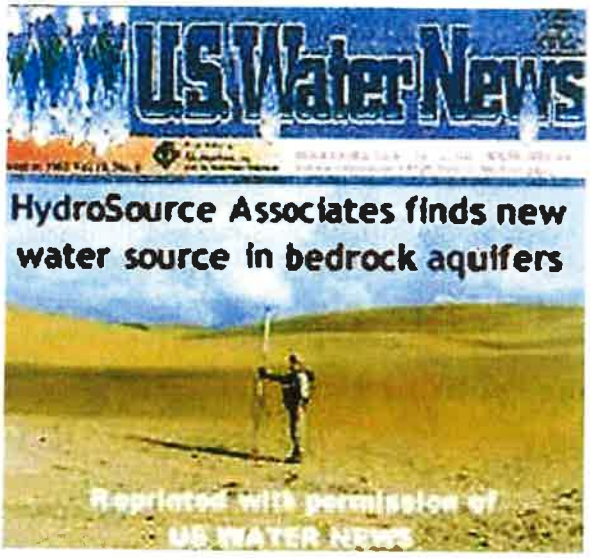
# About HydroSource Associates

HydroSource Associates (HSA) was established in 1991 as a multi-disciplinary group of water professionals that specializes in the exploration, development, protection and sustainable management of groundwater resources. Types of water sources developed by HSA include: potable water; commercial/industrial process water; fire suppression; supplies for heating/cooling and geoexchange systems; snow-making, irrigation and aquaculture water sources; land-based brackish and/or seawater wells that serve as pre-treated feedwater for reverse-osmosis/membrane treatment technologies; and riverbank filtration sources that supply pre-treated raw water for conventional surface water treatment facilities.




HSA's work has included assessment of existing water sources, both existing wells that water systems wish to assess in terms of their condition, productivity and sustainability, and water quality; and wells that are dormant and have been out of operation for some reason. Often, we make recommendations as to how to improve the source either by construction enhancements, source rehabilitation, or some type of water treatment.

HSA has also been involved in Aquifer Storage and Recovery (ASR) and artificial recharge projects whereby raw and/or treated surface water is used to recharge underground aquifer systems for later extraction and use.

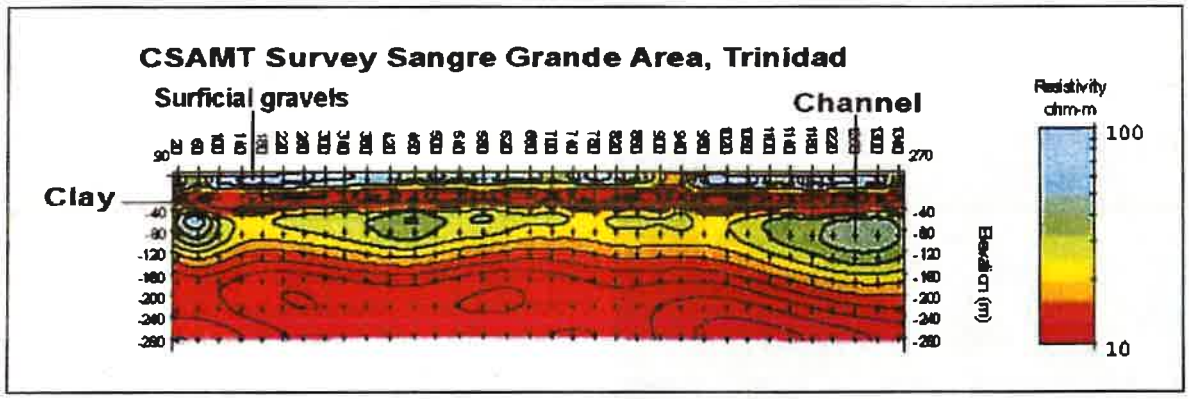

As population has increased and land development has progressed over the years, readily available supplies of uncontaminated fresh water have become increasingly limited. To address this, HSA has expanded its knowledge and experience in evaluation and determination of water source sustainability and proper management. HSA professionals have experience working in many U.S. states, in South America, Africa, China and the Middle East. Our primary markets are New England, New York, the Carolinas, and the Caribbean.

