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IDC ARCHITECTS

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Western New York Science and Technology Advanced Manufacturing Park (STAMP)

Conceptual Water and Wastewater Alternatives Analysis and Recommendations Report

Prepared for

Genesee Gateway Local Development Corporation (GGLDC)

August 2013

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Executive Summary

Introduction

The Genesee County Industrial Development Agency, doing business as the Genesee County Economic Development Center (GCEDC), is currently leading an effort with support from its non-profit real estate affiliate, the Genesee Gateway Local Development Corporation (GGLDC), collectively referred to as the 'Developer'. This effort is to advance planning for a high technology campus with an expected focus on semiconductor manufacturing at an approximately 1,243-acre site located in western Genesee County, in the Town of Alabama, known as the Western New York Science and Technology Advanced Manufacturing Park (STAMP). The high technology industry requires specific favorable development conditions, including reliability and quality in the key utilities of power, natural gas, water, and wastewater. A critical requirement for successful development is the ability to provide a reliable, high-capacity and cost-effective source of high-quality potable water, and the ability to properly manage the subsequent wastewater generated from both sanitary and industrial process water applications.

Purpose and Scope

This report presents a comparative analysis of various alternatives identified to provide up to 12 million gallons per day (MGD) of potable water supply and manage up to 12 MGD of wastewater generated at the STAMP site. This is separate from the Town of Alabama water project which will obtain water from the Village of Oakfield, and may provide water to support construction and potentially ancillary development on the STAMP site. The basic premise for this analysis is that a tenant will develop the site to accommodate semiconductor manufacturing facilities (known as fabs) to fabricate 450mm wafers. It is anticipated that development of the site would occur in three major phases over a period of years. It is also assumed that this phased development will require the build-out of the water supply and wastewater (sewer) management system in three phases accommodating 4, 8, and 12 MGD, respectively, to support the main manufacturing facilities as well as any ancillary support facilities. Related high technology industries (e.g. Flat Panel Displays, FPD) would also benefit from this study.

IDC Architects/CH2M HILL led this study. Clark Patterson Lee provided engineering support, review, and guidance regarding local conditions. The Developer council, Philips Lytle, provided land use and legal support and the Developer consultant, Conservation Connects, provided environmental support. This project, including the comparative analysis and alternatives decision-making process, was structured by bi-weekly conference call updates and discussions, as well as two formal workshop sessions between the Developer and the various team members. Meetings and facility tours were also conducted with the various local water and sewer authorities to understand their plans and interest in supporting the project. The study was completed in approximately eight months.

Water Supply Alternatives

Initially, seven potential sources of potable water were identified and assessed, either as sole sources or as part of a blended source to supply 12 MGD of potable water for high tech operations on the STAMP site. Based on discussions and analysis of the preliminary cost and regulatory challenges, three of the original potential alternatives were eliminated during the initial phase of the study. The eliminated alternatives were:

- Monroe County Water Authority (MCWA);
- City of Batavia;
- A new intake on Lake Ontario near Lyndonville, New York.

Subsequent discussions and evaluations indicated that the following four alternatives, as well as a variation of Alternative 4, are technically viable. The four viable alternatives are:

1. Obtaining the full 12 MGD from Niagara County Water District (NCWD).
2. Obtaining up to 8 MGD from NCWD and another 4 MGD from Lockport via the NCWD distribution system.
3. Obtaining up to 8 MGD from NCWD with another 4 MGD from Erie County Water Authority (ECWA) via the NCWD distribution system.
4. Obtaining 8 MGD from NCWD and 4 MGD from existing Genesee County water suppliers via their MCWA and ECWA interconnections. The variation of this alternative is to obtain the 4 MGD from Genesee County first, and then subsequently obtain the 8 MGD from NCWD.

Wastewater Management Alternatives

Initially, five potential wastewater management scenarios were identified and assessed for providing treatment and disposal of 11 MGD of pre-treated industrial effluent and 1 MGD of sanitary sewage effluent from the STAMP site. Based on discussion with the local authorities and consultant team, as well as analysis of regulatory constraints, water quality concerns, and capital cost, all five alternatives were eliminated from consideration. The five eliminated alternatives were to:

- Construct an on-site treatment facility and discharge via pipeline to an off-site location beyond the local area;
- Pump the full 12 MGD to the City of Lockport WWTP;
- Construct an on-site wastewater treatment facility to discharge to a local receiving water;
- Construct an on-site treatment facility with deep-well injection of effluent;
- Manage wastewater through reuse alternatives.

Additional discussions then identified three alternatives for further evaluation. Subsequent study indicated that all three alternatives, as well as a variation of Alternative 3 (identified as Alternative 4 later in the report), are technically viable. The three base alternatives are:

1. Pumping 12 MGD of combined, pre-treated process effluent and sanitary sewer to the Bird Island Wastewater Treatment Plant (Bird Island WWTP) in Buffalo, New York, owned by the Buffalo Sewer Authority (BSA).
2. Pumping 12 MGD of combined, pre-treated process effluent and sanitary sewer to the Van Lare Wastewater Treatment Plant (Van Lare WWTP) in Rochester, New York, owned by Pure Waters/County of Rochester.
3. Pumping 11 MGD of pre-treated process effluent for direct discharge to Lake Ontario, and pumping 1 MGD of sanitary sewer to the Village of Medina Wastewater Treatment Plant (Medina WWTP).

For each of these options, upgrades may be required to individual wastewater treatment plants, which may provide benefit to the local communities through improved wastewater treatment process and/or expanded capabilities. In addition, conceptual water and wastewater studies (Appendices A and B) were provided to the New York State Department of Environmental Conservation (NYSDEC) for review and input, and two (2) meetings were held with NYSDEC to review these options.

Water and Wastewater Conclusions, Recommendations, and Costs

Conceptual designs were prepared for each water and wastewater alternative. The conceptual designs included conveyance route schematics, pumping requirements, and Class 4/5 construction cost estimates, as well as input from applicable regulatory agencies, water districts, municipal waste authorities, and local municipalities (villages, towns, and cities). This information was compiled and evaluated during a team workshop in the form of a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis aiding in the selection of the preferred alternatives for both water supply and wastewater management.

Selected Water Supply Alternative

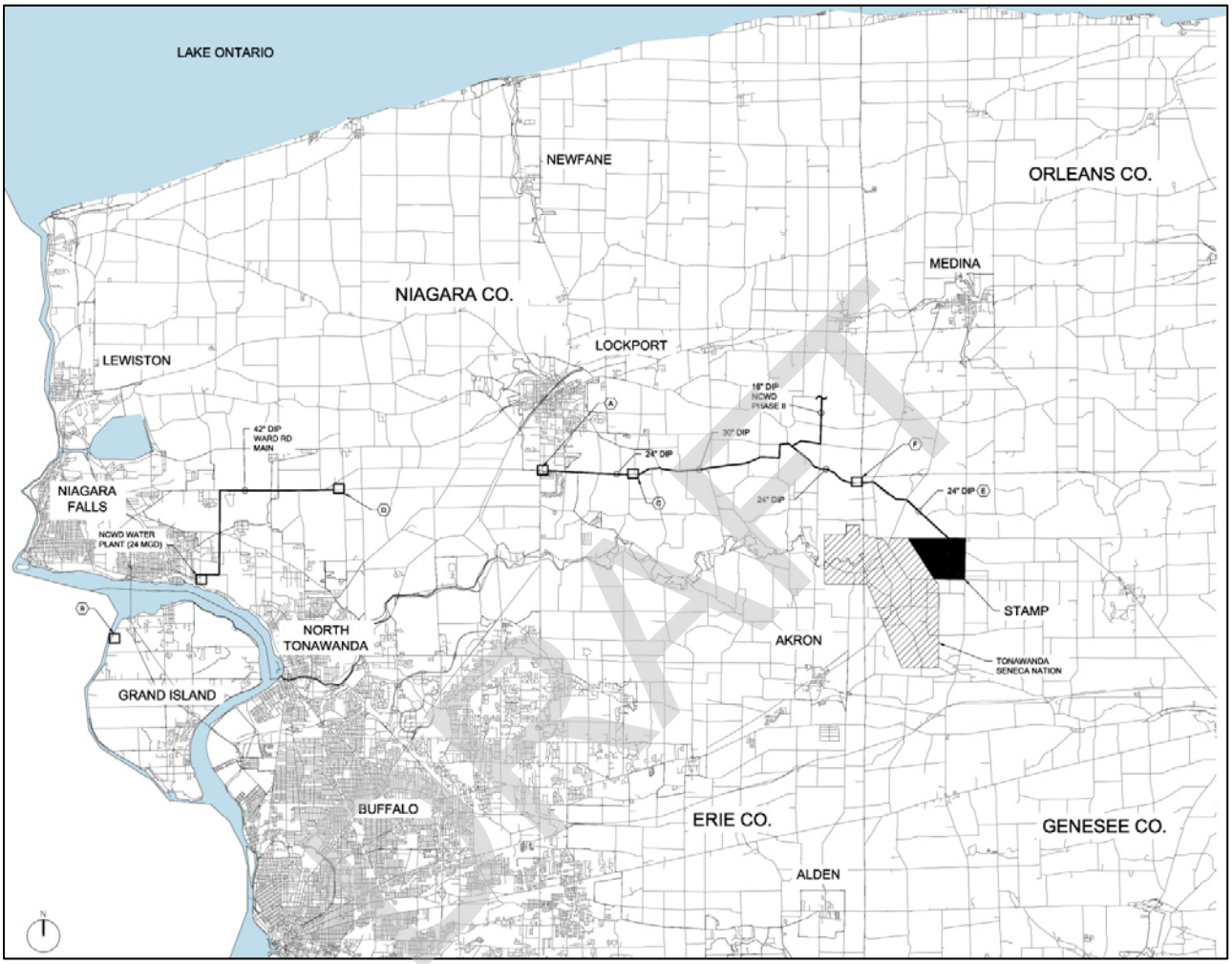
Solution

NCWD supplies a portion of the water for each of the four viable water alternatives selected for further evaluation, and is projected to be able to supply up to 8 MGD for each option, with the improvements identified within this report. In discussions with the NCWD and their engineers, Wendel, we reviewed and assessed the potential for NCWD providing 2, 4, 6 and 12 MGD to the STAMP site. Wendel provided a summary of necessary improvements and cost estimates for each level of production. While the review specifically identified a 6 MGD target, the cost estimates were based on installing transmission lines that could provide the full 12 MGD upon full build out. Increasing to 8 MGD would involve only minor additional effort or cost, possibly some additional pump station work to ensure the capacity is available. However, any increase beyond 8 MGD, will involve a significant price increase in pump station upgrades, additional water transmission costs, intake capacity improvements and treatment plant upgrades. Evaluation of the alternatives resulted in a recommendation that Phase 1 of the water supply should be obtained from NCWD. It is also recommended that Phase 1 should include constructing the pipeline capacity required to supply the full 12 MGD of water to the STAMP site, as well as the pump station upgrades necessary to transmit 8 MGD. With these improvements, NCWD will be able to accommodate the first two phases of site development and construction of manufacturing facilities, as well as any ancillary support facilities. Since the pipeline capacity is sized for the full 12 MGD this would provide a cost effective Phase 3 alternative for contingency planning / risk assessment scenarios. Refer to Figure E-1.

The decision on how to supply the remaining 4 MGD of water supply required to meet the build-out demand of 12 MGD can be deferred until a later date. There are two cost-effective options available; one Phase 2 alternative would be to receive the final 4 MGD (12 MGD total) from NCWD (complete Alternative 1) and would utilize the spare capacity of the pipeline installed as part of Phase 1, and the other alternative would be to receive the final 4 MGD from new connections within Genesee County (complete Alternative 4A). Additional pump station upgrades would be required to support either alternative.

Site Plan

Figure E-1: Recommended Water Supply Alternative Conceptual Routing | Alternative 1 and 4A – Phase 1



SWOT Analysis

A SWOT analysis, which includes a discussion of strengths, weaknesses, opportunities, and threats to the viability or preference for each viable alternative, was assembled during a team workshop to integrate the Developer and consultant team points of view. The following are key considerations for Alternatives 1 and 4A, the recommended alternatives:

Alternative 1 – 12 MGD NCWD

Key Strengths and Opportunities

- Active interest/enthusiasm on the part of NCWD to be a committed partner to deliver the project;
- Single source of supply for 12 MGD of water (customer and water quality);
- Consistent water quality and essay;
- Ability to work with one supplier;
- Low NCWD existing bulk water rates;

- May be able to negotiate favorable bulk rate with NCWD;
- Potential for cost sharing with the existing NCWD Capital Improvement Plan (CIP) and shared benefits with Niagara County;
- Expected costs least likely to change.

Key Weaknesses and Threats

- Potential need for significant upgrades to treatment, intake, and pumping;
- Timing and regulatory approval for significant treatment and intake upgrades;
- Lack of bulk water rate control depending on the supplier of record to supply the STAMP site.

Alternative 4A – 8 MGD NCWD and 4 MGD Genesee County Sources

Key Strengths and Opportunities

- Lowest cost of two preferred alternatives;
- Strengthening of existing water supply within the County.

Key Weaknesses and Threats

- Two to three different sources of water and water quality for Phase 2;
- Significant coordination between multiple systems;
- Limited ability to negotiate water rates given existing rate structures in County;
- Need for partial implementation of Genesee County Water Project;
- Assurance that full 4 MGD is available from Genesee County.

Estimated Costs

Alternative 1 acquires the full 12 MGD water supply capacity from NCWD and is estimated to require approximately $67.7 million in capital costs and $12.2 million in engineering costs. This results in a total cost of $79.9 million for Alternative 1. Refer to Table E-1.

Alternative 4A acquires 8 MGD of water supply capacity from NCWD and 4 MGD from multiple sources within Genesee County and is estimated to require approximately $63.3 million in capital costs and $11.4 million in engineering costs. This results in a total cost of $74.7 million for Alternative 4A.

