

The background of the slide is a light blue gradient. It is decorated with numerous water droplets of various sizes, some appearing as simple circles and others as more complex, rounded shapes with highlights and shadows, giving them a three-dimensional appearance. The droplets are scattered across the page, with a higher concentration in the upper and lower right areas.

# WATER SUPPLY FEASIBILITY STUDY AND FIRM CAPACITY ANALYSIS

TOWNSHIP OF MOORESTOWN

# GOALS AND CONSIDERATIONS

- Meet NJDEP Firm Capacity and Allocation Requirements
- Provide for future development and water demands
- Maximize the use of your existing allocation
- Maximize the use of your existing treatment plants and wells
- Minimize the purchase cost of New Jersey American Water
- Minimize project capital costs and operation and maintenance costs

# FIRM CAPACITY AND WATER ALLOCATION

- FIRM CAPACITY

- Having the well, water treatment capacity and/or contractual purchase agreement to supply water meeting your historical and future peak demands with your largest well or treatment process out of service
- Historical peak day = peak daily demand in last 5 years
- Future peak day demands = future development estimated demand x 3
- Firm Capacity = (Well/Treatment Capacity with largest unit out of service + Contractual Supply) - (Historical and future peak day demands)
- Firm Capacity must be  $> 0$
- Existing Firm Capacity  $< 0$

# FUTURE DEVELOPMENT WATER DEMANDS

- Future Development Water Demands
  - Water demand projections developed for 5, 10 and 15 year timeframes
  - Development projects already in some phase of the approval process
  - Development projects that have been presented or discussed but for which no formal applications have been submitted
  - Potential construction based on current zoning and land use regulations
  - 5, 10 and 15 projections

# EXISTING WATER DIVERSION ALLOCATION

- Existing Water Supply Diversion Allocations
  - Yearly Water Diversion Allocation– 917.603 MGY
  - Monthly Water Diversion Allocation– 150.000 MGM
- Yearly Surplus/Deficit
  - Peak Yearly Demand in Last 5 Years plus 15 Year Projected Demands– 1,262.041 MGY
  - Projected Yearly Deficit =  $917.603 - 1,262.041 = -344.348$  MGY
- Monthly Surplus/Deficit
  - Peak Monthly Demand in Last 5 Years plus 15 Year Projected Demands– 188.570 MGM
  - Projected Monthly Deficit =  $150.00 - 188.570 = -38.570$  MGM

# EXISTING WELLS AND WATER TREATMENT PLANTS

- North Church Street WTP
  - Plant Firm Capacity- 2.88 MGD
  - Well Firm Capacity- 2.88 MGD
  - Plant Capacity Limited to Temporary Treatment System Capacity of 1.728 MGD (1,600 GPM)
- Hartford Road WTP
  - Plant and Well Firm Capacity- 2.016 MGD
  - Plant is currently listed as inactive by NJDEP
- Kings Highway WTP
  - Existing plant capacity ~ 0.5 MGD
  - Under construction to restore firm capacity to 2.016 MGD

# NEW JERSEY WATER COMPANY SALES AGREEMENTS

- General Metered Service
  - Yearly contractual requirements
  - Allows purchase of any quantity on a daily basis
  - Rate ~ \$6.50 per 1,000 gallons
- Commodity–Demand Service
  - Yearly and monthly contractual requirements/limitations
  - Maximum monthly purchase limitations
  - Penalties imposed if limitations exceeded
  - Rate ~ \$3.25 per 1,000 gallons

# ALTERNATIVES OVERVIEW

- Alternative 1 – Upgrade North Church Street and Hartford Road Treatment Plants
  - North Church Capacity – 2.88 MGD
  - Hartford Road Capacity – 2.016 MGD
- Alternative 2 – Increase capacity of Hartford Road Treatment Plant and close North Church Street Plant
  - Hartford Road Capacity – 4.896 MGD
- Alternative 3 – Close North Church Street and Hartford Road Treatment Plants and purchase water from New Jersey American Water Company
- Supplemental Alternative – Upgrade Hartford Road Treatment Plant Only
  - Upgrade Hartford Road Plant to its current capacity of 2.016 MGD and close North Church Street Plant
- All alternatives assume that the Kings Highway Water Treatment Plant has been upgraded and has a firm capacity of 2.016 MGD

