjusted using sulfuric acid. The acidified feed is preheated in an Evaporator Heat Exchanger and directed to a Deaerator to remove any non-condensable gases (i.e., air) from the feed water. The deaerated feed is then sent to an Evaporator Sump. The brine slurry contained in the Evaporator Sump is evaporated using a mechanical vapor compressor as the energy source, producing a pure water vapor stream. The water vapor condenses on the shell side of an Evaporator Condenser, producing a high quality distillate stream for re-use in the power plant. A small blowdown stream is withdrawn from the Evaporator Sump to control the solids concentration in the Evaporator. This blowdown stream is solidified using a small spray drying device. A more detailed description of this process is presented diagrammatically in the Process Flow Schematic and General Arrangement Drawing contained as appendices to the engineering report.

Q. Why will the system be designed to handle an average of 50,000 gpd?

A. The average daily HRSG blowdown (process wastewater) load during normal operation is 17,299 gallons (see Table 8.2.1). However, the peak daily blowdown load is 57,200 gallons and occurs when the project is operating under a daily stop/start regimen. To these amounts an allowance of 1000 gallons per day for washdown has been added. With a 10% contingency, the total process wastewater flows become 20,100 gallons and 64,000 gallons respectively. Thus, the ZLD system needs to be capable of handling the normal steady flow of 20,100 gpd, and accommodate the peak flow of 57,000 gpd. By selecting a system of 50,000 gpd, the system can readily accommodate the smaller constant flow. When the flow exceeds 50,000 gpd, the "overflow" will be routed to a small isolated segment of one of the storage tanks to store the overage until it can be processed through the ZLD. The isolated segment will have a capacity of 272,000 gallons, which will allow the plant to operate in this mode for about two months.

Q. Is the ZLD system feasible for this type of facility?

A. Absolutely. The process wastewater that needs to be treated is relatively clean to begin with. The characteristics of the HRSG blowdown, the major component of the process wastewater that will be treated, is detailed in the RCC Ionics report. One of the attachments to the RCC report, entitled "Zero Liquid Discharge Industrial Plants", provides a list of the different applications of the ZLD system over the years. Many of the facilities where it has been used are power plants. These systems have been designed to handle wastewater flows ranging from a few gallons per minute to thousands of gallons per minute. The text of the report also provides some additional background information regarding the use of the -ZLD system at two facilities that are comparable to this facility.

Q. Is the ZLD system proven and reliable?

A. Yes it is. As the RCC Report indicates ZLD systems are not new. Some applications of the ZLD system at power plants date back to the 1970s, and involved significantly greater volumes of wastewater than will be produced at this facility. Over the years the system design has become more refined such that today's systems can treat and recover approximately 99% of the wastewater for reuse. The remaining one percent, which for this project during normal baseload operation will be approximately 0.3 gallons per minute, is lost through the steam vent for the system.

Q. Are there any solid wastes produced by the ZLD System.

A. Yes. A dry solid waste is produced by the Spray Dryer component of the system. The chemical composition of the solid waste is:

Total Solids production – <10 lb/day during nomal baseload operation and
<20 lbs/day during peak operation

Chloride - 34.5%	Fluoride - 0.04%
Calcium - 8.2%	Nitrate - 3%
Magnesium - 4.2%	Phosphate - 1%
Sodium - 29.5%	Zinc - 0.04%

Sulfate - 19.5%   TOTAL – 100%

The solids produced by the Spray Dryer are a mixture of sodium chloride, sodium sulfate, calcium sulfate, magnesium sulfate, and a few minor trace compounds in the percentages presented above. The solids are non-hazardous and could be collected in a roll-off box, which could be hauled to a landfill periodically. Since, based on the chemistry and assumptions provided by Ramapo Energy, there is only about 10 lb/day of solid waste production during normal operation, , the disposal of the waste product could be scheduled once a month.

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Q. What will happen to sanitary wastewater?

A. Initially a holding tank will be used to accumulate sanitary waste, and then have it trucked away. Table 8.2.1 provides a very conservative assumption that 5,300 gallons of sanitary wastewater will be produced each day. Approximately one truck per day will be needed to haul the wastewater away. Eventually, the Project will send its sanitary wastewater to the Rockland County Sewer District No. 1 sewer system. The County of Rockland has recently approved an expansion of the District's service area to include an area in which the Project site is located. According to the County's discovery responses to the Applicant the estimated completion date for the expansion project is 2010. However, a plan included with the County's discovery responses, entitled Western Ramapo Sewer District Expansion: Sewer Location Map (Sheet 1 of 2), dated July 11, 1997, indicates that "initial construction" of a sewer main will take place along the Route 59/Route 17 corridor, running generally from the Village of Hillburn to the Village of Sloatsburg. The Applicant is following up with the County to determine the estimated completion date for the "initial construction." The Project's sanitary wastewater may be able to be directed to the District's sewer system shortly after the "initial construction" is complete. If necessary, the Applicant will install and fund a connecting line from the Project along Torne Valley Road to the "initial construction" when it is in service, and in fact may install a dry pipe in anticipation of this hook-up at least as far as the waste supply hook-up point.

Q. If the sanitary waste is directed to the District's sewer expansion facilities, will it be transferred out-of-basin?

A. Based on the information available to date, the answer is no. The initial proposal for the sewer expansion was to send the wastewater from the expansion service area out-of-basin from the Ramapo River Basin to the Hudson River basin. Subsequently, the Board of the Sewer Commissioners for the District passed a resolution (No 99-14) on May 27, 1999 approved the SEQRA findings statement for the sewer expansion, which requires that an in-basin treatment facility be utilized to serve the sewer expansion wastewater. On March 6, 2001, the County Board of Legislatures passed a resolution (No. 101 of 2001) approving funding for the sewer expansion. Recent public hearings have been held regarding the location of the in-basin treatment facility. All alternative locations for the treatment facility are believed to be relatively close to the Energy Facility Site. The Applicant has requested additional information from the

County regarding the alternative sites, however, based on the information available to date, if the Energy Facility eventually directs its sanitary wastewater to the District's sewer system, it will be treated and discharged in-basin.

Q. Please describe the impacts and mitigation associated with wastewater generated by the Project.

A. The ZLD system will eliminate process wastewater discharge and reduce water supply needs. If -sanitary waste is eventually discharged to the District's sewer system it will be treated and discharged in basin. Trucking process wastewater away and diverting process wastewater to the RCSWMA Co-Composting facility were considered but for the reasons stated above not preferred.

The alternative design of discharging the sanitary wastewater into a subsurface disposal system on-site was evaluated. Because of the significant amount of ledge and steep slopes on the property, this alternative was considered impractical.

A wastewater SPDES permit is not required for the Project. There will not be any discharge of process effluent to the Ramapo River, Torne Brook, or Candle Brook. Because there will be no discharge of Project wastewater or treated wastewater to these surface water bodies, wetland resources areas or the ground, existing surface water quality and groundwater quality will not be effected by construction and operation of the Project.

Water vapor will be vented to the atmosphere through the stacks.

A.

Q. What impact would there be on water consumption at the plant if the RCSWMA accepted wastewater flow from the Project for non-potable uses at its Facilities?

A. As part of the design of the Project we are prepared to install a valved connection that would allow us to connect to the RCSWMA at a later date and supply wastewater from the plant, should the RCSWMA decide to pursue our offer. Any wastewater supplied to RCSWMA would effectively reduce our capability of recovering the wastewater stream for reuse on site by the amount supplied to the RCSWMA. Therefore, it would have to be made up by additional withdrawals from UWNY. For instance, if the RCSWMA could use all of the wastewater stream, then our annual consumption would revert to the 23 million gallons. However, by supplying the RCSWMA with this wastewater stream, we would be displacing an equivalent amount of the RCSWMA's withdrawals from UWNY, with a zero sum result.

Q. Please describe the proposed conditions in the Project as they relate to solid waste.

A. The solid waste that will be generated during Project construction and operation are described in Section 8.4.1 of the Application. Construction wastes include stumps and grubbings, and additional construction wastes such as steel, copper, aluminum, wood transport boxes, PVC cable and piping, and incidental plastics and paper. Operation wastes include waste oils, flushing materials solvents, empty drums, spent catalyst and miscellaneous rubbish.

Q. What about the waste products produced by the ZLD system?

A. As indicated above, extremely small quantities of non-hazardous solid wastes will be produced by the ZLD system. These wastes are classified as non-hazardous and can be readily disposed at a solid waste landfill.

Q. What are the anticipated impacts and mitigation proposed relating to solid wastes generated during Project construction and operation.

A. The Applicant will implement a program to minimize solid waste and encourage recycling. Programs tailored towards solid waste minimization during construction will include such elements as:

- Directing clearing and grubbing wastes to local composting facilities, where available
- Segregating waste materials into stockpiles of metal and scrap wood made available for salvage on a regular basis
- Utilizing excess excavation materials in the final grading plan and wetland mitigation effort to eliminate disposal, thus creating a balanced cut and fill for the Project
- Minimizing spill impacts when transferring fluids or refueling vehicles through the use of procedures and containment structures
- Including reuse and recycling capabilities in the evaluation criteria for selecting and purchasing of construction materials and aids

Recycling will be encouraged and supported through placement of appropriate containers, labeled for the wastes designated for recycling, in and around the construction offices, warehouses, lunch rooms, and other areas of the Project to facilitate the recycling program.

Q. Please describe the permit requirements and applicable compliance standards relating to wastewater and solid waste generated by Project construction and operation.

A. These issues are discussed in Section 8.5 of the Application, as superseeded and supplemented by the Addendum No. 2. The ZLD system will not require any additional approvals. When available infrastructure is available, the Applicant will seek approval to hook-up to the District's sewer expansion to discharge sanitary waste.

With respect to solid waste, the Applicant has made adequate provision for disposing of wastes at appropriately licensed and approved disposal facilities that have the capacity to handle Project wastes. Spectraserv, out of South Kearny, New Jersey, has expressed its willingness and interest in providing the Project with the services necessary to transport, process and dispose both the sanitary waste and the solid waste expected to be generated by the facility. Solid waste will be managed in accordance with local, state, and federal regulations, policies, and guidelines; including, 6 NYCRR Part 360, Section 2-21 of the Ramapo Code (Local Law 1-1985 as amended), Section 2-23 of the Ramapo Code (Local Laws 1-1965 and 9-1983 as amended. The development will therefore have no adverse affects to the Project site or region related to the disposal of solid waste.

With respect to hazardous waste, the facility will be designed and operated to comply with the Federal Resource Conservation and Recovery Act (RCRA) and all applicable hazardous waste regulations in 6 NYCRR Parts 370 - 376 and 40 CFR 260 - 279.

Q. Are stormwater permitting requirements addressed in the Application?

A. Yes. Section 8.5.4 of the Application addresses stormwater permitting requirements. The project will be covered under NYSDEC SPDES general permiting requirements for stormwater during construction and operation. A preliminary Stormwater Pollution Prevention Plan, an essential component of stormwater permitting requirements is included in the Application as Appendix I-1.

Q. In your opinion, will Project construction or operation result in any significant adverse impacts relating to solid waste?

A. No. There will be no significant impacts with the mitigation measures in place. During Project construction and pre-operational cleaning, some solvents and flushing materials will be used. These materials will be provided by the construction contractor, and will be handled and disposed of in accordance with all applicable rules and regulations. This will be enforced by the Contract Documents which will specify the contractor's obligation to maintain the site free from debris and litter, and to dispose of all wastes via a licensed waste hauler in accordance with all applicable local, state, county, and federal laws.

Office and other facility wastes generated during Project operations will be recycled. A private contractor will dispose of non-recyclable materials. Normal Project maintenance will generate small quantities of solid waste on a periodic basis. Depleted SCR catalysts will be sent to the manufacturer or licensed recycler for recovery or disposal.

All of the construction wastes, stumps, grubbings and recyclable materials will be disposed of by a licensed contractor. Wastes from routine operation of the Project will be disposed of at a licensed facility. Special wastes, including waste oils, empty drums or solvents, will be transported and disposed of at a licensed disposal facility.

Q. Does this conclude your testimony at this time?

A. Yes.

Case No. 98-F-1968
Ramapo Energy Project

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DOCUMENT REQUEST

Request No. NJDEP-6
Requested By: Roger S. Haase, Deputy Attorney General, NJDEP
Requested Of: Ramapo Energy, L.P. ("RELP")
Date of Request: August 8, 2001 (e-mail and overnight mail)
Reply Date: August 20, 2001
Subject: Water Supply

1. Provide the protocols on how and when RELP intends to refill the nine million gallon capacity storage tanks before and after a declared drought event.

Response:

No specific protocols regarding Ramapo Energy's refilling of the Facility's water storage tanks have been established. Ramapo Energy has made a commitment that the Facility will not take any water from UWNY during a Stage II drought alert issued by Rockland County. To clarify, this commitment includes any drought alert level greater than a Stage II. Ramapo Energy is willing to have this commitment as a condition in the Certificate. Otherwise, Ramapo Energy will follow any applicable requirements that UWNY might have regarding refilling the water storage tanks.

2. Provide all plans and specifications for the construction and operation of the proposed facility including any materials which may provide information responding to the following questions: Is this an air cooled power plant? If not, what type of plant will it be? Will the combustion engines and turbines use water or other fluid to transfer heat? What, if any, fluids will be used to generate electricity? How

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/19/01
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EX 137

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will this occur? How will the combustion energy be converted to electricity? In addition, please provide the plans and specifications for the individual combustion units and the heat transfer units and the engineering analysis of the energy and heat transfer (water, air) balance for peak and ordinary electric generating demand levels.

Response:

All of the relevant information is contained in the Application materials. As detailed in Section 2.4.6 of the Application, the facility will be air cooled. Furthermore, a sketch of the proposed air-condenser is provided. The combustion/generation process is detailed in Section 2 of the Application. The following additional information is provided with this response:

1. Description of the combustion turbine
2. Description of the Heat Recovery Steam Generator (HRSG).
3. Two heat balances for one of the four modules, which make up the proposed plant. One heat balance is for normal base load operation and the other is for peak load operation.

This information is representative of the equipment and performance data relating to the proposed plant. It will be finalized during contract negotiations with Alstom.

An up-to-date water balance table was submitted with Supplement 2 to Addendum No. 2, Table 8.2.1.

With reference to the primary fluids, there are four used in the process to generate electricity, natural gas, air, exhaust gas and water:

1. Natural Gas will be used as the only fuel for the gas turbines.

2. Air will be drawn into the compressor section of the gas turbine and discharged under pressure into and around the combustion chamber to support combustion of the natural gas fuel and provide cooling.
3. Exhaust gas, the product of combustion, is routed through the gas turbine's turbine section where its mass flow is converted into shaft power used to drive the electric generator.
4. Demineralized water is routed to the tube side of the HRSG where the hot gases exiting the gas turbine provide the heat to convert the water to steam. The steam is then routed to a steam turbine where its useful enthalpy is converted into additional shaft power to drive the electric generator.

3. Please provide copies of all documents, including, but not limited to, correspondence, studies and plans and specifications which may provide information necessary for a water balance which traces water as it enters the plant, is used in the plant's various processes and operations, and exits the plant. Such a water balance would account for all water provided by UWNY and show: a) where and to which equipment water will be provided, b) how much water will be used by which equipment, c) how much water will be consumed or "lost" by which equipment, and d) how much water will be converted to industrial or sanitary wastewater and the fate of the wastewater. This water balance would show the above for both average and peak water use periods.

Response:

Please refer to the water balance diagram, Table 8.2.1, submitted with Supplement 2 to Addendum No. 2. This water balance diagram shows the expected usage of the plant with the Zero Liquid Discharge (ZLD) system installed. Cooling of some of the auxiliary equipment will be provided through a closed loop cooling water system. In this system demineralized water is pumped through the various equipment to remove the unwanted heat and then routed to an air/water heat exchanger to release the excess heat to the atmosphere. Other than the original fill of the closed loop cooling water system, there is no continual or frequent replacement of the system's water. The only piece of equipment that "uses" water is the HRSG. Here water is "lost" through the regular blowdown of the steam cycle required to ensure that the system is maintained in a clean condition. The amount of blowdown is noted on Table 8.2.1 as "Blowdown to ZLD".

From Table 8.2.1 the quantity of water "converted to industrial or sanitary wastewater" is noted under the heading "Potable to Sewer". As noted on page 22 of the testimony of Bernardo/Marchmont/Heins (revised July 31, 2001), the sanitary waste will be routed to a holding tank and removed by a licensed contractor at regular intervals. Also as noted on page 31 of same testimony, the contractor Spectraserv has agreed to provide services for the removal of the sanitary wastes. Furthermore, as noted on pages 21-22 the testimony, if sewer service becomes available to the project, sanitary wastes will be routed to the sewer.

Table 8.2.1 provides the water balances for "both average and peak water use periods". These are noted on the water balance as "Base Load Operation" and Base Load Operation with Steam Augmentation" respectively.

4. On page 7 of Kevin Phillips' testimony submitted in this matter, he states that in a May 24, 2001 correspondence, Environmental Sciences Services stated that water balance estimates are based on operating experience with similar power plants around the world as well as the design concepts developed for this particular type of plant. Please provide the names, locations, capacities and water balances of other

electric generating stations using the cooling processes proposed by RELP.

Response:

The use of information gleaned form the operations of other plants is a continuing activity for manufacturers. This is true in this case where Alstom reviews performance data on a continuing basis to improve its predictions of plant performance. However, the direct comparison of water usage rates for the Applicant's project with other similar plants will be misleading. This is because there are many factors that impact water usage rates, which include operating regimen, makeup water quality, wastewater recycling, zero discharge and project size. Besides, the water balances for other projects are proprietary information for their respective owners.

The projects that employ the identical combination of power generation and air-cooled technologies as the Ramapo Energy Project are located in the U.S. They are:

1. 1,650 MW Midlothian I and II in Midlothian, Texas
2. 550 MW Blackstone Project in Blackstone, Massachusetts
3. 550 MW Bellingham Project in Bellingham, Massachusetts

Of these projects the only one that is most similar to the Ramapo Project is our Blackstone plant, although this project does not have a Zero Liquid Discharge (ZLD) system. It has been operating for about two months and has demonstrated a water usage close to that projected for the Ramapo project, taking into account project size and the ZLD system.

5. Please provide copies of all documents, including, but not limited to, correspondence, studies and plans and specifications that review the potential availability of wastewater from all sources for onsite use at the facility.

Response:

Please refer to the engineering report on the Zero Liquid Discharge system, Attachment B (included with the August 3, 2001 submission). It identifies the wastewater streams available for onsite use utilizing the ZLD system. Quantities described are taken from the water balance table.

6. Please provide copies of all documents and analyses that evaluate the potential for recovery of water from the combustion process.

Response:

The only documents that provide these data are those referenced in the response to question 5 above.

7. The March 15, 2001 water supply contract between UWNY and RELP indicated that UWNY could provide up to 108 million gallons of water per year (MGY) and 27 million gallons of water per month (MGM). However, the application before the New York Board on Electrical Generating Siting and the Environment specifies that RELP would require only 23 MGY. In the event that the most recent contract still contains provisions that would allow RELP to use more than 23 MGY, please provide an explanation why the amounts of water specified in the application substantially differ from that in the contract. In addition please provide the most recent water supply contract between UWNY and RELP, including any amendments to the contract.

Response:

The UWNY Amendment to Agreement predates Ramapo Energy's commitment to limit its annual water supply from UWNY to 23 MGY. The Amendment to Agreement included in Errata No. 5 is the most recent contract. Ramapo Energy is willing to commit, as a condition of certification, to taking no more than 23 MGY from UWNY.

8. RELP indicated in its Article X application that it will provide UWNY with funds targeted to improve its water supply system, which may include improvements to stream flow augmentation. Please provide: a) a description, including the plans and specifications of each improvement UWNY will construct with the funds provided by RELP, b) the source of water for the improvement and the average and peak amounts to be withdrawn, c) where the water from each improvement will be distributed, d) where the water will be discharged (as wastewater), e) estimates of stream flow depletion as a result of the improvement's withdrawals, and f) any studies or evaluations of the impact of the improvements on down stream flow, water supply, habitat or recreational uses, or of other environmental impacts.

Response:

This request is identical to NJDEP-7, Item 2, which was sent to UWNY. Ramapo Energy would need to obtain the relevant specific information from UWNY to respond to this request. Given the detailed specific information requested, Ramapo Energy therefore directs NJDEP to UWNY's response to NJDEP-7, Item 2 as the most appropriate method by which to obtain this information. The information available to Ramapo Energy on this issue is included in the letter from UWNY to RELP dated February 8, 2001, which was included as part of the Amendment to Agreement dated April 15, 2001 submitted on June 21, 2001

9. Please provide documentation that guarantees that the funds to be provided to UWNY will result in upgrades to UWNY's water system that will specifically help to offset the impact of RELP's water use on the Ramapo River.

Response:

Please refer to the revised Appendix H-2 and the revised testimony of Donald Distante submitted with Supplement 2 to Addendum No. 2 and the letter mentioned in response to question 8 above.. The UWNY Master Plan also provides information regarding these and other projects. Otherwise, Ramapo Energy is not in possession of any additional documentation responsive to this request.

10. Please provide estimates of the proposed facility's anticipated operating schedule, including total number of days and consecutive days of expected peak power generation per year.

Response:

As noted in Table 8.2.1, RELP has assumed the following operating regimen:

1. Base load operation for a full year without interruption
2. Base load operation for 6 days a week, 18 hours a day throughout the year
3. Base load operation for a full 6 days a week, shutting down on Sundays
4. Base load operation for a full year without interruption plus 120 hours at peak load (steam augmentation). The peak load period is anticipated to occur for 2 hours a day, 5 days a week over a 12-week period during the summer.
5. Base load operation for 6 days a week, 18 hours a day throughout the year plus 120 hours at peak load (steam augmentation). The peak load period is

anticipated to occur for 2 hours a day, 5 days a week over a 12-week period during the summer.

6. Base load operation for a full 6 days a week, shutting down on Sundays plus 120 hours at peak load (steam augmentation). The peak load period is anticipated to occur for 2 hours a day, 5 days a week over a 12-week period during the summer.

Of the six regimen noted above number 1 provides the greatest annual water consumption of 16.6 million gallons a year (MGY) with the Zero Liquid Discharge system (ZLD) in place. This amount is less than the 23 MGY because the introduction of the ZLD occurred after the Amendment to Agreement had been executed. However, if the adjacent RSCWMA Facilities accept the Applicant's offer to supply them with wastewater for non-potable uses, our water consumption would revert to 23 MGY. This apparent increase would be offset by the savings in potable water supply to the County Facilities.

11. Please provide all analyses of the relationship between projected peak energy demand of the facility, including the projected duration of peaks and associated water use, relative to the UWNY's ability to supply sufficient water during peak periods.

Response:

The Applicant understands the phrase "peak energy demand of the facility" to refer to the amount of electricity used by the plant when in operation (parasitic load) which results in the difference between "gross" output and "net "output. The "projected duration of the peaks and the associated water use" is noted in the response to question 10 above. There is no relationship between these two concepts. However, with regard to UWNY's ability to supply sufficient water during peak periods, it should be pointed out that such periods are expected to occur during the summer. If there is a drought during the summer, which results in a Stage II (or greater) Drought Alert, Ramapo Energy will cease receiving water from UWNY. During this period Ramapo Energy will rely on the water stored on site to support operations. There will be 8.25 million gallons on site available to support operations (i.e., 9 million gallons of storage less water reserved for fire protection purposes). Under normal base load operation and with the ZLD in place, this amount of water will allow REP to operate for more than a year. If we assume 60 hours of peak operation then this amount of water would last for 190 days.