Both Alternative 1 and 4A acquire the initial 8 MGD water supply capacity from NCWD, and therefore have the same initial cost. Phase 1 is estimated to require approximately $39.2 million in capital costs and $7.1 million in engineering costs. This results in a total cost of $46.3 million for either alternative to acquire the initial 8 MGD from NCWD.

The final 4 MGD water supply capacity source and routing varies between Alternative 1 and 4A, and the costs differ as well. Alternative 1 acquires the final 4 MGD from NCWD (same supply as Phase 1) and is estimated to require approximately $28.5 million in capital costs and $5.1 million in engineering costs for Phase 2. This results in a total cost of $33.6 million to acquire the final 4 MGD from NCWD for Alternative 1.

Alternative 4A acquires the final 4 MGD from multiple sources with Genesee County and combines it with water supplied by NCWD in Phase 1. This approach is estimated to require approximately $24.1 million in capital costs

and $4.3 million in engineering costs for Phase 2. This results in a total cost of $28.4 million to acquire the final 4 MGD from Genesee County for Alternative 4A.

Table E-1: Recommended Water Supply Cost Summary by Phase | Alternative 1 and 4A

WATER SUPPLY				
	Phase 1	Phase 2		Build-out Total
	Alternatives 1 and 4A	Alternative 1	Alternative 4A	
Estimated 2014 Capital Costs (Millions)	$39.2	$28.5	$24.1	$63.3 – 67.7
Engineering Total (Millions)	$7.1	$5.1	$4.3	$11.4 – 12.2
Total Costs (Millions)	**$46.3**	**$33.6**	**$28.4**	**$74.7 – 79.9**

Selected Wastewater Management Alternative

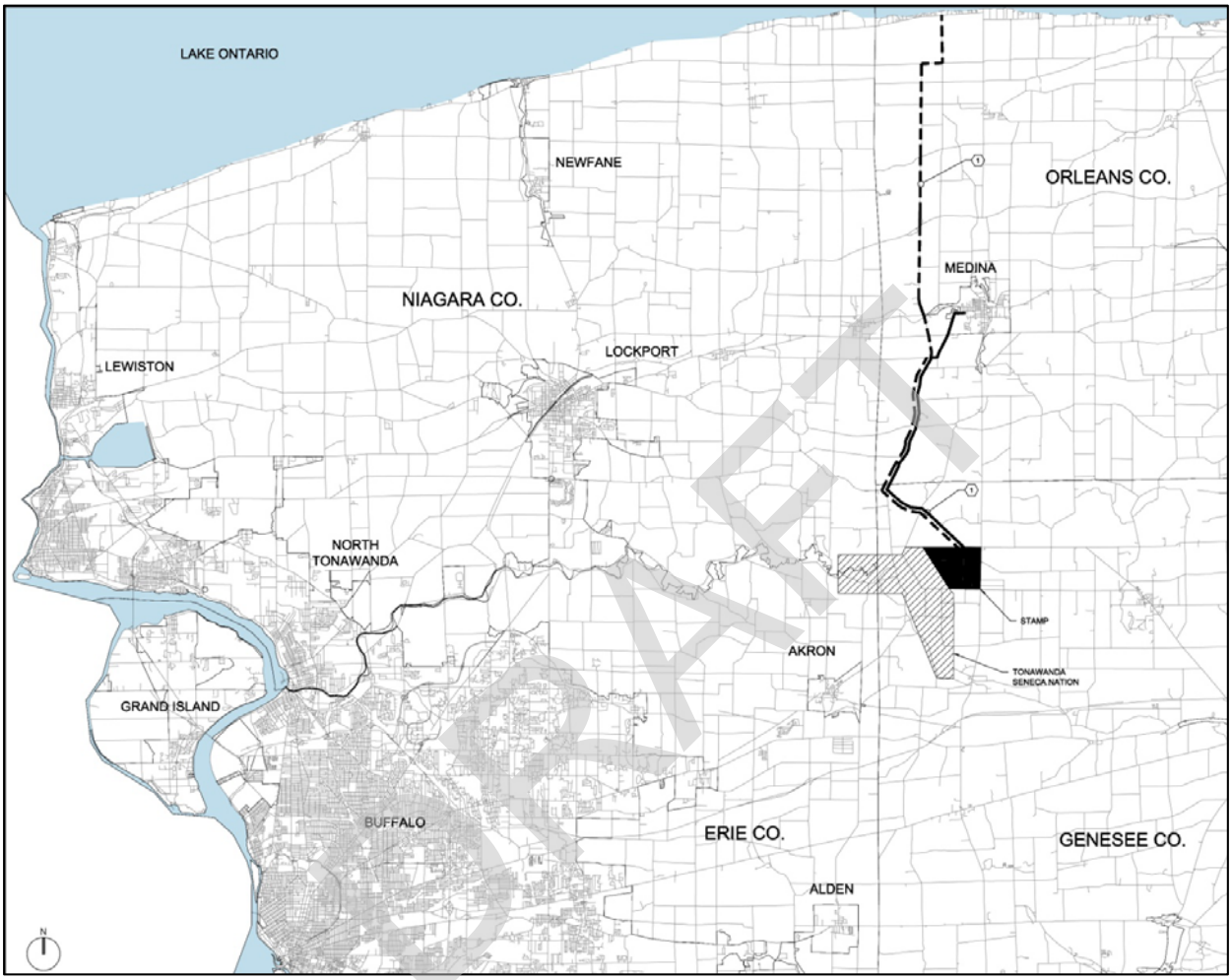
Solution

Evaluation of the viable alternatives resulted in the selection of Alternative 3 (1 MGD to Medina WWTP and 11 MGD to Lake Ontario) as the recommended alternative. This alternative splits wastewater flows, sending up to 1 MGD of sanitary effluent to the Village of Medina WWTP and up to 11 MGD of pre-treated process effluent to Lake Ontario for direct discharge. Refer to Figure E-2.

Alternative 3 has the lowest total estimated capital cost at $67.0 million, as well as local conditions that favored the selection of this alternative. NYSDEC provided input related to the various viable alternatives and capabilities of the WWTP associated with each alternative. NYSDEC also provided critical information related to concerns and uncertainties related to permitting for direct discharge into Lake Ontario for Alternative 3 as compared to a discharge to the Buffalo sewer system in Alternative 1. Their input indicated that concerns related to Alternative 3 were no more significant than the wet-weather concerns related to Alternative 1 remaining under consideration, and that both alternatives would have a similar set of uncertainties which would need to be addressed as the project moves forward. The conclusion of these discussions was that Alternative 3 clearly emerged as the preferred alternative.

Site Plans

Figure E-2: Recommended Wastewater Management Alternative Conceptual Routing | Alternative 3



SWOT Analysis

A SWOT analysis was also assembled to integrate the Developer and consultant team points of view for the wastewater alternatives. The following are key considerations for Alternative 3, the recommended alternative:

Alternative 3 – 1 MGD to Medina WWTP and 11 MGD to Lake Ontario

Key Strengths and Opportunities

- Active interest and enthusiasm on the part of Medina to be a committed partner to deliver the project;
- Only limited modifications required to connect the 1 MGD forcemain to the WWTP;
- Spare capacity is available at the WWTP;
- Lowest expected overall cost alternative;
- Potential for shared community benefits with the Village of Medina.

Key Weaknesses and Threats

- Opportunities to phasing of construction are limited to the installation of future pumps and motors at the STAMP pump station;
- Potential for SPDES permitting issues for the discharge to Lake Ontario, including uncertainties/challenges and public perception;
- Currently, the Medina WWTP has the highest sewer rates, and uses one of the least effective biological treatment processes;
- Potential additional pre-treatment requirements due to composition of wastewater.

Estimated Costs

Alternative 3 sends 1 MGD of sanitary wastewater effluent to the Medina WWTP and 11 MGD of pre-treated process effluent for discharge into Lake Ontario. This alternative is estimated to require approximately $56.8 million in capital costs and $10.2 million in engineering costs. This results in a total cost of $67.0 million for Alternative 3. Refer to Table E-2.

This alternative does not offer the opportunity for a significant deferral of cost through phasing, and as a result phasing is not recommended as part of wastewater implementation.

Table E-2: Recommended Wastewater Management Cost Summary by Phase | Alternative 3

WASTEWATER MANAGEMENT			
	Phase 1 Alternative 3	**Phase 2 Alternative 3**	**Build-out Total**
Estimated 2014 Capital Costs (Millions)	$56.8	N/A	$56.8
Engineering Total (Millions)	$10.2	N/A	$10.2
Total Costs (Millions)	**$67.0**	**N/A**	**$67.0**

Cost Summary – Water Supply and Wastewater Management

Multiple possibilities still exist for Phase 2 water supply sources and a more detailed evaluation and analysis will be required to determine the final preferred concept for that phase. Since multiple possibilities still exist for Phase 2 water supply sources, a cost range is provided for evaluation and budgetary purposes for that phase. Refer to Table E-3.

Combined water and wastewater costs for Phase 1 will include water infrastructure to provide 8 MGD and wastewater infrastructure to remove 12 MGD of effluent. Phase 1 is estimated to require approximately $96.0 million in capital costs and $17.3 million in engineering costs. This results in a total cost of $113.3 million for Phase 1.

The cost summary does not include costs related to wastewater in Phase 2 because recommended Alternative 3 does not offer significant opportunities to defer costs.

Phase 2 is estimated to require approximately $24.1 – 28.5 million in capital costs and $4.3 – 5.1 million in engineering costs. This results in a total cost of $28.4 – 33.6 million for Phase 2.

This results in a total cost range of $141.7 – 146.9 million in combined capital and engineering costs to provide 12 MGD of potable water and remove 12 MGD of wastewater effluent.

Table E-3: Recommended Water and Wastewater Alternatives Cost Summary by Phase

WATER SUPPLY				
	Phase 1	**Phase 2**		**Build-out Total**
Alternative(s)	**Alternatives 1 and 4A**	**Alternative 1**	**Alternative 4A**	
Estimated 2014 Capital Costs (Millions)	$39.2	$28.5	$24.1	$63.3 – 67.7
Engineering Total (Millions)	$7.1	$5.1	$4.3	$11.4 – 12.2
Total Costs (Millions)	$46.3	$33.6	$28.4	$74.7 – 79.9
WASTEWATER MANAGEMENT				
	Phase 1 Alternative 3	**Phase 2 Alternative 3**		**Build-out Total**
Estimated 2014 Capital Costs (Millions)	$56.8	N/A		$56.8
Engineering Total (Millions)	$10.2	N/A		$10.2
Total Costs (Millions)	$67.0	N/A		$67.0
GRAND TOTAL – WATER SUPPLY & WASTEWATER MANAGEMENT				
Total Costs (Millions)	**$113.3**	**$28.4 – 33.6**		**$141.7 – 146.9**

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Section 1.0 | Introduction

The Genesee County Industrial Development Agency, doing business as the Genesee County Economic Development Corporation (GCEDC), is currently leading an effort with support from its non-profit real estate affiliate, The Genesee Gateway Local Development Corporation (GGLDC), collectively referred to as the 'Developer'. This effort is to advance planning for a high technology campus with an expected focus on semiconductor manufacturing at an approximately 1,243-acre site located in western Genesee County, in the Town of Alabama, known as the Western New York Science and Technology Advanced Manufacturing Park (STAMP). The high technology industry requires specific favorable development conditions including reliable and quality in the key utilities of power, natural gas, water and wastewater. A critical requirement for successful development is the ability to provide a reliability, high-capacity and cost-effective source of high-quality potable water, and the ability to properly manage the subsequent wastewater generated from both sanitary and industrial process water applications.

1.1 Purpose and Scope

This report presents a comparative analysis of various alternatives identified to provide up to 12 million gallons per day (MGD) of potable water supply and manage up to 12 MGD of wastewater generated at the STAMP site. This is separate from the Town of Alabama water project which will obtain water from the Village of Oakfield, and may provide water to support construction and potentially ancillary development on the STAMP site. The basic premise for this analysis is that a tenant will develop the site to accommodate semiconductor manufacturing facilities (known as fabs) to fabricate 450mm wafers. It is anticipated that development of the site would occur in three major phases over a period of years. It is also assumed that this phased development will require the build-out of the water supply and wastewater (sewer) management system in three phases accommodating 4, 8, and 12 MGD, respectively, to support the main manufacturing facilities as well as any ancillary support facilities. Related high technology industries (e.g. Flat Panel Displays, FPD) would also benefit from this study.

The objective of this report is to provide the Developer the information necessary to make an informed decision and selection of preferred water supply and wastewater management alternatives to advance to the next stage of design development. IDC Architects (IDCA), in conjunction with Clark Patterson Lee (CPL), identified multiple water supply and wastewater management alternatives, and conducted an analysis of the advantages and disadvantages of each alternative. An overview of the background discussions with the potential water suppliers and wastewater treatment providers, as well as system requirements, Class 4/5 cost estimates (including capital costs, engineering design, and engineering services during construction), and recommendations for further actions regarding the selected viable alternatives are included in the subsequent sections of this report. Additional alternatives were also identified and assessed, and eliminated immediately. Detailed narratives for the eliminated water and wastewater alternatives are included in the Final Comparative Technical Memoranda, attached as Appendices A (Water Supply) and B (Wastewater Management).

This report utilizes information presented in the Draft Evaluation and Conceptual Design Memoranda and Final Comparative Analysis Technical Memoranda issued by IDCA on November 23, 2012 and February 27, 2013, respectively, to perform analyses and generate recommendations. This report also incorporates the Developer review comments received during Workshop No. 1 held on November 27, 2012 and Workshop No. 2 held on January 18, 2013. This report also includes information provided by the New York State Department of Environmental Conservation (NYSDEC) during two meetings held on April 4, 2013 and May 17, 2013.