The majority of HSA's work has involved assessing and developing water resources for national governments, cities, towns, villages, community water systems, homeowners associations, private and pubic water companies, large-scale real estate developers, various types of industries and manufacturing facilities, bottled and mineral water companies, power plants, public and private fisheries/aquacultural operations, agricultural enterprises, vacation hotels and ski resorts, golf courses, and a host of other clients requiring water supplies in the range of thousands to many millions of gallons per day, such as the 19,000,000 gallon per day water sources we developed for the government of Trinidad and Tobago, or the two wells that each produce over 4,300,000 gallons

per day located and developed for the Village of Saranac Lake, New York. HSA's track record of success is world-wide, having developed many millions of gallons per day of groundwater supplies for hundreds of clients in hydrogeologic settings and climates ranging from tropical, to temperate, to arid. The wells we locate and develop for our clients are typically the highest yielding wells in the region.

HSA's water source development approach begins with the assessment of many different types of pertinent technical information. Once these data sets are integrated, they provide a preliminary view to broad areas possessing heightened potential for high-yield groundwater source development. HSA's professionals then correlate remotely sensed and mapped data with field observations to further refine and delineate areas that possess favorable attributes for the development of high-quality, productive, and sustainable groundwater sources.

Further refinement is achieved through use of geophysical tools and techniques. HSA can employ a suite of geophysical instruments selected and modified to perform high-resolution investigations of the subsurface.




HSA's professional staff are highly experienced in design, construction and testing of bedrock and overburden/screened wells, having directed well installations and pumping tests in diverse hydrogeologic settings. HSA is experienced with many drilling and development technologies. We use dual rotary, dual wall, sonic, air rotary, mud rotary, eccentric drilling (e.g., Odex, Concentrix, etc.) methods, cable tool, drive-and-wash, reverse circulation, and can utilize inclined borehole or horizontal well drilling techniques where warranted.

Well development methods HSA has used include surge, water-jetting, chemical treatment, Airburst™, and hydrofracturing. These methods are carefully chosen by HSA based on a thorough understanding of well and aquifer hydraulics and proper well performance diagnosis with the goal of developing the maximum amount of water from a particular hydrogeologic environment. This is because decisions on the design of the well, and/or the method of drilling or well development used can often turn apparent well failures into resounding successes.

Once wells are drilled, aquifer testing is conducted to determine safe pumping rates and schedules, as well as to obtain regulatory approvals required from local, state and/or federal authorities. These pumping tests are sometimes highly specialized, based on differences in well design, hydraulics, site conditions, water system design, and aquifer characteristics. HSA has conducted hundreds of aquifer tests on a wide variety of types of water supply wells and aquifers.

Since its inception, HSA has continually expanded its capabilities, advanced its technology, and successfully applied its groundwater development program over a highly diverse spectrum of geologic and geographic settings. HSA's technical experience currently spans a range of disciplines including geology, hydrology, hydrogeology, geochemistry, geophysics, remote sensing, and water resources management. We have an outstanding track record of success, having located and developed many millions of gallons per day of groundwater supplies for numerous clients. We have sited, designed, developed, tested and/or evaluated in some way hundreds of groundwater sources. Regulatory officials that oversee the permitting of water supplies, especially in our core market areas, know us well, and we are well-respected and well-regarded for the work we do as capable, experienced and ethical professionals.

## HYDROSOURCE ASSOCIATES, P.C. KEY PERSONNEL

### Claude A. Cormier, P.G. – President

Mr. Cormier is the President and principal owner of HydroSource Associates, Inc. (HSA) with over 30 years of professional hydrogeological experience. He is the chief technical, administrative, and financial supervisor for HSA projects and personnel, and has acted in this role for nearly all of HSA's New York groundwater source development projects, including those in Ticonderoga, Malone, Saranac Lake, AuSable Forks, Newcomb, Houghton-Caneadea, Lyons Falls, Crown Point, Marathon, Elizabethtown, Keene, Plattsburgh, Paris, Gilbertsville, Sandy Creek, Lacona, Beekmantown, Watson, Chesterfield, Bridgewater, Mexico, Forestport, et al. He has extensive experience in conducting all phases of the firm's systematic approach to groundwater exploration, development and protection. Mr. Cormier is a licensed geologist in New York and New Hampshire.

Mr. Cormier will act as HSA's technical and administrative director, and the main point of contact for the project. He will be primarily responsible for planning and implementation of HSA's hydrogeologic evaluations, efforts associated with well investigations, diagnoses, installation, design and/or development optimization, and subsequent well and aquifer testing activities.

Mr. Cormier is a licensed geologist in New York and New Hampshire.