12. RELP has not provided data to substantiate its estimates of base or peak water use. Please provide data and analyses to demonstrate how it arrived at estimates of water use for the facility.

Response:

The estimates of water consumption rates noted in Table 8.2.1 were provided by Alstom Power Generation who will have the turnkey responsibility for the project. The Engineering, Procurement and Construction contract between Alstom and RELP will cover performance guarantees including the water consumption rates noted in Table 8.2.1. Analyses and the development of water consumption rates are proprietary possessions of Alstom.

13. In its Article 10 application, RELP claims that surface water is not an alternative because none exists on the proposed project's site. Please provide any documents demonstrating or explaining why the use of surface water from any source for the facility is not feasible.

Response:

Please refer to Section 7 of the Application. It describes the surface water resources on, and in the immediate vicinity, of the Project Site. Section 7 of the Application states that no lakes, ponds, or vernal pools are located on the Site. Section 7 also discusses Torne

Brook, a small perennial stream, and Candle Brook, an intermittent stream, located in the immediate vicinity of the Project Site. Section 7 further states that both brooks (Torne Brook and Candle Brook) are tributary to the Ramapo River, but neither constitutes a sufficient source of water for the Project. Candle Brook was eliminated as a potential source of water due to its intermittent nature. Torne Brook was eliminated as a potential source of water due to the limited drainage basin area upstream of the Project Site and it's ecological value as a trout habitat.

14. RELP in Addendum 2 has committed to discontinue using water from UWNY during a Stage II drought alert. Rockland County Health Department promulgated new drought regulations in May 2001. Please provide all documentation committing RELP to discontinue using UWNY's water during Stage III through V drought declarations by Rockland County.

Response:

Please refer to Addendum No. 2 and Supplement 2 to Addendum No. 2. Please also refer to the response to question 1 above. Ramapo Energy anticipates that its commitment to discontinue using UWNY's water during Stage II through Stage V would be memorialized as an Article X Certificate condition.

15. Please provide copies of all analyses addressing how the water supply infrastructure projects funded partially by RELP, which would increase the availability of water for flow augmentation in the Ramapo River, would affect the declaration of a Stage II drought alert by Rockland County.

Response:

Information concerning this issue should be sought from UWNY, who will implement the projects. Notwithstanding, Ramapo Energy believes that of the four UWNY projects for which it will provide funds, the one related to improving the control of releases from

Potake Lake is most likely to help UWNY's water supply infrastructure in the Ramapo River basin. Please refer to the revised Appendix H-2 and the revised testimony of Donald Distante submitted with Supplement 2 to Addendum No. 2, the Amendment to Agreement dated March 15, 2001 and UWNY's letter dated February 8, 2001 for additional information. Otherwise, Ramapo Energy is not in the possession of any additional documentation responsive to this request.

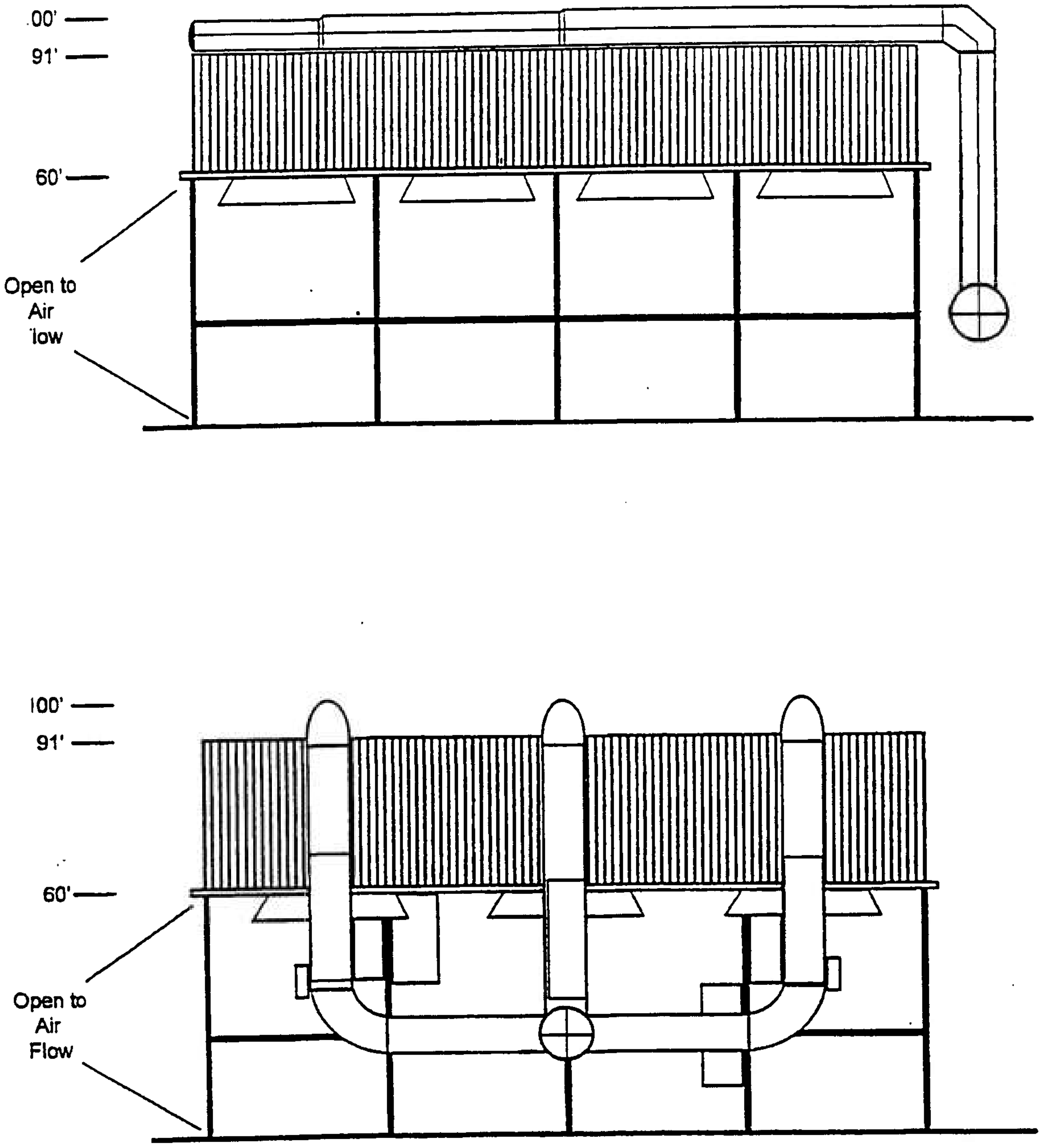
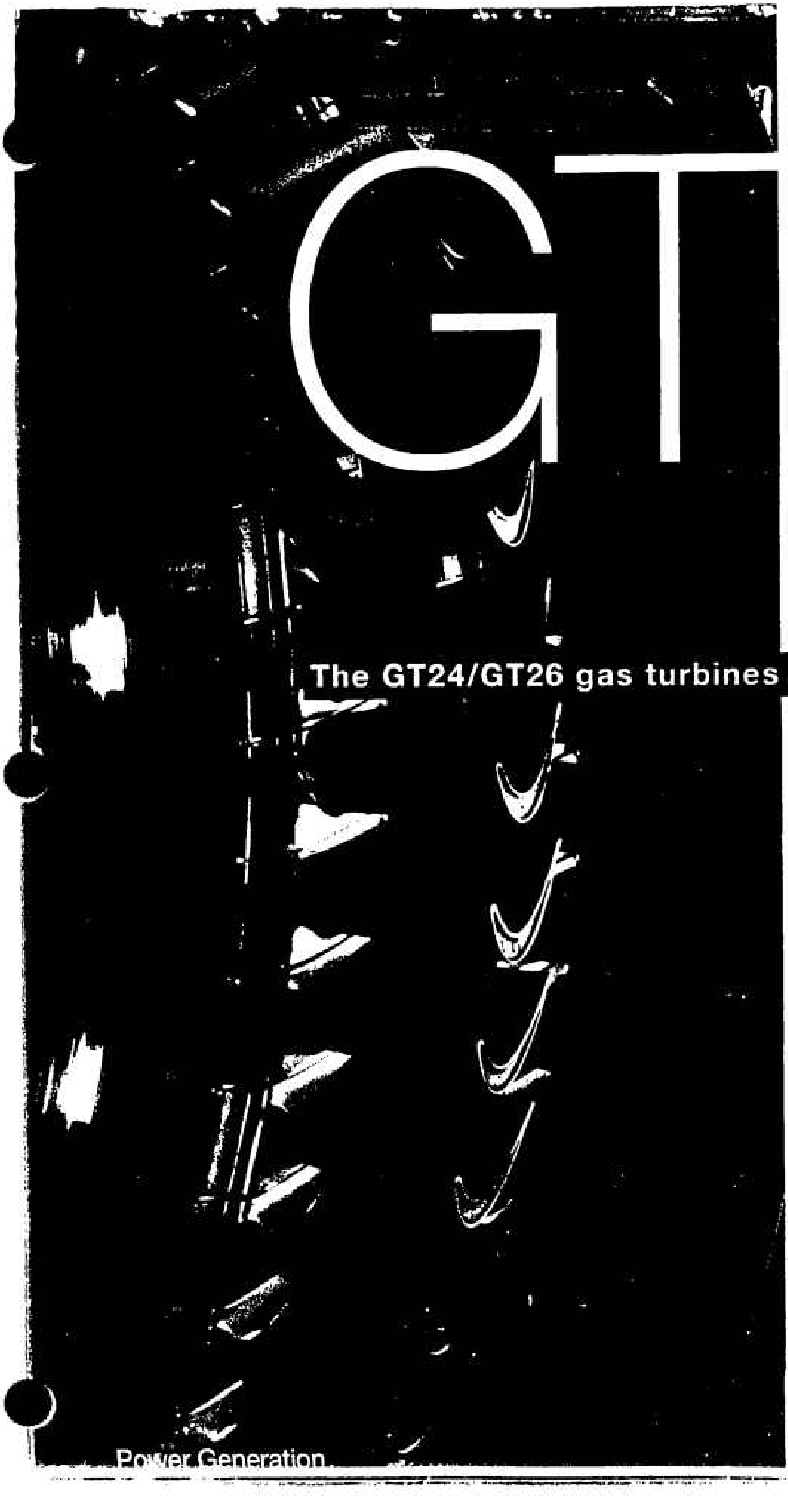


Figure Elevation View of the Air Cooled Condensers for the Ramapo Energy Project

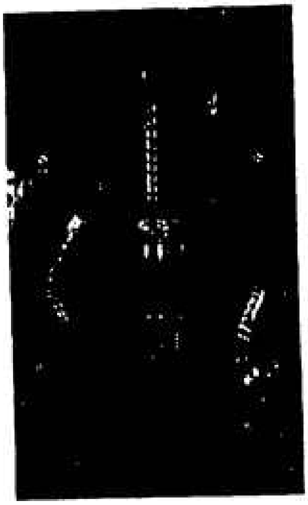


The GT24/GT26 gas turbines

Power Generation

ALSTOM

Introducing the unique gas turbine with a built-in performance record.



Responding to a changing industry.

Around the world, utilities and independent power producers are facing unprecedented change. Deregulation is leading to greater competition at a time of shifting trends in consumption. Tighter emissions legislation and local regulatory authorities make environmental compliance essential.

Power generators need to ensure reliability of supply but simultaneously reduce the cost per kilowatt hour of producing electricity. The challenge, as always, is to raise efficiency.

But is this possible?

Recognizing the importance of these issues, we have developed a way to lower kilowatt hour cost without reducing plant availability or compromising emissions limitations.

The solution is the compact GT24/GT26 sequential combustion gas turbines. Sequential combustion actually raises net efficiency to nearly 58% in combined cycle operation. And it does all this with relatively low firing temperatures.

Consequently, while efficiency levels and power density increase, negative factors [illegible] mechanical stress are significantly reduced compared with conventional gas turbines producing similar outputs.

Unusually low environmental emissions are achieved with our unique, dry low NOx EV burner technology, proven by more than 300,000 hours of operation.

The GT24 and GT26 represent a unique approach in heavy duty gas turbine technology, and include many major components and subsystems that have been proven over many years and in more than 300 applications.

Gas Turbine	60Hz	50Hz
Combined Cycle*	**60Hz**	**50Hz**
Net Output [MW]	271	393
Net Efficiency [%]	57.6	57.9

* Basis: cooling tower cooling

	GT24	GT26
Power	1	1.44 (1.2*)
Torque	1	1.73 (1.2*)
Power density	1	1

Consider the benefits of GT24/GT26 sequential combustion technology.

Competitive Kilowatt Hour

In combined cycle applications, the GT24/GT26 have as much as a 10% advantage in electric rate reduction over conventional turbine technology.

High Reliability/Availability

Lower turbine inlet temperature and a uniform annular temperature profile extend unit operating life.

High Power Density

Compared to conventional turbines, the GT24/GT26 provide 60% more output in the same footprint. High power density design leads to reduced steam cycle requirements and lower capital costs.

Low Maintenance Costs

State-of-the-art materials are exposed to lower turbine inlet temperature. The compact annular combustor also provides a uniform hot gas temperature profile which prevents hot spots, increasing the lifetime of the hot gas path turbine blading stages.

Lower Environmental Emissions

The GT24/GT26 superiority in emissions is a combination of basic thermodynamics, combustion technology and design features. Sequential combustion technology is the industry's most innovative platform for low emission, high efficiency gas turbines.

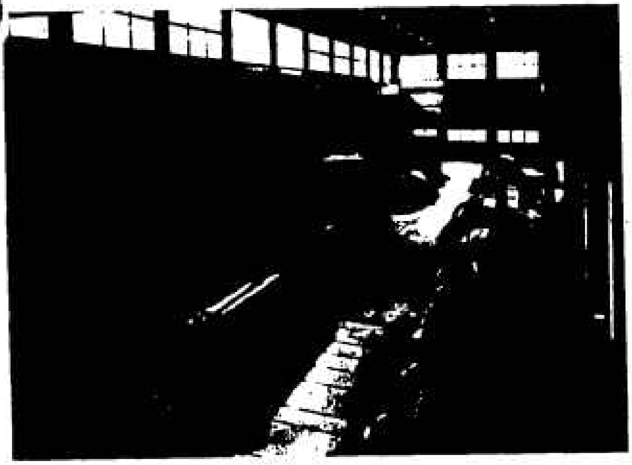
Long-Term Payback

In combined cycle applications, the GT24/GT26 have as much as a 65% advantage in internal rate of return over conventional turbine technology.

Unique performance that is already long proven.

You want to drive down the cost of power generation, but how is this truly feasible? Of course there are options, but what is the best for your particular requirements?

To minimize your investment, whether you need a complete plant or plant retrofit, you need a system that can be installed in the shortest time possible and guarantee minimum maintenance.



The first sequential combustion gas turbines were put in operation in 1948 in Beznau, Switzerland.

And surely, if you want to safeguard your investment, the chosen system must be thoroughly proven.

Surprisingly, these are all reasons that make the GT24 and GT26 worthy of serious consideration. Both are unique, offering unrivalled economies of performance and both have been thoroughly proven and can confidently guarantee maximum availability.

A Brief History

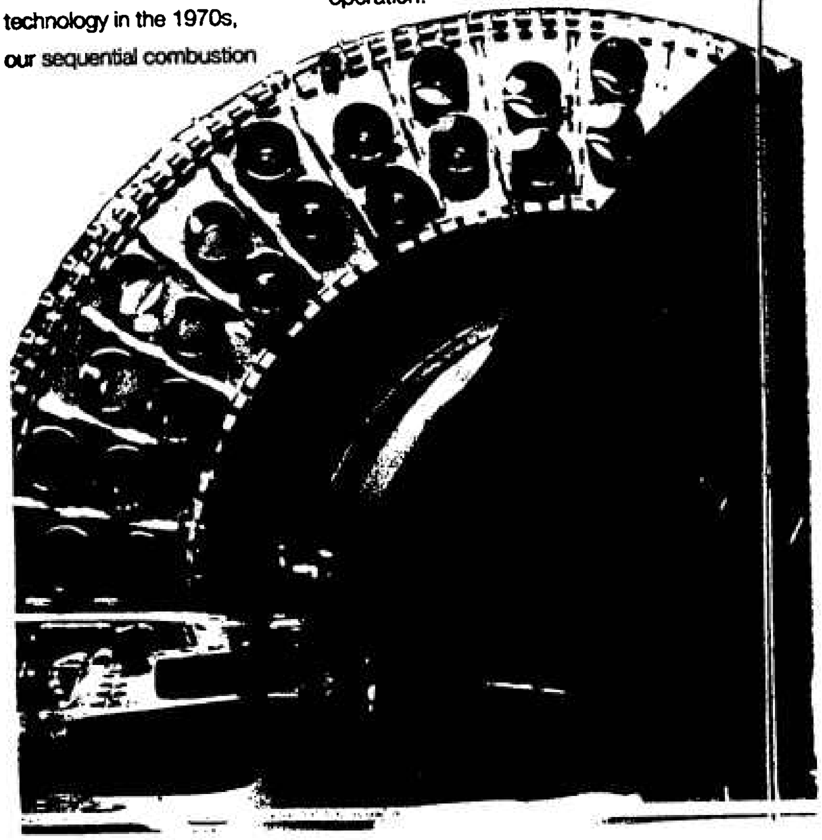
Nobody knows sequential combustion turbines better than us. Not only did we invent the idea, we've been designing, manufacturing and installing them for nearly 50 years.

Our first went on stream in Switzerland in 1948. Many more followed.

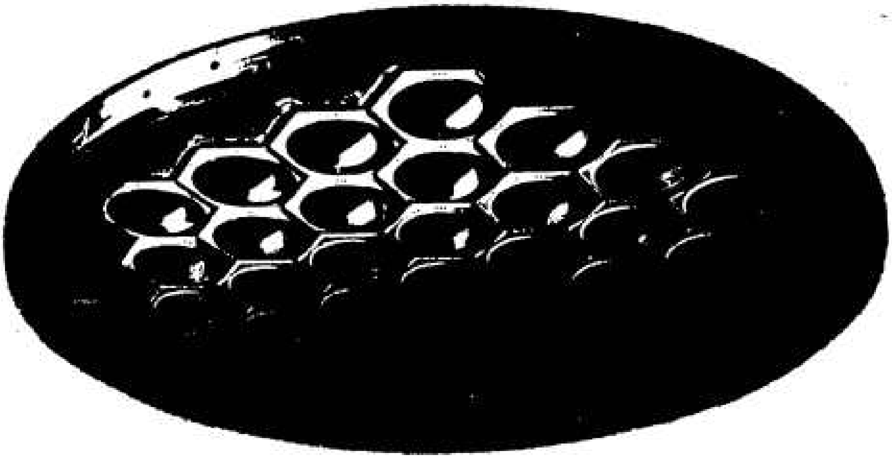
With the appearance of metallurgically superior hot-gas materials and advanced blade-cooling technology in the 1970s, our sequential combustion technology began to fulfil its outstanding potential.

In 1978, ABB introduced the next generation, a single rotor sequential combustion gas turbine, which has proven itself with an impressive record of 99.2% reliability over the last 15 years.

ABB is the only manufacturer in the world to have chosen this path leading to high gas turbine efficiency. Over half of the 700 MW installed using the sequential combustion concept are still in operation after 30-40 years of reliable operation.



■ The EV burner, first applied in the silo combustor GT11N in 1990, has now logged over 300,000 operating hours.



The Components

Whether a power plant is used for continuous baseload or intermediate duty, complex maintenance schedules and unforeseen failure can take it off-line, diminishing its production capacity.

■ ABB first employed modern annular combustion in the 165 MW GT13E2 gas turbine.

To prevent any such occurrence, an unequalled standard of quality was adopted as the foundation on which ABB power systems are built. Look at the primary elements that support the GT24 and GT26. Every fundamental gas turbine component is the result of time-tested design principles, manufactured within the strictest tolerances possible.

Robust Welded Rotor

Adherence to this high standard is especially apparent in the rotor assembly employed in the GT24/GT26. Applied in both gas and steam turbines since 1929, the single-shaft rotor has now proven itself over several decades without a single failure. ABB's standard single-shaft rotor design is welded from forged discs and rings which allow for two-bearing support. The resultant rotor stiffness reduces bending effects to give a vibration-free operation recognized for its high reliability and operational surety.

Compressor

An evolutionary process over the last two decades with compressor design, exhibited by the continuous increase of the pressure ratio in the GT8, GT11 and GT13 gas turbines, provided the basis for the GT24 development. In addition, ABB's vast experience with industrial compressors made operation at pressure ratios over 30 bar and beyond possible.

EV Burner

The Environmental (EV) burner – the result of research started in 1987 – is the latest step in ABB's development program. Rather than just concentrating on ever lower NOx levels, ABB has chosen a total solution that limits pollutants and at the same time increases energy efficiency. These burners were first applied commercially in silo combustor system GT11N gas turbines in 1990. In 1993, the EV burner was utilized in the annular combustor arrangement of the GT13E2 gas turbine. To date, the units with this burner technology have accumulated over 300,000 hours of reliable operation.

Annular Combustion

The annular combustor using EV burners was extensively tested before its introduction in the GT13E2 gas turbine in 1993. Since that time, over 100,000 hours of operation have been logged on these units. The annular design is advantageous because it provides a perfect, even, circumferential temperature profile, resulting in improved cooling, longer blade life and lower emissions

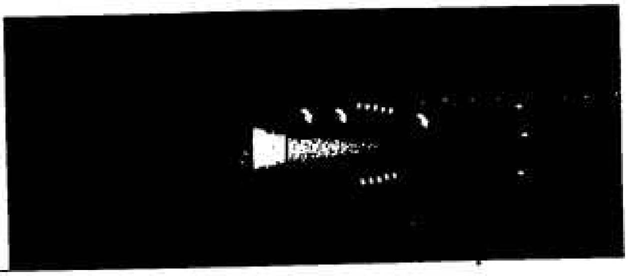
Sequential combustion – designed to perform.

SEV combustor are much more uniform than in conventional combustors. This effectively prevents temperature peaks and resultant NOx formation.

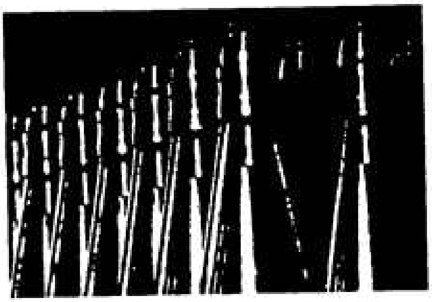
The design of the SEV combustor provides additional advantages. In the SEV burner, where incoming hot gas has a considerably lower O_2 content than normal air, less oxygen is available for NOx formation. Furthermore, because the SEV air is at a temperature considerably higher than conventional combustion air, it requires less heating to reach flame temperature. Both of these NOx mitigating phenomena are known from other combustion technologies, which employ exhaust gas recirculation.

Given that a large amount of the total unit fuel is burned in the SEV combustor with very low NOx formation, the NOx emission values (at 15% O_2) are lower at the SEV exit than at the SEV inlet. This phenomenon results from the consumption of oxygen within the SEV combustor with minimal NOx production.

Successive design refinements to the major gas turbine components such as the annular combustor, EV burner, rotor assembly and compressor, help increase overall plant availability. Evolutionary design, based on decades of experience with main system components dramatically streamline and simplify the GT24 and GT26.