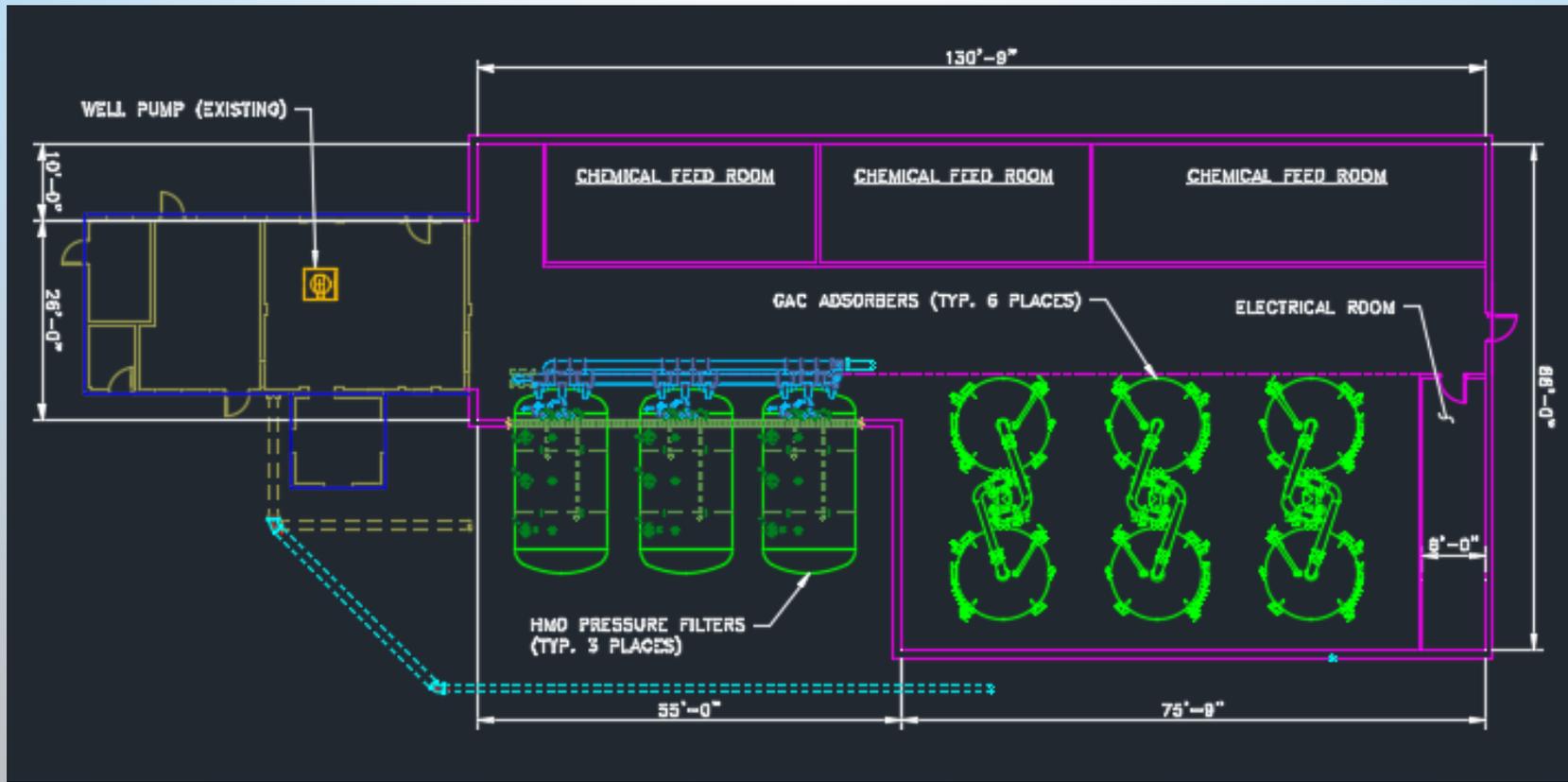
# ALTERNATIVE 1 – UPGRADE NORTH CHURCH STREET AND HARTFORD ROAD TREATMENT PLANTS