1.2 Process

This report is the culmination of the STAMP Conceptual Water and Wastewater Engineering Study. Previous work performed under this study included the identification and evaluation of potential water supply and wastewater management alternatives for the STAMP site. A series of technical memoranda were drafted and two workshops were held as part of an iterative process that progressively evaluated the various alternatives for a variety of parameters including technical viability, capital cost, long-term operation and maintenance cost, regulatory acceptance, and stakeholder concerns. These evaluations have resulted in comparative data for each alternative which have been summarized into system requirements, SWOT analysis, and cost breakdown for each alternative, as well as its phased development.

System Requirements

System requirements were determined through conversations with the regional and local authorities and suppliers with reference to their future capital improvement plans, and from knowledge of local conditions, professional best practices, and intimate knowledge and experience with the system requirements of the high technology industry. Both the water supply and wastewater alternatives were evaluated through this multi-faceted lens of experience.

From a technical perspective, the following water supply elements were studied and detailed: pump station improvements, transmission improvements, main construction, intake improvements, treatment plant upgrades, system upgrades, connection upgrades, and storage.

The following wastewater management elements were addressed: segregation of sanitary and process wastewater (or lack thereof), introducing a new pumping station, expansion of existing pumping stations, new sewer line(s), average conveyance pipeline distances and diameters, interconnection points to existing system(s), wet-weather improvements, and effluent discharge point(s) in the case of discharge to Lake Ontario.

SWOT Analysis

A **SWOT**—**S**trengths, **W**eaknesses, **O**pportunities, and **T**hreats—Analysis is a strategic planning exercise used to consider both internal and external factors affecting decision-making. Strengths and weaknesses are internal considerations, while opportunities and threats are factors external to the decision-making context. A SWOT analyzes competitive advantages and disadvantages in the environment in which one operates, in order to inform decisions.

In the case of the SWOT Analysis conducted for water supply and wastewater management for STAMP, the Developer and consultant team discussed the inherent advantages and challenges facing the project in terms of internal capabilities, site attributes, potential suppliers, political and socio-economic considerations, and competing projects as seen through the lens of the best option(s) to provide water and remove wastewater from STAMP in support of a high tech industrial user.

Costs

Costs for both water supply and wastewater management alternatives were prepared according to the standards of the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System at Class 4 or Class 5 levels. Class 4 Rough Order of Magnitude level is defined as a -30% to +50% level of accuracy, while Class 5 Rough Order of Magnitude is defined as a -50% to +100% level of accuracy. A Class 4/5 Cost Estimate is appropriate for the level of conceptual design considered for STAMP to date.

All construction costs were standardized to include both capital cost items, as well as engineering costs and a standard contingency for all construction costs. Pre-construction engineering costs include planning, design, permitting, legal, and miscellaneous costs. The following values were consistently used for each alternative:

- 20% contingency for all construction costs;
- Pre-construction engineering costs of 10%;
- Engineering during construction costs of 8% for inspections, administration, and services during construction;
- Escalation factor of 4% to reflect cost projections to 2014 US Dollars.

In addition to the above, a phased approach to meeting water demands was considered as industrial demands will increase at the site over its incremental build-out over time. It is projected that the proposed manufacturing facilities will be built out in three, 4 MGD phases to meet a total water supply need of 12 MGD. The issue of potential generation of capital for future project phases based upon water rates established in initial phases was also studied as a potential income stream.

In terms of wastewater management, scenarios are presented that meet the need to treat 12 MGD, though phasing scenarios are not included as they are not practical. However, the following cost-related assumptions were included in the study:

- Cost of conveyance was based on one pump station located at STAMP that assumed a combination of force main and gravity conveyance. Pipeline length was based on a routing along secondary roads;
- A pipeline average diameter was used to estimate comparable capital and annual costs for each alternative, with pipe routing and line sizes to be optimized during detailed design of the selected alternative;
- The cost of process wastewater effluent pre-treatment will be the operational, maintenance, and financial responsibility of the semiconductor or other high tech user and is not included in the estimates.

Project Team

IDCA has worked with the Developer's consultants, specifically CPL, Conservation Connects, LLC, and the Developer's council, Phillips Lytle, as well as local water suppliers to incorporate their local knowledge, past and current efforts on this project, and their technical experience into the study.

1.3 Semiconductor Wastewater Quality Considerations

The semiconductor industry has specific standards for wastewater treatment. It is anticipated that any semiconductor manufacturer operating at the STAMP site will segregate and dispose of high strength organic solvents and concentrated or toxic metals, and provide for fluoride, ammonia, copper, and TSS removal to reach the concentration levels indicated in Table 1-1 below. These wastewater quality ranges were considered in the wastewater alternatives considered in this report.

Table 1-1: Typical Wastewater Quality Ranges for Semiconductor Manufacturing

Parameter	Units	Typical Range
Potential Hydrogen (pH)	s.u.	6-9
Total Dissolved Solids (TDS)	mg/l	1,200-2,200
Chemical Oxygen Demand (COD)	mg/l	200-400
Biochemical Oxygen Demand (BOD)	mg/l	40-150
Ammonia-N	mg/l	20-100
Nitrate N (NO_3-N)	mg/l	5-50
Phosphorus (P – Total)	mg/l	2-5
Total Suspended Solids (TSS)	mg/l	5-200
Fluoride	mg/l	2-10

Notes:
1. Pretreatment typically provided on-site for fluoride, ammonia, copper, and TSS to reach these levels.
2. On-site segregation and disposal of high strength organic solvents and concentrated/toxic metals.
3. TDS and ions in effluent depend on feed water levels.
4. Manufacturing wastewater only; domestic not included.

Section 2.0 | Water Supply Alternatives

2.1 Background

The basis of this water supply alternatives analysis is to meet the water supply requirements that a semiconductor or similar high technology manufacturer will need for initial operations on the order of 4 MGD. Over a period of years, the facilities will be expanded in two major phases, each requiring an additional 4 MGD of water for an expected, total demand of 12 MGD at build-out. The semiconductor industry requires steady and reliable, potable-quality water, preferably from a single source, to maintain consistent and predictable water quality for operations.

Initially, seven potential sources of potable water were identified and assessed, either as sole sources or as part of a blended source of supply. These sources included:

- Niagara County Water District (NCWD)
- City of Lockport (Lockport)
- Monroe County Water Authority (MCWA)
- Erie County Water Authority (ECWA)
- City of Batavia
- Interconnections within Genesee County with existing supplies (Genesee County)
- A new intake on Lake Ontario near Lyndonville, New York

Each of the public water suppliers were contacted to obtain their assessments of providing up to 12 MGD of potable water to the STAMP site. Based on these discussions and an analysis of the preliminary cost and regulatory challenges, three of the potential alternatives were eliminated. The four alternatives remaining for further study are:

1. Obtaining the full 12 MGD from NCWD;
2. Obtaining up to 8 MGD from NCWD and another 4 MGD from Lockport via the NCWD distribution system;
3. Obtaining up to 8 MGD from NCWD with another 4 MGD from ECWA via the NCWD distribution system;
4. Obtaining 8 MGD from NCWD and 4 MGD from existing Genesee County water suppliers via their MCWA and ECWA connections.

Subsequent evaluations indicated that all four alternatives referenced above, as well as a variation of Alternative 4, are technically viable. Although all four alternatives and a variation of Alternative 4 are technically viable solutions, NYSDEC indicated that care should be taken to ensure that alternatives do not violate the Great Lakes Compact or the newly issued NYSDEC Water Withdrawal Regulations (6NYCRR Part 601). Intra-Basin transfers of water may be allowed, however, the non-consumptive portion of withdrawals exceeding 5 MGD must be returned to the source watershed (Lake Erie Basin). Transfers of more than 100,000 GPD, but less than 5 MGD, may be allowed to be discharged into another Great Lakes Watershed (Lake Ontario Basin) if the applicant can demonstrate that there is no feasible, cost effective, and environmentally sound alternative. Preliminary guidance from NYSDEC indicated that while withdrawal from the Niagara River and discharge into the Lake Ontario Basin is permittable within the Great lakes Compact and the new NYSDEC Water Withdrawal regulations, withdrawals from the Lake Erie Basin and discharge into the Lake Ontario Basin may not be permitted. Thus, it may be very difficult, perhaps impossible, to obtain approval for an Intra-Basin transfer for Alternative 3, which includes obtaining 4 MGD from ECWA(Lake Erie Basin), if the wastewater is discharged to the Lake Ontario Basin. Alternative 4A, which proposes to obtain up to 4 MGD from existing Genesee County water suppliers, could also be subject to the Intra-Basin limitations if a portion of the 4 MGD is obtained from the ECWA connection in Genesee County. It would be prudent to assure that the full 4 MGD under this alternative is obtained from MCWA

sources, otherwise an Intra-Basin approval may be required if the corresponding wastewater solution includes discharge to the Lake Ontario Basin. Summaries of the four alternatives are included in this section. Conceptual designs that include conveyance route schematics, pumping requirements, and Class 4/5 construction cost estimates were prepared to provide additional information for comparison and are provided in Appendix A.

The following subsections provide an overview of the viable alternatives selected for study and a comparative analysis based on factors such as capital cost, operation and maintenance costs, permitting issues, stakeholder concerns, and phased construction. Other factors include a comparison of current and projected water rates and the potential for revenue generation resulting from the sale of water to the end user.

2.2 Summary of Water Supply Alternatives

Overview

Based on technical viability, estimated capital and engineering cost, and consideration of local issues and drivers, the four water management alternatives identified for further evaluation are:

1. Receiving the full 12 MGD of water supply from NCWD;
2. Receiving 8 MGD from NCWD and 4 MGD from Lockport;
3. Receiving 8 MGD from NCWD and 4 MGD from ECWA;
4. Receiving 8 MGD from NCWD and 4 MGD from Genesee County.

For comparison purposes, Table 2-1 provides a summary of the technical requirements and costs for each alternative:

Table 2-1: Water Supply Alternatives | Comprehensive Cost Comparison Summary

Alternatives	Quantity	Technical Requirements	Estimated 2014 Capital Costs (Millions)	Total Costs (Millions)*
Alternative 1 NCWD	12 MGD	Intake, Treatment, Pumping, Transmission, Storage	$67.7	$79.9
Alternative 2 NCWD/Lockport	8 MGD/4 MGD	Pumping, Transmission, Storage	$53.1	$62.7
Alternative 3 NCWD/ECWA	8 MGD/4 MGD	Pumping, Transmission, Storage	$71.7	$84.7
Alternative 4 NCWD/Genesee Co.	8 MGD/4 MGD	Pumping, Transmission, Storage	$63.3	$74.7

*Notes:
1. All capital cost estimates are Class 4/5 cost estimates. Class 4/5 cost estimates are consistent with the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The majority of items will be Class 4 – Rough Order of Magnitude, with a -30% to +50% level of accuracy, some additional items will in the estimates will be at Class 5 – Rough Order of Magnitude, with a -50% to +100% level of accuracy.
2. All construction costs were standardized to include a 20% contingency, with engineering costs included separately.
3. Pre-Construction engineering costs of 10% are included for each alternative. These pre-construction engineering costs include planning, design, permitting, legal, and miscellaneous.
4. Engineering during construction costs of 8% are included for each alternative. These costs include inspections, contract administration, and other general services during construction.
5. A 4% escalation factor was included to project the cost to 2014 dollars.
6. All alternatives assume $6 million in capital cost sharing with NCWD Main Construction.

Alternative 1 | 12 MGD of water supply from NCWD

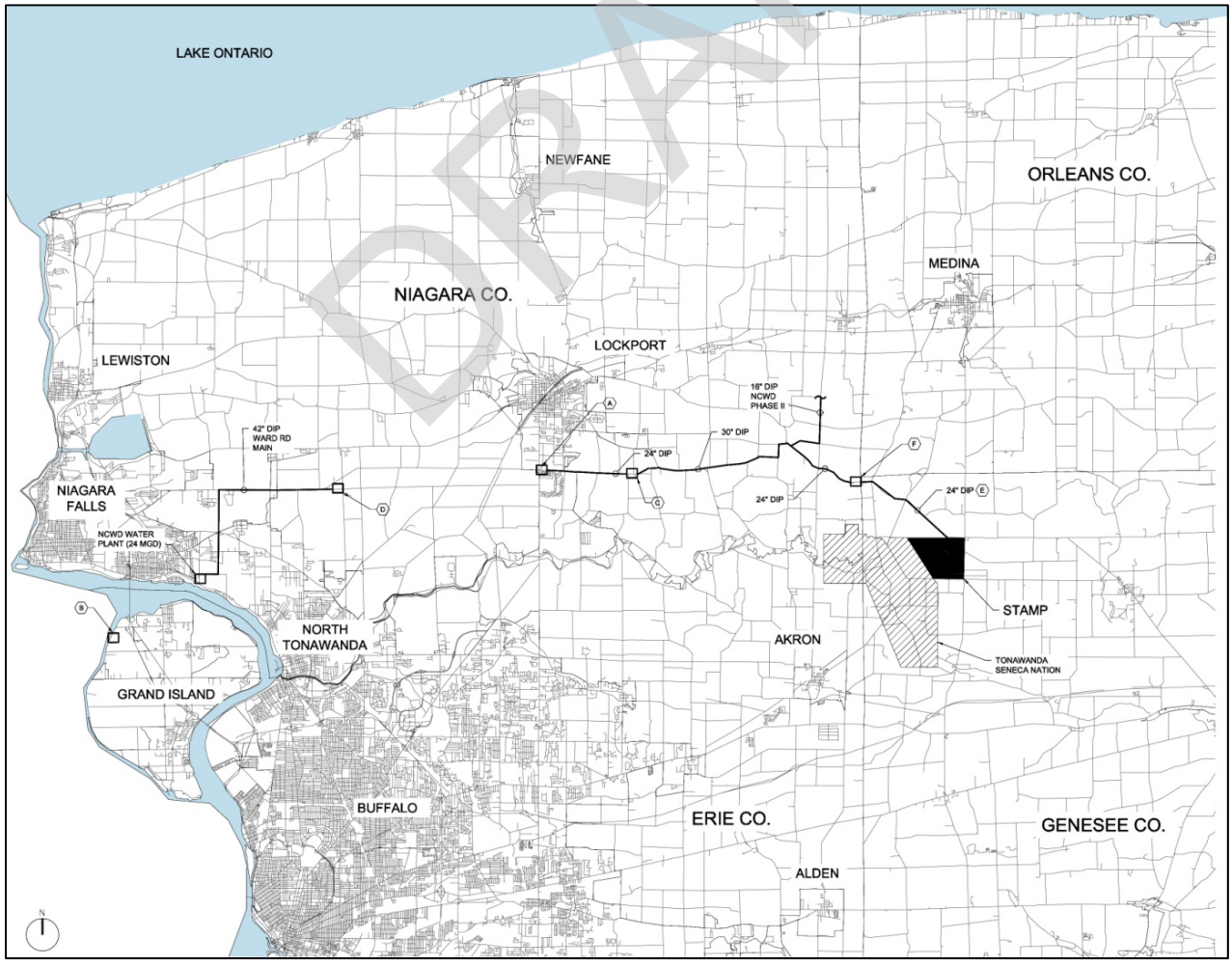
Overview

Alternative 1 anticipates that NCWD will provide the full 12 MGD water supply necessary to build out STAMP. Discussions with representatives of NCWD revealed that supplying the 12 MGD would require a series of improvements. This alternative is described in detail in Appendix A. Below is a list of anticipated high-level system requirements and conceptual routing. Refer to Figure 2-1.