EV burner



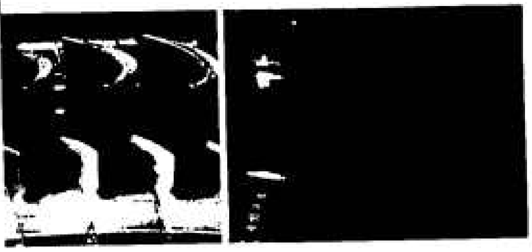
The EV burner provides the benefit of low NOx combustion without water or steam injection, and can be operated on gas, on liquid, or in dual fuel operation. The burner is shaped like two half-cones slightly offset sideways to form two inlet slots of constant width running the component's full length.

Combustion air enters the cone through these slots and fuel is injected through a series of fine holes in their edges. With this arrangement fuel and air spiral into a vortex form and are intensively mixed.

Excess air is a feature of the EV burner design, resulting in a flame temperature around 500°C lower than in a conventional diffusion burner – and an accompanying lower NOx level.

Compressor

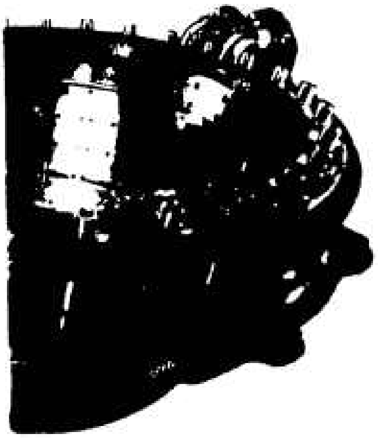
The GT24/GT26 employ controlled diffusion airfoil (CDA) blading which is individually optimized according to specific requirements and boundary layer conditions. This leads to higher overall efficiency while retaining a high surge margin. Additionally, the operating range is wider when compared to other compressor designs.



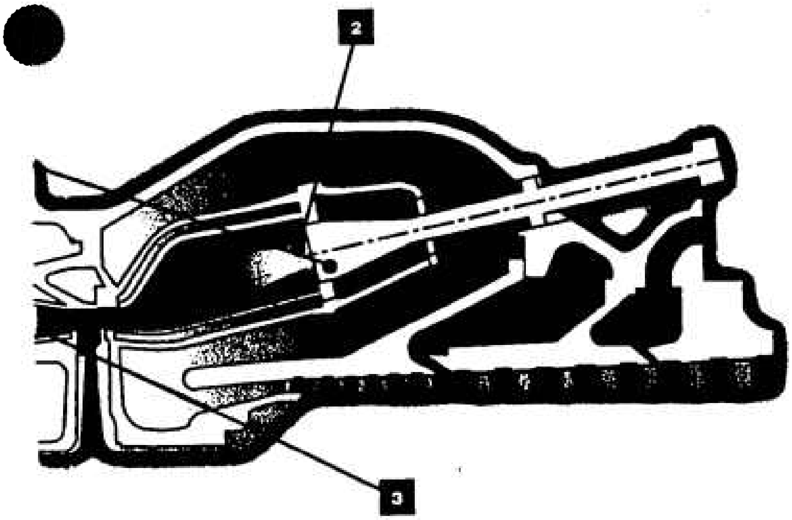
Turbine

The sequential combustion concept results in a gas turbine exhibiting extremely high power density. Due to the smaller blade dimensions of the GT24/GT26, the machines experience lower mechanical stresses, increasing blade lifetime. The five rows of turbine blades are anchored in fir tree slots. Air from compressor stages cools the turbine shaft and first turbine disc. Air-cooled first stage blades utilize a combination of film and convection cooling techniques via internal cooling circuits with cooling air drawn from

Inside the SEV, the phenomena of vortices created by delta wings is analogous to the lift-enhancing technique utilized by airplanes during flight. The incorporation of this design element in the SEV burner enables the formation of a nearly perfect fuel/air mixture.



combustion works



3 The hot exhaust gas exits this first combustor, moving through the high pressure turbine stage before entering the SEV combustor.

4 Vortex generators in the SEV combustor enhance the SEV [illegible]

The SEV combustor consists of 24 diffusor-burner assemblies, distributed annularly, followed by a single, annular combustion zone surrounded by convection-cooled walls. Exhaust gas from the high pressure turbine enters the SEV combustor through the diffusor area.

Combustion temperature uniformity in the SEV, like in the EV, is determined by the spatial homogeneity of the fuel/air mixture which is again accomplished by the use of vortices. Each SEV burner contains delta-shaped wings, formed like ramps and located on all four of the burners interior walls, which swirl combustion air into vortices.

Fuel is then injected through 24 air-cooled fuel nozzles, distributing it in a manner which forms a perfect fuel/air mixture prior to combustion. The fuel jet is surrounded by cool carrier-air which postpones spontaneous ignition until the combustion zone, beyond the burner area. There, the vortices break down, and like in the EV, combustion occurs in a single, stable flame ring, operating smoothly across its entire load range.

Material temperatures in the combustion areas never exceed 900°C and neither the EV nor SEV combustors contain any moving parts. This mechanical simplicity,

low turbine material temperatures drive the high reliability and availability of the GT24/GT26 design.

Uncoupling emissions and performance

NOx formation depends on the temperature, pressure and residence time in high temperature regions inside the combustion area. NOx emissions for the GT24/GT26 units are below 25 vppm, and achievement of single digit NOx levels is within development range for several reasons.

In both the EV and SEV combustors, high temperature residence times are 50% shorter than in conventional combustors. In addition, when comparing conventional and reheat gas turbines, the Brayton cycle demonstrates thermodynamically that conventional machines need a higher combustion exit temperature to achieve an equivalent specific output.

Given the importance of the relationship between NOx production and flame temperature, it is also notable that the temperature profiles

Sequential combustion – its beauty is in its simplicity.

Like all the best ideas, sequential combustion is based on a simple and solid concept: the reheat principle for gas turbines.

One can visualize sequential combustion as a gas turbine comprising two combustor-turbine pairs in series, where the exhaust gases from the first turbine feed the combustor of the second.

An efficient 22-stage subsonic compressor feeds combustion air into the first combustor at twice the normal pressure. There fuel is mixed with the high pressure air and burns in the first combustor – the annular EV combustor. The hot gases drive a first turbine, the single-stage high pressure turbine.

Unlike conventional turbines, fuel is injected in a second burner set and ignites spontaneously in the following annular combustion zone – the SEV (Sequential EV) combustor, thereby reheating the air before expanding it further into four additional low pressure turbine stages.

Low Maintenance Costs

EV combustion

The EV combustor has an annular arrangement fitted with 30 EV burners, each operating over the whole load range. Compared to other combustor arrangements, the annular combustor exhibits a much more even temperature distribution of hot gas, in circumferential direction.

Radial temperature uniformity is accomplished by pre-mixing virtually all incoming compressor air with the fuel in the EV burner; and by the absence of film cooling in the convection-cooled combustor walls. This produces a single, uniform flame ring in the free space of the EV combustion zone. Beneficially the flame has no contact with the walls of the burner.

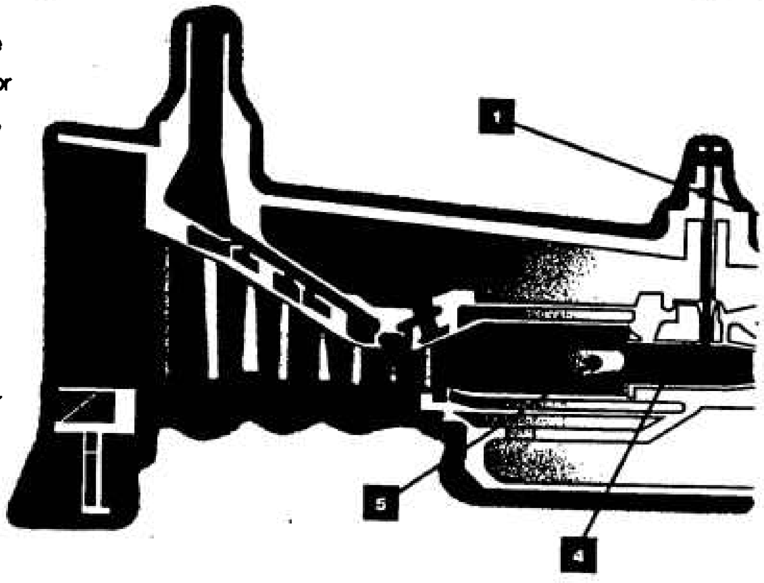
These design features distinguish the EV combustor significantly from other combustion systems. The prevention of damage to turbine blading caused by temperature peaks or hot spots exceeding maximum allowable material temperature limits, enhances the reliability and efficiency of the GT24/GT26 first turbine stage, and increases the lifetime of the hot gas components

SEV combustion

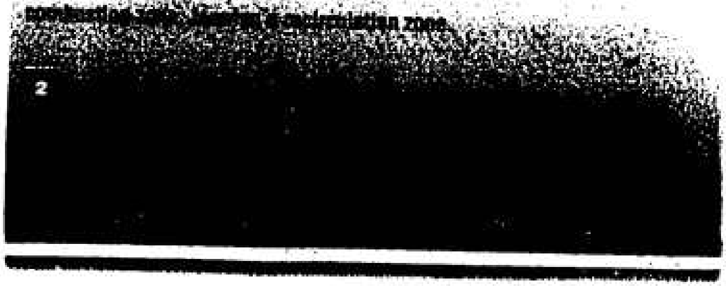
In the annular SEV combustor, the combustion process is repeated in a similar fashion as in the EV: vortex generation, fuel injection, premixing and vortex breakdown.

■ The EV chamber is built from flexible double wall segments without thin-walled transition pieces. Its design eliminates the need for mechanical flame holders and cross firing tubes, significantly reducing maintenance costs throughout the life of the unit.

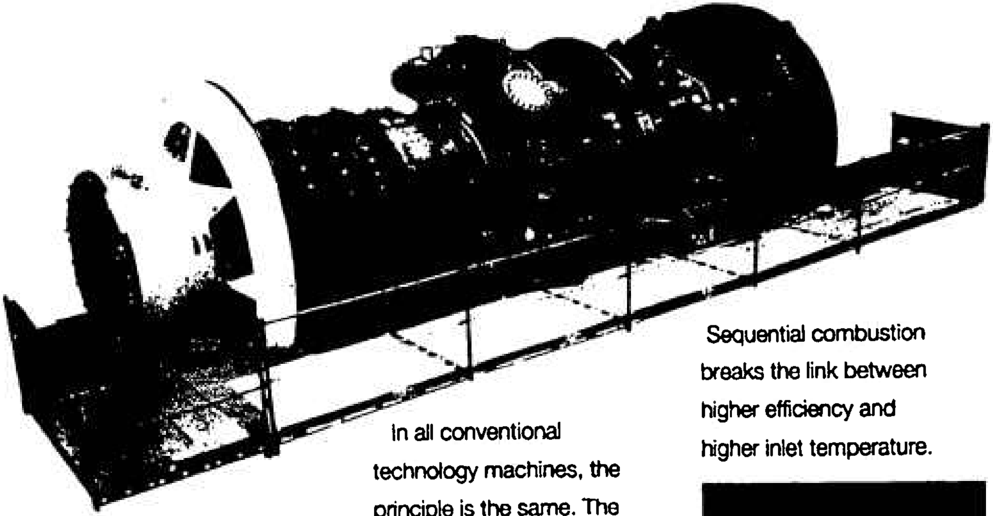
How sequential c



1 **Compressed air is fed into the double-cone EV burner, creating a homogeneous, lean fuel/air mixture. The vortex flow, induced by the shape of the burner, breaks down at the EV burner exit into the [illegible]**



Sequential combustion – the thermodynamics of cycle optimization.



Sequential combustion provides an alternative approach to optimizing the gas turbine cycle. The thermodynamic benefits of this innovative cycle are illustrated through the enthalpy-entropy relationship.

The enthalpy-entropy diagram (Brayton cycle) graphicly represents the thermodynamic processes (compression, combustion and expansion) and states (temperature and pressure) that fuel and air undergo in the gas turbine cycle.

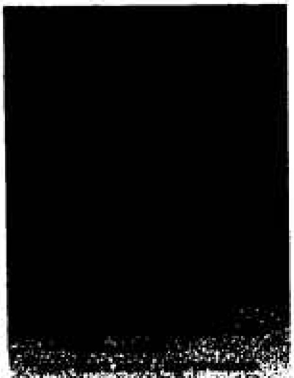
Enthalpy is a measure of the energy density, while entropy reflects the efficiency of the compression and expansion processes, and heat transfer to the gas during the combustion process

In all conventional technology machines, the principle is the same. The compressor increases the pressure of the inlet air from ambient conditions to the compressor discharge state. In the combustor, heat energy in the fuel is released into the combustion air, which increases its specific energy (enthalpy), and raises its temperature to peak level.

W[illegible] - work output (expansion through turbine)
T - temperature

The hot gases expand through the turbine, producing the work to drive the compressor and the electric generator. To achieve more work, turbine inlet temperature must be increased

Sequential combustion breaks the link between higher efficiency and higher inlet temperature.



[illegible]
W_{hpt} - work output (high pressure turbine expansion)
W_{lpt} - work output (low pressure turbine expansion)
T - temperature

In sequential combustion, the process is characterized by a split of the combustion process into two stages, which are separated by an expansion to an intermediate pressure level. In this so-called "reheat" process, heat is added at higher average temperature. This results in higher gas turbine efficiency and higher power density in comparison to conventional single combustion gas turbine processes.

The sequential combustion principle has now been successfully applied to the large, heavy duty, GT24 and GT26 gas turbine models. These units possess several important features which distinguish them from conventional machines.

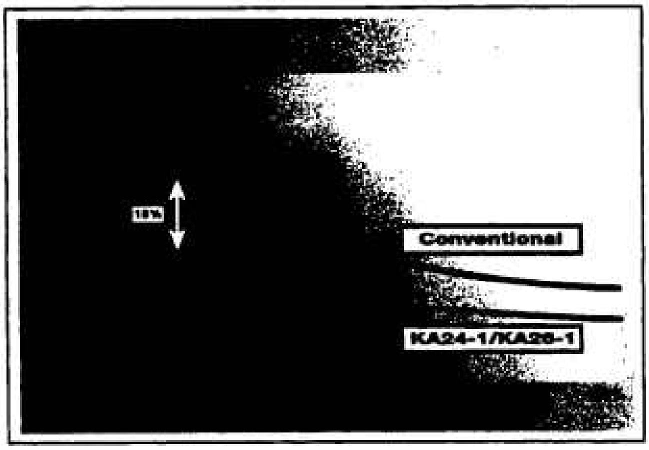
- The GT24/GT26 operate at a compression ratio of 30:1, nearly double the ratio of a conventional heavy duty gas turbine.
- At full load, approximately 60% of the total amount of fuel is burned in the first combustion stage to reach the allowed turbine inlet temperature.
- The first expansion occurs in the single stage high pressure turbine (hpt) which reduces the pressure from 30 to 15 bar. The high pressure turbine exhaust gas temperature decreases to approximately 1,000°C.
- The remaining 40% of the fuel is burned in the "reheat" combustor, where similar turbine inlet temperatures as in the hpt are reached again.
- The second expansion occurs in a four-stage low pressure turbine (lpt). At approximately 640°C, subsequent exhaust gas temperatures are ideal for combined cycle applications.
- The GT24/GT26 pressure ratio is similar to that of an aeroderivative gas turbine. The ensuing higher power density, in combination with the sequential combustion principle prevents excessive turbine inlet temperatures while providing exceptional gas turbine and combined cycle efficiencies.
- The GT24/GT26 achieve low emission levels without compromising cycle efficiency

Sequential combustion applications.

Combined cycles with greater operating flexibility

The combined cycle power plant is the most efficient and environmentally sound way to generate electric power. Although the GT24 and GT26 can be used for quickly installed blocks of simple cycle power, the reheat process in sequential combustion provides optimum exhaust temperatures for combined cycle.

Part Load Heat Rate Combined Cycle KA24-1/ KA26-1 versus Conventional CC Technology



The two individually controlled combustor chambers of the GT24/GT26 sustain high efficiency and low emissions at part load operation through manipulation of air flow by three variable guide vanes. The vanes allow reduction of air mass flow linearly to 60% of the full load level while maintaining the exhaust temperature of the gas turbine at almost its design point.

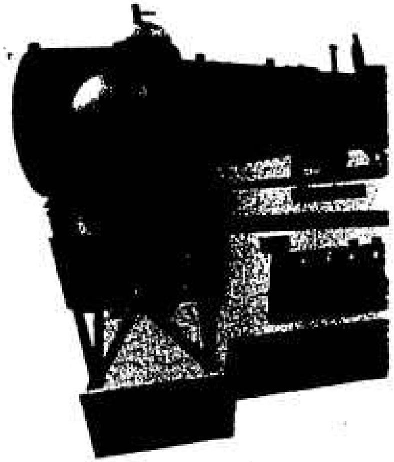
This ensures that the thermodynamic quality of the sequential combustion combined cycle remains nearly constant, maintaining its high live steam temperatures. As a result, GT24/GT26 system efficiency at 50% load, for example, is approximately 15% better than a conventional gas turbine combined cycle power plant.

This maximizes the long term value of GT24/GT26 power plants by significantly broadening their operating flexibility – a key success factor for utilities and IPPs alike in the increasingly deregulated and competitive power generation market.

The single shaft solution

The GT24 and GT26 are available in both single-shaft and multi-shaft arrangements. The single-shaft combined cycle system consists of one gas turbine, one steam turbine, and one HRSG, with the gas turbine and steam turbine coupled to a single generator in a tandem arrangement.

The key advantage of the single-shaft arrangement is its operating simplicity which results in high reliability – as much as 1% higher than



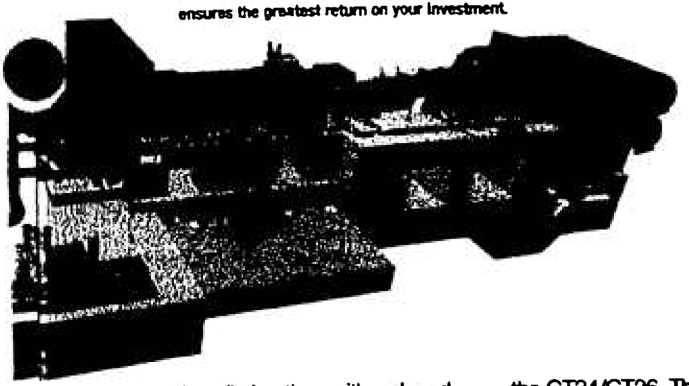
multi-shaft blocks. Operational flexibility is provided with a steam turbine which can be disconnected, using a self-synchronizing clutch, during start-up or for simple cycle operation of the gas turbine.

In terms of overall investment, the first cost of the single-shaft is approximately 5% lower than multi-shaft arrangement. Single-shaft plants realize savings in both power island and balance of plant costs. Power island costs are saved by the reduction of electrical equipment: they require only one generator, one bus duct and one step-up transformer. Balance of plant savings come from lower civil and structural costs.

Combined cycle plant arrangements

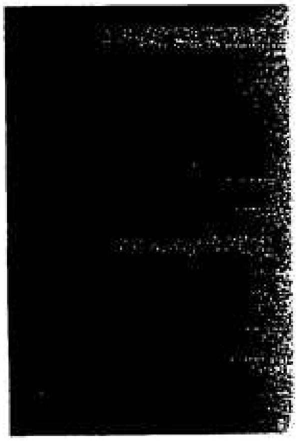
Based on customer requirements, ABB has introduced a range of standard, modular-design combined cycle plants, configured to provide optimal performance and shortened

■ The combination of low capital investment, fast construction, excellent thermal performance and high operating reliability and availability of single-shaft power trains ensures the greatest return on your investment.



installation time with reduced overall costs. Through the reference plant approach, ABB is able to supply low risk, turnkey plants.

Despite standardization, reference modules are adaptable to site conditions and to plant power requirements. Pre-engineered packages utilizing the GT24 and GT26 gas turbines are offered in the following blocks:

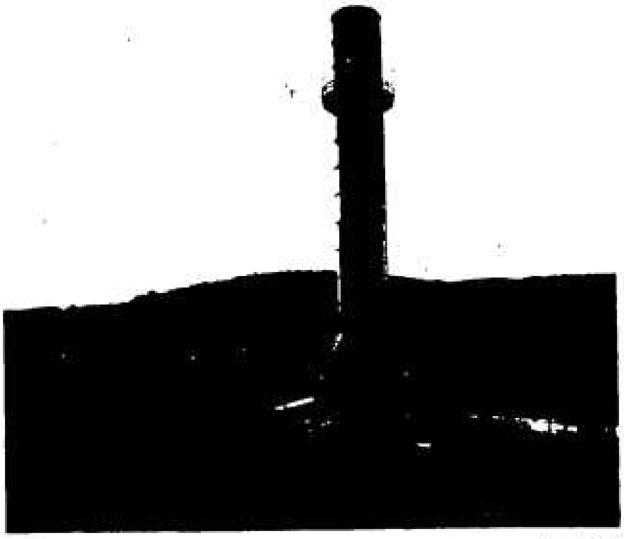


The reference plant requires short start-up time and is simple to operate and control.

Repowering with sequential combustion gas turbines

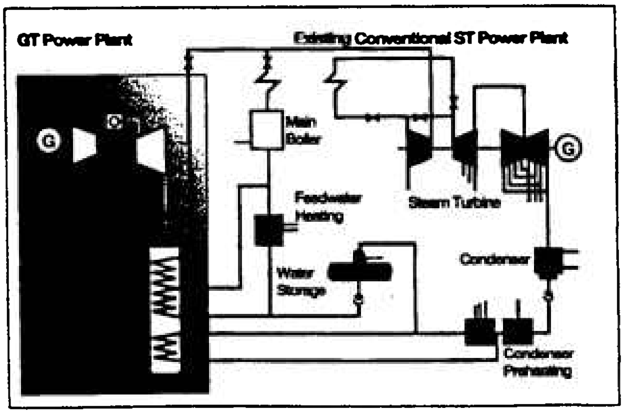
ABB has developed a hybrid plant concept combining conventional steam plants with the GT24/GT26. This concept responds to the most critical requirements of modern power generation systems – lowest generating cost, fuel mix capabilities, operational flexibility and minimum environmental impact.
The concept exhibits an extraordinary design flexibility by integrating high performance sequential combustion gas turbine technology with a wide range of existing or new conventional steam power plants.

High marginal efficiencies on natural gas of up to 70% can be achieved. These plants combine an operating and dispatching flexibility with continuous fuel optimization, low O&M costs and moderate capital investment.



■ Jersey Central Power & Light Company installed the first GT24 to replace two aging steam turbines at its Gilbert Station. The addition of the simple cycle GT24, coupled with the retirement of two older steam units resulted in a net plant increase of 96 MW, with higher efficiency and lower emissions.

■ Badenwerk AG, a German public utility, selected the GT26 to repower an existing reheat steam turbine at its Rheinhafen district heating station in Karlsruhe. The repowering will not only extend the economic life of the existing steam turbine, but will also lower overall plant fuel consumption and emissions.



■ The hybrid plant concept, combining conventional steam and gas turbine power plants, provides the advantages of lowest generation cost, fuel mix capabilities and minimum environmental impact.

Fast payback and long-term value through lower cost production.

Electric utilities and IPPs throughout the world face complex criteria when evaluating the type of power generation they should develop. The most important factors that must be considered include competitive and regulatory conditions, fuel availability and price, financeability and life cycle costs.

In today's competitive marketplace, the need to optimize a plant's investment potential while protecting margins is every power generator's paramount issue.

Utilities seek to lower their rate base, while independent power producers (IPPs) try to maximize their return on investment. Thanks to their fast construction and low specific cost, combined cycle plants provide both with their needed solution, by offering optimal conditions for economically attractive generation of electric power.

With the GT24 and GT26 combined cycles, margins can be increased or rates reduced through their highly efficient operation, optimum power density and exceptional RAM characteristics. Improved plant performance and lower maintenance requirements can provide a competitive advantage for power generators.