- Upgrades to North Church Street Plant include 3 treatment options
  - Option 1
    - Hydrous Manganese Oxide (HMO) pressure filtration to remove radium, gross alpha and manganese
    - Granular Activated Carbon (GAC) to remove 1,2,3-trichloropropane and tetrachloroethylene
  - Option 2
    - Hydrous Manganese Oxide (HMO) pressure filtration to remove radium, gross alpha and manganese
    - Granular Activated Carbon (GAC) to remove 1,2,3-trichloropropane and tetrachloroethylene
    - Advanced Oxidation to remove 1,4-Dioxane
      - Two options for Advanced Oxidation
        - Ultraviolet light and hydrogen peroxide
        - Ozone and hydrogen peroxide
- Upgrade Hartford Road Plant to its current permitted capacity to remove iron and manganese

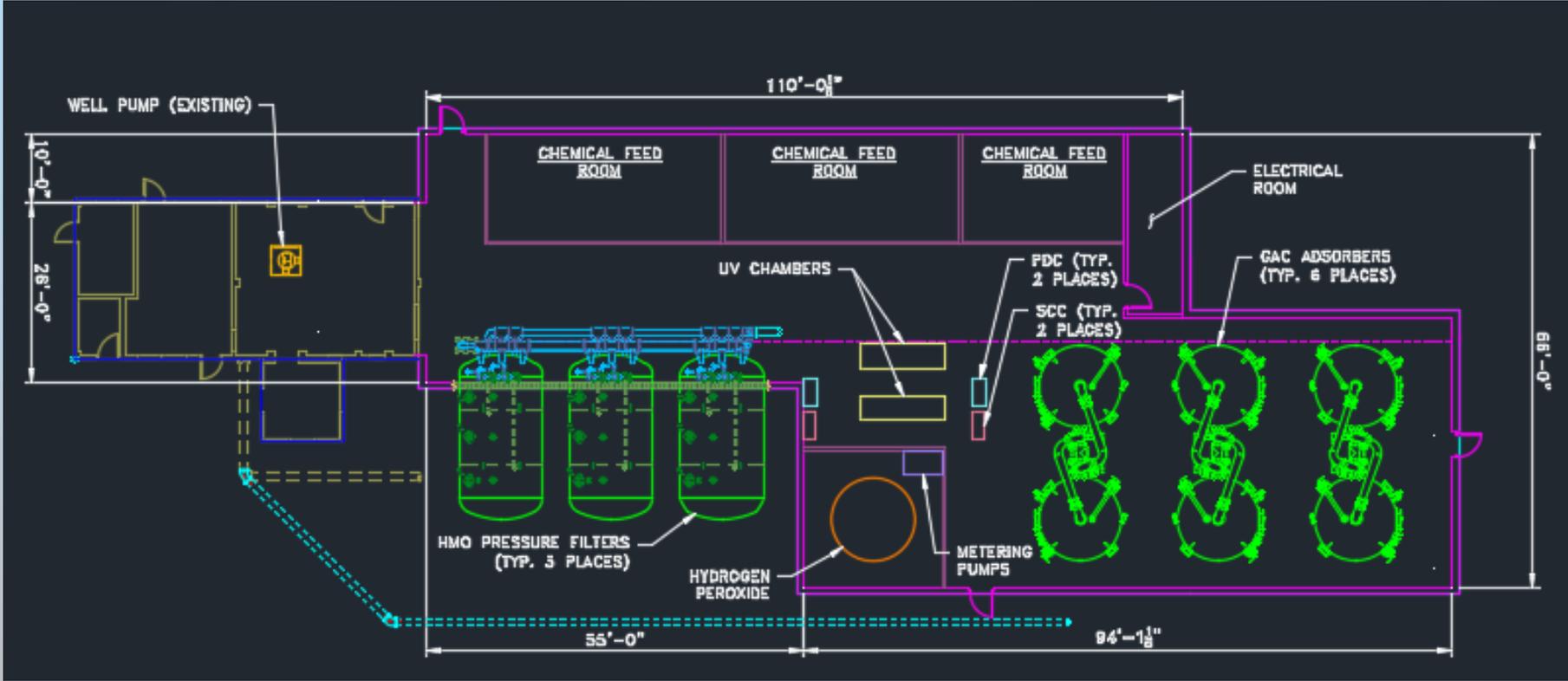
# ALTERNATIVE 1 – NORTH CHURCH STREET SITE PLAN