System Requirements

- Various new and improved transmission lines;
- Installation of new waterline;
- Improvements to two pump stations;
- Construction of an elevated storage tank;
- Intake improvements;
- Major improvements to NCWD treatment plant.

Figure 2-1: Water Supply Conceptual Routing | Alternative 1



SWOT Analysis

Key Strengths and Opportunities

- Active interest/enthusiasm on the part of NCWD to be a committed partner to deliver the project;
- Single source of supply for 12 MGD of water (customer and water quality);
- Ability to work with one supplier;
- Lowest apparent NCWD existing bulk water rates;
- May be able to negotiate favorable bulk rate with NCWD;
- Potential for cost sharing with the existing NCWD Capital Improvement Plan (CIP) and shared benefits with Niagara County;
- Expected costs least likely to change.

Key Weaknesses and Threats

- Potential need for significant upgrades to treatment, intake, and pumping;
- Timing and regulatory approval for significant treatment and intake upgrades;
- Lack of bulk water rate control depending on the supplier of record to supply the STAMP site.

Cost

Table 2-2: Water Supply Cost Summary | Alternative 1

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 1 NCWD (12 MGD)	$67.7	$12.2	$79.9

Alternative 2 | 8 MGD from NCWD and 4 MGD from Lockport

Overview

Alternative 2 anticipates that NCWD will provide 6-8 MGD, and that the City of Lockport will provide 4-6 MGD to supply the 12 MGD necessary to build out STAMP. Discussions with representatives of NCWD and the City of Lockport revealed that supplying these quantities would require a series of improvements to each system. This alternative is described in detail in Appendix A. Below is a list of anticipated high-level system requirements and conceptual routing. Refer to Figure 2-2.

System Requirements

NCWD

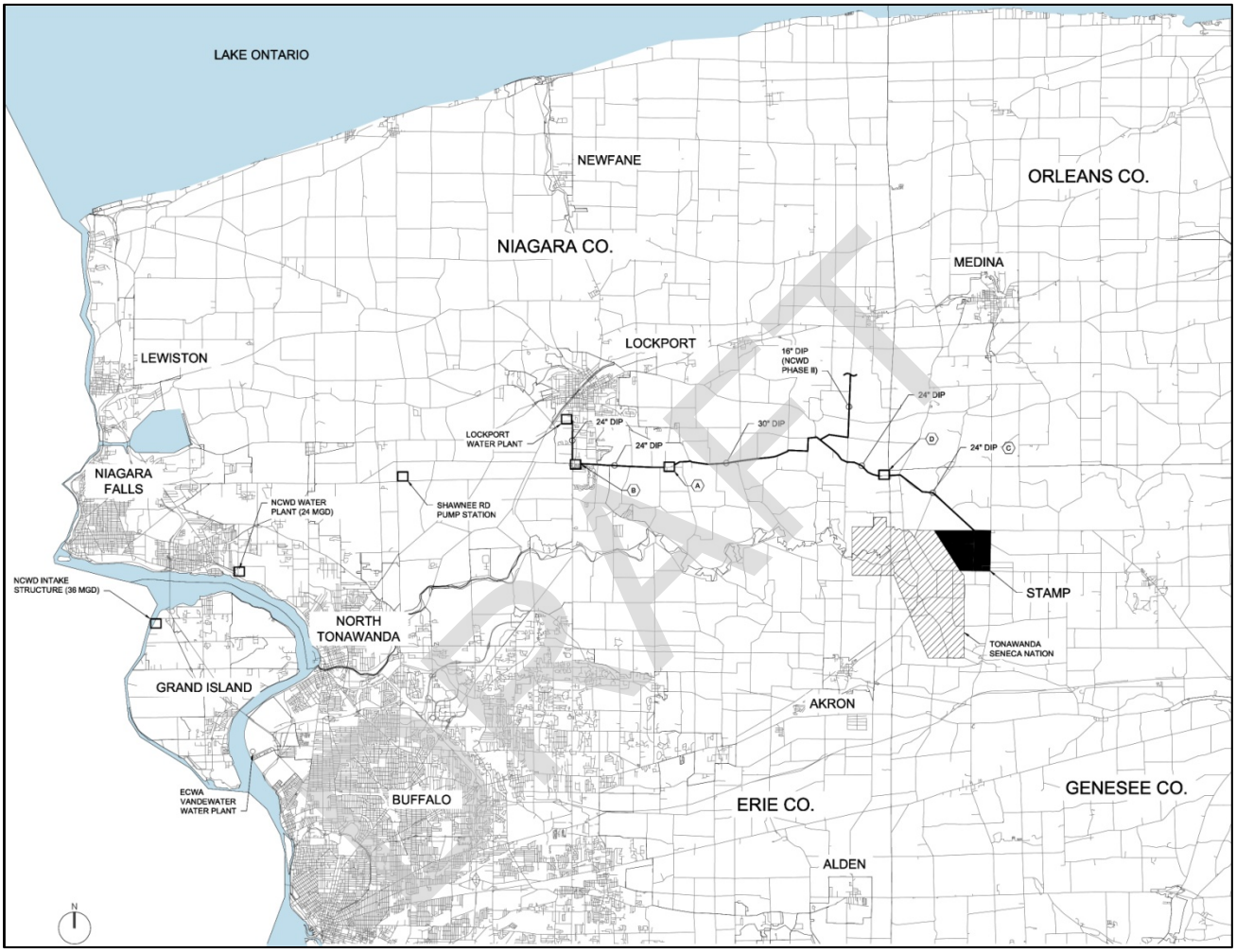
- Various new and improved transmission lines;
- Installation of new waterline;
- Improvements to two pump stations;
- Construction of an elevated storage tank;
- Minor improvements to the water treatment plant.

Lockport

- New transmission line;

- Treatment plant, pumping capability and connection upgrades.

Figure 2-2: Water Supply Conceptual Routing | Alternative 2



SWOT Analysis

Key Strengths and Opportunities

- Lowest known capital costs - however, known capital cost does not include any potential upgrades identified below.

Key Weaknesses and Threats

- The condition of portions of the Lockport intake line, which are currently under review and inspection, is unknown;
- The review and inspection is expected to require upgrades to treatment, intake and pumping at both NCWD and Lockport;

- If the capital cost to repair the intake line is excessive, it could jeopardize the future of the Lockport treatment facility and eliminate this alternative as a viable solution;
- Additional questions related to the reliability and condition of the Lockport source as a long-term solution due to the age of the facilities;
- Timing and regulatory approval for significant treatment and intake upgrades, especially at Lockport;
- Potential contamination issues with intake, and required upgrades related to superfund status;
- Capital costs are expected to escalate due to large number of unknowns related to this alternative, but total capital costs will not be known until the planned study is completed;
- Relationship between water district and city;
- Lack of bulk water rate control depending on the supplier of record to supply the STAMP site;
- Additive cost of Lockport water rates;
- Two different sources of water and water quality.

Cost

Table 2-3: Water Supply Cost Summary | Alternative 2

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 2 NCWD (8 MGD) / Lockport (4 MGD)	$53.1	$9.6	$62.7*

*Capital costs and engineering costs expected to escalate due to larger number of unknowns with this alternative.

Alternative 3 | 8 MGD from NCWD and 4 MGD from ECWA

Overview

Alternative 3 anticipates NCWD will provide 6-8 MGD, and that the ECWA will provide 4-6 MGD to meet the required 12 MGD for build out of STAMP. Discussions with representatives of NCWD and the ECWA revealed that supplying these quantities would require a series of improvements to each system. This alternative is described in detail in Appendix A. Below is a list of anticipated high-level system requirements and conceptual routing. Refer to Figure 2-3.

System Requirements

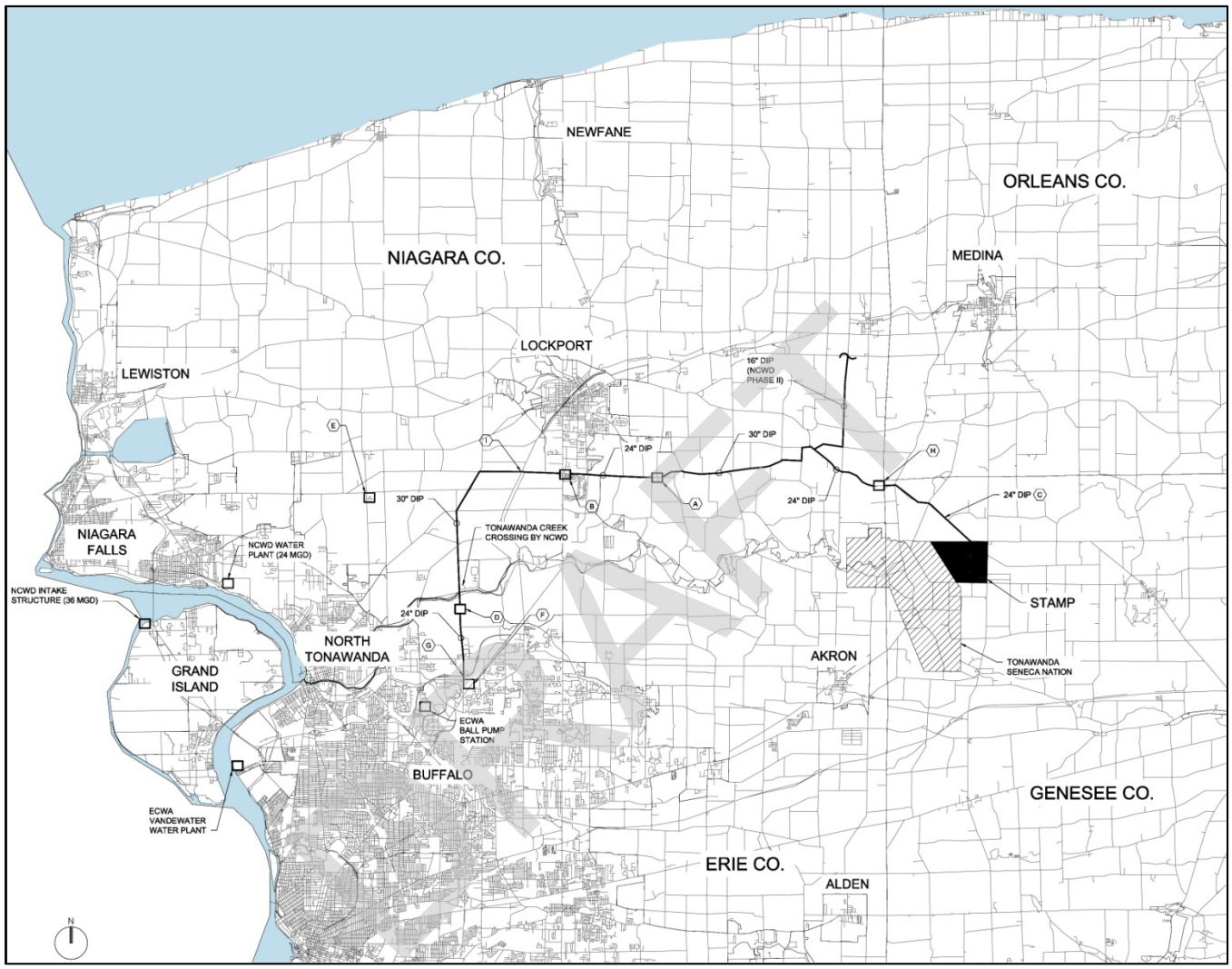
NCWD

- Various new transmission lines, including a crossing of the Erie Canal;
- Installation of new waterline;
- Improvements to two pump stations;
- Minor improvements to the water treatment plant.

ECWA

- Construction of a dedicated pump station;
- Additional pumping capacity;
- A new transmission main.

Figure 2-3: Water Supply Conceptual Routing | Alternative 3



SWOT Analysis

Key Strengths and Opportunities

- Two solid, redundant water supply sources;
- Allows for the potential to be phased;
- Multi-county involvement and support for project.

Key Weaknesses and Threats

- Alternative would require approval of an Intra-Basin Transfer from the Lake Erie to Lake Ontario Basin, if the wastewater solution includes a discharge to Lake Ontario, which may be difficult to obtain;
- Potentially difficult Erie Canal, Thruway, and Tonawanda Creek transmission line crossings;
- Additive cost of ECWA water rates;

- Two different sources of water and water quality;
- Increased urban area for pipe construction (Erie County);
- Erie County's existing rate agreement with MCWA in Genesee County could limit rate negotiations;
- Regulatory approval for increased treatment capacity;
- Unforeseen cost increases.