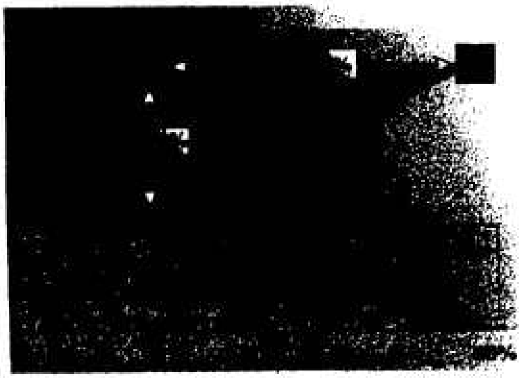
A case study of solid investment

In combined cycle applications, sequential combustion gas turbines are regarded as the best means possible for power generation. When considering that each percentage point increase in efficiency will generate substantial revenue gains over the life of a generation facility, the operating benefits of the GT24 and GT26 become very clear.

A case study comparing a state-of-the-art combined cycle plant using conventional gas turbine technology with a combined cycle plant using sequential combustion, demonstrates the advantageous potential of the GT24/GT26 for both IPPs and utilities alike.

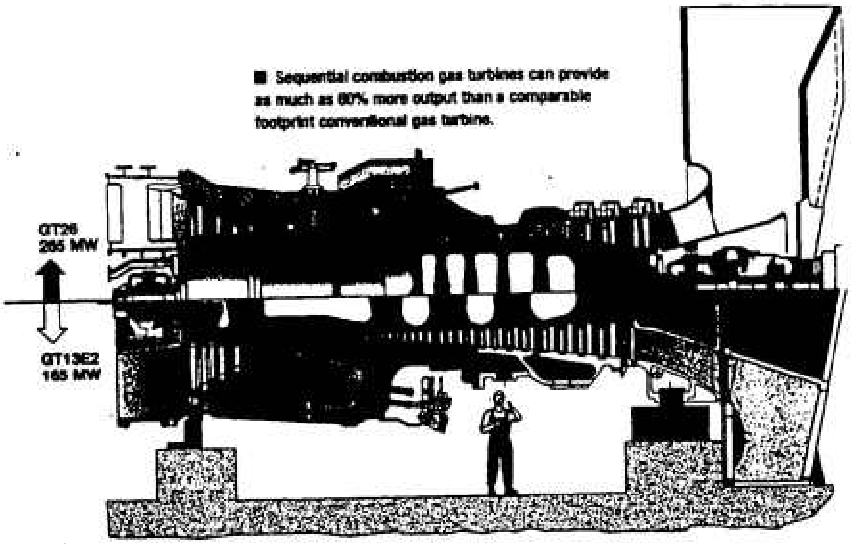
The GT24/GT26 can be compared favorably against a conventional combined cycle technology base case from two points of view – that of an IPP and that of a utility – using an electric rate based on current industry assumptions (20% internal rate of return after income [illegible]

Economic Comparison Diagram



Assumptions

Discount rate:	10%
General escalation:	4%
Output degradation:	3%
Heat rate degradation:	2%
Plant availability:	90%
Development costs:	US$ 5M
Owner contingency on EPC cost:	5%
Natural gas price:	US$ 3/MBtu
Interest rates:	10%
Long term debt:	15 yr
Debt / Equity	80 / 20
Income tax rate:	42%
Insurance:	1%/EPC cost/year
Local taxes:	US$ 10/kW/yr



■ Sequential combustion gas turbines can provide as much as 60% more output than a comparable footprint conventional gas turbine.

How does sequential combustion provide competitive advantage?

The growing worldwide access to natural gas resources, increasingly strict environmental legislation and trend away from state managed monopolies toward competitive, market-driven private sector participation have changed the face of power generation.

Sequential combustion is a technology that responds to this change, by providing superior operating flexibility. With high combined cycle efficiencies, the GT24 and GT26 are excellent performers when used in baseload operation. However, sequential combustion has set a new industry standard for part load efficiency and its advantage for load following and cycling duty is unmatched.

As demonstrated, the part load efficiency of the GT24/GT26 is approximately 15% better than a conventional gas turbine combined cycle power plant. Herein is a significant advantage of the GT24/GT26. In deregulated markets, power pools operate on the competitive dispatch principle – where the lowest price power producers are retained in an order of merit on the grid. The full and part load efficiencies of the GT24/GT26 combined cycle plants provide power producers the competitive advantage needed to win pool access, and to extend their production to the grid. Sequential combustion thereby enables increased revenue and maximium capital cost recovery.

Low emission levels are also maintained throughout the load range, preventing costly penalties which offset the economic gains of efficient plant operation.

The link between design and performance

Modern sequential combustion was conceived with reliability, efficiency and reduced emissions in mind.

Successive design refinements to major system components such as the annular combustor, EV burners, rotor assembly and compressor, each proven in many units and many thousand hours of operation contribute to increased plant reliability and availability.

Lower turbine inlet temperature and uniform annular temperature profile extend unit operating life by further increasing reliability and availability while reducing maintenance requirements. This means that the plant – and the income it generates – stay on-line.

In addition, the GT24 and GT26 are designed with a power density previously unattainable in heavy duty gas turbines.

Compared to conventional heavy duty gas turbines, they provide 60% more output in the same footprint. This is seen when comparing the GT26 dimensions with those of the 165 megawatt GT13E2.

The combination of high power density and high exhaust temperature contributes to decreased stack and condenser losses in a combined cycle steam cycle. It also reduces the steam cycle size requirements – and consequently the costs of components like the boiler, condenser and steam turbine.

High Power Density

This results in capital cost savings in the bottoming cycle and thus for the entire combined cycle system. In addition, compact plant design reduces civil and building work requirements for lower plant capital costs.

6.4.1 Main Features

- Dual pressure reheat heat recovery steam generator
- HP boiler part: Once Through System (Monotube design)
- LP boiler part: Natural circulation drum-type boiler system
- Horizontal arranged, outdoor installed HRSG
- Internal insulated (Cold casing design)
- Maximum extent of shop assembly allowing short erection time
- High degree of standardization enabling the use of the same basic elements for different HRSG sizes.
- Serrated (or solid) finned tube design
- Special welding process assures high heat transfer rate
- Large LP steam drum
- HP water/steam separator
- SCR system

6.4.2 General Description

Introduction

A dual pressure reheat HRSG for outdoor installation is proposed to generate the steam for the steam turbine set, utilizing the waste heat from the gas turbine (GT) exhaust.

The HRSG is a, once through, design for the HP part and a natural circulation boiler design for the LP part.

Heat Transfer Tubing and Fins

The heat transfer tubing is of the serrated (or solid) finned tube design.

The HRSG heat transfer tubing is made by helical winding fin stock to the walls of bare tubing by a low penetration, high frequency resistance welding process. This attachment weld is designed to provide a metal joint, which improves heat transfer between the fin and the tube. The very low penetration of the attachment weld minimizes any effects on the physical or chemical characteristics of the tube and/or fin.

HP / LP / Reheat Steam System

Steam is generated in the HRSG by heat transfer from the GT exhaust gases to the feedwater. The HRSG is designed as a dual pressure reheat boiler generating the following steam:

- High pressure (HP) steam

3-229

- Low pressure (LP) steam
- Reheat (RH) steam

The HP part of the boiler is designed as a once through system, whereas the LP part is a natural circulation drum-type boiler system. The HP once through system is fed with saturated LP water from the drum. Therefore, the LP drum functions as a feedwater storage tank for the HP system.

LP System

The LP system is fed directly with condensate from the condensate tank of the ACC. In the fuel gas mode of the plant the condensate is preheated in the LP economizer before entering the LP drum. The LP feedwater control valve is located between the LP economizer and the drum.

If the HRSG is fired with oil, the LP economizer is bypassed and pressurized in order to avoid acid condensation in the economizer gas path and the feedwater will be led directly into the LP drum.

Water for fuel gas preheating is taken from the outlet of the LP economizer and returned into the flashbox of the condenser.

The LP evaporative circuit incorporates a large steam drum, which ensures steam purity and reduces the potential for water surges normally, encountered during cold starts. Natural circulation in the evaporative steam generating section is assured by an adequate arrangement of the downcomer and riser tubes. All pressure parts are fully drainable and ventable.

HP System

The HP system is fed from the LP steam drum by 1 x 100% constant speed feedwater pumps.

A water/steam separator is located at the inlet of the HP superheater. During full load or high part load once through mode it receives superheated steam from the preceding HP boiler surfaces. At low part load and during start-up, however, it receives a two-phase mixture and separates the saturated water, which is then recirculated via the LP drum. The water recirculation to the LP drum is established by the pressure difference between HP separator and LP drum. During very early stages of start-up, when the pressure difference is not sufficient to establish recirculation to the LP drum, the water is rejected through the blow-down ensuring a stable minimum flow through the HP economizer/evaporation.

Reheat System

The RH is fed with steam leaving the HP turbine and returns reheated steam up to live steam temperature to the IP turbine. To control the RH outlet temperature, an injection type attemperator is situated down stream of the reheater. The spray-type desuperheater incorporates all necessary internals, control and the shut off valves.

On the exhaust side of the HRSG downstream of LP superheater a selective catalyst NOx reduction system (SCR) is installed. The NOx reduction in the exhaust gases is achieved by the chemical reaction between the NOx and ammonia. The ammonia solution is sprayed into the exhaust gas upstream the catalyst section by means of an ammonia injection grid. The ammonia solution is stored in tanks and is forwarded to the evaporator and the injection grid with a distribution system.

3-230

Shop Pre-Assembly

In order to reduce the overall time span from placement of an order to commercial operation, all components for the chosen HRSG design are shop-fabricated to the maximum extent possible permitted by shipping constraints. The largest and most complex sub-assemblies are the heat exchanger modules themselves. Other shop fabricated components are the drum, the water/steam separator, the outer casing panels, the stack, the HRSG / stack transition piece etc.

Shipping

The heat absorbing sections of the heat recovery steam generator are contained within shop assembled pressure parts assemblies which are capable of being shipped by rail or barge.

Each set of pressure parts is properly braced for rail shipment in shop assembled shipping braces.

Field Assembly

The HP once through pressure part modules can be lifted into the boiler support steel using hydraulic jacks. The LP pressure part modules will be put into the upright position by cranes. Transport frames are supplied as part of the module and are used as buckstays for the casing during construction of that portion of the boiler. Field assembly of the pressure part modules is accomplished without the requirement to perform tube to tube welds. All field welds are pipe butt welds, with pipe spools supplied for connecting pressure parts. Welds for tube return bends and header connections are located outside the gas path.

LP Steam Drum

The LP steam drum shall be of fusion welded construction, fabricated from carbon steel plate and equipped with two (2) manway openings, one at each end of the drum.

The steam drum will include steam separators with corrugated plate dryers and dry box.

Connections are provided on the steam drum for steam outlet, feed inlet, riser and downtake, venting, safety valves, surface blowdown, feed water regulators, water columns, chemical feed, sampling and nitrogen blanketing.

Water / Steam Separator

For reasons of steam quality and cleaning of the W/S cycle, a water/steam separator is installed in the HP once through system. This separator is a vertical arranged bottle. A cleaning of the HP part is foreseen during start-up and twice the week during normal operation by overfeeding the HP evaporator section. The solids and corrosion products will be discharged from the separator to the blow down tank during this cleaning operation.

The main purpose of this separator is to ensure, that during start up operation no water from HP economizer/evaporator section will reach the HP superheater. This separation will be achieved by a cyclone separator.

3-231

Ductwork

The ductwork includes:

- HRSG inlet duct from the outlet flange of the gas turbine
- HRSG intermittent duct between HP and LP part of the HRSG; containing the SCR.
- HRSG outlet duct between HRSG outlet and connection to the stack

The ductwork will be fabricated as shop assembled panels consisting of carbon steel outer casing, insulation and internal liner.

Construction of Ductwork (Casing, Insulation and Liners)

The HRSG will be internally insulated (Cold casing design). Insulation materials will be first grade insulating materials as required for low casing temperature, safe efficient operation and minimum maintenance. The floors of the ducts will be sloped and provided with drains suitable for water washing.

Shoulder studs will be welded to the inside of the outer casing. Insulating blanket will be impaled on the shoulder studs. An oversize washer will be placed over the insulation and stopped from compressing the insulation by the shoulder of the stud. The liner plate will be installed with studs protruding through oversize holes in the liner. On the gas side, the liner will be secured with an oversize washer welded to the stud. This construction permits the liner plate to expand with respect to the outer casing.

Structural Steel

The proposed equipment shall include the following structural steel:

- Platform supporting steel.
- Miscellaneous framing and equipment support steel integral with the unit.
- Base plates.

All connections steel to steel shall be designed for and employ high strength bolts. Connections for platform steel to module steel are field welded.

Exhaust Stack

A free standing carbon steel stack will be furnished.

The stack is fitted with caged ladders and platforms. A butterfly type stack damper is installed.

Platforms and Stairways

The proposed equipment shall include a system of platforms and stairways as required for the proper operation and maintenance of the steam generator components described in this proposal.

All ladders will include safety cages.

3-232

Expansion Joints

The expansion joints at the inlet and outlet duct are specified as follows:

- Fabric type or metallic
- Internally insulated
- Corrosion resistant

The design will withstand transient conditions of GT, including frequent startup and shutdown.

Instrumentation

The instrumentation is adequate to start up, shut down, operate and control the HRSG unit automatically from the control room safely and economically.

All signals, which serve as HRSG protection, are provided as triple signals, each of them are independent from another.

A positioner is integrated in each feed water control valve. Transmitters are of the 2-wire, 4-20 mA type.

Electrical Equipment

The requirements for the electrical systems and equipment apply for:

- Motor operated valves

Cleaning, Painting and Coating

Cleaning

All portions of the boiler and supporting steel are cleaned in a manner necessary to provide a satisfactory surface for its intended service function. Surfaces that are to receive shop coats of paint or preservative are properly conditioned prior to application.

Preservation and Protection

Machined surfaces that will be exposed to the atmosphere in transit and subsequent storage shall be protected.

Painting and Coating

The boiler modules are coated with shop primer. Nozzles and open tube ends are capped and sealed.

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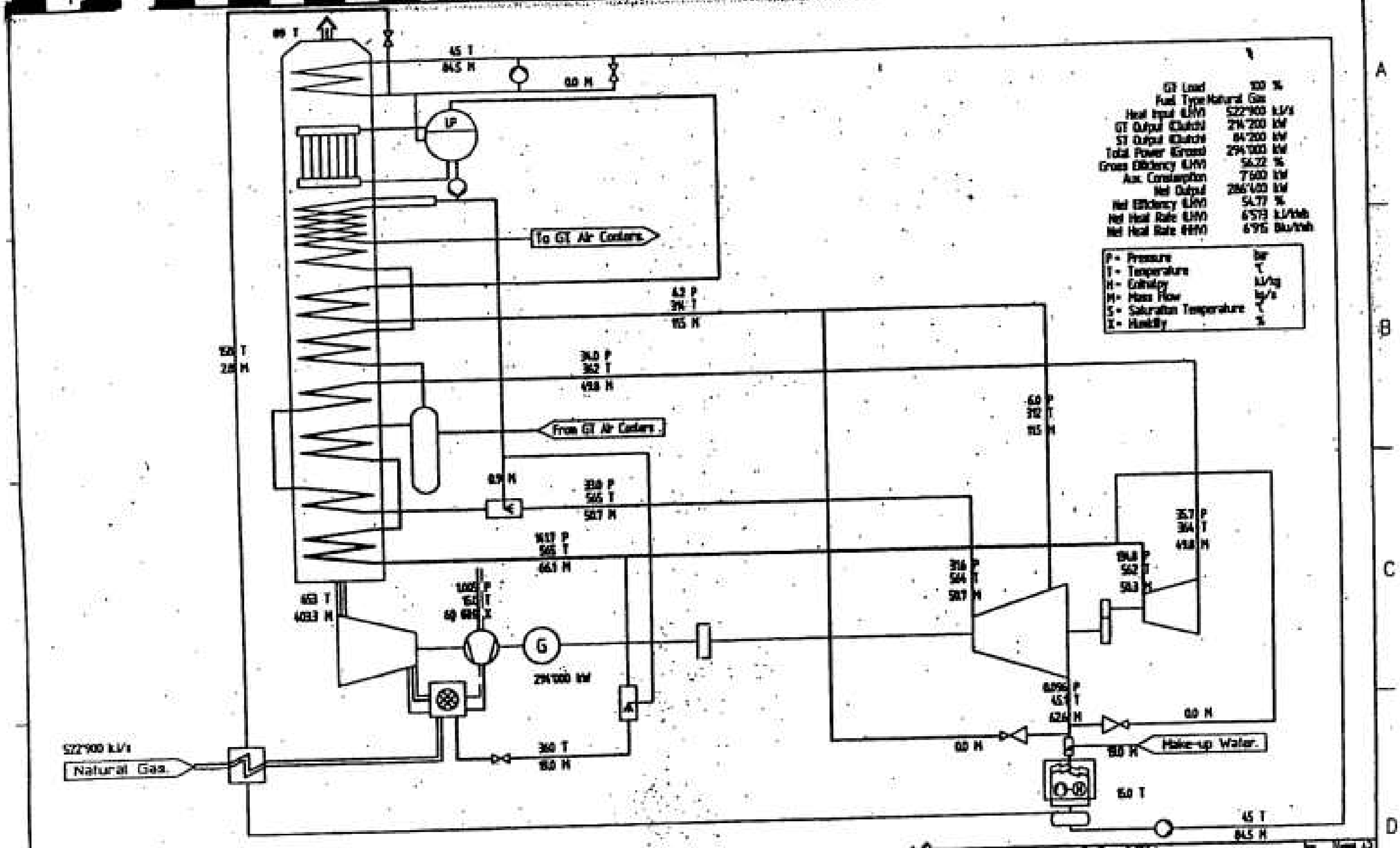

GT Load	100	%
Fuel Type	Natural Gas	
Heat Input (LHV)	522'900	kJ/s
GT Output (Clutch)	214'200	kW
ST Output (Clutch)	84'200	kW
Total Power (Gross)	294'100	kW
Gross Efficiency (LHV)	56.22	%
Aux. Consumption	7'600	kW
Net Output	286'400	kW
Net Efficiency (LHV)	54.77	%
Net Heat Rate (LHV)	6'573	kJ/kWh
Net Heat Rate (HHV)	6'916	Btu/kWh

P = Pressure bar
T = Temperature °C
H = Enthalpy kJ/kg
M = Mass Flow kg/s
S = Saturation Temperature °C
X = Humidity %

1999.04.30 Rauch
1999.04.30 Pourheidari
1999.04.30 Schwartz
KWG54

ABB Power Generation Ltd

HEAT BALANCE: 120mbar ACC (design)
08 Design: 100% GT Load; Tamb = 15.0°C
with steam injection into GT

ANP BLACKSTONE
HWV 302 791
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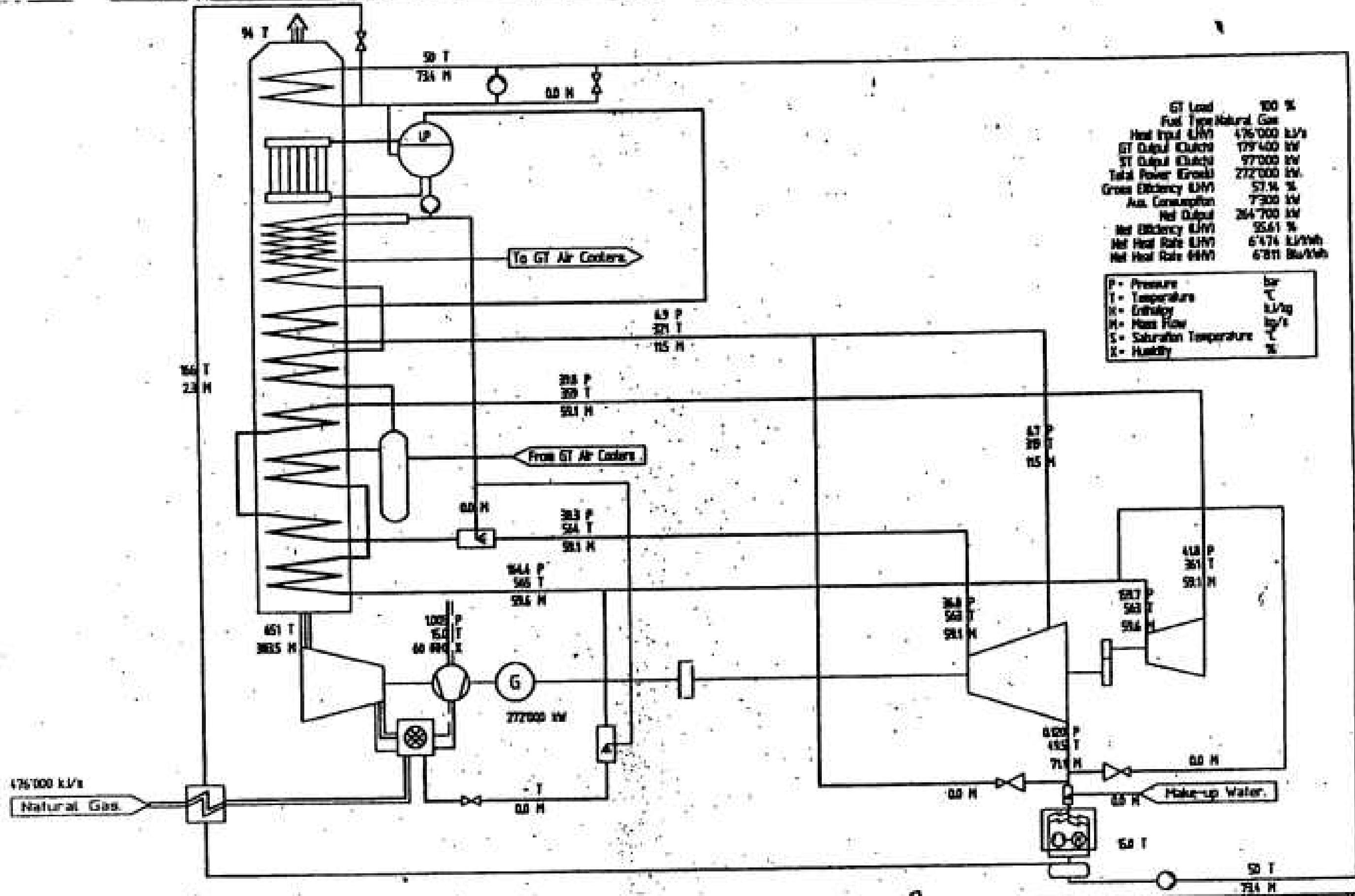
6
A3

TV13207



GT Load	100	%
Fuel Type	Natural Gas	
Heat Input (LHV)	476'000	kJ/s
GT Output (Clutch)	179'400	kW
ST Output (Clutch)	97'000	kW
Total Power (Gross)	272'000	kW
Gross Efficiency (LHV)	57.14	%
Aux. Consumption	7'300	kW
Net Output	264'700	kW
Net Efficiency (LHV)	55.61	%
Net Heat Rate (LHV)	6'474	kJ/kWh
Net Heat Rate (HHV)	6'811	Btu/kWh

P = Pressure	bar
T = Temperature	°C
H = Enthalpy	kJ/kg
M = Mass Flow	kg/s
S = Saturation Temperature	°C
X = Humidity	%

1999.04.30 Raack
1999.04.30 Pourhaidari
1999.04.30 Schwefer
KWG54

ABB Power Generation Ltd

HEAT BALANCE: 120mbar ACC (design)
Design: 100% GT Load; Tamb = 15.0°C
w/o steam Injection into GT

ANP BLACKSTONE
HAW 302 791
A3
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Responses to
New Jersey Department of Environmental Protection
Document Request of August 8, 2001
Case No. 98-F-1968
Request No. NJDEP-7

Ramapo Energy Project

Request 5: United Water New York indicated in their response to the New York State Department of Public Service's water supply stipulations (Appendix H-2) that the utility had identified a source of water for surface water augmentation of 300 million gallons within the Ramapo watershed and that is in negotiations to obtain rights to this water. Please provide copies of all documents identifying and describing the source of the 300 million gallons of water, the conditions under which the water could be used, and the current status of these negotiations.