### Fred Bickford, M.S., P.G., A.I.P.G. – Senior Hydrogeologist/Project Manager

Fred Bickford is a hydrogeologist with 40+ years of experience in groundwater exploration, groundwater monitoring, and mineral exploration and development. He has acted as a Senior Hydrogeologist and Project Manager on many high-yield groundwater source evaluation, development, and permitting projects in New York State during his professional career.

Mr. Bickford will serve in this role for HSA during work for the Town of LeRay. He will provide hydrogeologic expertise in the analysis of aquifer parameters and well hydraulics, aquifer and well performance, and groundwater extraction potential and sustainability. Mr. Bickford will be the primary author of technical reports and regulatory permit applications, and will serve as a technical liaison between HSA, the Town, BCA, the NYSDOH and/or NYSDEC, as warranted. Mr. Bickford is also adept at numerical groundwater modeling, and can provide these abilities, should they become necessary for any reason.

Mr. Bickford is a licensed geologist in New York and New Hampshire.

**Cameron Warlick, M.S., P.G. – Senior Hydrogeologist**

Mr. Warlick is an HSA geologist/hydrogeologist and a project manager with nearly 24 years of professional hydrogeologic, and groundwater exploration and development experience. His capabilities include geologic mapping, groundwater exploration, aquifer identification and evaluation, geophysical survey program design, implementation and interpretation of their results, test and production well logging, design and construction, aquifer/well pumping test design, implementation, and sustainability analysis, conceptual and numerical groundwater modeling and aquifer parameter estimation. He has prepared numerous groundwater source extraction reports and regulatory permit applications. He also possesses abundant experience and working capabilities in ArcView GIS, MODFLOW and other modeling software packages. Mr. Warlick has a bachelor's degree and master's degree in geology, both from Clemson University in South Carolina. He is a licensed geologist in South Carolina, Georgia, and New Hampshire.

Mr. Warlick will provide senior hydrogeologic support as may be needed, including performance of both desk-top and on-site exploration activities, analysis of groundwater recharge and extraction potential and sustainability, and/or technical report and regulatory permit application preparation, geophysical surveys, and well drilling and testing.

# HSA SIMILAR PROJECT EXPERIENCE

The well siting, design, and installation/construction efforts described in the example projects below were overseen by HSA, as were the subsequent pumping tests, sustainability analyses, and preparation of associated regulatory source permits and approval applications.

**Discharge of 1,500 gpm During Pumping Test of a New Well HSA Sited and Developed for Ticonderoga, New York**

## Town of Ticonderoga, New York

***Goal:*** Locate and develop a new groundwater source with a sustainable capacity of 1,200,000 gallons per day to replace the Town's surface water source, allowing it to avoid having to construct a more expensive surface water treatment facility.

***Project result:*** HSA conducted a groundwater exploration program and source development feasibility study, identifying multiple areas believed to have a high potential for groundwater development. This was followed by well-siting geophysical surveys and test well installation. Large diameter production wells were installed and tested according to State and Federal requirements. HSA conducted the appropriate testing of the wells to meet NYSDOH and NYSDEC regulations, prepared the required hydrogeologic supporting information, and obtained a withdrawal permit for a sustainable yield of 1,500 gpm (2,160,000 gpd) without any follow-up correspondence requested by the State regulatory agencies. A second back-up well was sited and developed nearby. This well was permitted at a sustainable capacity of more than 1,100 gpm (1,584,000 gpd).

The new wells went on line in 2019 and have been the Town's sole source of water since. The Town recently hired HSA once again to help locate and develop additional groundwater sources for another proposed water district.

## Village of Malone, New York

*Goal*: Locate and develop 2.0 million gallons per day (MGD) of water supply production capacity from new groundwater sources to serve the Village and four correctional facilities. Based upon previous work of other hydrogeologic/engineering consultants (four wells installed on the same property by the client's prior consultant yielded a maximum of about 120 gpm each), the Village was expecting to have to develop, connect, and manage as many as 10 to 12 wells to provide the required water.

**Discharge during a pumping test of one of two, 2,000 gpm production wells HSA sited and developed for the Village of Malone, NY**

**Sustainable output of over 2,000 gpm from second well HSA developed for the Village of Malone, NY**

***Project result***: HSA located and developed over 5.5 MGD of new groundwater capacity from just 2 wells. The wells are 20" diameter, screened wells in a sand-and-gravel aquifer. The wells were tested according to State regulatory standards and source approvals were obtained from the NYSDOH and NYSDEC.

The wells have been in operation for more than 15 years now. The Village of Malone recently contracted again with HSA to construct, develop, test and permit another production well to provide additional supply capacity for their system.