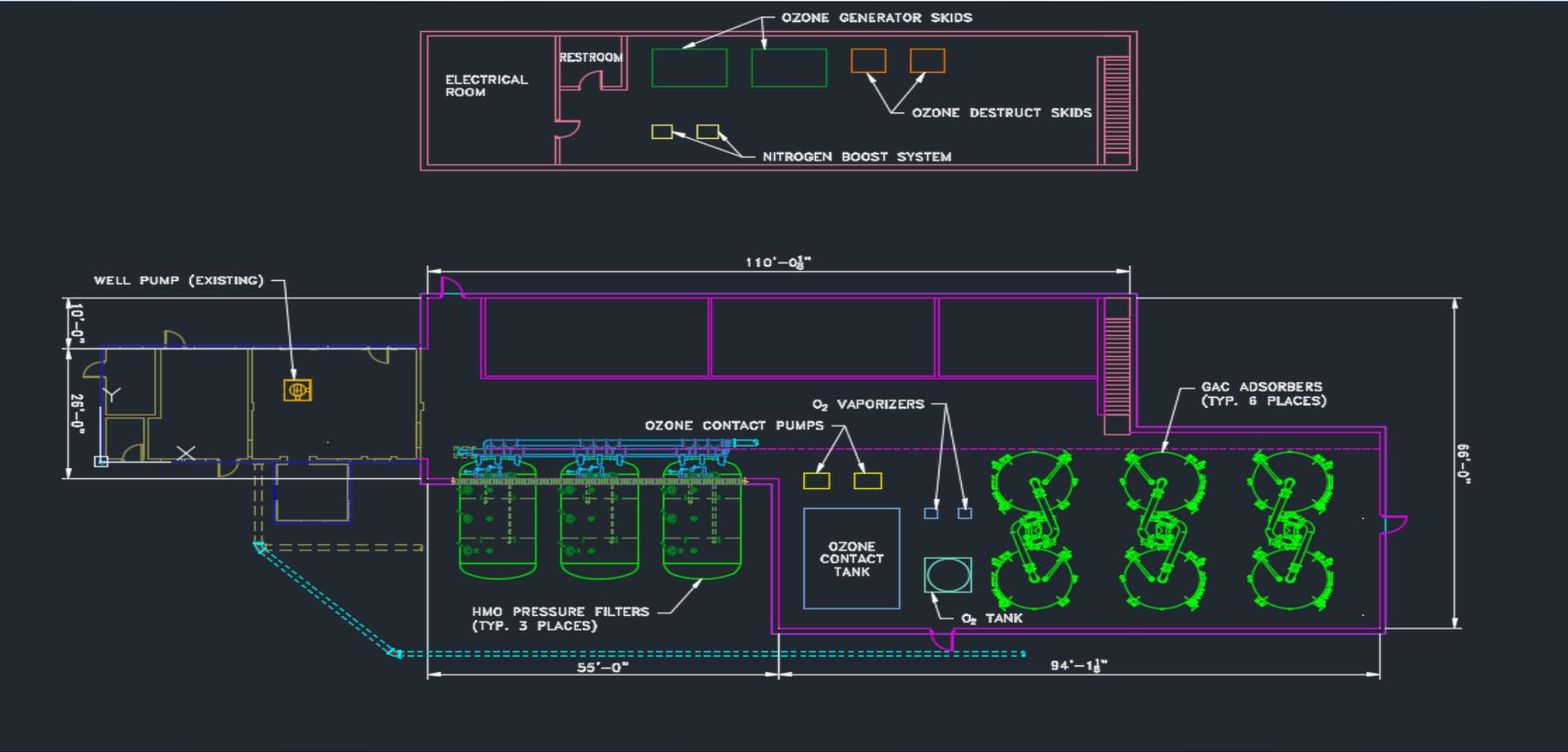
# ALTERNATIVE 1 – OPTION 1 LAYOUT



# ALTERNATIVE 1 - OPTION 2 LAYOUT UV PROCESS



# ALTERNATIVE 1 - OPTION 2 LAYOUT OZONE PROCESS





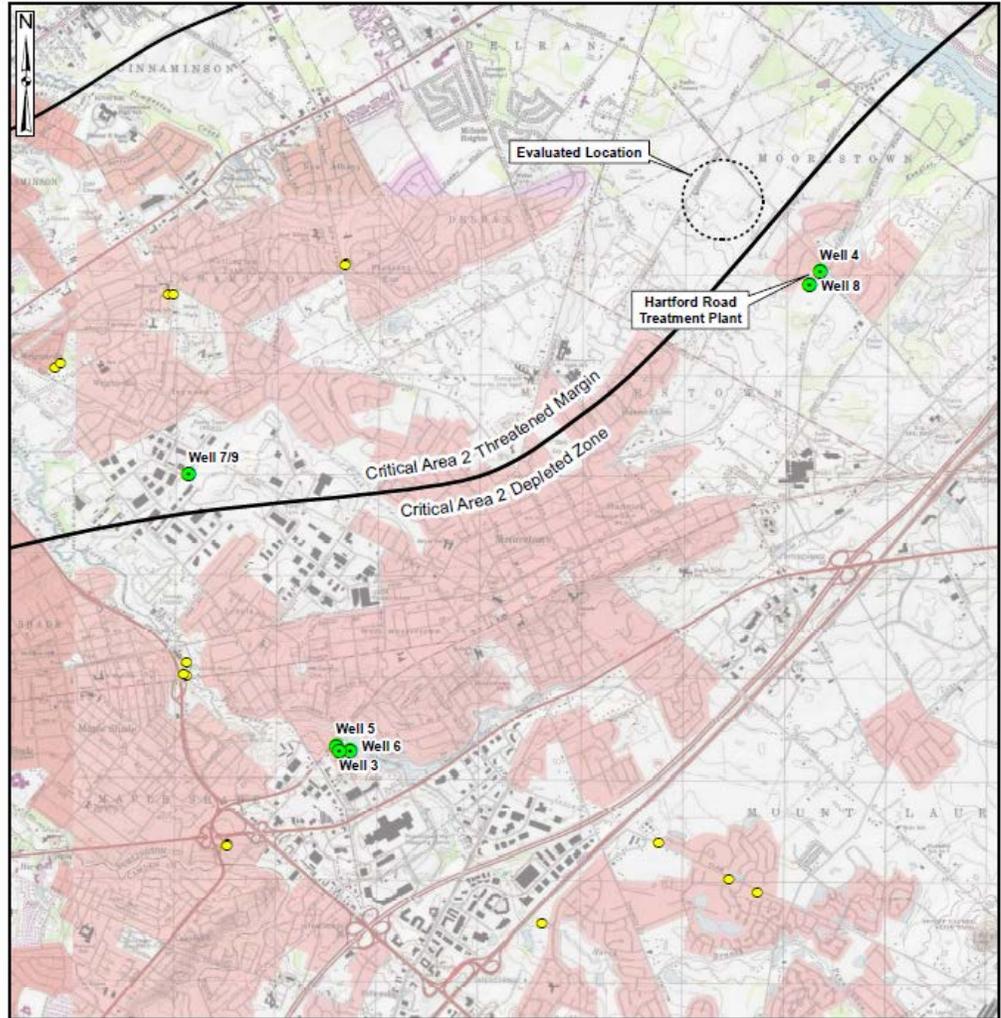
# ALTERNATIVE 2 – INCREASE CAPACITY OF HARTFORD ROAD TREATMENT PLANT

- Wells 7 and 9 and the North Church Street plant would be closed and the new Hartford Road plant would be expanded to have a capacity equal to the permitted capacity of the two (2) plants, 4.896 MGD
- Two (2) new wells equivalent in capacity to wells 7 and 9 would be constructed in the vicinity of the Hartford Road plant
- Plant would be designed to remove iron and manganese using pressure filters similar to Kings Highway WTP



# ALTERNATIVE 2 WELL LOCATION

- Location of the new wells would need to meet the following requirements:
  1. Screened in the same aquifer as existing wells 7 and 9 (Threatened Margin of the Lower Potomac–Raritan–Magothy Aquifer)
  2. Be in a location where the aquifer can support the new wells
  3. Be far enough away from the outcrop area of the aquifer
  4. Be in the Threatened Margin, not the Depleted Zone of Water Supply Critical Area No. 2
  5. Be as close to the Hartford Road plant as possible
- Item 4 will require the new wells to be constructed approximately 3,000 feet northwest of the Hartford Road plant