Response: The potential source of augmentation is Potake Pond. While an agreement in principle has been reached for the purchase of Potake Pond, negotiations are ongoing concerning the final terms of an agreement. The conditions under which the water could be used will be subject to the final terms of that agreement and any permit requirements of the New York State Department of Environmental Conservation.

Data Response Prepared By: Donald Distante

Date: August 23, 2001

Ex. NJDEP-110

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/29/01
CASE NO. 98-F-1968
EX 138

STATE OF NEW YORK

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Water Supply Application No. 6507
Stream Protection Application No. 492
DEC Project No. 344-99-0060

SPRING VALLEY WATER COMPANY, INC.

41st Application

DECISION

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
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CASE NO. 98-F-1968
EX 139

Ex. NJDEP-111

State of New York

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Water Supply Application No. 6507
Stream Protection Application No. 492
DEC Project No. 344-99-0060

In the Matter of the Application

- of -

SPRING VALLEY WATER COMPANY, INC.

for the taking of additional sources of public water supply for distribution throughout its service area in Rockland County, New York, by the development of 10 new wells located in its Ramapo Valley Well Field in the Village of Hillburn and the Town of Ramapo, Rockland County, New York.

41st Application

DECISION

Water Supply Application filed	December 23, 1974
Stream Protection Application filed	March 13, 1975
Hearing held in Town of Clarkstown	June 18, 1975 July 24, 1975 January 28, 1976 February 25 & 26, 1976 March 2, 1976
Decision	September 15, 1976

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Report
by

Robert S. Drew
Hearing Officer

I, Robert S. Drew, hereby submit this Hearing Officer's Report including Findings of Fact and Conclusions and Recommendations.

Robert S. Drew

Robert S. Drew
Hearing Officer

REPORT ON WATER SUPPLY APPLICATION NO. 6507

PROCEEDINGS

Spring Valley Water Company, Inc. (the "Applicant") on December 23, 1974, filed an application with the Department of Environmental Conservation (the "Department") for the taking of additional sources of public water supply by the development of 10 wells in its proposed Ramapo Valley Well Field (the "Project") located in the Village of Hillburn and Town of Ramapo, Rockland County. A companion stream protection application for a transmission main crossing of the Ramapo River to connect the various wells in this well field was filed by the Applicant on March 13, 1975.

After due notice published in the Journal News of Nyack on May 22 and 29, 1975, a public hearing was commenced before Robert S. Drew, Hearing Officer, in the Clarkstown Town Hall on June 18, 1975, at 10:00 o'clock in the forenoon and pursuant to adjournments duly taken was continued in the same location on July 24, 1975, January 28, 1976, February 25 and 26, 1976, and March 2, 1976. Proof of publication for the hearing notice has been received by the Department.

At this hearing the Hearing Officer reviewed the application, maps and plans submitted and heard arguments for and against the Project and general statements concerning the Project, all as shown by the stenographic record of the proceedings.

The Applicant was represented at the hearing by its attorney, Onofrio F. Laurino, Esq.

The Department was represented at the hearing by Robert M. Hallman, Deputy Commissioner and General Counsel (Laurens M. Vernon, Esq., of Counsel).

Objections and/or notices of appearance to the Project as originally proposed were filed by several units of State, county and local government, and several conservation groups, all situated in New York State, and by several units of government and one conservation group situated in the State of New Jersey. These various parties were represented at the hearing as follows:

New York State

County of Rockland by Diana Rivet, Esq., County Attorney

Rockland County Department of Health by George O'Keefe, P.E., Assistant Commissioner for Environmental Health

Village of Suffern by Harvey Barr, Esq., Village Attorney

Village of Hillburn by Jerome Kornfeld, Esq., Village Attorney

New York State Public Service Commission by Carl Etter, Jr., Assistant Utility Engineer

Rockland County Conservation Association, Inc., by Betsy Pugh

West Branch Conservation Association by Walter Fleisher, Jr.

State of New Jersey

State of New Jersey and the New Jersey Department of Environmental Protection, jointly represented by Stuart Meislik, Esq., Deputy Attorney General

North Jersey District Water Supply Commission by Dean Noll, Chief Engineer

Township of Mahwah by Kevin Funabashi, Esq., Township Attorney

Ford Motor Company (Mahwah, New Jersey, Plant) by Dominic Caratello

Passaic River Coalition by Richard Rozewsky

The Village of Sloatsburg, in Rockland County, New York, filed as an objector but did not appear at the hearing. The Rockland County Soil and Water Conservation District and the Dundee Water Power and Land Company, Weehawken, New Jersey, filed notices of appearance but likewise did not appear at the hearing.

A portion of the hearing was attended by State Senator Linda Winikow, State Assemblyman Robert Connor, a representative on behalf of State Assemblyman Eugene Levy, and by Isaac Goodfriend, Rockland County Legislator.

Approximately 100 persons attended the opening session of the hearing; between 10 and 80 persons attended each of the remaining hearing sessions.

During the course of the hearing on January 28, 1976, objections to the Project were subsequently withdrawn by the Village of Hillburn, New York, and by the Department of Environmental Protection, State of New Jersey; North Jersey Water Supply Commission; Township of Mahwah, New Jersey; and the Ford Motor Company (Mahwah, New Jersey, Plant). The withdrawal of the aforementioned objections was subject to stipulations entered into between the aforementioned parties and the Applicant, the pertinent terms of which are detailed in the Findings of Fact in this Report.

At the close of the hearing session on February 26, 1976, the Hearing Officer afforded all parties an opportunity to make an inspection of the Project Site. An inspection was thereafter made by the Hearing Officer accompanied by representatives of the Applicant and the Village of Suffern.

At the close of the last day of the hearing on March 2, 1976, the Hearing Officer afforded all parties an opportunity to file either a closing summation, memorandum of law or a brief following the receipt of the complete stenographic transcript of the hearing. The transcript of the last day of the hearing was received on April 2, 1976. Thereafter, a closing summation was filed by the Rockland County Conservation Association on April 19, 1976, and a Summary Brief by the Village of Suffern on May 13, 1976. The Applicant subsequently filed a Reply Brief on June 4, 1976. No other parties filed any written summations or briefs and the hearing was then closed by the Department on June 4, 1976.

SUMMARY DESCRIPTION OF THE PROJECT

The Applicant proposes to develop a major additional source of public water supply for distribution throughout its service area in Rockland County by the development of a series of 10 wells, known as its Ramapo Valley Well Field, located adjacent to the Ramapo River in the Village of Hillburn and the Town of Ramapo, Rockland County. These wells would be developed to produce a total average yield of 8 to 10 million gallons per day with a peak capacity up to 14 million gallons per day. The proposed well field is about 10,000 feet in length extending from the hamlet of Ramapo on the north to the New York State Thruway Bridge over the Ramapo River at the Village of Suffern on the south. Within this well field permanent production wells would be spaced at intervals from 850 to 1000 feet apart on a north-south axis. Water from each of the wells would be pumped into a common transmission main to a centrally located pump station. The water would then be chlorinated, chemically adjusted for pH if necessary and pumped through approximately 10,000 feet of 30 inch transmission main to the Village of Suffern where a connection would be made to the Applicant's existing system. The estimated total cost of this Project including all test wells, permanent wells, acquisition of lands and easements, construction of the central pump station and the 30 inch transmission main is 2.5 million dollars.

Witnesses appearing for the Applicant were Robert Gerber, P.E., Vice President for Development and Planning for the Applicant corporation, and Russell Slayback of the firm of Leggette, Brashears and Graham, Consulting Groundwater Geologists.

POSITION OF OBJECTORS AND PARTIES-IN-INTEREST

The objectors and parties-in-interest previously identified in the Report are concerned with a number of engineering, economic and environmental issues regarding the proposed Project.

The Villages of Suffern, Hillburn and Sloatsburg, all located in the western section of Rockland County, questioned the effect of the taking of water from the proposed wells on their existing sources of supply and the possible future need to develop additional wells for their respective residents from this same aquifer. Subsequent to the start of the hearing, the Village of Hillburn and the Applicant entered into a stipulation dated August 27, 1975, whereby Hillburn would purchase water on a wholesale basis from the Applicant to replace its existing sources of supply. This stipulation was made part of the hearing record and the Village of Hillburn then withdrew its objections.

The Village of Suffern contends that the proposed wells cannot be operated by the Applicant without adversely affecting the Village's own wells and therefore requests that the Project be denied. The Village further indicated, however, that if the Department approves the subject Project, in whole or in part, realistic conditions should be imposed to protect the Village's interests. The Applicant has no objections to the Department including several of Suffern's recommended conditions of approval as more fully outlined in the Findings of Fact of this Report. The Village of Sloatsburg did not appear at the hearing and present any testimony regarding its existing water supply system.

The Township of Mahwah, New Jersey, the North Jersey District Water Supply Commission and the State of New Jersey Department of Environmental Protection were collectively concerned at the start of the hearing with any reduction in the flows of the Ramapo River resulting from the operation of the proposed wells which could affect the water supply needs of the residents of northern New Jersey.

Subsequent to the start of the hearing, the Applicant entered into a stipulation dated September 11, 1975, with the State of New Jersey Department of Environmental Protection, whereby the Applicant agreed to certain conditions as more fully outlined in the Findings of Fact of this Report. This stipulation was made part of the hearing record and the State of New Jersey subsequently withdrew its objections. The Township of Mahwah, New Jersey, North Jersey District Water Supply Commission, and the Ford Motor Company (Mahwah, New Jersey, Plant) also agreed to the terms of this stipulation and each of these parties also withdrew its objections.

The West Branch Conservation Association and the Rockland County Conservation Association, Inc., questioned the need for the development of additional wells by the Applicant and whether the overall costs and feasibility of alternate sources of supply were adequately studied and considered by the Applicant. These groups are also concerned with the diversion of water from the Ramapo River Basin into the Applicant's distribution system, which is located primarily in the Hudson River Drainage Basin. They contend that if additional water is made available to the residents of Rockland County, a large percentage of this additional water would eventually be discharged into the Rockland County Sewer District Plant No. 1 in the Town of Orangetown, which plant presently is at its maximum capacity and has experienced operational problems.

The need for the proposed Project and the effect on the groundwater resources of Rockland County by the withdrawal of water from the Ramapo River Basin and its subsequent transfer into the Hudson River Basin were also questioned by Senator Winikow, Assemblyman Connor and Assemblyman Levy.

The Village of Suffern and the Ford Motor Company (Mahwah, New Jersey, Plant) are further concerned with the effects of any reduction in river flows which would reduce the waste assimilative capacity of the River for their respective sewage treatment and industrial waste treatment plants.

At the start of the hearing on June 19, 1975, the County of Rockland initially requested an adjournment of the hearing to the fall of 1975 in order to allow its County Legislature to carry out a study of the water needs for the residents of Rockland County and for the County to develop a water resource policy. The County, thereafter, did not authorize any studies of its own and did not actively participate in subsequent sessions of the hearing.

Witnesses appearing on behalf of the various objectors and parties-in-interest were:

Mr. Norman Lindsay, P.E., Thomas Riddick and Associates, Consulting Engineers, on behalf of the Village of Suffern

Mr. George O'Keefe, Assistant Commissioner for Environmental Health, Rockland County Health Department

Mr. Walter Fleisher, Vice President of the West Branch Conservation Association, and Mr. James Hardy, an environmental engineer with the firm of Clinton Bogart Associates, on behalf of that Association.

No other parties presented any testimony or called any witnesses on their behalf.

POSITION OF THE DEPARTMENT STAFF AND OTHER STATE AGENCIES

The Department staff appeared at the hearing neither in favor of nor opposed to the Project. The staff through cross-examination by its counsel and by a technical review of reports and other data submitted by all parties assisted in the development of a full and complete record on all pertinent environmental issues relating to the proposed Project.

The New York State Department of Health and the New York State Public Service Department had no objections to the proposed Project. The New York State Department of Health requested that the approval of any wells be subject to the Applicant providing adequate sanitary controls around each well, that the raw water quality meet New York State Drinking Water Standards or that adequate treatment be provided and that final plans and specifications be submitted for approval prior to any construction. The Rockland County Department of Health concurred in the above recommendations and, in addition, requested that the Applicant maintain adequate sanitary controls of the surface and ground waters within a 200-foot radius of each well and that the top of each well be above the level of the 100-year flood.

FINDINGS OF FACT

General Background

1. The Applicant is a waterworks corporation duly established as a New York corporation in 1893 under the provisions of the Transportation Corporation Law of the State of New York with its office at 360 West Nyack Road, West Nyack, New York. The Applicant is a fully owned subsidiary of the Hackensack Water Company, Inc., which has its office at 4100 Park Avenue, Weehawken, New Jersey. The Applicant and the Hackensack Water Company, Inc., utilize joint engineering and legal services as needed for various water supply projects including the subject Project.

2. The Applicant has applied to and received approval from the Department and its predecessors on numerous occasions, from 1905 to present, for the development of various groundwater and surface water supplies and for the extension of its water supply and distribution mains into additional service areas.

3. The Applicant provides water service throughout the vast majority of Rockland County, New York, within a service area of 121 square miles located within the Towns of Clarkstown, Ramapo, Haverstraw, Orangetown, and Stony Point, including several incorporated villages within those towns. The Applicant also supplies water under a prior approval of a predecessor of the Department to the Hackensack Water Company, Inc., for distribution by that Company to a small area

in the Borough of Montvale, Bergen County, New Jersey. The total population presently served by the Applicant is estimated at 219,000 persons which figure represents about 80 percent of the estimated present total population of Rockland County.

Existing Sources of Supply

4. The Applicant obtains its supply of water for use throughout its service area in Rockland County through two impounding reservoirs and from 55 wells located at scattered locations throughout Rockland County. The Applicant's total system consists of 11 interconnected pressure districts. The largest pressure district contains the DeForest Reservoir and encompasses the majority of the Towns of Clarkstown and Orangetown in the southern and eastern sections of the County with about one-half of the total water demands. The second largest pressure district encompasses the western section of the County which the proposed Ramapo Valley wells would serve directly.

5. The primary surface supply consists of a large impounding reservoir known as DeForest Lake Reservoir located in the Town of Clarkstown on the Hackensack River. This reservoir has a dependable safe yield of 10 million gallons per day. The Applicant also has a small impounding reservoir known as Stony Point Reservoir located in the northern section of the County which has a total safe yield of 1.5 million gallons per day. The total dependable yield from the Applicant's 55 wells is an additional 23 million gallons per day. Water from each of the Applicant's wells and from the two impounding reservoirs is pumped directly into the pressure district in which the supply is located. Water is also transferred as needed between adjoining pressure districts in accordance with standard operating procedures based on water demands and pressures within each district.

6. The total dependable yield on a sustained basis from the above-noted sources of supply is about 34.5 million gallons per day. Allowing a 5 percent reduction in the well capacity due to units temporarily out of service for repairs or other reasons, the well capacity would be reduced by about 1.2 million gallons per day for a total dependable yield on the system of 33.3 million gallons per day.

7. In addition to the sources noted above, an additional well which was previously approved by the Department with a yield of 0.5 million gallons per day is scheduled to be placed into service during 1976 on the Applicant's Grandview Avenue Well Site in the Town of Ramapo.

8. Subsequent to the close of the hearing on the subject Project, the Applicant on June 17, 1976, received Department approval under Water Supply Application No. 6503 to develop four additional rock wells located at its Long Clove Road Well Site, West Gate Boulevard Well Site and River Rise Road Well Site in the Town of Clarkstown and at its Eckerson Road Well No. 2 Site in the Town of Ramapo. Each of these wells would be developed to provide between 150-250 gallons per minute for a total yield of 1.1 million gallons per day. These wells are proposed to be placed into operation during 1977. At the request of the Applicant, the hearing on Water Supply Application No. 6503 will be reopened during the fall of 1976 to consider an additional well of 200-250 gallons per minute capacity at the intersection of Pasack and Grotke Roads in the Town of Ramapo.

9. The conditions of the approval authorizing the development of the DeForest Reservoir by the Applicant (Water Supply Application No. 2189) reserved a maximum of 10 million gallons of water per day on a year-round basis for residents in Rockland County. The present rated capacity of the Applicant's filter treatment plant at the DeForest Reservoir is 20 million gallons per day. Therefore, although the Applicant can take up to 20 million gallons per day on any given day from DeForest Reservoir to meet peak demands on its total system, the taking of water from the DeForest Reservoir over the full year must be limited to an average of 10 million gallons per day.

Present and Projected Water Supply Demands

10. A tabulation of projected population increases within Rockland County for the years 1980, 1990, and 2000 compiled by several agencies in recent years has been considered by the Applicant in the formulation of its own population projections. These agencies include the New York Office of Planning Services (1973); report by Quirk, Lawler and Matusky, Consulting Engineers (1970); the Temporary State Commission for Southeastern New York (1972); and the Rockland County Planning Board (1976). The population projections contained in each of these reports are in fairly reasonable agreement within a range of approximately ±8 percent over the median 25-year projection. The estimates range from a low of 290,000 to a high of 330,000 persons in the year 1980 and from a low of 375,000 to a high of 440,000 persons in the year 2000.

11. The Applicant's projected population figures within its service area are 252,000 persons in 1980, 315,000 in 1990, and 357,000 in the year 2000. These estimates fall somewhere in the middle range between the high and low population estimates contained in the studies indicated above. Based on the ultimate capacity of the land for development in Rockland County, taking into consideration zoning changes and land use patterns over recent years, the Applicant estimates that the ultimate population of Rockland County might possibly exceed 500,000.

12. The number of new dwelling units constructed within the Applicant's service area in the last six years has varied from a low of approximately 1100 units in 1970 to a high of 2700 units in 1973. The total number of units constructed in 1975 was 1305 units which was about 100 units higher than the figure originally projected by the Applicant. The corresponding number of new units for the previous five-year period from 1965 to 1969 varied from a high of 2800 units in 1965 to a low of 1800 units in 1969.

13. The Applicant has based its projections of the average daily and peak water usage on its system through the year 2000 on a continued yearly increase in the construction of new dwelling units, continued population increase in the County resulting from an excess of births over deaths together with some net migration into the County, a small increase in the per capita water consumption by existing consumers, and a study of the actual average and peak demands on its system over the past 10 years. The Applicant has also taken into consideration recent and projected changes in land use within Rockland County which would have an effect on population projections and corresponding water usage.

14. The Applicant's present per capita consumption is about 105 gallons per day which is lower than the corresponding per capita consumption in 60 adjoining communities in northern New Jersey.

15. The actual average and maximum daily water consumption on the Applicant's system for the years 1974 and 1975 and the projected average and maximum daily rates for the years 1976-1980, 1990 and 2000 are as follows:

Year	*Average Daily	*Maximum Daily
1974	22.51	37.91
1975	23.20	35.70
1976	24.30	41.30
1977	25.20	43.00
1978	26.10	44.70
1979	27.00	46.40
1980	28.00	48.00
1990	36.00	62.00
2000	42.00	73.00

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*Million gallons per day

16. Based on analyses of records compiled by the Applicant on its system for the past 10 years, water usage in excess of the average daily demand occurs for approximately 120 days a year generally during the period between late May and mid-September. The ratio of the maximum to average usage over the past 10 years has varied from 137 to 190 percent of the average with the mean at 165 percent. To estimate the maximum future daily demands for the years 1980, 1990 and 2000, the Applicant selected rates at 175 percent and 200 percent of the projected average demands. The maximum demand figures indicated in the above Finding of Fact for those years represent the 175 percent rate; for 200 percent the corresponding figures for 1980, 1990 and 2000 would be 54, 71 and 84 million gallons, respectively.

17. By operating its DeForest Reservoir filter treatment plant at a peak capacity of 20 million gallons per day and by operating all of its other sources of supply at peak or near peak capacity, the Applicant presently has available source capacity to meet a peak demand on any given day of about 43.8 million gallons per day.

18. As indicated in Finding of Fact No. 15 above, by 1977 the estimated peak day would be 43 million gallons per day which is only 0.8 million gallons per day less than the present maximum capacity of the Applicant's entire system. To meet estimated peak demands in 1977 and 1978 and to provide a small safety margin, the installation of the four recently approved wells identified in Finding No. 8 would be required. To meet the projected peak demands beyond ~~1980~~ 1978 would require the development of additional sources of supply. 9/19/85*

19. The Applicant, as a private water company, does not have any legal authority to enforce sprinkling restrictions or other restrictions on the use of

*see letter of 10/24/77 from R.S. Drew, appended to this decision water by its customers. Restrictions on the use of water during critical periods could be enacted, if deemed necessary, by the respective municipalities within the Applicant's service area or as an alternative by the Applicant with the approval of the New York State Public Service Commission. In order to reduce leakage in its overall system, the Applicant maintains an on-going leak detection program. The Applicant's meter readers also look for unusual consumption patterns by its customers which may be caused by leaks on the customer's property. The Company's present rate schedule as approved by the New York State Public Service Commission also includes a higher incremental second rate step (cost per gallon) for water used by each customer in excess of the first 22,500 gallons per quarter. This rate schedule was imposed to discourage the excessive use of water by residential property owners.

Project Planning and Proposed Well Field

20. The Applicant continually evaluates projected average and peak daily demands on its system to allow sufficient lead time for the investigation of additional sources of supply, the obtaining of all necessary approvals and the construction and placing into operation of such additional water supplies and other related improvements on its system prior to the time the increased demands actually occur.

21. In recent years, the Applicant has placed increased importance on developing additional groundwater resources, where such supplies are available and can be economically developed, since groundwater resources are generally more economical to develop than major impounding reservoirs. There are also few undeveloped potential reservoir sites remaining in Rockland County and surface supplies generally require greater capital investment for land and construction and greater operational expenses for treatment of the water.

22. Planning and engineering investigations for the subject Project were commenced in 1971 by the Applicant under the direction and supervision of Robert Gerber, P.E., Vice President for Development and Planning. Mr. Gerber is a registered engineer in the States of New York, New Jersey, and Mississippi and has been engaged in the field of water supply and sanitary engineering for some 27 years. Mr. Gerber has been employed with the Company since 1960 in various capacities including the positions of sanitary engineer and plant manager. In his present capacity, Mr. Gerber is in charge of water supply planning and development.

23. In addition to the studies carried out by the Applicant's own engineering staff, the Applicant engaged the firm of Leggette, Brashears and Graham, Westport, Connecticut, a consulting firm specializing in groundwater hydrology. Mr. Russell Slayback of that firm coordinated the groundwater and geologic investigations at the Project Site and supervised the carrying out of a detailed well testing program. Mr. Slayback is a 1959 graduate of Rensselaer Polytechnic Institute, Troy, New York, with a BS in Geology and has had 15 years' experience in groundwater hydrology and geology including studies relating to the development of water supplies for several water companies and municipalities in the United States and Canada. Since 1970, Mr. Slayback has been the senior hydrologist for the firm of Leggette, Brashears and Graham and is presently a partner in that firm.