Cost

Table 2-4: Water Supply Cost Summary | Alternative 3

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 3 NCWD (8 MGD) / ECWA (4 MGD)	$71.7	$12.9	$84.7

Alternative 4 | 8 MGD from NCWD and 4 MGD from Genesee County

Overview

There are two phasing alternatives for water supply Alternative 4. Alternative 4A anticipates NCWD will provide the first 8 MGD, and that a combination of existing local Genesee County water suppliers will provide 4 MGD in a second phase, to meet the required 12 MGD necessary for build out of STAMP. Alternative 4B reverses the order of the improvements, assuming Genesee County provides the first 4 MGD, and then NCWD provides 8 MGD in a second phase.

Discussions with representatives of NCWD and the Genesee County water suppliers (Town of Alabama, Town of Pembroke, Village of Oakfield, MCWA, and ECWA) revealed that supplying these quantities would require a series of improvements to each respective system. This alternative is described in detail in Appendix A. Below is a list of anticipated high-level system requirements and conceptual routing. Refer to Figure 2-4.

System Requirements

NCWD

- Various new transmission lines;
- Installation of new waterline;
- Improvements to two pump stations;
- An elevated storage tank;
- Minor improvements to the treatment plant.

Town of Alabama

- Improvements to the Town of Alabama water project to increase capacity.

Town of Pembroke

- A new transmission main and connection to Pembroke system.

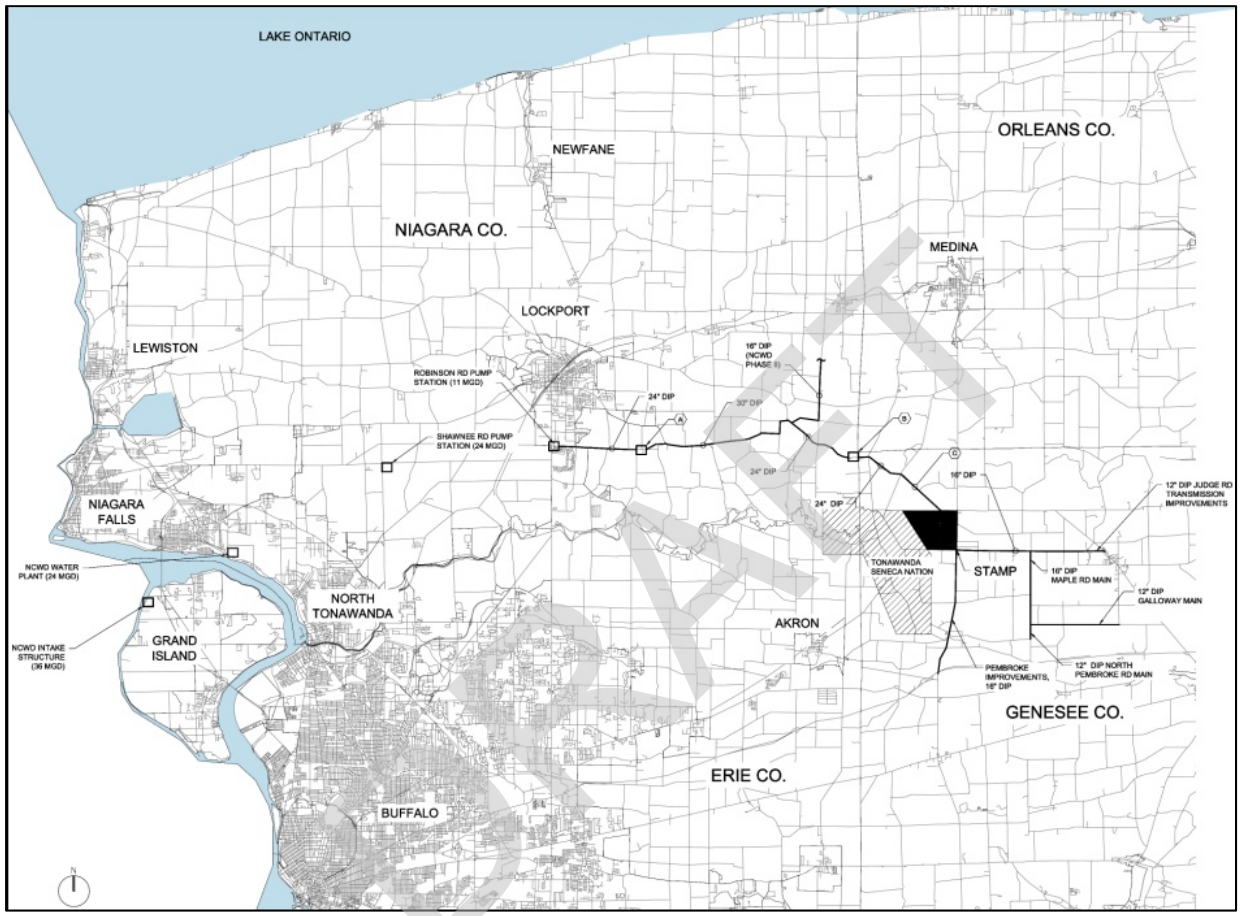
Village of Oakfield

- New transmission lines and connection to Oakfield system.

MCWA and ECWA

- Pump capacity improvements with the ECWA and MCWA connections.

Figure 2-4: Water Supply Conceptual Routing | Alternative 4



SWOT Analysis

Key Strengths and Opportunities

- Second lowest overall expected cost alternative;
- Can be phased two different ways;
- Strengthening of existing water supply within the County.

Key Weaknesses and Threats

- Two to three different sources of water and water quality;
- Significant coordination between multiple systems;
- Limited ability to negotiate water rates given existing rate structures in County;
- Need for partial implementation of Genesee County Water Project;
- Assurance that full 4-6 MGD is available from Genesee County.

Cost

Table 2-5: Water Supply Cost Summary | Alternative 4

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 4 NCWD (8 MGD) / Genesee County (4 MGD)	$63.3	$11.4	$74.7

2.3 Phased Approach to Construction of Water Supply

The concept of phasing the water supply system construction to better match the three phases (4, 8, and 12 MGD) of site development was closely examined. In addition to deferring some of the initial capital costs, phasing also offers opportunities to generate revenues to fund future expansion and allows more time to better define long-term uncertainties related to each alternative.

Each of the four alternatives shown on Table 2-1 was evaluated in terms of the opportunity to phase the construction. For Alternatives 1 through 3, Phase 1 includes the NCWD system requirements necessary to provide the minimum of 6-8 MGD supply. However, phased construction of Alternative 4 can be delivered in two different scenarios:

1. Alternative 4A: Receive 8 MGD from NCWD for Phase 1 and 4 MGD from Genesee County for Phase 2.
2. Alternative 4B: Receive 4 MGD from Genesee County for Phase 1 and 8 MGD from NCWD for Phase 2.

Table 2-6 below provides an overall comparative cost summary of the phased approaches.

Table 2-6: Water Supply Alternatives | Comprehensive Cost Comparison Summary by Phase

	Estimated 2014 Capital Costs (Millions)	Estimated Engineering Costs (Millions)[1]	Estimated Total Costs (Millions)[2]
Alternative 1 (NCWD)			
Phase 1 (8 MGD)	$39.2	$7.1	$46.3
Phase 2 (4 MGD)	$28.5	$5.1	$33.6
Total (12 MGD)	**$67.7**	**$12.2**	**$79.9**
Alternative 2 (NCWD/Lockport)			
Phase 1 (8 MGD)	$39.2	$7.1	$46.3
Phase 2 (4 MGD)	$13.9	$2.5	$16.4
Total (12 MGD)	**$53.1**	**$9.6**	**$62.7**
Alternative 3 (NCWD/ECWA)			
Phase 1 (8 MGD)	$39.2	$7.1	$46.3
Phase 2 (4 MGD)	$32.5	$5.9	$38.4
Total (12 MGD)	**$71.7**	**$12.9**	**$84.7**
Alternative 4A (NCWD/Genesee County)			
Phase 1 (8 MGD)	$39.2	$7.1	$46.3
Phase 2 (4 MGD)	$24.1	$4.3	$28.4
Total (12 MGD)	**$63.3**	**$11.4**	**$74.7**
Alternative 4B (Genesee County/NCWD)[3]			
Phase I (4 MGD)	$30.4	$5.5	$35.9
Phase 2 (8 MGD)	$32.9	$5.9	$38.8
Total (12 MGD)	**$63.3**	**$11.4**	**$74.7**

Notes:
[1] Engineering Costs include 18% of estimated capital costs for planning, design, legal, miscellaneous, and services during construction.
[2] Total capital and engineering costs do not include operation and maintenance costs.
[3] The cost estimates for each alternative include a $6 million cost sharing with NCWD. Under Alternative 4B, however, the delay in constructing the Phase 2 NCWD portion of the system may result in the loss of that cost sharing opportunity, thus increasing the Phase 2 and total cost shown.

Based on evaluation and analysis of the information above and within Appendix A, the client and consultant team reached consensus during the project's Workshop No. 2 that the water supply for Phase 1 should be obtained from NCWD. Having an active and willing partner with the ability to provide up to 8 MGD from a single source is a strong initial development proposition. Additional primary drivers for this preferred approach are the low existing bulk rates for Phase 1, the potential for cost sharing with the existing NCWD Capital Improvement Plan (CIP), shared benefits with Niagara County, and the flexibility this approach provides for the second phase of development (continued evaluation of both NCWD and Genesee County alternatives in the future).

NCWD Phase 1 will include the construction of the piping required to provide the full 12 MGD to the Niagara and Genesee County boundary, as well as the construction of the transmission pipeline from the Genesee County line to STAMP. Phase 1 will also include construction of at least one day of on-site storage. Installing smaller piping in Phase 1 to supply 8 MGD and subsequently installing larger piping at a later date would not be consistent with the current needs of NCWD, nor be cost-effective.

Based on the team's consensus, the preferred Phase 2 alternative will either be to obtain the remaining 4 MGD from NCWD, or obtain it from Genesee County connections. The Genesee County connection improvements require actions and cooperation between the Town of Alabama, Town of Pembroke, Village of Oakfield, and capacity improvements provided by the MCWA.

Obtaining the final 4 MGD from the NCWD (Alternative 1) has the advantage of continuing the willing relationship with NCWD, and provides for a single supplier. However, this scenario will require significant upgrades and costs by NCWD to assure an adequate source of supply and effective treatment.

Obtaining the last 4 MGD from connections within Genesee County (Alternatives 2, 3, and 4) in Phase 2 has the advantage of introducing ancillary enhancements in water supply that will provide benefits throughout the County, built upon the close working relationship between the Developer and Genesee County. However, there are also uncertainties involved with the Genesee County connections that will need to be resolved, including the timing and effectiveness of the Genesee County Phase II Water Project, the future of the Batavia supply, the variation in water quality by multiple suppliers, coordination of projects between multiple systems, and water rates established by the MCWA. .Due to the overall opportunity to phase the water supply system, the project enjoys inherent flexibility in selecting the final phase of development between the offerings of Lockport, ECWA, and the various Genesee County municipalities.

2.4 Revenue Generation Opportunities

As part of the water supply study, the team put together a sampling of water rates paid by other semiconductor manufacturing facilities. Table 2-7 indicates costs per 1,000 gallons of water to range between $2.05 and $2.91 for three, similar, built projects. It should be noted that water usage varies from campus to campus, and rates may reflect different levels of savings based on those usage rates. Table 2-7 below provides a summary of water rates paid by other campuses which house semiconductor manufacturing facilities, as well as current rates from potential providers:

Table 2-7: Example Water Rates Summary

	Similar Manufacturing Campuses			Local Providers			
Location	**Chandler, AZ**	**Saratoga, NY**	**East Fishkill, NY**	**NCWD**	**ECWA**	**MCWA (Genesee County)**	**Industry Average**
Annual Average Cost per 1,000 gallons	$2.53	$2.05	$2.91[1]	$1.50[2]	$2.49 / $2.12[3]	$4.00 / 4.15[4]	$5.00[5]

Notes:
[1] Cost includes annual operation and maintenance charge, administrative charge, and capital replacement charge; assumes Water Purchased equals Water Purchase Forecast @ $1.93/1,000 gal. If the usage was lower than the predicted volume, the fabricator would pay $1.80/1,000 gal for the unused amount.
[2] Based on 2012 rates; final costs would be dependent on actual contract negotiations with the water suppliers.
[3] Based on 2012 rates; $2.49/1,000 gallon cost for first 2.5 million gallons, then $2.12 per 1,000 gallons thereafter.
[4] Current Western Genesee County water rate that will apply if the MCWA is the supplier of record, regardless of the Alternative.
[5] From SEMATECH International, Fab Utility Cost Vales for Cost of Ownership (COO) Calculations, "Table 1 Industry Average Utility Purchase Costs", page 12, 2002.

As of the date this report was written, MCWA has a franchise agreement to deliver water within Genesee County at a rate of $4.00/1,000 gallons. If a new water distribution entity was established by either Genesee County or the Developer, it may be possible to create a capital improvement fund to help finance the Phase 2 water supply construction. The new water supply entity could potentially purchase water from NCWD at the current bulk rate of $1.50/1,000 gallons and sell it to the STAMP tenants at a higher, but still competitive, rate. Water rates charged, however, need to include both the cost of purchasing water, any operation and maintenance costs assumed by the entity, as well as any financing costs.

Any new entity created would be classified as a public, non-transient, non-community water system under the New York State Sanitary Code, 10 NYCRR Subpart 5-1.1(au) and would be subject to Health Department oversight. Such systems regularly serve potable water to at least 25 people, for four hours or more per day, for four or more days per week, and for 26 or more weeks per year. This new entity, a water-works corporation under the Transportation Corporations law, would be responsible for the operation and maintenance of the transmission main from the Niagara County line to STAMP, as well as site storage and regulatory compliance. The new entity could operate the system itself or contract operations and maintenance to an existing water department.