4,000 2,000 0 4,000 Feet



**Legend**

- Moorestown Water Supply Well
- Other Public Water Supply Well



New Jersey  
Quadrangle Location

BASE SOURCE: USGS TOPOGRAPHIC QUADRANGLE

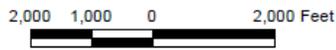
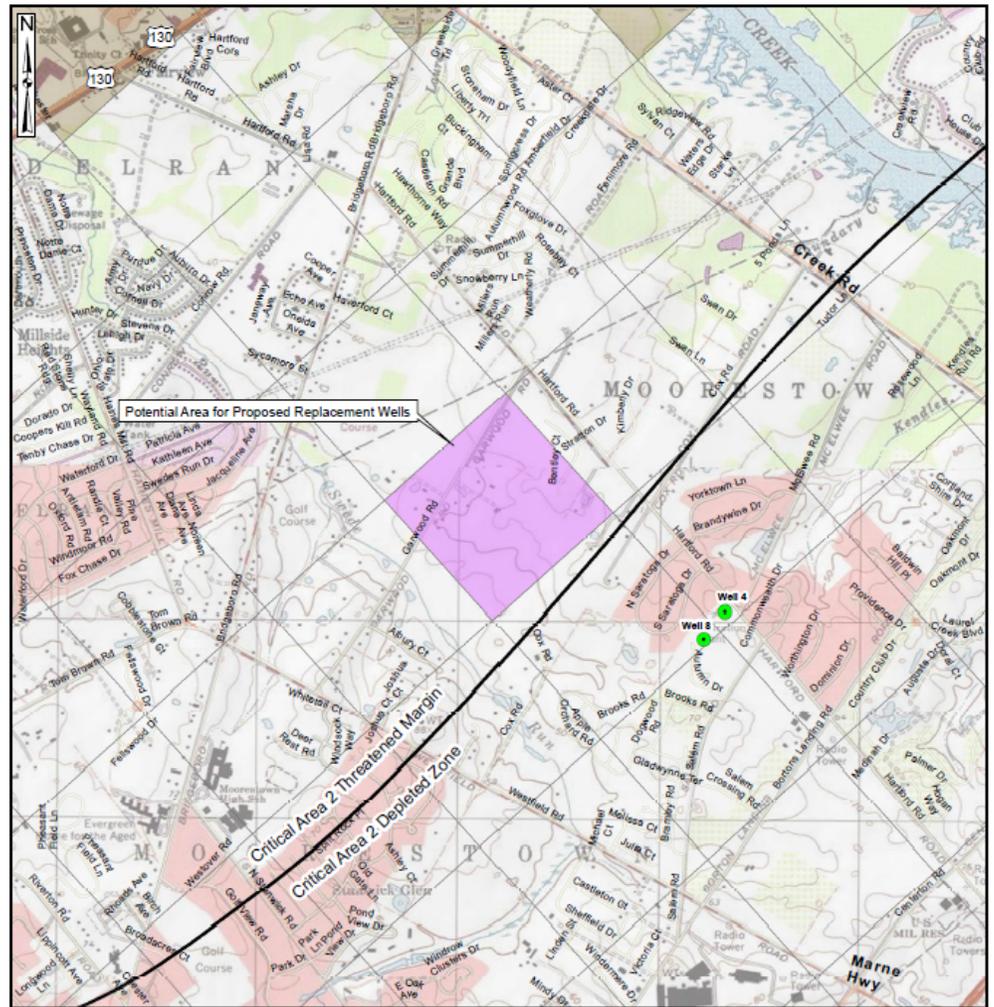
**MOORESTOWN TOWNSHIP**  
**2 EXECUTIVE DRIVE SUITE 9A**  
**MOORESTOWN, NEW JERSEY 08057**

**OVERVIEW OF WATER SUPPLY WELL LOCATIONS**



Prepared by:  
**LEGGETTE, BRASHEARS & GRAHAM, INC.**  
 Professional Groundwater and Environmental Services  
 600 East Crescent Avenue, Suite 200  
 Upper Saddle River, New Jersey 07458  
 (201) 818-0700 www.lbgweb.com DATE: 08/05/16

FILE: C:\msdn\moorestown DRAWN BY: ZT CHECKED BY: DT FIGURE: 1



**Legend**

- Moorestown Water Supply Well
- Modeled Pumping Cell
- Aquifer Model Limit (Lower-PRM)
- RASA Model Grid
- Critical Area 2 Limits