24. Following a review of the pertinent literature, the logs of test borings drilled by the New York State Thruway Authority and a geophysical survey of the general area along the Ramapo River north of the Village of Suffern, a test boring program was initiated in June 1971 by the Applicant's consultants on property owned by Orange and Rockland Utilities, Inc., approximately in the center of the Project Site. Initially, test borings were driven to refusal at depths of 85 to 108 feet to establish the depth to rock and to provide preliminary data on the water-bearing characteristics of the valley fill material. The borings were then converted to observation wells.

25. The results of the test borings confirmed the presence of a highly permeable glacial outwash aquifer. A 12-inch test production well (TPW-1) was then drilled to a depth of 87 feet and pumped at rates from 600 to 2000 gallons per minute to provide a basis for evaluating the efficiency of the well.

26. The Applicant's consultants thereafter conducted a comprehensive test drilling program consisting of numerous 2½-inch test borings, 8-inch test wells and large diameter production wells throughout the Project Site. An investigation of the character and the bed of the Ramapo River was also made. Due to the size and nature of this groundwater proposal, the depth of investigations carried out by the Applicant's consultants substantially exceeded the average. A summary report of the consultant's hydrogeologic investigations was submitted to the Applicant in November 1974 with a supplemental report of additional test drilling submitted in June 1975. Following any approval of this Project, the Applicant and its consultants would carry out additional testing as may be necessary to determine the exact locations and final design of each of the permanent wells. The various observation wells located throughout the well field would also be retained.

27. The Applicant selected the development of the proposed Project in lieu of a surface reservoir in the Ramapo Valley for the general reasons cited in Finding of Fact No. 21 and in view of the favorable results obtained from the engineering and geologic investigations carried out by its consultants for the development of a major well field. The Applicant also anticipated that any major diversion of water from the Ramapo River would have probably resulted in greater objections from the State of New Jersey and its affected subdivisions.

28. The Applicant also investigated alternative sources of supply to meet future demands on its system including the development of its previously authorized Ambrey Pond Reservoir. This reservoir, which would primarily supplement the water supplies in the northern section of the County, has been delayed due to the problems in land acquisition and a redesign of the structure necessitated when a buyer could not be found for the materials to be excavated. Ambrey Pond Reservoir is presently not scheduled for construction for at least 5 to 10 years. The filter treatment and transmission facilities from the Applicant's DeForest Reservoir have also already been developed to the maximum extent possible for the dependable yield from that source of supply.

29. The proposed Project is generally consistent with the recommendations for the development of a major water supply project in the Ramapo Valley by the

Spring Valley Water Company contained in the Comprehensive Water Supply Study for Rockland County (CPWS-67), published in 1970, prepared under contract for the New York State Department of Health by the firm of Quirk, Lawler and Matusky, Consulting Engineers. The Project is also generally consistent with the recommendations made by the Temporary State Commission on the Water Supply Needs of Southeastern New York in its report entitled "Proposed Water Supply Projects for Southeastern New York," dated December 1973 with the exception that in both studies recommendations were made for the construction of a surface water diversion from the Ramapo River in conjunction with any major groundwater development. The Applicant has estimated that a surface water reservoir could cost in excess of 35 million dollars. In view of this cost and the reasons previously cited in Findings Nos. 21 and 27, the Applicant rejected any proposal involving an impounding reservoir on the Ramapo River or any diversion of water from the River to an off-stream pumped storage reservoir.

30. The filing of an application with the Department for the subject Project and the taking of all necessary steps to implement the Project was duly authorized by a resolution of the Board of Directors of the Applicant corporation on October 4, 1974. The Project will be financed directly by the Applicant.

31. The proposed Ramapo Valley Well Field is located within the Village of Hillburn and the Town of Ramapo on the east side of the New York State Thruway as shown on Appendix "A" which is attached to and made a part of this Report. The well field is approximately 10,000 feet long and from 500 to 1200 feet in width situated generally parallel to the New York State Thruway and the Ramapo River.

32. A more detailed map showing the boundaries of the well field, the location of the test wells, proposed permanent production wells, the collection main between the wells, the pump station and control building and the transmission main from the well field along Route 59 to connect with the Applicant's existing system is outlined on Appendix "B". The Applicant intends to convert the three existing test production wells (Wells 1, 2 and 3) to permanent production wells. The final location of the remaining seven wells would depend upon the results of additional test drilling.

33. As shown on Appendix "B", the Applicant would only own a portion of the land within the well field containing the pump station and control building and production Well No. 3. The remainder of the well field is owned by the Ramapo Land Company, Orange and Rockland Utilities, Inc., and the Erie-Lackawanna Railroad, respectively. The Applicant intends to obtain easements from the owners in order to have sanitary control over all land within a 200-foot radius of each permanent well.

Ramapo River Watershed

34. The Ramapo River drains a watershed area of about 95 square miles in New York State before entering the State of New Jersey at the community of Mahwah, which is located immediately south of the New York-New Jersey State Line. At the Project Site the drainage area is about 90 square miles while the area at the Mahwah gauging station on the Ramapo River is about 118 square miles. The headwaters of the River are in a broad valley underlain by carbonate rock near the community of

Harriman in Orange County. From Harriman through the Ramapo project area to Suffern, the River flows in a southerly direction through a steep narrow valley incised in hard granite and granite gneiss. In the Suffern-Mahwah area, the valley widens at the juncture of the Mahwah River (a major tributary draining an area to the northeast of the Village of Suffern). The elevation of the valley floor drops from about 520 feet above sea level at Harriman to about 270 feet at the New Jersey line at Mahwah for an average gradient of about 18 feet per mile.

35. The River valley in the area of the proposed Project Site is partially filled with unconsolidated glacial deposits and relatively small amounts of recent alluvium. The glacial deposits consist of stratified glacial drift deposited by melt water during the last retreat of the glacial ice, thought to have occurred about 18,000 years ago. The valley fill is a heterogeneous mixture of layered sand, gravel and cobbles with lenticular interbeds of clay, silt and fine sand. These glacial deposits are generally highly permeable and are known to reach thicknesses of 150 feet or more in the Suffern area. The stratified glacial drift, also known as outwash, is the principal aquifer in the Ramapo Valley.

36. The average annual precipitation in the drainage basin is 45.6 inches measured at Suffern. Since the crystalline bedrock is very impervious and is either exposed at the surface or only thinly mantled with glacial till along the steep valley slopes, the percentage of the precipitation discharged as surface runoff to the Ramapo River is high. The average runoff is 1.25 mgd (million gallons per day) per square mile, or about 59 percent of the annual precipitation. The average river discharge at the Mahwah, New Jersey, gauging station is 146 mgd but periodic low flows reach less than 10 percent of the average flow. For example, the minimum seven day consecutive low flow, which would statistically occur once in every 10 years (MA7CD/10) for the Ramapo River measured at the Mahwah, New Jersey, gauge is 8.0 million gallons per day (mgd). Based on a comparison of the area of the drainage basis at the Mahwah gauge and the corresponding area of the drainage basin at the Project Site, a flow of 8.0 mgd at the Mahwah gauge would be approximately 6.25 mgd at the Project Site. The lowest flow during a 54 year recorded period at the Mahwah gauge is 4 million gallons per day.

37. At the confluence of Torne Brook with the Ramapo River in the northern portion of the Project Site, the Ramapo River has an average flow of 111 million gallons per day and a median flow (a flow which would be exceeded 50 percent of the time) of 62 million gallons per day. At this same location a low flow of 10 million gallons per day or less would be statistically expected to occur only about 5 percent of the time.

38. The Ramapo River in the area of the Project Site has for the most part a moderate gradient over a hard bottom with several alternating pools and riffles with some large boulders which are exposed during periods of low flow. The River also contains one long pool with a silty bottom created by the low dam of Orange and Rockland Utilities, Inc., located in the center of the Project Site as shown on Appendix "B". Upstream and downstream of this pool the banks of the River are 4 to 5 feet above the normal water surface and are relatively steep. The top of the banks is tree lined for the most part with flat open areas extending back from the trees.

39. During normal and high flow periods, the River throughout the Project Site averages around 80 feet in width with an average depth of about 3 feet and a total bottom area of about 18 acres. During low flows between 8 and 10 million gallons per day, the River narrows between the exposed rocks to some 5 to 10 feet in width with an average depth of 6 inches or less except in a few deeper pools. The corresponding wetted bottom area at this flow would be 4 to 5 acres.

40. Using all available data on the thickness and extent of the aquifer and applying a water storage factor of 30 percent, the Applicant's consultants have estimated the total volume of water storage in the aquifer formation at 2 billion gallons, of which amount as much as 70 percent might be available to the subject wells.

41. The diversion of water from storage in the aquifer through the pumping of wells in the subject well field would be ultimately replenished in large measure by infiltration from the Ramapo River although the quantity of water pumped at any given time would not result in a simultaneous equal amount of infiltration since the water diverted would be derived in part from aquifer storage and partly from sources other than river infiltration. Furthermore, the amount of water induced to infiltrate from the River to the aquifer at any given time would be dependent on several factors, not related to the pumping rate, such as the vertical and horizontal permeability of the aquifer deposits underlying the River, the depth, quantity and velocity of flow in the River and the temperature of the river water.

42. As the flow in the River decreases, the infiltration rate of water from the River into the groundwater aquifer will likewise decrease due to the reduced width of the River and the reduced depth (head) of the water in the River. Various infiltration rates (expressed in terms of gallons per day per surface area of river bottom per foot of effective head difference) were discussed at the hearing by the various technical witnesses to estimate the loss of water (recharge) from the River into the aquifer during low flow conditions on the River of 8 million gallons per day or less at the Project Site. If a new gauging station were located on the River downstream of the Project Site in the general vicinity of the Thruway bridge, however, practically all of the infiltration during periods of low flow from the River into the aquifer would occur upstream of this gauging station and would be reflected in the gauge readings. Based on the rate of infiltration expected for this aquifer, it would be highly unlikely that the River would ever entirely dry up or drop a significant amount below 8 mgd if the Applicant reduced its pumping from the subject wells when the flow in the River was 10 mgd and ceased all pumping when the flow in the River was 8 mgd respectively as recorded at the downstream gauge.

43. The Ramapo River from the New Jersey-New York State Line upstream to a point 1.5 miles southeast of the Village of Sloatsburg is classified as Class A with a Standard of A which indicates a best usage of water for "water supply for drinking, culinary or food processing purposes and any other usage." The River from that point upstream to Tributary 23, about 1.5 miles south of Harriman, is classified as Class A with a Standard of A(T) which indicates that the waters have a further best usage as a trout fishery resource.

44. The Ramapo River is suitable for boating and canoeing generally during the spring and early summer from the Orange and Rockland dam in the middle of the Project Site to the New York-New Jersey State Line. This section of the River may also be used by childred for limited swimming in some of the deeper pools. Upstream from the Project Site, sections of the River are used for trout fishing while the section within the Project Site contains certain warm water species including panfish and a few small-mouth bass.

Stipulation with the Village of Hillburn

45. The Village of Hillburn is located immediately northwest of the Village of Suffern on the west side of the New York State Thruway. The Village has a population of about 1300 persons with 256 metered water services.

46. The Village presently obtains its water supply from a surface reservoir located west of the Village and from wells located within the Village. These sources of supply are barely adequate to meet the Village's present and future water supply demands and for the last few years the Village has been actively investigating the development of additional sources of supply.

47. The Village of Hillburn and the Applicant entered into a stipulation dated August 27, 1975, whereby the Village would purchase a wholesale supply of water from the Applicant through a metered connection on Fourth Street near the Erie Railroad right-of-way on the east side of the Ramapo River. This new supply of water is intended to replace the Village's existing supplies. Under this stipulation the Village would also continue to provide retail water service.

48. The agreement between the Applicant and the Village is for a period of 30 years subject to several conditions including but not limited to the minimum and maximum quantities of water to be furnished, the price of the water and the water pressures to be provided. The agreement is further contingent upon the Department approving the subject Project.

Stipulation with the State of New Jersey

49. During the hearing session on January 28, 1976, a stipulation dated September 11, 1975, was jointly presented by the Applicant and the Division of Water Resources, Department of Environmental Protection, State of New Jersey, and made part of the hearing record. The North Jersey District Water Supply Commission, the Township of Mahwah, New Jersey, and the Ford Motor Company (Mahwah, New Jersey, plant) likewise joined in this stipulation. The pertinent conditions of this stipulation are summarized as follows:

A. In the event the Department determines that all or part of the conditions specified below are unacceptable in granting any approval of this Project, each of the aforementioned parties reserve the right to reinstate its objections without prejudice.

B. The Applicant shall install water monitoring and measuring devices on the Ramapo River upstream and downstream of the subject Project Site.

C. Said monitoring and measuring devices shall remain in continuous operation for the duration of the agreement between the Applicant and the parties unless otherwise agreed upon in writing by the parties.

D. The Applicant shall make available to the parties monthly summaries of river flow and pumpage from the subject wells unless otherwise agreed upon in writing by the parties.

E. The Applicant shall also make available to the parties hydrogeological data relating to the operation on the subject well field.

F. A computer model of the aquifer at the subject Project Site shall be developed by the Applicant within two years following any approval of this Project by the Department.

G. Whenever the flow of the Ramapo River measured at a gauging station referenced to in paragraph "I" below is between 8 and 10 million gallons per day and the parties have determined that as the result of the Applicant's pumping an infringement exists as to the existing diversion rights to the waters of the Ramapo River by the State of New Jersey, the Applicant shall reduce its rate of pumping by a quantity equal to the infringement up to a maximum reduction of 2 million gallons per day.

H. In the event the procedures in paragraph "G" above fail to cure the infringement on the existing rights of diverters in the State of New Jersey, the Applicant agrees to submit the issue of infringement to arbitration.

I. Notwithstanding paragraphs "G" and "H" above, the Applicant will cease all pumping from the subject wells if the flow of the Ramapo River as measured at a gauging station to be installed between the Village of Suffern and New York State Thruway crossing of the Ramapo River is at or below 8 million gallons per day.

J. The conditions of this stipulation do not apply to any possible future requests for additional water from this well field by the Applicant beyond the pumping limits requested herein.

Village of Suffern Water Supply and Sewage Treatment Facilities

50. The Village of Suffern maintains its own Village owned and operated water system with its sources of supply located in a well field adjacent to the east bank of the Ramapo River within the Village about 2000 feet south (downstream) of the southern boundary of proposed Ramapo Valley well field of the Applicant. In 1975 the Village had a population of 10,000 persons. Future growth within the Village is expected to be gradual, increasing to 15,500 in the year 2000.

51. The Village's system consists of three wells which pump directly through a central pump station and treatment building into a transmission main and then into the distribution system. The system also contains two service (pressure) storage reservoirs and a separate booster pumping station which pumps water into a high service (pressure) district located in the eastern section of the Village and to a high pressure storage tank. Treatment facilities consist of chlorination and a recently completed treatment plant for the removal of manganese from Wells Nos. 1 and 3.

52. The capacity of the Village's wells is as follows:

Well No.	Year Installed	Capacity (GPM)	Drawdown (Feet)
1	1936	600	9
2	1937	900	12
3	1973	1500	10

The combined yield of the three wells is 3000 gallons per minute or 4.28 million gallons per day (MGD). With the largest well out of service, the combined capacity would be reduced to 1500 gpm or 2.14 mgd. The Village also maintains an interconnection for emergency purposes with the adjacent facilities of the Appliant.

53. The average daily demand on the Village's system in 1975 was 1.85 mgd and the maximum demand (based on 150 percent of the average) was 2.77 mgd. Estimates for the year 2000 for the average and maximum demands are 2.37 mgd and 3.55 mgd, respectively.

54. Since 1968 the Village has engaged the consulting engineering firm of Thomas M. Riddick and Associates, New York City, for all matters involving its water supply and sewage treatment systems. Norman Lindsay, P.E., has been associated with this firm for the past 30 years and is now its president. Mr. Lindsay reviewed the Applicant's proposed Project and evaluated its potential effects on the water supply and sewage treatment facilities of the Village of Suffern.

55. In order to meet peak demands on its system in the future with the possibility of one of its existing wells out of service, the Village applied to the Department in 1974 for the development of its Well No. 4 with a yield of 1400 gallons per minute (2 mgd). This well is intended to be used primarily for standby purposes and as needed to meet peak demands on its overall system. This well was approved by the Department on October 8, 1974, under Water Supply Application No. 6437 and is scheduled to be placed into operation in 1977.

56. The nearest proposed wells of the Applicant in this Project (Well No. 2 and Well No. 10) would be located 2200 feet and 3100 feet, respectively, to the north of nearest well (Well No. 1) of the Village of Suffern. The Village's new Well No. 4 would be located in this same general area about 150 feet north of Well No. 1. The Village's Well No. 3, which has the greatest capacity, is located about 2800 feet from the closest of the Applicant's proposed wells. In general, the aquifer formation within the Suffern well field is thicker, wider and more transmissive with better river infiltration conditions than at the proposed Project Site of the Applicant. Suffern's wells are also spaced closer together than the Applicant's proposed wells and the well screens are set at a somewhat higher level (elevation).

57. The Village of Suffern's existing sewage treatment plant is located about 600 feet south of its water treatment and operations center. This plant is a two-stage high rate trickling filter facility with separate anaerobic sludge digestion providing secondary treatment with a capacity of 1.5 mgd.

58. The minimum average seven day consecutive low flow with a return occurrence of 10 years (MA7CD/10) of the Ramapo River at Suffern is about 6.7 mgd. The Ramapo River at this point has been determined by the Department as a water quality limiting stream with respect to the discharge of treated sewage from the Suffern treatment plant. The waste assimilative capacity of the Ramapo River at this flow rate, which was used to calculate the effluent limitations in Suffern's present permit, is in the range of 760-940 pounds of total oxygen per day. The effluent presently being discharged from this plant exceeds this limit and the Village is under a directive of the Department to upgrade its existing facilities. The Village in 1975 prepared a "Plan of Study" to upgrade its sewage treatment facilities to provide a higher degree of treatment and to allow for an expansion of the capacity of the plant. This proposal of the Village is presently under review by the Department and the United States Environmental Protection Agency.

Position of the Village of Suffern

59. The Village of Suffern requested in its Summary Brief filed on May 13, 1976, that in the event the Department approves the subject Project, in whole or in part, the following conditions, which are summarized, be imposed.

A. Such monitoring and measuring devices necessary to determine the impact of the proposed Project on the water resources of the Ramapo Valley be installed and maintained by the Applicant. Details of the proposed monitoring installation should be subject to approval by the Village of Suffern.

B. If alterations to any of Suffern's water supply facilities become necessary, such alteration shall be carried out in a manner satisfactory to the Village of Suffern, and shall result in conditions at least equal to present conditions. Such alteration shall be performed at no cost to the Village even if it is necessary to provide a betterment in order to equal existing conditions. If no agreement can be reached between the Village and the Applicant with respect to the implementation of either of the above conditions, the matter shall be subject to arbitration.

C. If at any time the actions of the Applicant incapacitate part or all of the Suffern water supply, if requested, the Applicant shall furnish water to the Village at a cost no greater than the cost to Suffern for producing its own water until the condition is corrected.

D. The Applicant shall maintain the minimum average 7 day consecutive low flow recurring once every 10 years (MA7CD/10) at the existing Mahwah gauge by supplementing the minimum flows as required.

E. The Applicant shall cease all pumping if the groundwater table in the Suffern well field drops below elevation 258 with no pump operating.

60. The Applicant, in its Reply Brief filed on June 4, 1976, responded to the conditions of approval requested by the Village of Suffern as follows:

A. The Applicant has no objection to the Village of Suffern offering recommendations concerning the details of the proposed river gauging station or other monitoring facilities which the Department may require, provided they are not in conflict with the recommendations and requirements necessary to fulfill the terms of its stipulations with other parties.

B. The Applicant agrees to pay for modifications, repairs or alterations to Suffern's facilities deemed to have been damaged as a result of its operations in the proposed Ramapo Valley well field. The Applicant further does not object to a determination by a third party in the event the principal parties are not in accord although it believes that measuring the extend of damage might better be reached through further negotiations with the Village of Suffern.

C. In the event the Applicant, through its operations of the subject Ramapo Valley well field, should somehow cause damage to Suffern which would not permit it to use its facilities to satisfy the needs of its consumers, the Applicant would furnish as much water as is necessary to Suffern at a cost equal to Suffern's production costs for such time as the interference by Spring Valley shall persist or until Suffern's damage is remedied.

D. The Applicant contends that it should not be obligated to maintain the minimum average 7 day consecutive low flow recurring every 10 years (MA7CD/10) throuth supplementation of the river flow above Suffern and that the stipulations designed to satisfy the minimum flow requirements of other users amply demonstrate the reasonableness of the Applicant's voluntary action with regard to river flows.

E. Since the Applicant has indicated in Item B above its willingness to correct through whatever means may be necessary any damage to Suffern's wells, there is no reason for Suffern to discontinue pumping when the groundwater table in the Suffern well field drops below elevation 258.

Existing Water Supplies—Other Communities in the Ramapo River Basin

61. The Village of Sloatsburg, located about 2 miles north of the Project Site, is supplied by the Pothat Water Company, which takes its supply of water from Pothat Lake. As indicated in the Comprehensive Water Supply Study for Rockland County (CPWS-67), previously cited in this Report, the sources of supply of the Pothat Water Company are adequate to supply the Village through the year 2020.

62. Sterling Forest Corporation owns large tracts of presently undeveloped wooded mountain terrain comprising a large portion of the upstream portions of the Ramapo River Basin located in the Town of Tuxedo generally west and north of the Village of Tuxedo Park in Orange County. Overall, the Corporation's total land holdings are in excess of 20,000 acres. Of this total, some 2000 acres have been developed for housing units, research and educational facilities for several major corporations, and for various recreational facilities including a small ski area and a major scenic attraction known as Sterling Forest Gardens. The Corporation presently has an existing water supply system containing both surface reservoirs and a number of wells. It appears that the Sterling Forest Corporation is planning a large residential complex to consist of 3900 units known as Sterling One. This project as proposed would be developed over the next 10 to 12 years on 1300 acres located along both sides of Route 210 several miles west of the Ramapo River and at considerably higher elevations. No testimony was presented at the hearing to indicate whether that project as presently proposed would be approved by the local authorities and if approved, when it would be actually developed. Furthermore, no testimony was presented to indicate whether Sterling Forest would need to develop additional sources of public water supply for this proposed project, and, if such additional supplies were needed, whether any development of wells in the vicinity of the Ramapo River would be considered.

63. Downstream from the Village of Suffern, the Borough of Mahwah, New Jersey, takes its supply of water from wells located near the Ramapo River. The Borough of Oakland, New Jersey, located several miles south of Mahwah likewise takes its supply of water from wells and the North Jersey District Water Supply Commission pumps water from the Ramapo River further downstream at the community of Pompton Lakes into its Wanaque Reservoir.

Miscellaneous

64. A single crossing of the Ramapo River in the vicinity of the Route 59 bridge would be required for the pipeline connecting the various wells within the well field. This crossing would be on lands owned by the Ramapo Land Company from which the Applicant would obtain an easement and on lands already purchased by the Applicant.

65. The crossing would involve the construction of a narrow trench approximately 80 feet long across the River. The pipe would then be laid in the trench, the trench backfilled, and the disturbed banks of the River riprapped with large boulders.

66. The Applicant's total assets as of December 31, 1975, were in excess of 61 million dollars. In the event any legal damages should result from the carrying out of this Project, the Applicant would be capable of paying any damages to which it might be adjudged liable.

67. The chemical and bacteriological quality of the water from the subject wells meets New York State drinking water standards and, as a further safeguard against any contamination within the distribution system, all water from these wells will be chlorinated prior to distribution. Chemical adjustment for pH would be applied in the central pump station if necessary. The elevation of the top of the well casing of each permanent well would be higher than the 100-year flood level of the Ramapo River. The Applicant would also own the land immediately surrounding each well or obtain a protective easement where ownership is not possible in order to provide adequate protection of the wells from the discharge of any surface contaminants.