## City of Plattsburgh, New York

***Goal:*** The City of Plattsburgh obtains water from two reservoirs west of town to satisfy system demand of up to several million gallons per day. The cost of repairing or replacing an ageing dam at one of their reservoirs would be many millions of dollars, the required work would take a number of years, and it could be difficult to keep the City system supplied with water while the work was being undertaken. The City hired HSA to develop

groundwater sources capable of supplying enough water to reduce the City's reliance on the reservoir, or perhaps even to allow the reservoir to be decommissioned entirely.

**Very high rate of water production from cyclone on drill rig during well installation**

***Project Result:*** HSA conducted a broad hydrogeological review to identify properties considered likely to have the characteristics necessary to support high-yielding wells, while also being capable of satisfying regulatory requirements for public drinking water supplies. HSA identified a major, previously undiscovered sand-and-gravel aquifer on the City's reservoir property. A large-diameter supply well has been constructed and tested, and NYSDOH and NYSDEC have approved the well at a permitted rate of one million gallons per day. The aquifer is extensive and productive, and receives recharge from a large upgradient watershed area. The City property is large enough to accommodate a wellfield consisting of several wells. This gives the City the ability to potentially develop sufficient source capacity to allow it eventually to discontinue using the reservoir.

**Installing 20-inch diameter screen in new production well for the Houghton-Caneadea Water District**

## Houghton Water & Sewer District, Caneadea, New York

***Goal:*** Because the aquifers in the Caneadea area produce water with moderate levels of naturally occurring arsenic, the District was seeking to develop a minimum of 900,000 gallons per day (625 gpm) of new capacity in close proximity to the District's planned arsenic treatment facility, rather than installing a pipeline to connect existing production wells which were over a mile from the treatment facility site.

***Project result:*** HSA located a new source and an adjacent backup source near the new treatment facility. Whereas the goal was to develop a minimum of 625 gpm of new source capacity, the wells were approved and permitted by the regulatory agencies at 1,450 gpm (over 2 mgd) each. HSA received commendations from the local regulators for its work.

## Village of Saranac Lake, New York

**3,000 gpm discharge during pumping test of a new well HSA sited and developed for Saranac Lake**

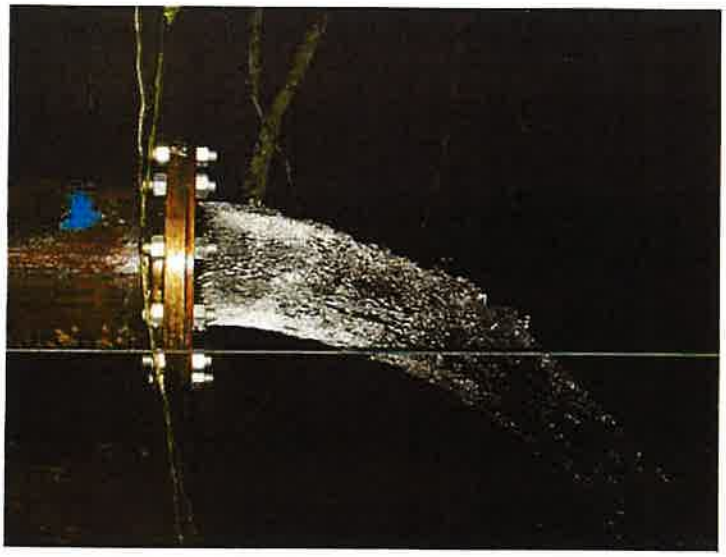
***Goal:*** Locate and develop a new groundwater source with a sustainable capacity of 1,200,000 gallons per day to replace its surface water source, to avoid the need to construct a more expensive surface water treatment facility.

***Project result:*** HydroSource conducted a groundwater exploration program and source development feasibility study, followed by well-siting geophysical surveys and test well installation. Two large diameter production wells were installed, tested and permitted according to State and Federal requirements. These two wells have a sustainable yield of 3,000 gpm each (~4,300,000 gpd).

## Private Industry in Lyons Falls, New York

***Goal:*** Develop a groundwater source that could reliably supply 1,200 gallons per minute to satisfy the fire safety requirements of the State, county and the National Fire Protection Agency.