New Jersey  
Quadrangle Location

BASE SOURCE: USGS TOPOGRAPHIC QUADRANGLE

**MOORESTOWN TOWNSHIP  
2 EXECUTIVE DRIVE SUITE 9A  
MOORESTOWN, NEW JERSEY 08057**

**POTENTIAL AREA FOR REPLACEMENT WELLS**



Prepared by:  
**LEGGETTE, BRASHEARS & GRAHAM, INC.**  
Professional Groundwater and Environmental Services  
800 East Crescent Avenue, Suite 200  
Upper Saddle River, New Jersey 07458  
(201) 818-0700 [www.lbgweb.com](http://www.lbgweb.com)

# ALTERNATIVE 3– CLOSURE OF NORTH CHURCH STREET AND HARTFORD ROAD PLANTS

- Under this alternative both the North Church Street and Hartford Road plants would be closed and only the Kings Highway plant would be operated
- The additional water required to satisfy actual water demands and NJDEP's requirements for firm capacity and monthly and yearly allocation demands would be purchased from New Jersey American Water Company

# SUPPLEMENTAL ALTERNATIVE – CLOSURE OF NORTH CHURCH STREET PLANT AND UPGRADE HARTFORD ROAD PLANT AT CURRENT CAPACITY

- Under this alternative the Hartford Road plant would be upgraded to its current capacity and the North Church Street plant would be closed
- The additional water required to satisfy actual water demands and NJDEP's requirements for firm capacity and monthly and yearly allocation demands would be purchased from New Jersey American Water Company

# ALTERNATIVE TIMELINES

|   | Alternative 1             | Alternative 2                     | Supplemental Alternative  |
|---|---------------------------|-----------------------------------|---------------------------|
| Hydrogeological Analysis and DEP Approval | -                         | Minimum 12 Months                 | -                         |
| Design                                    | 12 Months                 | 10 Months                         | 10 Months                 |
| Permitting                                | 3 Months                  | 3 Months                          | 3 Months                  |
| Bidding/Award                             | 2 Months                  | 2 Months                          | 2 Months                  |
| Notice to Proceed                         | 1 Month                   | 1 Month                           | 1 Month                   |
| Construction                              | 12 Months                 | 12 Months                         | 12 Months                 |
| <b>Total</b>                              | <b>2 Years – 6 Months</b> | <b>Minimum 3 Years – 4 Months</b> | <b>2 Years – 4 Months</b> |
| <b>Estimated Completion Date</b>          | <b>August 2019</b>        | <b>July 2020 or later</b>         | <b>June 2019</b>          |

# ALTERNATIVES COST SUMMARY

**Moorestown Township  
Water Supply Feasibility Study and Firm Capacity Evaluation  
Capital, O&M and Net Present Value Costs**

| Alternative 1  | Annual Capital Cost |                |                | NPV - Life Cycle Cost | NPV - NJAW Purchase | Total NPV Cost of Alternative |
|--|---------------------|----------------|----------------|-----------------------|---------------------|-------------------------------|
|  | Capital Cost        | Annual O&M     | Debt Service   |                       |                     |                               |
| North Church Street (HMO/GAC ) (2.88 MGD) and Hartford Road (2.016 MGD)        | \$20,141,000.00     | \$959,000.00   | \$1,482,010.00 | \$40,243,000.00       | \$33,952,000.00     | \$74,195,000.00               |
| North Church Street (HMO/GAC/ UV) (2.88 MGD) and Hartford Road (2.016 MGD)     | \$23,387,000.00     | \$1,175,000.00 | \$1,720,856.00 | \$47,957,000.00       | \$33,952,000.00     | \$81,909,000.00               |
| North Church Street (HMO/GAC/ Ozone) (2.88 MGD) and Hartford Road (2.016 MGD)  | \$28,225,000.00     | \$1,112,000.00 | \$2,076,845.00 | \$51,757,000.00       | \$33,952,000.00     | \$85,709,000.00               |
| <b>Alternative 2</b>   |                     |                |                |                       |                     |                               |
| Hartford Road Pressure Filters (4.896 MGD)                                     | \$22,175,000.00     | \$508,000.00   | \$1,631,675.00 | \$33,350,000.00       | \$34,364,000.00     | \$67,714,000.00               |
| <b>Alternative 3</b>   |                     |                |                |                       |                     |                               |
| New Jersey American Water Purchase Distribution System Improvements            | \$630,000.00        | \$0.00         | \$46,357.00    | \$659,000.00          | \$103,400,000.00    | \$104,059,000.00              |
| <b>Supplemental Alternative</b>  |                     |                |                |                       |                     |                               |
| Upgrade Hartford Road at Current Capacity (2.016 MGD) & Close N. Church Street | \$11,444,000.00     | \$340,000.00   | \$842,070.00   | \$18,768,000.00       | \$56,820,000.00     | \$75,588,000.00               |