68. In addition to the approval of these wells by the Department, the final plans must also be approved by the Rockland County Health Department. In order to construct the central pump station, the Applicant must obtain a Building Permit from the appropriate local municipality.

CONCLUSIONS AND RECOMMENDATIONS

1. The standards upon which a determination must be made by the Department for any project involving the taking of a source of water supply and for the distribution of that supply to the public are contained in Article 15, Title 15, of the Environmental Conservation Law. Sections 1-0101 and 3-0301 of the Environmental Conservation Law also state with particularity the policies and factors which guide the Department in reaching a decision on projects which may have a substantial impact on the environment. These include:

A. "...the policy of the State of New York to conserve, improve and protect its natural resources and environment and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well being." Section 1-0101(1)

B. "...the policy of the state...to develop and manage the basic resources of water, land, and air to the end that the state may fulfill its responsibility as trustee of the environment for the present and future generations." Section 1-0101(2)

C. "...the policy of the state to foster, promote, create and maintain conditions under which man and nature can thrive in harmony with each other, and achieve social, economic and technological progress for present and future generations..." Section 1-0101(3). In particular, see Section 1-0101(3)(b) and (c).

D. "...the responsibility of the department, in accordance with such existing provisions and limitations as may be elsewhere set forth in law, by and through the commissioner to carry out the environmental policy of the state set forth in Section 1-0101 of this chapter..." Section 3-0301(1). In particular, see Section 3-0301(1)(b), (c), and (t).

2. In addition, Sections 15-0103 and 15-0105 provide additional findings and policies which the Commissioner must consider in administering Article 15 including determinations on public water supply systems. See especially Section 15-0103(2), (3), (8), (11) and (13) and Section 15-0105(1), (2), (3), (4), (5), (6), and (7).

3. The standards upon which a determination must be made by the Department for any project involving the taking of a source of water supply and for the distribution of that supply to the public under Section 15-1503 of the Environmental Conservation Law are contained in sub-Section 15-1503(4) of that Law. This sub-Section reads as follows:

> "15-1503(4). The department, after hearing, shall determine whether the plans proposed are justified by public necessity, whether they take proper consideration of other sources of supply which are or may become available, whether they provide for the proper and safe construction of all work connected therewith, whether they provide for the proper protection of the supply and the watershed from contamination or provide for the proper treatment of such additional supply, whether they provide for an adequate supply; whether such plans are just and equitable to the other municipalities affected thereby and to the inhabitants thereof, particular consideration being given to their present and future necessities for sources of water supply, and whether the plans make fair and equitable provisions for the determination and payment of any and all legal damages to persons and property both direct and indirect which will result from the execution of the plans or the acquiring of such lands. If the application is for approval of a multi-purpose project, in whole or in part authorized by a general plan adopted and approved pursuant to Title 11 of this article, the department, in addition, shall determine if the plans as submitted are in conformity with such general plan."

4. The standards upon which a determination must be made for any project involving the disturbance of a stream bed classified C(T) or higher under Section 15-0501 of the Environmental Conservation Law are contained in Section 608.6 entitled "Standards" of the Official Compilation of Codes, Rules and Regulations of the State of New York (6NYCRR - Conservation). This Section reads as follows:

> "608.6 Standards. (a) The basis for the issuance of a permit shall be a determination that the proposal is in the public interest in that:
>
> (1) The proposal is reasonable and necessary.

(2) The proposal will not endanger the health, safety and welfare of the people of the State of New York.

(3) The proposal will not cause unreasonable, uncontrolled or unnecessary damage to the natural resources of the State, including soil, forests, water, fish and aquatic and land related environment.

"(b) Where disturbance of stream bed is involved—the proposal will not cause unreasonable, uncontrolled or unnecessary:

(1) Erosion of soil from banks or uplands.
(2) Increased costs of water treatment.
(3) Loss of crop land and forest flooding.
(4) Destruction and failure of natural propagation of fish and aquatic resources.
(5) Loss of water for beneficial uses and purposes.
(6) Pollution of affected waters.
(7) Increases in turbidity.
(8) Deposition of silt and debris.
(9) Irregular variations in water velocity.
(10) Irregular variations in temperature of waters.
(11) Irregular variations in level of waters."

5. The decision by the Department on the subject proceedings is limited to a determination of whether or not the proposed project meets the criteria cited in Conclusions Nos. 1, 2, 3 and 4.

6. The decision by the Department on this Project should not be construed as a precedent regarding future decisions to be made on any subsequent applications that may be filed by the Spring Valley Water Company, Inc., or by any other waterworks corporation, municipality, or other party for the development of either ground or surface waters within the Ramapo River Basin for public water supply purposes.

7. Assuming that all well supplies are operating at maximum or near maximum capacity and the DeForest Filter Plant is operating at 20 million gallons per day, which is twice the average daily yield of the reservoir allocated to Rockland County residents, the Applicant's present sources of supply are just adequate to meet the peak demands on its overall system through 1977. The construction of the wells recently approved under Water Supply Application No. 6503, together with the Applicant's present sources of supply, should be sufficient, however, to meet peak demands on the Applicant's overall system for the next two to three years.

8. The Applicant has an obligation to provide water under all conditions and at all times of the year to meet average and peak demands on its system as these demands arise and to plan ahead to have the necessary sources of supply, transmission, distribution and storage facilities constructed prior to the time such facilities are needed. The Applicant carried out lengthy site investigations, well testing and other planning activities for the development of the subject wells commencing in 1971. The Applicant thereafter applied to the Department under the subject application in December 1974 to allow sufficient lead time to obtain all

necessary approvals and to install the subject wells in advance of the projected increased peak and average demands on its system commencing in 1979 or 1980.

9. The present and future water supply needs of the residents of the Ramapo River Basin both upstream and downstream from the Project Site in New York State and within the State of New Jersey downstream from the Project Site and the potential to meet these needs by the reasonable acquisition and use of the surface and groundwater resources within the Ramapo River Basin must be considered by the Department in reviewing the subject proposal by the Applicant. The Department must also take into consideration the uses of the Ramapo River for recreational purposes and the maintaining of sufficient flows for aquatic life and for the assimilation of treated sewage and industrial waste discharges downstream of the Project Site.

10. The hydrogeologic investigations including the development of test and observation wells carried out by the Applicant and its consultants have been sufficiently detailed to indicate the presence of an excellent aquifer formation in the Ramapo Valley adjacent to the Ramapo River extending a considerable distance upstream from the Village of Suffern. These tests further indicate that the quality and quantity of water in this aquifer is sufficient to permit the development of a series of large capacity wells for public water supply purposes.

11. The development at this time of a major well field adjacent to Ramapo River at the western edge of the Applicant's service area is a feasible source of water supply, from an engineering, geologic and economic standpoint, to meet the projected increased average and peak demands on the Applicant's total system.

12. The investigations carried out by the Applicant identified in Conclusion No. 10 indicated that the Ramapo Valley aquifer is relatively complex and that extrapolation of limited well pumping tests to determine the total aquifer response cannot be solely relied upon. Further well testing together with continuous monitoring of the Ramapo River and controls on the quality of water to be pumped should therefore be required by the Department in any approval of the subject Project in order to protect the water supply rights of the residents within the areas specified in Conclusion No. 9 and to insure that adequate flows are maintained in the Ramapo River for other purposes.

13. The development of additional wells in the Ramapo Valley would also be a logical source of public water supply to meet the needs of the residents of the Villages of Hillburn, Suffern and Sloatsburg. The wells proposed by the Applicant would have ample surplus capacity to supply water on a wholesale basis to the Village of Hillburn as is presently proposed as the result of the stipulated agreement between the Applicant and Hillburn. These wells would also have an ample surplus capacity to supply water to the Village of Suffern if such water is needed due to any temporary loss of capacity in the Suffern well field or on a permanent basis if at some time in the future it is advantageous for the Village of Suffern to purchase all or part of its water from the Applicant. There was no testimony presented at the hearing to indicate that there would be any need for the Village of Sloatsburg or the Pothat Water Company to develop additional sources of either ground or surface water in the Ramapo Valley in the foreseeable future.

14. Although the Village of Hillburn would be acquiring a new wholesale source of public water supply from the Applicant to replace its existing sources of supply under the terms of the aforementioned stipulated agreement with the Applicant, the Village would continue to provide retail water service within the Village. A separate water supply application will therefore be required by the Department from the Village prior to the time the Village plans to purchase such a wholesale supply of water from the Applicant.

15. The development of the subject wells by the Applicant is not expected to have a significant adverse effect on the water supply facilities of the Village of Suffern although some lowering of the water levels within the Suffern well field might be expected. Any adverse effects which might occur within the Suffern well field most probably could be corrected at the Applicant's expense by lowering the pumps in Suffern's wells, by a reduction in the pumping rate of the Applicant's wells during periods of low flows in the Ramapo River, or by other operational controls as may be specified in the conditions made a part of any approval of this Project. Furthermore, an approval of this Project in whole or in part does not preclude any other municipality, private water company or other party either upstream or downstream from the Project Site from applying to the Department in the future for the development of either surface or groundwater supplies in the Ramapo River Valley.

16. The development of the subject wells by the Applicant is not expected to have an adverse effect on the few private well supplies serving individual houses in the hamlet of Ramapo located immediately upstream from the Project Site. If damages should occur to any private wells, the Applicant is prepared to make arrangements to insure that no person is without water and/or to satisfy any claims for financial damages.

17. The single pipeline crossing of the Ramapo River within the Project Site would involve only a temporary disturbance of a short section of the bed and banks of the Ramapo River in the vicinity of the Route 59 bridge. The effects of this disturbance would be further minimized by the methods of construction to be employed by the Applicant. This pipeline crossing is reasonable and necessary as part of the overall Project and the proposed method of construction would not endanger the health, safety and welfare of the people of the State or cause any unreasonable, uncontrolled or unnecessary damage to the natural resources of the State.

18. No testimony was presented to indicate that the carrying out of this Project would cause any adverse effects on the water quality in the Ramapo River or unduly reduce the normal flows in the River thereby reducing the recreational potential of the River or the use of the waters of the River for waste assimilation by the Village of Suffern and/or other downstream parties. The period of greatest demands on the Applicant's system and the corresponding period when the wells would have the maximum use would generally occur in the months of late May-early September while the lowest flows in the Ramapo River generally occur during the month of September with some low flows occurring in August and October.

19. No testimony was presented to indicate that there is any correlation between present operational problems at the Rockland County Sewer District Plant No. 1 in the Town of Orangetown, which are presently under investigation and review by the Department, and the development of additional sources of public water supply by the Applicant. The time required by the Applicant to construct the necessary transmission main and to fully develop the permanent wells proposed under this Project would be a minimum of 2-3 years and more likely 4-5 years which should provide time for the present problems at the aforementioned sewage treatment plant to be resolved.

20. The Project, as modified with the recommended conditions of approval herein, is justified by public necessity and meets each of the statutory determinations listed in Conclusion No. 3.

21. In view of the above Findings of Fact and Conclusions, it is hereby recommended that the subject Project be approved as modified by the following conditions:

A. The Applicant is authorized to acquire as additional sources of public water supply for its overall system a total of up to 10 wells with an installed pumping capacity not to exceed 14 million gallons per day on lands presently acquired and/or to be acquired by the Applicant or to be in some other way controlled by the Applicant known as its "Ramapo Valley Well Field" located in the Village of Hillburn and the Town of Ramapo, Rockland County, as shown on the maps and plans filed with the application.

B. The Applicant in its development and subsequent operation of this Project shall be bound by the terms of its stipulation with the Village of Hillburn dated August 27, 1975, and the terms of its stipulation with the Department of Environmental Protection, State of New Jersey, dated September 11, 1975, which stipulation was likewise agreed to by the North Jersey Water Supply Commission, the Township of Mahwah, New Jersey, and the Ford Motor Company (Mahwah, New Jersey, plant). The terms of the aforementioned stipulations shall remain in effect unless modified by the respective parties and thereafter submitted to the Department for approval.

C. In addition to the monitoring and measuring devices to be installed on the Ramapo River upstream and downstream of the Project Site and the computer model of the aquifer to be developed in conjunction with the installation of the permanent wells, all in compliance with the stipulation entered into between the Applicant and the State of New Jersey, the Applicant shall install an observation well downstream of the Project Site in the vicinity of the New York State Thruway bridge. The exact location and the records to be kept for this well shall be determined by the Applicant after consulting with the Village of Suffern provided, however, that any agreement with the Village of Suffern shall not conflict with the terms of the aforementioned stipulation with the State of New Jersey.

D. The total volume of water pumped from any combination of the 10 Ramapo Valley wells shall not exceed 14 million gallons per day on any given day and the total amount of water pumped in any calendar month shall not exceed the figure obtained by multiplying the number of days in that month by an average pumping rate of 10 million gallons per day.

E. The Applicant shall maintain daily pumping records for the total amount of water pumped from each well and shall also maintain flow records for the Ramapo River at the gauging stations to be established upstream and downstream of the Project Site respectively, as more fully outlined in the aforementioned stipulation with the State of New Jersey. As an alternative, the Applicant may contract with the United States Geological Survey for the installation and/or maintenance of these gauging stations. In addition to making these records available to the parties to the aforementioned stipulations, the Applicant shall also make such records available upon request to the Department and/or to any appropriate unit of government having an interest in reviewing such records. The Applicant shall furthermore make such records available upon request at its office for review and inspection by the general public and upon request shall provide copies to any person upon the payment of a fee for any required reproduction of such records.

F. The Applicant must retain ownership of all land which has been acquired at the subject Project Site. In addition, all land which is not already owned by the Applicant or proposed to be acquired located within a 200-foot radius of each well shall be protected through the use of easements or other appropriate measures to prevent any pollution of the ground or groundwater within that distance.

G. The area around each well shall be graded to direct surface drainage away from the well. The top of each well shall also be at a higher elevation than the 100-year flood level. The central pump station and control building shall be locked at all times and be constructed in such a manner to adequately protect all equipment from damage by vandals or other unauthorized persons.

H. Nothing contained in this decision and approval shall be held to authorize the Applicant to supply, sell or distribute water from any of the subject wells for any purpose unless all such water shall first have been treated by disinfection in a manner satisfactory to the Department and to the New York State Department of Health.

I. The Department, upon consultation with the New York State Department of Health, reserves the right to require the taking of further sanitary precautions of the further treatment or purification of the water from any one or all of the subject wells should conditions in the future indicate a need for such action.

J. Prior to starting work on any construction authorized herein, including the permanent wells, central pump station, stream gauging stations, the transmission main, and the transmission main crossing of the Ramapo River, detailed plans of such facilities shall have been submitted to and approved by the Department. Thereafter, such construction work shall be entirely completed in full accordance with the plans which have been so submitted and approved. Following the approval of these plans, a separate stream protection permit shall be issued by the Department for the stream gauging stations and for the transmission main crossing of the Ramapo River.

K. In the event the continuity of any private well supply is endangered as a result of the operation of the subject wells, the Applicant shall take appropriate measures as necessary to insure that no private well owner is without water and/or take other appropriate measures to resolve any claim for damates.

L. The Applicant shall make any necessary modifications, such as the lowering of pumps, repairs or other alterations to the water supply facilities of the Village of Suffern deemed to have been damaged as a result of the construction or operation of the subject wells. Such alterations shall be carried out in a manner satisfactory to and at no cost to the Village of Suffern and shall result in conditions at least equal to existing conditions even if it is necessary to provide a betterment of the Suffern system in order to equal existing conditions.

M. Notwithstanding the terms of Condition "L", if at any time the actions of the Applicant have caused damage to Suffern's wells which would prevent Suffern from utilizing its facilities to meet the needs of its customers, at the option of the Village of Suffern the Applicant shall furnish water to Suffern at a cost not greater than the cost to Suffern for producing its own water for such time periods as the interference of Suffern's wells by the Applicant's operations shall persist or until some other action is taken by the Applicant to correct the damage to Suffern's wells.

N. The Department reserves the right to rescind or to modify the approval being given under this decision or to take whatever action it may deem suitable and proper to be just and equitable to the parties to this proceeding and in the public interest if one or more of the permanent wells are not constructed and the system placed into initial operation by December 31, 1981. The Applicant may, at its option and upon notice to the Department, install the 10 permanent wells over a number of years provided that all wells shall be installed no later than December 31, 1984.

O. Notwithstanding the terms of Condition "N", the Department further reserves the right at any time upon a written request from any party to this proceeding or upon its own motion and after due notice to all parties to reopen the hearing on the subject Project if documentation is submitted including but not limited to the following points: 1) the carrying out of this Project has caused or would tend to cause a significant change in the water quality of the Ramapo River and/or a significant reduction in the waste assimilative capacity of the Ramapo River required for the discharge of treated sewage or industrial wastes for any downstream discharger; 2) the carrying out of this Project has caused or would tend to cause a significant change in the quality or a significant change in the water levels of the wells used as sources of public water supply by the Village of Suffern; 3) data collected by the Applicant as a result of its ongoing monitoring program and its computer model analysis indicates the operating conditions of approval should be modified in order to insure the viability of this aquifer on a long-term basis; and 4) the affected parties have previously discussed the issues outlined in Items 1, 2 and 3 above and a mutually agreed solution could not be obtained.

Following any reopening of the hearing, the Department may reaffirm, rescind or modify any of the conditions of this decision in any manner as may be found to be just and equitable to the parties to this proceeding and in the public interest.

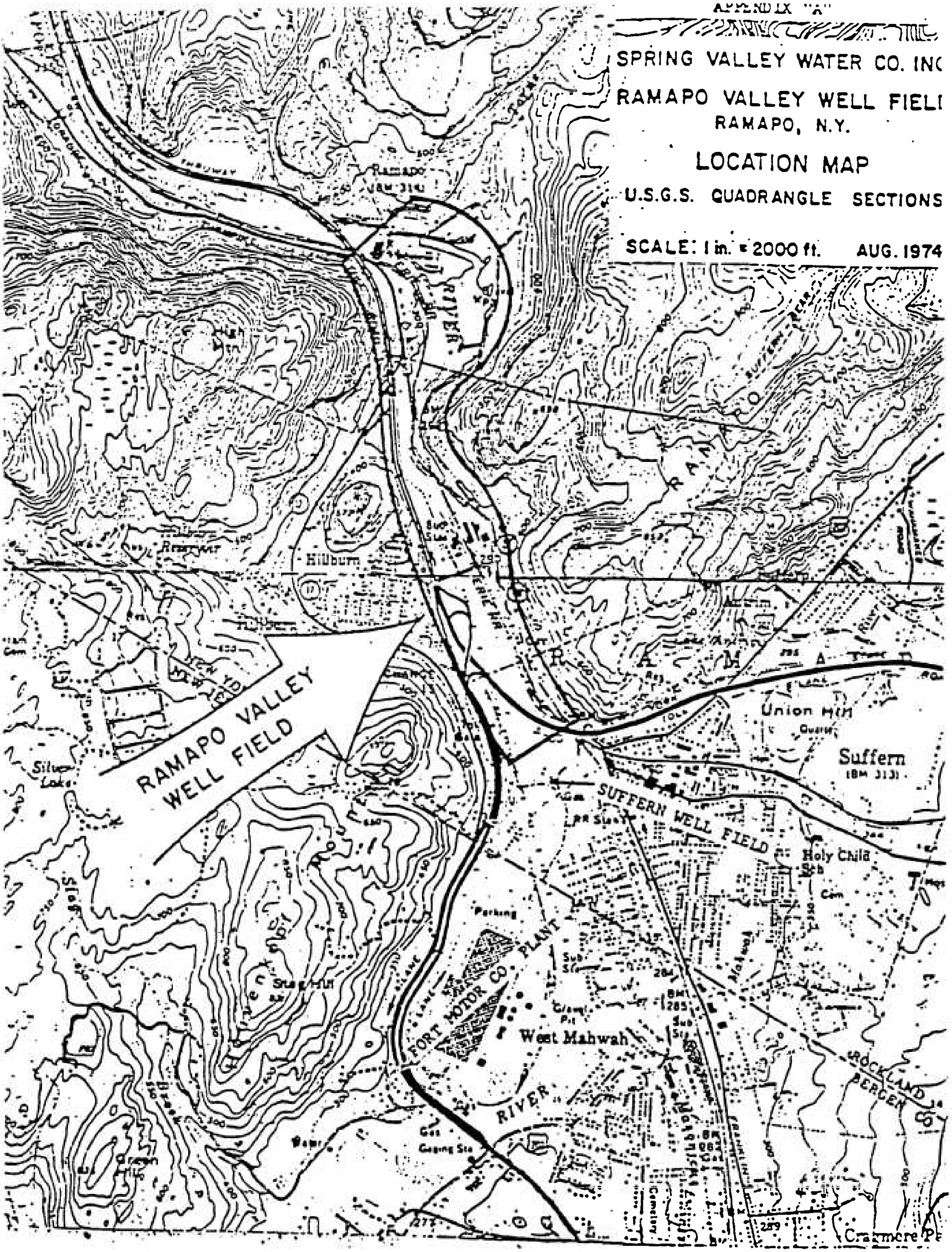
P. Any modification of the terms of the stipulations between the Applicant and the Village of Hillburn and the Applicant and the State of New Jersey or any other agreements between the affected parties on the issues identified in sub-Items 1, 2, and 3 of Condition "O" above shall be submitted to and be approved by the Department.

Q. In conjunction with the development of the aforementioned Ramapo Valley wells, the Applicant may, upon a request for water service, supply potable water to the lands of the Ramapo Land Company or to any individual party presently served by an individual well supply in the hamlet of Ramapo or in the general vicinity of the Project Site where the Applicant had heretofore not previously supplied water. The Applicant shall outline on a map to the Department the areas in which water service would be provided prior to supplying such water.

R. Section 15-1529 of the Environmental Conservation Law - forbids the operation of any of the aforementioned water supply facilities until, as constructed, they have been approved by the Department. Such final approval will only be given upon a written request to the Department by the Applicant. In general, such approval will not be given until all provisions affecting quality of the water and safety of the works fully have been complied with.

S. Granting of the approvals in this decision for the subject Project by the Department does not relieve the Applicant of the responsibility of obtaining any other permission, consent or approval which may be required from any other unit of government having jurisdiction.

APPENDIX "A"



SPRING VALLEY WATER CO. INC

RAMAPO VALLEY WELL FIELD

RAMAPO, N.Y.

LOCATION MAP

U.S.G.S. QUADRANGLE SECTIONS

SCALE: 1 in. = 2000 ft. AUG. 1974

Office of Hearing Officers

October 24, 1977

Carl Crossman, Esq.
Spring Valley Water Company, Inc.
360 West Nyack Road
West Nyack, New York 10994

Dear Mr. Crossman;

Water Supply Application No. 6507
Spring Valley Water Company, Inc.
(Ramapo Valley Wells)

This letter is in reply to your recent request for a verification of the date "1980" which appears on page 8 in the next to last line of Finding of Fact No. 18 of the Department's Decision on the subject application, dated September 15, 1976. Specifically you inquired whether the date "1980" may be in error and whether the correct date should have read "1978."

To determine whether the date "1980" is correct or in error, I reviewed the entire Hearing Officer's Report, which Report was adopted and incorporated by reference as the Department's Decision.

Specific reference to the projected average and maximum daily water demands on the Spring Valley Water Company's overall system, the additional sources of supply planned by the Company under Water Supply Application No. 6503, and the need for the subject Ramapo Valley Wells to meet increased peak and average demands on the Company's system may be found in Findings of Facts Nos. 8, 15, 16, 17 and 18 and in Conclusions Nos. 7,8 and 11. For your information and review I have extracted a copy of pages 6, 8, 22 and 23 from the subject Decision, whereupon the aforementioned Findings of Fact and Conclusions are found.