***Project result:*** HSA's exploration and well siting geophysical survey program identified optimal locations for the installation of test wells designed to test the subsurface conditions at the site. Following the installation of just two test wells and preliminary hydraulic/pumping tests, which showed the aquifer was capable of meeting the flow needs of the facility, HSA designed and installed a large-diameter well adjacent to the test well determined to have the most favorable



**1,900 gpm discharge from 10-inch diameter orifice weir during pumping test of well HSA sited and developed in Lyons Falls, New York**

subsurface conditions. Final pumping tests demonstrated that the well's sustainable capacity was at least 1,900 gpm. Well performance during the pumping test greatly exceeded expectations, and the well was subsequently approved by the presiding regulatory officials.

## Town of Webb, Old Forge, New York

***Goal***: Locate and develop new groundwater sources to enable Old Forge to avoid having to construct a lengthy pipeline, and build and operate a surface water treatment facility.

**Discharge from orifice weir during pumping test of one of two 700 gpm (1,000,000 gpd) well sources sited and developed by HSA for Old Forge, New York**

***Project result***: After having been told by preceding consultants that groundwater was not a viable solution to the Town's water supply needs, HSA located and developed two screened, sand-and-gravel wells in a previously unknown aquifer. The wells were within a few hundred feet of an existing water main. Each well can be pumped at over 700 gpm (>1,000,000 gpd) on a sustained basis. The wells have been in operation consistently since the early 1990's.

**150 gpm of natural artesian flow originating from a well HSA sited and developed for Elizabethtown**

## Town of Elizabethtown, New York

***Goal***: Replace the Town's four low-yield bedrock wells and adjacent springs with a new groundwater source.

***Project result***: HSA located and developed a free-flowing, artesian, screened primary well and backup well in a confined sand-and-gravel aquifer. Each well demonstrated a sustainable capacity of 350,000

gallons per day (gpd), but the Town's average daily need was only approximately 150,000 gpd, or about 100 gallons per minute (gpm). The wells flow freely at 125-150 gpm and are located at an elevation higher than the Town's storage tank which, in turn, is located above the Town. To meet normal demands, the water supply system requires virtually no pumping, thus providing a large energy cost savings to the Town.

The wells HSA developed for the Town have been in operation for 20 years. Elizabethtown has contracted and is currently working with HSA again to construct, develop, test and permit another production well to provide additional supply capacity for their system.

## Village of Marathon, New York

***Goal***: Locate and develop a new groundwater source to replace one well deemed to be under the influence of surface water, another that produced water with very high levels of manganese and a third which had been taken off line due to volatile organic compound contamination. A minimum source capacity of 250,000 gpd was needed.

**Water being produced by the aquifer discovered by HSA while test well drilling for the Village of Marathon, New York**

***Project result***: HSA located and developed two screened sand-and-gravel wells, one primary and one back-up well, that can each yield 400,000 gpd, and a bedrock well that can produce 250,000 gpd, in addition. The wells were located in a separate, previously unknown aquifer that produces very good quality water. HSA coordinated its work with and received source approvals for the new wells from the Cortland County Health Department, the NYSDOH, the NYSDEC and the Susquehanna River Basin Commission.

## Island of Trinidad, Trinidad and Tobago, West Indies

**Well installation on the Island of Trinidad, West Indies**

***Goal*:** Locate and develop 15,000,000 gallons per day of new groundwater source capacity across the island nation, and develop a new island-wide hydrogeologic assessment atlas and report for the Trinidad and Tobago Water & Sewerage Authority.

***Project result*:** HSA produced a report containing a unique water recharge analysis that used a combination of meteorological data from satellites along with runoff data from existing stream gauging stations that were combined with a GIS modeling program. HSA digitized over 1,000 electric well logs, interpreted over 40 seismic images, and analyzed over 1,800 analog water well logs. Data was integrated into a GIS program to generate new hydrogeologic maps for the island. In addition, in just 20 months, over 18,000,000 gallons per day of new groundwater source capacity was sited and developed, from both bedrock and alluvial aquifers, many of them that were previously unknown to exist. Much of the success can be attributed to HSA's use of geophysical and drilling technologies it introduced into Trinidad for groundwater exploration, including controlled-source audio-magnetotelluric geophysical surveys and dual rotary drilling. The project included comprehensive (pump) testing, and numerical modeling of a number of aquifer environments to delineate recharge areas, assess sustainable wellfield pumping rates, determine where additional wells could be located, and as an on-going tool that is presently being used to manage the country's groundwater reserves.

**1,000+ gpm discharge from one of several similar yielding wells HSA sited and developed for the Water and Sewerage Authority of Trinidad and Tobago**