2.5 Annual Operating Costs

The annual cost of supplying water to the STAMP site will ultimately be determined based on negotiations with the water supplier(s). For comparison purposes, Table 2-8 below presents a summary of annual water costs based on current rates for purchasing and delivering water under the various alternatives.

Table 2-8: Annual Water Cost Summary

	4 MGD ($/Year)	8 MGD ($/Year)	12 MGD ($/Year)
MCWA as the Supplier[1]			
Alternative 1 NCWD 12 MGD	$5.8M	$11.7M	$17.5M
Alternative 2 NCWD/Lockport	$5.8M	$11.7M	$17.5M
Alternative 3 NCWD/ECWA	$5.8M	$11.7M	$17.5M
Alternative 4A NCWD/Genesee Co.	$5.8M	$11.7M	$17.5M
Alternative 4B Genesee Co./NCWD	$6.1M	$11.9M	$17.7M
New Entity as the Supplier[2]			
Alternative 1 NCWD 12 MGD[3]	$2.6M	$5.1M	$7.8M
Alternative 2 NCWD/Lockport[4]	$2.6M	$5.1M	$11.1M
Alternative 3 NCWD/ECWA[4]	$2.6M	$5.1M	$11.1M
New Entity and MCWA as the Supplier			
Alternative 4A NCWD/Genesee Co.[5]	$2.6M	$5.1M	$11.2M
Alternative 4B Genesee Co./NCWD[6]	$6.1M	$8.7M	$11.2M

Notes:

[1] If MCWA is the water supplier of record (based on their current franchise agreement) it is assumed that their current Western Genesee County rate of $4.00/1,000 gallons would apply, regardless of the MCWD or ECWA bulk rate.

[2] Assumes that MCWA does not hold the franchise and a new entity is created to deliver water to STAMP.

[3] Assumes a bulk rate of $1.75/1,000 gallons that includes $1.50/1,000 gallons for NCWD purchase plus $0.25/1,000 gallons for estimated operation and maintenance.

[4] Assumes a bulk rate of $1.75/1,000 gallons per (3) above for the first 8 MGD (Phases 1 & 2) plus an additional $2.30/1,000 gallons for purchase of either Lockport or ECWA water (total of $4.05/1,000 gallons) for remaining 4 MGD required for Phase 3.

[5] Assumes that a new entity is formed as in (2) above to deliver first 8 MGD (Phases 1 & 2) at $1.75/1,000 gallons as in (3) above and the remaining 4 MGD (Phase 3) will be delivered at $4.15/1,000 gallons by MCWA under a revised franchise agreement.

[6] Assumes that the first 4 MGD (Phase 1) is supplied at the MCWA franchise rate of $4.15/1,000 gallons and the remaining 8 MGD (Phases 2 & 3) will be delivered by the new entity at $1.75/1,000 gallons.

If MCWA is determined to be the supplier, they would purchase water from NCWD at a negotiated bulk rate and then sell it to the end users at STAMP. While MCWA currently offers a bulk rate of $2.82/1,000 gallons, in Genesee County, their Western Genesee County Class Rate would likely apply. While no current agreement exists between NCWD and MCWA for selling water in Genesee County, the assumption is that a mark-up similar to the current ECWA mark-up would apply, which is approximately $4.00/1,000 gallons.

The current bulk rate charged by NCWD is approximately $1.50/1,000 gallons and is negotiable, depending on the needs of specific accounts. This rate would likely apply to the 8 MGD obtained from the NCWD in Phase 1 if a new water supply entity is created. Operation and maintenance costs for the Genesee County portion can be approximated as a man-year of labor plus periodic pipe and tank maintenance, tank painting, and regulatory monitoring and reporting costs. This results in an estimated annualized cost of approximately $200,000. The resulting water costs for the first 8 MGD of water supplied under Phase 1 could be as low as $1.75/1,000 gallons.

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Section 3.0 | Wastewater Management Alternatives

3.1 Background

Overview

Consistent with the water supply analysis, the wastewater management alternatives are based upon a semiconductor or similar high-technology manufacturer requiring an initial start-up wastewater management capacity of 4 MGD of combined wastewater effluent. Over a period of years, the site will continue be to developed, with two additional phases each requiring additional wastewater management capacity. It is assumed that this phased development will require the phased build-out of a wastewater management system to support a total of 4, 8, and 12 MGD of combined wastewater effluent capacity to support the main manufacturing facilities as well as any ancillary support facilities. At a more detailed level, each phase is anticipated to contribute 0.33 MGD of sanitary waste effluent, and 3.66 MGD of process waste effluent, for a total discharge at build-out of 1 MGD of sanitary effluent and 11 MGD of process effluent.

Local municipalities and authorities were contacted to gauge their interest and ability to provide the wastewater treatment services for STAMP. Based on these supplier meetings, as well as a preliminary assessment of the infrastructure improvement requirements, four potential alternatives were identified for further study. A detailed description of the analyses performed as well as a summary of the major discussion points with the potential wastewater treatment providers is included in the Comparative Analysis Technical Memorandum attached as Appendix B.

The following subsections provide an overview of the viable alternatives selected for further study and a comparative analysis based on factors such as capital cost, operation and maintenance costs, permitting issues, stakeholder concerns, and phased construction. Other factors include a comparison of current and projected wastewater rates.

Initially, five potential wastewater management scenarios were identified and assessed for providing treatment and disposal of 11 MGD of pre-treated industrial effluent and 1 MGD of sanitary sewage effluent from the STAMP site. These scenarios were:

- Construct an on-site treatment facility and discharge via pipeline to an off-site location beyond the local area;
- Pump the full 12 MGD to the City of Lockport WWTP;
- Construct an on-site wastewater treatment facility to discharge to a local receiving water;
- Construct an on-site treatment facility with deep-well injection of effluent;
- Management through reuse alternatives.

Significant regulatory constraints, water quality concerns, and high capital cost were identified for all of the on-site wastewater treatment alternatives. Further analysis and discussion with the NYSDEC indicated that any alternative that involved discharge of the wastewater to the local streams would face significant permitting challenges due to the relatively low seasonal stream flows, as well as other constraints related to stream classifications and wet-weather discharges. Water purification requirements for the process water and inconsistent demands for beneficial off-site reuse due to seasonal limitations, eliminated management through reuse alternatives.

Based on input from NYSDEC and analysis and discussion with the Developer and the consultant team during project Workshop No. 1, all scenarios referenced above were eliminated from further consideration. Only scenarios that include discharge to a body of water large enough to provided adequate dilution are anticipated to meet both regulatory compliance and the proposed budget.

As a result, the three new alternatives were identified for evaluation:

1. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Bird Island Wastewater Treatment Plant in Buffalo, New York, owned by the Buffalo Sewer Authority;
2. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Van Lare Wastewater Treatment Plant in Rochester, New York, owned by Pure Waters/County of Rochester;
3. Pumping 11 MGD of pre-treated process effluent for direct discharge to Lake Ontario, and pumping 1 MGD of sanitary sewer to the Village of Medina wastewater treatment plant (WWTP).

Subsequent evaluations indicated that all three alternatives referenced above, as well as a variation of Alternative 3 (identified as Alternative 4 later in this Section), are technically viable. Summaries of the four alternatives are included in this section. Conceptual designs that included conveyance route schematics, pumping requirements, and Class 4/5 construction cost estimates were prepared to provide additional information for comparison and are provided in Appendix B.

3.2 Summary of Wastewater Management Alternatives

Based on technical viability, estimated capital and engineering cost, and consideration of local issues and drivers, the four wastewater management alternatives identified for further study are:

1. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Bird Island Wastewater Treatment Plant in Buffalo, New York, owned by the Buffalo Sewer Authority;
2. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Van Lare Wastewater Treatment Plant in Rochester, New York, owned by Pure Waters/Monroe County;
3. Pumping 11 MGD of pre-treated process effluent to Lake Ontario, and pumping 1 MGD of sanitary sewer to the Village of Medina WWTP;
4. Pumping 4.5 MGD of combined sanitary and pre-treated process effluent to the Village of Medina WWTP in a first phase. For subsequent phases, segregate the pre-treated process and sanitary effluents and send up to 11 MGD of process effluent to Lake Ontario and 1 MGD of sanitary effluent to the Village of Medina WWTP.

Table 3-1 below provides a summary of the four alternatives.

Table 3-1: Wastewater Management Alternatives | Comprehensive Cost Comparison Summary

Alternatives	Quantity	Technical Requirements	Estimated 2014 Capital Costs (Millions)	Total Cost (Millions)*
Alternative 1 Bird Island WWTP	12 MGD	Pumping, Transmission	$73.2	$86.4
Alternative 2 Van Lare WWTP	12 MGD	Pumping, Transmission	$95.4	$112.5
Alternative 3 Medina WWTP / Lake Ontario	1/11 MGD	Pumping, Transmission	$56.8	$67.0
Alternative 4 Expanded Medina WWTP / Lake Ontario	4.5/11 MGD	Pumping, Transmission, WWTP Improvements	$93.0	$109.7

*Notes:
1. All capital cost estimates are Class 4/5 cost estimates. Class 4/5 cost estimates are consistent with the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The majority of items will be Class 4 – Rough Order of Magnitude, with a -30% to +50% level of accuracy, some additional items will in the estimates will be at Class 5 – Rough Order of Magnitude, with a -50% to +100% level of accuracy.
2. All construction costs were standardized to include a 20% contingency, with engineering costs included separately.
3. Pre-Construction engineering costs of 10% are included for each alternative. These pre-construction engineering costs include planning, design, permitting, legal and miscellaneous.
4. Engineering during construction costs of 8% is included for each alternative. These costs include inspections, contract administration, and other general services during construction.
5. A 4% escalation was also included to project the cost to 2014 dollars.

Alternative 1 | Bird Island WWTP (12 MGD)

Overview

Alternative 1 entails pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Bird Island WWTP in Buffalo, NY, owned and operated by the Buffalo Sewer Authority (BSA). 12 MGD will meet the wastewater treatment demands for full build out of the STAMP site. Discussions with representatives of BSA revealed that they can accommodate 12 MGD; however system improvements and regulatory considerations are associated with this proposed alternative. Some of these improvements and regulatory considerations are described in detail, in Appendix B.

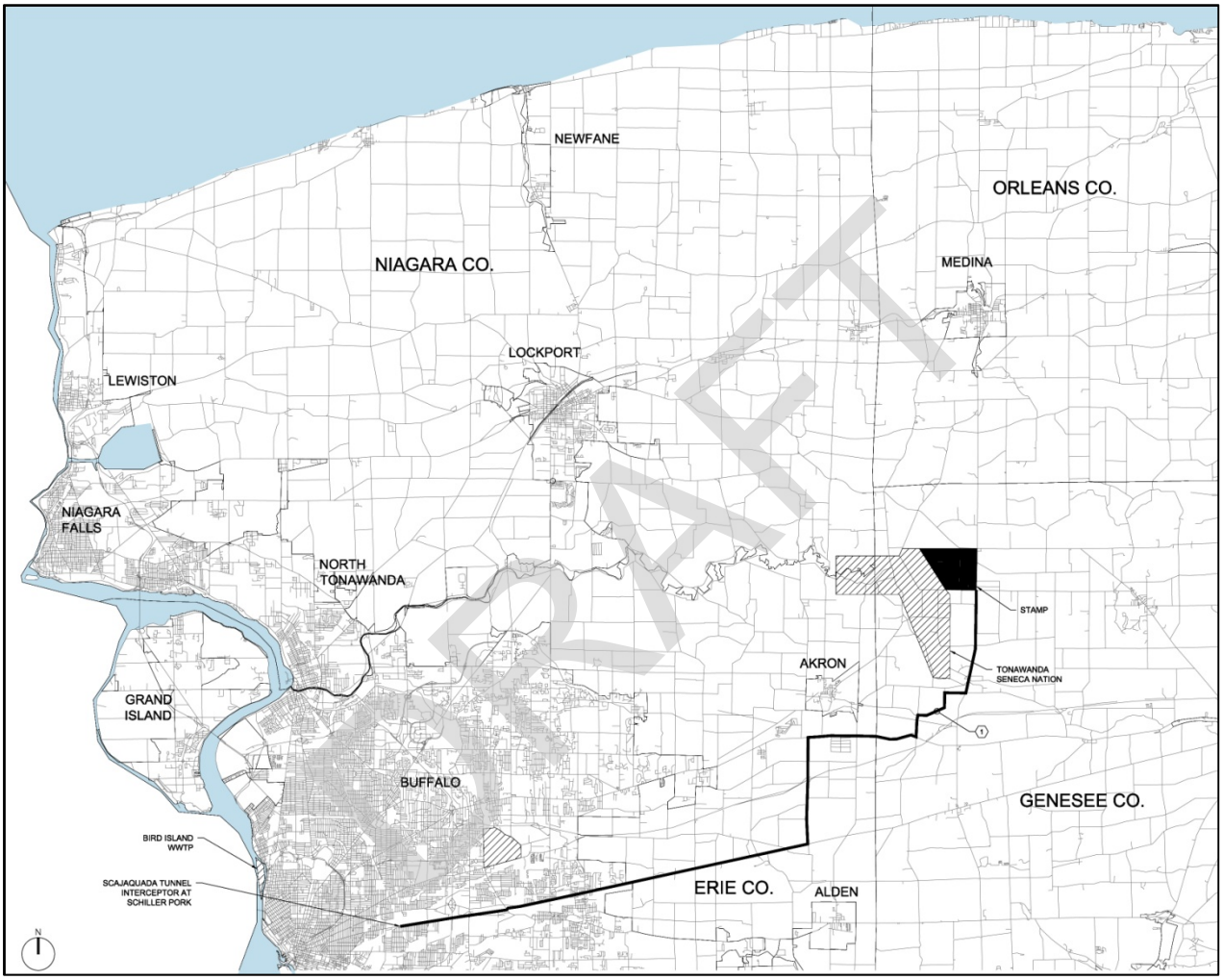
In addition to information provided by BSA and included in Appendix B, NYSDEC also provided critical information related to concerns and uncertainties related to permitting for this alternative. NYSDEC indicated that wet-weather events resulted in effluent bypassing treatment at the WWTP and the effluent being directly discharged into area waterways. Input from NYSDEC revealed that permitting challenges and capital costs associated with this alternative could be extremely significant.