I call your particular attention to the last line in Conclusion No. 7. The next two to three years indicated therein refers to the years 1976, 1977 and 1978. The last line of Conclusion No. 8 furthermore refers to the installation of the subject Ramapo Valley Wells in advance of the projected peak and average demands on the Company's system commencing in 1979 or 1980.

After reviewing the entire Decision it is evident that the date "1980" in the next to last line of Finding of Fact No. 18 was inadvertently in error and this date should correctly read "1978." The last sentence of Finding of Fact No. 18 should accordingly correctly read as follows: "To meet the projected peak demands beyond 1978 would require the development of additional sources of supply."

We apologize for any inconvenience this error may have caused you and we thank you for calling it to our attention. This letter will serve as formal notification by the Department of the correction of this error and this letter may be appended to your copy of the Decision. We will likewise append the file copy of this letter to the original of the Decision which is kept on file in our Albany office.

Very truly yours,

Robert S. Drew
Hearing Officer

RSD:ls
Enclosure

cc: George Danskin - DEC - New Paltz

Spring Valley, New York 10994

Mr. Eric B. Outwater
Acting Regional Administrator
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10007
Attention Chief, Environmental Impact Branch

The Honorable Benjamin A. Gilman
Member of Congress
House of Representatives
Washington, D.C. 20515

Mr. Donald Jacobsen
Library Director
New City Free Library
125 South Main Street
New City, New York 10956

Honorable Robert Connor
New York State Assemblyman
60 Maple Avenue
New City, N. Y. 10956

Honorable Eugene Levy
New York State Assemblyman
1 South Madison Avenue
Spring Valley, N. Y. 10977

Onofrio F. Laurino, Esq.
Spring Valley Water Co., Inc.
4100 Park Avenue
Weehawken, N. J. 07087

West Branch Conservation Assn.
100 South Mountain Road
New City, N. Y. 10956

Mr. Carl T. Etter, Jr.
Assistant Utility Engineer
NYS Public Service Commission
Two World Trade Center
New York, N. Y. 10047

Mr. Daniel E. Serrell, P.E.
Senior Sanitary Engineer
NYS Dept. of Health
ESP Tower Bldg. - 4th Floor
Albany, N. Y. 12237

Mr. Peter Anderson, Secretary
Rockland County Soil & Water
Conservation District
23 New Hempstead Rd.
New City, N. Y. 10956

Mr. Isaac Goodfriend
Rockland County Legislature
County Office Bldg.
New City, N. Y. 10956

Mr. Dominic Carratello
Ford Motor Company
Highway 17
Mahwah, N. J. 07430

Mr. R. J. Kenyon
Ford Motor Company
3900 Welsh Road
Willow Grove, Pa. 19090

Spring Valley Water Company, Inc.

) ss.
COUNTY OF ALBANY)

Linda SantaBarbara , being duly sworn, deposes and says: I am over eighteen years of age and a Senior Stenographer of the State of New York, Office of Hearing Officers, having its office in the Department of Environmental Conservation.

On the 17th day of September, 1976, I served the annexed decision upon the attorneys or persons named below, by depositing a true copy thereof, properly enclosed in a sealed, postpaid wrapper, in a depository under the exclusive care of the United States Postal Service located in the County of Albany, New York, directed to the said attorneys and other persons at the addresses heretofore designated by them for that purpose as follows:

Mr. Russell Slayback
Leggette, Brashears and Graham
Consulting Groundwater Geologists
55 West State Street
Westport, Connecticut 06880

Ken Theim
Sterling Forest Water Corporation
Box 608
Tuxedo, New York 10987

Miss Frances Beinecke
NRDC, Inc.
15 West 44th Street
New York, N. Y. 10036

Mr. Charles Myers
Journal News
53 Hudson Ave.
Nyack, N. Y. 10980

Mr. & Mrs. Irving Meller

Torne Brook Road

Ramapo, New York 10931

Mr. John Russell
News Director
WRKL
New City, N. Y. 10956

ADDITIONAL SHEETS ATTACHED

Linda SantaBarbara
Linda SantaBarbara
Senior Stenographer

Sworn to before me this 20th
day of September, 1976

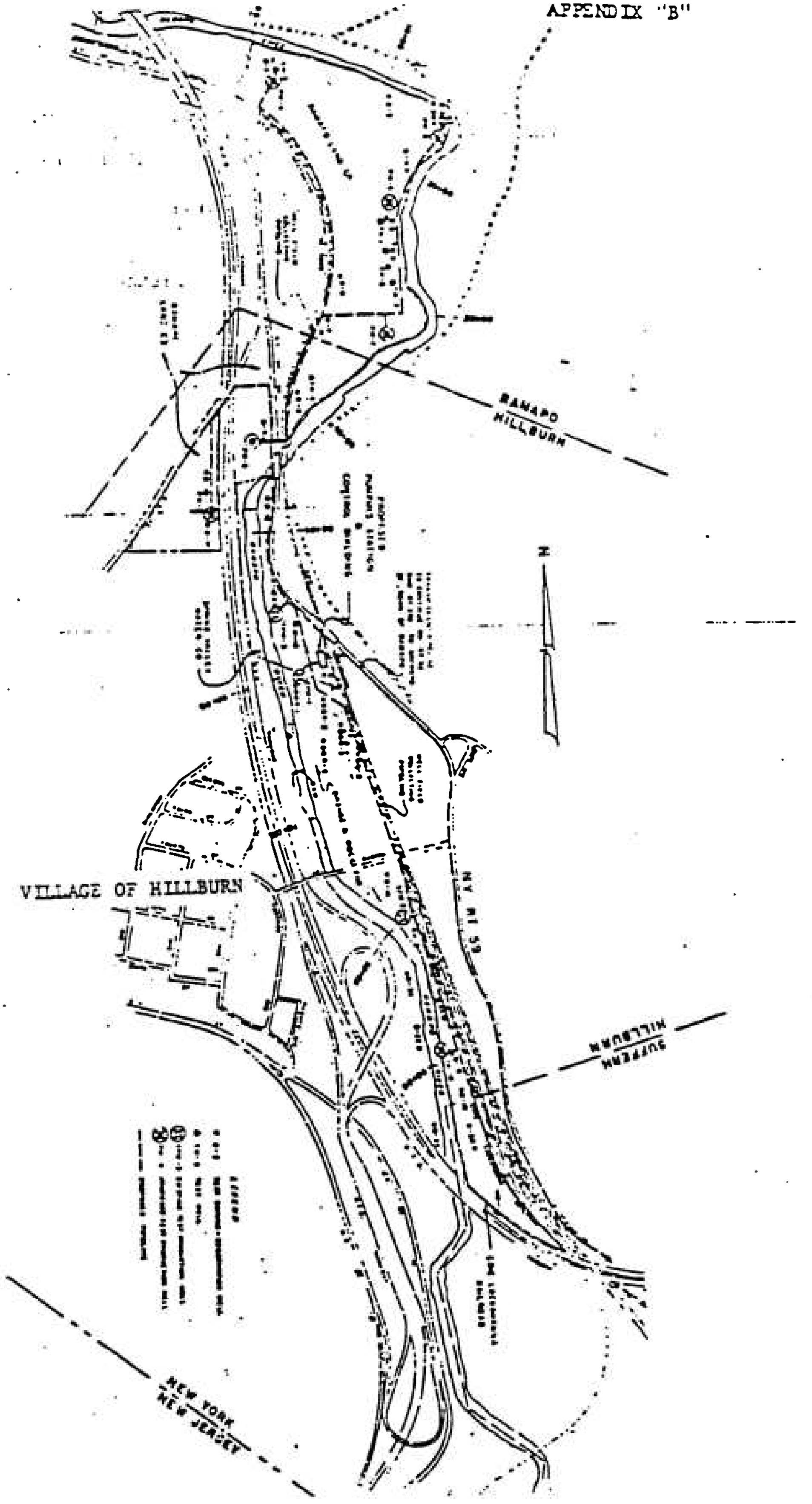
Elaine Rooney

ELAINE ROONEY
NOTARY PUBLIC, STATE OF NEW YORK
RENSSELAER COUNTY
COMMISSION EXPIRES MARCH 30, 19 77.

APPENDIX "B"

PROVISIONAL WELL CAPACITIES

Production Well No.		Capacity (gpm)
TPW	1	1400
"	2	1400
"	3	1400
PW	4	700
"	5	1000
"	6	350
"	7	350
"	8	1400
"	9	700
"	10	1000
TOTAL		9700



SPRING VALLEY WATER CO.,INC.
RAMAPO VALLEY WELL FIELD
RAMAPO,N.Y.
LOCATION MAP – TEST BORINGS AND WELLS

0 500 1000 2000
Scale in Feet

DECISION

The foregoing Report of Hearing Officer Robert S. Drew, including Findings of Fact and Conclusions and Recommendations, is hereby adopted and incorporated by reference as if set forth in this Decision.

Such Findings of Fact and Conclusions and Recommendations permit the Department of Environmental Conservation to approve of the said application, maps and plans of the Spring Valley Water Company, Inc., as modified and subject to the conditions set forth herein.

IN WITNESS WHEREOF, the Department of Environmental Conservation has caused this decision to be signed and issued and has filed the same with all maps, plans, reports, and other papers relating thereto at its office in the County of Albany this 15th day of September, 1976.

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PETER A. A. BERLE, COMMISSIONER

By:

STEPHEN L. GORDON
ACTING FIRST DEPUTY COMMISSIONER

LAW OFFICES
BEVERIDGE & DIAMOND, P.C.
15TH FLOOR
477 MADISON AVENUE
NEW YORK, NY 10022-5802
(212) 702-5400
TELECOPIER (212) 702-5450

STEPHEN L. GORDON
(212) 702-5410
sgordon@bdlaw.com

September 4, 2001

Via E-Mail and FedEx

Ella F. Fillippone, Ph.D.
Passaic River Coalition
246 Madisonville Road
Basking Ridge, NJ 07920

Re: Case: 98-F-1968 Ramapo Energy Limited Partnership

Dear Dr. Filippone:

Enclosed please find Ramapo Energy Limited Partnership's responses to PRC-1 through PRC-14.

If you have any questions, please do not hesitate to contact me at this office.

Sincerely,

Stephen L. Gordon

Enclosure

cc: Exhibit Exchange List (w/enc.)

N:\19\64\5010\LTR\mmm response to PRC 1-14.wpd

RECEIVED
SEP - 7 2001
DIVISION OF LAW
STATE OF NEW JERSEY

STATE OF NEW YORK
DEPT. OF PUBLIC SERVICE
DATE 11/19/01
CASE NO. 98-F-1968
EX 140

Ex. NJDEP-133

Case #98-F-1968
Ramapo Energy Project

PASSAIC RIVER COALITION
INTERROGATORY/DOCUMENT REQUEST

Request No.	PRC-1 through PRC-14
Requested By:	Passaic River Coalition
Requested Of:	Ramapo Energy Limited Partnership
Date of Request:	22 August 2001
Reply Date:	Ten days after receipt
Subject:	Water Resources

PRC-1. Please provide all studies, analyses, work papers, or other documentation relied upon to support the following statement: "The operation of the Energy Facility will have only minimal and localized impacts on the groundwater in the immediate vicinity of the Project." (Rebuttal Testimony of Hershberger/Faldetta/Rudenko, page 18, lines 11-12.)

Response: The statement is supported by the information presented in Section 3.0 – Proposed Blasting Plan and Exhibit 4 (Blasting Plan) of Addendum No. 2 regarding potential impacts to bedrock and the discussion regarding potential groundwater dewatering in the Rebuttal Testimony of Hershberger/Faldetta/Rudenko, page 17, line 12 through page 18, line 12.

Respondent: Jeff Hershberger, Sarah Faldetta, Doug Rudenko

PRC-2. Please provide analyses of pertinent data which compare the annual rate of recharge of precipitation to ground water from the site under existing conditions with those that would occur if the site were to be developed as proposed.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: The annual rate of groundwater recharge on the Energy Facility Site will be decreased by the percentage of the property that will be developed by buildings and impervious surfaces. Appendix I-2 of the Article X Application presents the Torne Brook Hydrologic Evaluation that takes into consideration the proposed development of the property. Attachment E in Appendix I-2 of the Article X Application includes the soil classification curve numbers, the times of concentration, and the watershed divides for existing and proposed conditions of the Ramapo Energy Facility. This data was utilized in evaluating the stormwater runoff and groundwater infiltration for the proposed facility.

The NYS DEC Stormwater Management Guidelines for New Development were utilized in designing the Best Management Practices (BMPs) to control and mitigate the impacts to water quality from runoff associated with land clearing, grading and construction activities. The extended detention basins were selected as the preferred method for controlling runoff. High groundwater elevations, shallow bedrock, and steep slopes prevent the use of infiltration facilities at the site. A further concern with the use of infiltration, as the primary method to manage stormwater, was the potential introduction of pollutants through spills to the groundwater without providing pretreatment. The proposed method of extended detention allows for pretreatment of potential groundwater contaminants.

Respondent: Janet Bernardo, Jeff Hershberger

PRC-3. Please provide analyses of pertinent data, which compare the annual rate of discharge of precipitation as surface water from the site under existing conditions with those that would occur if the site were to be developed as proposed.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: The Torne Brook Hydrologic Evaluation for existing and proposed conditions for various storm events is included in Appendix I-2 of the Article X Application. Table 1 within Appendix I-2, clearly compares the discharge rates for existing, developed, and proposed conditions with mitigation. In accordance with the NYSDEC requirements for stormwater discharge, the 2-year, 10-year, and 100-year storm events have been included in the analysis. The results of the hydrologic analysis indicate that the Ramapo Energy Facility as designed will not result in an appreciable increase in discharge.

Respondent: Janet Bernardo

PRC-4. Please provide analyses of pertinent data which estimate the time of travel of ground water from the proposed storm water detention basin(s) on site to the closest well in the Ramapo Valley Well Field (RVWF), assuming that an average of 10 million gallons per day (mgd) is being pumped from the RVWF, and assuming that there is no flow augmentation in the Ramapo River from surface water sources and that pumping from the RVWF ceases when flows over the Suffern gauging station in the river are below 8 mgd.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: This statement does not present a realistic scenario for the migration of shallow groundwater in the vicinity of the proposed stormwater detention basins to the Ramapo Valley Well Field (RVWF). It is anticipated that shallow groundwater in this area will discharge to either Candle

Brook or Torne Brook (or their tributaries) and migrate to the RVWF as surface water.

Respondent: Jeff Hershberger

PRC-5. Please provide analyses of pertinent data which estimate the time of travel of ground water from the proposed storm water detention basin(s) on site to the closest well in the Ramapo Valley Well Field (RVWF), assuming that an average of 10 million gallons per day (mgd) is being pumped from the RVWF, and assuming that there is flow augmentation in the Ramapo River from surface water sources so that pumping from the RVWF continues when flows over the Suffern gauging station would otherwise be below 8 mgd.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: See response to PRC-4.

Respondent: Jeff Hershberger

PRC-6. Please provide analyses of pertinent data which estimate the static water levels and their trends in the ten wells in the Ramapo Valley Well Field (RVWF), during the period from 1975 to 2000, and estimate those trends to the year 2025, assuming that the Ramapo Energy facility is built and operated as proposed.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: Ramapo Energy does not have information responsive to this request beyond that already provided in the Application materials. This request should be addressed to UWNY.

* PRC-7. Please provide analyses of pertinent data which estimate the loss in available potable water supplies that will be experienced by the Village of Suffern and communities in northeastern New Jersey, assuming that the Ramapo Energy facility is built and operated as proposed.

* **Response:** This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: Ramapo Energy does not have information responsive to this request beyond that already provided in the Application materials. This request should be addressed to UWNY.

PRC-8. Please provide analyses of pertinent data which estimate the efficiency, that is the ratio of the energy transmitted into the grid to the energy inherent in the natural gas consumed, of the proposed power plant operating at full capacity, i.e., 1,100 megawatts, when the ambient air temperature is 25 degrees centigrade, and the ambient air humidity is 75%, under the following alternative conditions:

- Usage of potable water, provided by United Water New York (UWNY), is limited to 40,000 gallons per day; or
- Usage of potable water is limited to 60,000 gallons per day; or
- Usage of potable water is limited to 176,000 gallons per day (usage based on Mirant Bowline Unit 3 estimates).

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: The amount of water available from UWNY does not impact the efficiency of the project under normal operating conditions. The only restriction it imposes is on the number of hours the plant can operate under peak conditions.

Respondent: Guy Marchmont

PRC-9. Please provide analyses of pertinent data which estimate the emissions, in mass per unit time, from the proposed plant, operating under the three alternative conditions listed in PRC-8, of the following air pollutants:

- Nitrogen oxides;
- Ammonia;
- Carbon dioxide.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: The emission rates for ammonia and nitrogen oxides (NOx) from the proposed Energy Facility are presented in Table 4.2 of the application for the realm of operating conditions (i.e. loads and ambient temperatures) that can be reasonably anticipated. The temperatures of -20'F, 50'F and 100'F represent the minimum, annual average and maximum ambient temperatures that are anticipated. The emission rates determined at these temperatures were used in the air quality impact analysis for the facility. The water consumption restrictions specified in PRC-8 will not impact the emission rates from the Energy Facility unless they prevent operation of the turbine systems under steam augmentation (identified as operating modes 9 and 10 in Table 4.2). As discussed in Section 4.5 of the application, the average anticipated emission rate of carbon dioxide from the Energy Facility is about 842,500 pounds per hour.

Respondent: Dammon Frecker

Case #98-F-1968
Ramapo Energy Project

PRC-10. Please provide analyses of pertinent data which describe the existing ambient concentrations in Candle Brook and Torne Brook found in the period from June through November of the following parameters:

- ➢ Kjeldal nitrogen;
- ➢ Nitrate nitrogen

Response: Please refer to Section 6.2.5.2 of the Application. Data sheets concerning the tests described in this Section will be forwarded under separate cover from ESS.

Respondent: Jeff Hershberger, Sarada Sangameswaran

PRC-11. Please provide analyses of pertinent data which estimate the increases in concentrations in Candle Brook and Torne Brook, caused by the operation of the proposed plant, operating under the three alternative conditions listed in PRC-8, of the following parameters:

- ➢ Kjeldal nitrogen;

Nitrate nitrogen.

Response: This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: Ramapo Energy does not have information responsive to this request beyond that already provided in the Application materials. Ramapo Energy will not be discharging wastewater to either stream. Flows of stormwater to either Candle Brook or Torne Brook will also not cause an increase in Kjeldahl or Nitrate nitrogen. The storage of ammonia will be inside a containment area, inside a building. The ammonia containment area is unconnected to the stormwater management system so that, even in the unlikely event of a spill, nitrogen bearing liquids will not enter runoff to Candle Brook or Torne Brook. Increases in concentrations of Kjeldahl or nitrate nitrogen will not result from any operating scenario.

Respondent: Janet Bernardo

PRC-12. Please provide analyses of pertinent data which estimate the increases in water temperatures in Candle Brook and Torne Brook that would be caused by the operation of the proposed facility.

Response:

This request is objectionable to the extent that it requests Ramapo Energy to develop information or prepare a study for another party. Without waiving that objection, Ramapo Energy provides the following response: The criteria governing thermal discharges are outlined in 6 NYCRR, Chapter X, Part 704. The special criteria listed for Nontrout waters, states that the water temperature shall not be raised to more than

90 degrees Fahrenheit, or shall not be raised or lowered by more than 5 degrees Fahrenheit over at least 50% of the cross sectional area. The special criteria for Trout waters states, (i) No discharge at a temperature over 70 degrees Fahrenheit shall be permitted at any time to streams classified for trout. (ii) From June through September no discharge shall be permitted that will raise the temperature of the stream more than two Fahrenheit degrees over that which existed before the addition of heat of artificial origin. Torne Brook is currently classified as Nontrout water, however it is the applicant's intention to conform to the criteria for Trout waters.

In the report prepared by J. Galli, 1991, entitled, "Thermal Impacts Associated with Urbanization and Stormwater Management Best Management Practices", Galli reported that stream temperatures throughout the summer are increased in urban watersheds, and the degree of warming appears to be directly related to the imperviousness of the contributing watershed. Galli included a figure in his report titled, "The Effect of Impervious Cover on Stream Temperature". The figure illustrates a direct correlation between the stream temperatures in Fahrenheit with the percent of impervious cover within a watershed.

A thermal discharge analysis was performed at Torne Brook directly west of the location at which the grass swale discharging from the Detention Basin #1 outfall reaches Torne Brook. The watershed area to this point of analysis was delineated as 95.2 acres. The amount of proposed impervious area within this watershed has been delineated as 10.3 acres or approximately 11% of the entire watershed. Utilizing the figure prepared by Galli an 11% increase in impervious area may produce a temperature increase slightly below two degrees Fahrenheit. This increase does not account for any mitigation between the impervious area and the existing stream. A habitat study preformed on 8/25/93 and 6/9/97 indicates the temperature for Torne Brook was 16.4 degrees Celsius (61.5 degrees Fahrenheit).

As stated previously the extended detention basins designed for the Energy Facility includes a forebay to collect the "first flush" of stormwater. During the summer months the first flush will be the warmest water entering the stormwater system. The detention basin will also include wetland plants which will function to reduce pollutants entering the drainage system as well as provide shade to lower the temperature of the stormwater within the basins. The grass swale designed as a recommended BMP to reduce the velocity of the stormwater as well as reduce additional pollutants will also be shaded to reduce the outflow temperature. A wooded buffer will remain along Torne Brook. The Energy Facility as designed will stay within the criteria for Trout waters.

Respondent: Jeff Hershberger, Sarada Sangameswaran, Janet Bernardo

PRC-13. Please provide a detailed description of the methods to be used to demineralize the potable water provided by UWNY that would be used for makeup water, the volume of water to be so treated, the locations of these treatment processes, and the disposal of the waste water and other wastes from these processes.

Response: A trailer mounted demineralizer system will be used to treat the water received from UWNY. The design of the trailer-mounted system will be finalized during the detailed design phase of the plant. However, as a minimum each trailer will contain anion and cation ion exchange units. The trailers will be located near the water storage tanks as noted on drawing C-2 Site Plan. There will be four trailers on site each with the capacity to handle approximately 25 gallons per minute. Thus with all four trains in operation a maximum of approximately 100 gallons per minute can be treated. As explained in our response to DPS-18, the regeneration of the ion exchange beds will take place off site. Attached to our response to DPS-18 is a letter from Ecolochem agreeing to supply the trailers and service them in its facility in East Hartford, Connecticut.

Respondent: Guy Marchmont

PRC-14. Please provide a detailed description of the alternative source(s) of water to be used in the event that UWNY could not supply the water required for makeup water, so that the proposed plant could continue to operate after the water stored on site had been consumed.

Response: As noted in the Application there will be three 3-million gallon water storage tanks on site. Of this amount 750,000 gallons will be dedicated to fire protection. Thus, 8,250,000 gallons will be available to support project operations. As noted in our response to NJDEP-6, with the Zero Liquid Discharge system (ZLD) in operation, this amount will allow the project to operate under normal base load conditions for more than a year. If we assume 60 hours of peak operation, then this amount would last for 190 days. With this capability on site, we do not believe that it is necessary to acquire alternate sources of supply. Thus, we have not searched for an alternate supply. It should be noted that under normal base load conditions no more than three tanker trucks a day would be required to support operations..

Respondent: Guy Marchmont

RE-183, Anne L. Kruger, 22 August 2001