Financing Period: 20 Years  
Overall Interest Rate: 4 Percent  
Inflation Rate: 3.5 Percent

HMO: Radium, gross alpha, manganese removal  
GAC: 1,2,3-trichloropropane, tetrachloroethylene removal  
UV: Advanced oxidation using UV for 1-4 dioxane removal  
Ozone: Advanced oxidation using ozone for 1-4 dioxane removal  
Pressure Filters: Iron and manganese removal

# SUMMARY

- Alternative 1
  - Construction would be complete before the December 2020 NJAW contract expiration
  - Allows reuse of existing equipment and investments made into treating contaminants at the North Church Street plant
  - Potential for future unknown contaminants at North Church Street plant that could require additional treatment or closure of plant
  - Option 1 – Rank in terms of Net Present Value – 2
  - Option 2 – Rank in terms of Net Present Value – 4 (UV) and 5 (Ozone)
- Alternative 2
  - Unlikely that construction would be complete before the December 2020 NJAW contract expiration
  - Reduces the number of plants that would need to be operated during high demand periods from three (3) to two (2)
  - Plant could be operated at reduced flow during low demand periods
  - Plant operation would be less complicated
  - Closes the North Church Street plant and avoids the possibility of having to treat unknown contaminants in the future
  - Installation of new wells although conceptually feasible could be delayed by land acquisition, ground water quality, NJDEP review and the Water Allocation Permit major modification approval process which could be subject to public hearings
  - Rank in terms of Net Present Value – 1

# SUMMARY

- Alternative 3
  - Township would have little or no ability to control rate increases which would be dictated by NJAW
  - May not be feasible to use NJAW Demand Commodity contract due to firm capacity requirements
  - Rank in terms of Net Present Value- 6
- Supplemental Alternative
  - Construction would be complete before the December 2020 NJAW contract expiration
  - Increases NJAW purchase requirements above Alternatives 1 and 2 but less than Alternative 3
  - Plant operation would be less complicated (iron and manganese only)
  - Closes the North Church Street plant which avoids the possibility of having to treat unknown contaminants in the future
  - Avoids potential project delays associated with new wells
  - Rank in terms of Net Present Value- 3

**Moorestown Township**  
**Water Supply Feasibility Study and Firm Capacity Evaluation**  
**Capital, O&M and Net Present Value Costs**

|  | Alternative 1          |                        | Alternative 2          | Alternative 3           | Supplemental Alternative |
|--|------------------------|------------------------|------------------------|-------------------------|--------------------------|
|  | Option 1               | Option 2A              |                        |                         |                          |
| Capital Cost                             | \$20,141,000.00        | \$23,387,000.00        | \$630,000.00           | \$630,000.00            | \$11,444,000.00          |
| O&M Cost                                 | \$959,000.00           | \$1,175,000.00         | \$508,000.00           | \$0.00                  | \$340,000.00             |
| Alternative Net Present Value            | \$40,243,000.00        | \$47,957,000.00        | \$33,350,000.00        | \$659,000.00            | \$18,768,000.00          |
| Purchase Water Cost Projections          |                        |                        |                        |                         |                          |
| 5 years                                  | \$978,480.00           | \$978,480.00           | \$978,480.00           | \$4,231,000.00          | \$1,973,000.00           |
| 10 Years                                 | \$1,031,120.00         | \$1,031,120.00         | \$1,031,120.00         | \$4,334,000.00          | \$2,076,000.00           |
| 15 Years                                 | \$1,697,600.00         | \$1,697,600.00         | \$1,697,600.00         | \$5,170,000.00          | \$2,841,000.00           |
| <b>Net Present Value (Present Worth)</b> | <b>\$74,195,000.00</b> | <b>\$81,909,000.00</b> | <b>\$67,714,000.00</b> | <b>\$104,059,000.00</b> | <b>\$75,588,000.00</b>   |