Below is a list of anticipated high-level system requirements, regulatory considerations and conceptual routing. Refer to Figure 3-1.

System Requirements

- Conveyance pipeline between the Scajaquada Tunnel Interceptor (Buffalo, NY) and STAMP;
- 12 MGD Pump Station at STAMP site.

Figure 3-1: Wastewater System Conceptual Routing | Alternative 1



Regulatory Considerations

- Pumping effluent to a large capacity facility such as Bird Island WWTP will aid in dilution of process effluents, such as TDS, and will not adversely affecting the plant's operation;
- Due to wet-weather bypass concerns, the existing SPDES permit would likely require review and modification, and may be subject to additional monitoring, recording, reporting, and renewal by application every five years;
- Semiconductor manufacturer will need to obtain an industrial pre-treatment permit from BSA.

SWOT Analysis

Key Strengths and Opportunities

- Second lowest capital cost alternative;

Key Weaknesses and Threats

- Length of pipeline – concern about minimum flows; unforeseen utility and environmental conflicts/mitigation/permitting, potential creation of a new transportation corporation;
- Lack of local support for project;
- Need to cross multiple regional infrastructure boundaries;
- Management of sewer line would need to create a transportation corporation;
- Unforeseen utility or environmental conflicts;
- Lack of spare capacity during wet-weather events, existing combined sewer overflow (CSO) issues and the potential for untreated process effluent being discharged directly into the Niagara River during wet-weather events;
- No significant opportunities to defer cost through phasing.

Cost

Table 3-2: Wastewater Management Cost Summary | Alternative 1

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 1 Bird Island WWTP (12 MGD)	$73.2	$13.2	$86.4

Alternative 2 | Van Lare WWTP (12 MGD)

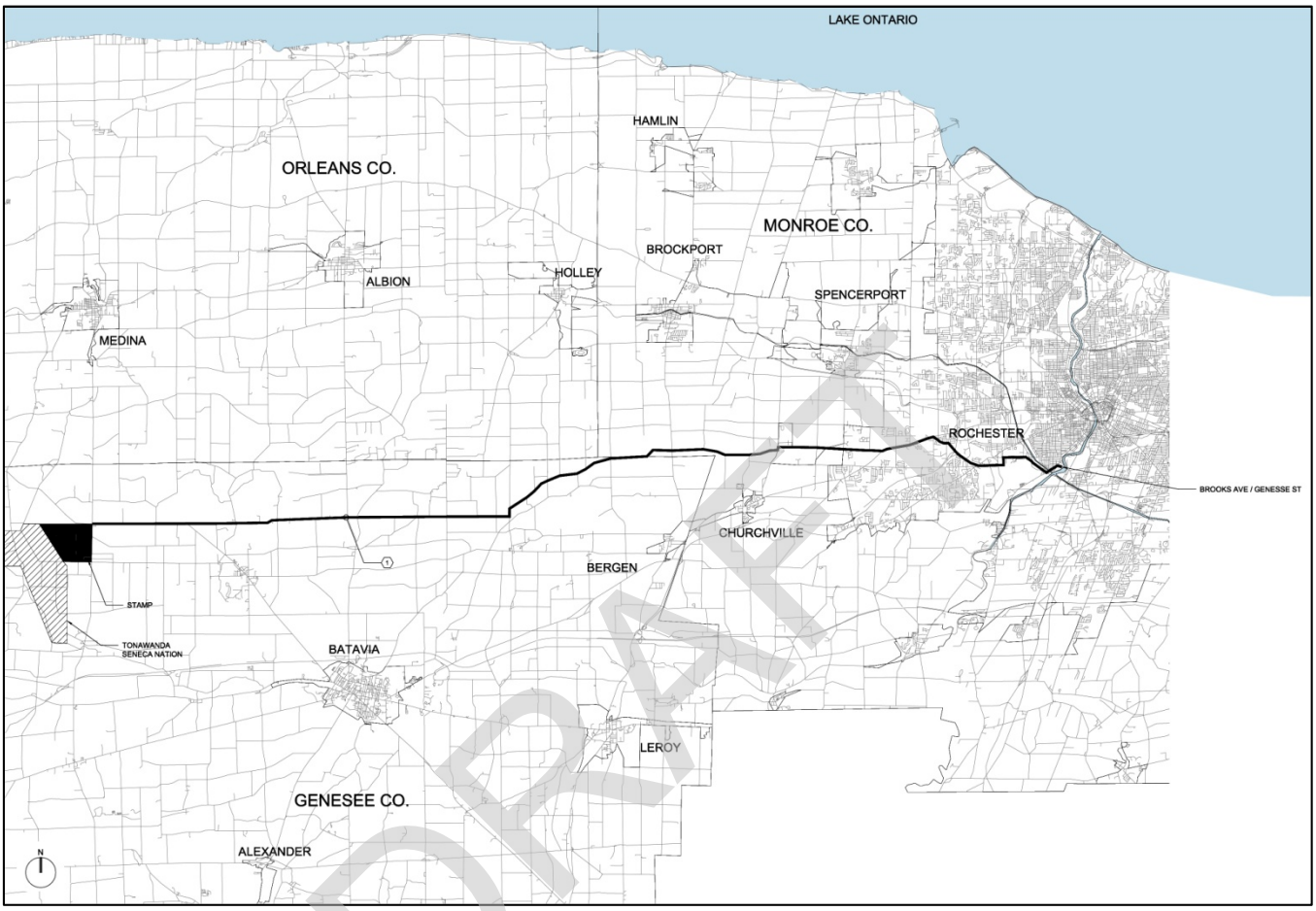
Overview

Alternative 2 entails pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Van Lare WWTP in Rochester, NY, which is owned and operated by Pure Waters. 12 MGD will meet the wastewater treatment demands for full build out of the STAMP site. Discussions with Pure Waters staff revealed that they can accommodate 12 MGD; however system improvements and regulatory considerations are associated with this proposed alternative. These improvements and regulatory considerations are described in detail, in Appendix B. Below is a list of anticipated high-level system requirements, regulatory considerations and conceptual routing. Refer to Figure 3-2.

System Requirements

- Conveyance pipeline between the Rochester Airport Sewer Interceptor (Rochester, NY) and STAMP;
- 12 MGD Pump Station at STAMP site.

Figure 3-2: Wastewater System Conceptual Routing | Alternative 2



Regulatory Considerations

- Pumping effluent to a large facility such as Van Lare WWTP will aid in dilution of process effluents, such as TDS, while not adversely affecting the plant's operation;
- No requirement for a SPDES permit;
- Semiconductor manufacturer will need to obtain an industrial pre-treatment agreement with Pure Waters.

SWOT Analysis

Key Strengths and Opportunities

- No permitting issues;
- Spare capacity is available;
- Pure Waters operates in a regional discipline.

Key Weaknesses and Threats

- Length of pipeline - concern about minimum flows; unforeseen utility and environmental conflicts/mitigation/permitting, potential creation of a new transportation corporation;

- Lack of local support for project;
- Need to cross multiple regional infrastructure boundaries;
- Management of sewer line would need to create a transportation corporation;
- Unforeseen utility or environmental conflicts;
- No significant opportunities to defer cost through phasing; Highest capital cost alternative;
- Congested install; permitting crossings, streams, railroad, utility, etc..

Cost

Table 3-3: Wastewater Management Cost Summary | Alternative 2

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 2 Van Lare WWTP (12 MGD)	$95.4	$17.1	$112.5

Alternative 3 | Medina/Lake Ontario (1/11 MGD)

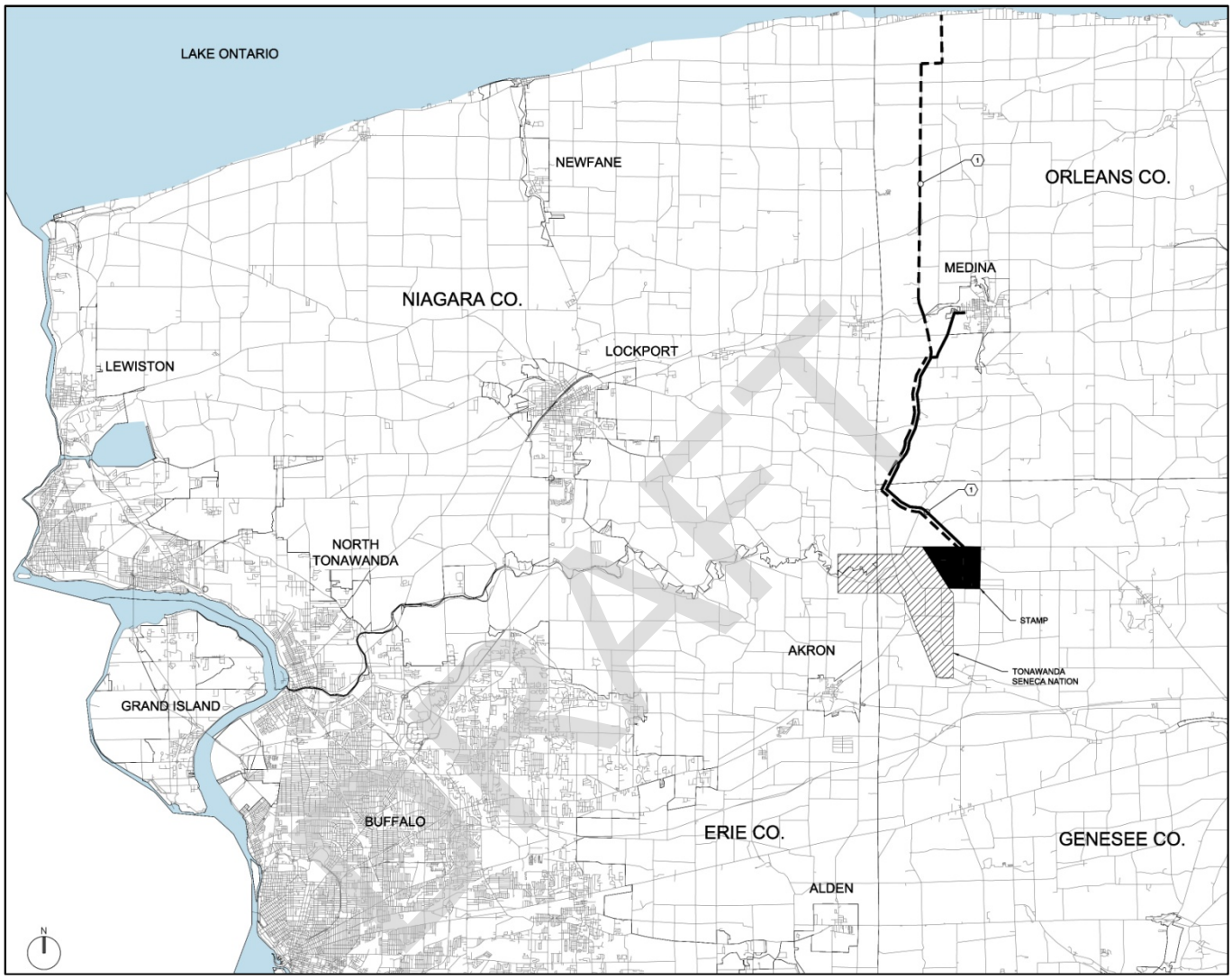
Overview

Alternative 3 entails directly discharging 11 MGD of pre-treated process effluent into Lake Ontario with 1 MGD of sanitary sewer to be pumped to, and treated at, the Medina WWTP. 12 MGD will meet the wastewater treatment demands for full build out of the STAMP site. Discussions with Medina WWTP staff and engineers revealed that they can accommodate 12 MGD; however system improvements and regulatory considerations are associated with this proposed alternative. These improvements and regulatory considerations are described in detail, in Appendix B. Below is a list of anticipated high-level system requirements, regulatory considerations and conceptual routing. Refer to Figure 3-3.

System Requirements

- Conveyance pipeline between an outfall into Lake Ontario and STAMP;
- Conveyance pipeline between the Village of Medina WWTP and STAMP;
- 12 MGD Pump Station at STAMP site.

Figure 3-3: Wastewater System Conceptual Routing | Alternative 3



Regulatory Considerations

- Discharge of 11 MGD of pre-treated industrial effluent to Lake Ontario may be permitted through use of diffuser systems;
- Confirm the assumption that current/projected 450mm semiconductor manufacturing processes do not discharge bio-accumulative chemicals into Lake Ontario (due to EPA regulation);
- Future detailed analysis of Lake Ontario discharge location to prevent interference with drinking water intakes and beaches;
- Requirement of a SPDES permit that will be subject to monitoring, recording, reporting, and renewal by application every five years;
- Discharge of any water drawn from the Lake Erie Basin to the Lake Ontario Basin would require an Intra-Basin approval under the Great Lakes Compact and NYSDEC regulations (6NYCRR Part 601) SWOT Analysis.

Key Strengths and Opportunities

- Active interest and enthusiasm on the part of Medina to be a committed partner to deliver the project;
- Only limited pump station upgrades required at the WWTP;
- Nominal spare capacity is available at the Village of Medina WWTP;
- Lowest expected overall cost alternative;
- Potential for shared community benefits with the Village of Medina.

Key Weaknesses and Threats

- Uncertainties and challenges inherent to SPDES permit for discharge to Lake Ontario;
- Public perception of additional discharge into the Lake as compared to WWTP;
- Uncertainty related to composition of process wastewater effluent and potential for additional pre-treatment requirements (TDS, etc) due to composition of wastewater;
- Secondary treatment at the Village of Medina WWTP is less effective than at alternative WWTPs;
- Medina currently has the highest sewer rates;
- No significant opportunities to defer cost through phasing;
- Management of sewer lines would need to create a transportation corporation.
- Basin watershed control and approval with ACOE and DEC;
- Discharge of any water drawn from the Lake Erie Basin to the Lake Ontario Basin would require an Intra-Basin approval under the Great Lakes Compact and NYSDEC regulations (6NYCRR Part 601).

Cost

Table 3-4: Wastewater Management Cost Summary | Alternative 3

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 3 Medina WWTP (1 MGD) / Lake Ontario (11 MGD)	$56.8	$10.2	$67.0

Alternative 4 | Expanded Medina WWTP / Lake Ontario (4.5/11 MGD)

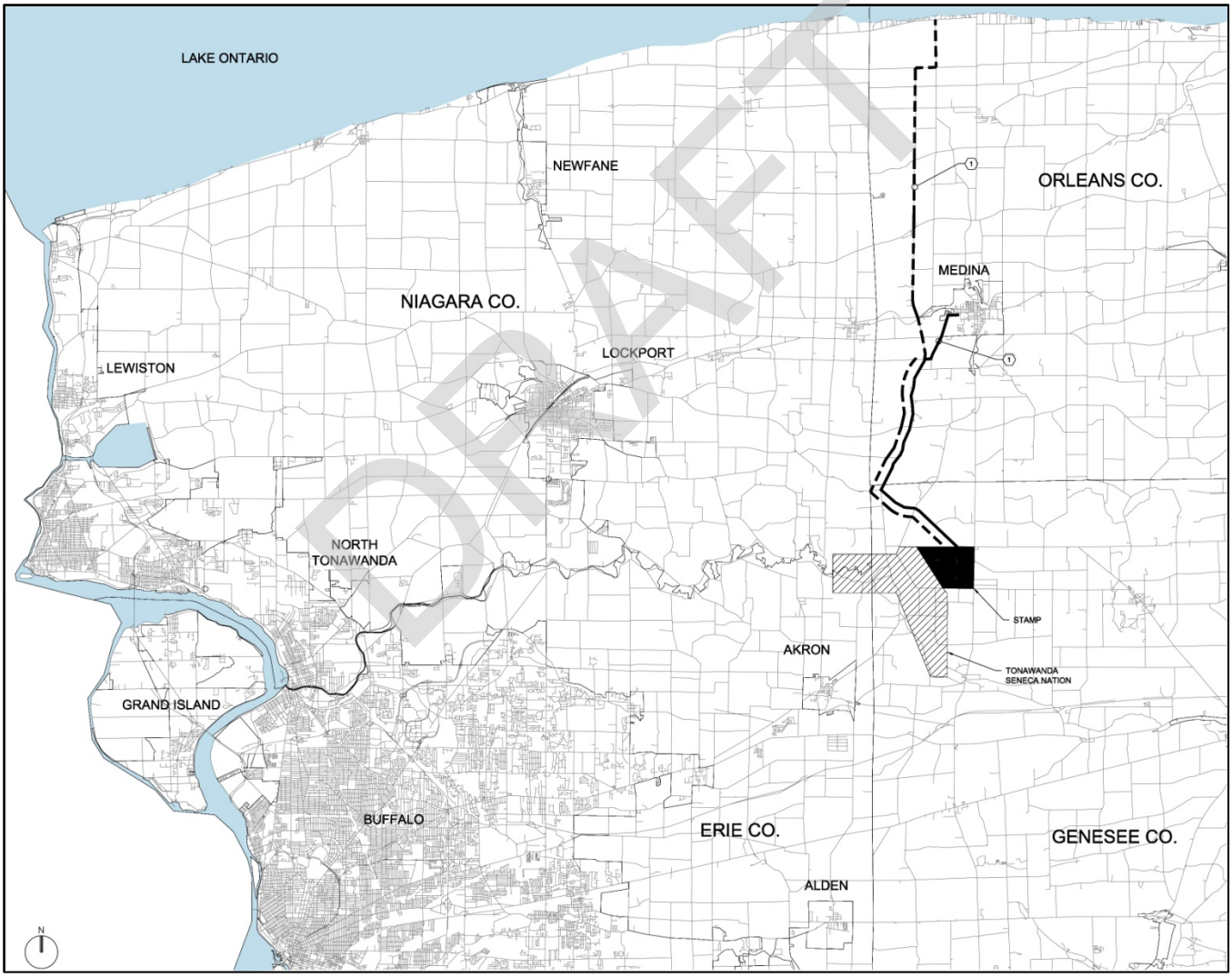
Overview

Alternative 4 spreads construction expenditures over two phases to reduce the initial capital cost investment. Phase 1 includes infrastructure to convey 4.5 MGD of combined pre-treated and sanitary sewer effluents from STAMP to the Medina WWTP (treated and discharged to Oak Orchard Creek). Phase 2 includes infrastructure required to directly discharge 11 MGD of pre-treated process effluent into Lake Ontario (1 MGD sanitary sewer is conveyed to, and treated at, Medina). 12 MGD will meet the wastewater treatment demands for full build out of the STAMP site. Discussions with Medina WWTP staff and engineers revealed that they can accommodate 4.5 MGD of combined effluents for Phase 1 and 1 MGD of sanitary effluent for Phase 2; however system improvements and regulatory considerations are associated with this proposed alternative. These improvements and regulatory considerations are described in detail, in Appendix B. Below is a list of anticipated high-level system requirements, regulatory considerations and conceptual routing. Refer to Figure 3-4.

System Requirements

- A Pump Station and sewer line to convey 4.5 MGD between STAMP and Medina in Phase 1;
- Expansion of Medina WWTP by 3.2-4.5 MGD due to ammonia load/concentration in Phase 1;
- Expansion of Medina WWTP to be dedicated to wastewater flows from STAMP in Phase 1, to avoid existing wet-weather flow of city's combined sewer system;
- Installation of 11 MGD sewer line from STAMP to Lake Ontario in Phase 2;
- Lower velocities in the sewer line to Medina (reduced from 4.5 to 1 MGD) may require additional modifications in Phase 2.

Figure 3-4: Wastewater System Conceptual Routing | Alternative 4



Regulatory Considerations

- Discharge of 11 MGD of pre-treated industrial effluent to Lake Ontario may be permitted through use of diffuser systems;
- Confirm the assumption that current/projected 450mm semiconductor manufacturing processes do not discharge bio-accumulative chemicals into Lake Ontario (due to EPA regulation);
- Future detailed analysis of Lake Ontario discharge location to prevent drinking water intakes and beaches;
- Requirement of a SPDES permit for Lake Ontario discharge that will be subject to monitoring, recording, reporting, and renewal by application every five years;
- Requirement of a SPDES permit for Medina WWTP flow expansion with potentially stricter treatment requirements;
- Increases to Oak Orchard TDS effluent concentration above current levels;
- Discharge of any water drawn from the Lake Erie Basin to the Lake Ontario Basin would require an Intra-Basin approval under the Great Lakes Compact and NYSDEC regulations (6NYCRR Part 601).

SWOT Analysis

Key Strengths and Opportunities

- Active interest and enthusiasm on the part of Medina to be a committed partner to deliver the project;
- Economic development and revenue-generating opportunities in the Village of Medina (after Phase 1);
- After Phase 1, Medina would have an expanded and upgraded plant, with spare capacity;
- After Phase 1, helps Medina's existing aging infrastructure issues;
- Only alternative with ability to phase;
- Provides flexibility to different markets (lower-flow flexibility).

Key Weaknesses and Threats

- Significant upgrades required at WWTP;
- Second highest expected overall capital costs;
- Phase 1 cost of this alternative (providing 4.5 MGD capacity) exceeds total cost of another alternative which provides 12 MGD of capacity;
- The most complex project option – includes Medina WWTP upgrade design for Phase 1;
- Small size of Medina WWTP versus discharge volume may create operational and monitoring challenges;
- Uncertainties and challenges inherent to SPDES permit for discharge to Lake Ontario;
- Public perception of additional discharge into the Lake as compared to WWTP;
- Uncertainty related to composition of process wastewater effluent and potential for additional pre-treatment requirements (TDS, etc) due to composition of wastewater;
- Medina currently has the highest sewer rates;
- No significant opportunities to defer cost through phasing;
- A transportation corporation would need to be established for management of sewer lines.

Cost

Table 3-5: Wastewater Management Cost Summary | Alternative 4

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)	Total Costs (Millions)
Alternative 4 Expanded Medina WWTP (4.5 MGD) / Lake Ontario (11 MGD)	$93.0	$16.7	$109.7

3.3 Annual Operating Costs

Sewer rates can vary significantly across municipalities, and reflect differences in operation and maintenance costs of the sewer system, including conveyance, wet-weather management, and treatment and disposal of the wastewater.

The Developer or Genesee County would have the option of creating an entity to convey the sanitary sewer and the pre-treated industrial effluent wastewater from the STAMP site to either a wastewater treatment plant and/or Lake Ontario. This entity would be responsible for the operation and maintenance of the pumping station at the STAMP site, the conveyance infrastructure, and regulatory compliance. The cost of treatment and disposal of the wastewater, and the annual operation and maintenance costs incurred by the conveyance, would be reflected in the sewer rates charged to end users at the STAMP site.

For industrial and commercial users, the rate is based on flow and wastewater characteristics. Surcharges are typically added for high-strength wastewater. A special contract is typically negotiated for industrial dischargers based on flows and the characteristics of the wastewater.

Operation and maintenance are essential to extend the lifetime of infrastructure, to ensure normal functioning, and to identify potential problems. Most maintenance activities are associated with the pumping station. However, gravity lines may require regular flushing depending on velocities and sewer characteristics. Force-main performance is directly related to the performance of the pumping station. Typical maintenance activities include route inspection, integrity inspection where exposed for condition of connections, noise, vibration, valve leakage, measurement of discharge pump rates, and suction and discharge pressures.

Water Supply Conclusions & Recommendations

Section 4.0 | Water Supply Conclusions and Recommendations

4.1 Elimination of Viable Water Supply Alternatives

Overview

Attraction of high technology tenants to the STAMP site largely depends on the Developer's ability to demonstrate the availability of a reliable, cost-effective, and long-term potable water supply. It is also imperative that the Developer has the ability to implement the construction of the initial infrastructure within the next two or three years. This will require that one or two preferred alternatives be identified so that detailed design and permitting activities may begin within the next few months.

While the five alternatives identified in Section 2 are technically viable, they each have their own unique set of risks. As part of the evaluation process, a preliminary qualitative risk assessment was performed for each alternative. This assessment was performed by a team of technical, legal, and regulatory permitting professionals to identify and evaluate both the tangible and intangible potential risks including such parameters as engineering, capital, and long-term operating costs; project delivery schedules; understanding of local stakeholder concerns; and anticipated permitting issues. In addition, risk mitigation measures were also identified and evaluated. This risk identification and mitigation assessment exercise demonstrated that lowest capital cost alone was not a suitable means for selecting a preferred alternative. This process resulted in the elimination of three alternatives; 2, 3, and 4B, as described below:

Water Supply Alternative 2 – 8 MGD from NCWD and 4 MGD from Lockport

Alternative 2 (8 MGD from NCWD and 4 MGD from Lockport) is the lowest total build-out cost alternative. However, a number of risks were identified:

- The ability to obtain a long-term agreement between Lockport and NCWD, which currently relies, although to an increasingly smaller degree, on Lockport's excess capacity to meet unusually high summer demands;
- The condition of the Lockport treatment facility – which is aging and in need of repairs;
- The condition of the Lockport 13-mile intake line, of which 3 miles are currently under review and inspection;
- If the cost to repair the intake line is excessive, it could jeopardize the future of the Lockport treatment facility;
- The timing of regulatory approvals required for treatment plant upgrades.

Additional considerations include:

- The condition of portions of the Lockport intake line, which are currently under review and inspection, is unknown;
- The review and inspection is expected to require upgrades to treatment, intake and pumping at both NCWD and Lockport;
- If the capital cost to repair the intake line is excessive, it could jeopardize the future of the Lockport treatment facility and eliminate this alternative as a viable solution;
- Additional questions related to the reliability and condition of the Lockport source as a long-term solution due to the age of the facilities;
- Timing and regulatory approval for significant treatment and intake upgrades, especially at Lockport;
- Potential contamination issues with intake, and required upgrades related to superfund status;

- Capital costs are expected to escalate due to large number of unknowns related to this alternative, but total capital costs will not be known until the planned study is completed;
- Relationship between water district and city;
- Lack of bulk water rate control depending on the supplier of record to supply the STAMP site;
- Additive cost of Lockport water rates.

The highest risk associated with this alternative is uncertainty. Whether it's in the form of contractual, permitting or required capital improvements by independent entities, suitable mitigation measures are beyond the control of the Developer. Individually, these risks could result in significant schedule delays and cost increases, and when combined those delays and cost increases could grow significantly. Therefore, this alternative was eliminated from consideration.

Water Supply Alternative 3 – 8 MGD from NCWD and 4 MGD from ECWA

Alternative 3 (8 MGD from NCWD and 4 MGD from ECWA) has the highest build-out cost. Several risks, which are similar to Alternative 2 above, were also identified for this alternative. These include:

- The timing of regulatory approvals related to the need for increased treatment capacity;
- Obtaining long-term agreements for the supply of the water at acceptable bulk rates;
- Uncertainty about NCWD's capital improvement budget and implementation schedule, which is beyond the Developer's control.

Additional considerations include:

- Discharge of any water drawn from the Lake Erie Basin to the Lake Ontario Basin would require an Intra-Basin approval under the Great Lakes Compact and NYSDEC regulations (6NYCRR Part 601). Preliminary guidance from NYSDEC indicated that while withdrawal from the Niagara River and discharge into the Lake Ontario Basin is permittable within the Great lakes Compact and the new NYSDEC Water Withdrawal regulations, withdrawals from the Lake Erie Basin and discharge into the Lake Ontario Basin may not be permitted. Thus, it may be very difficult, perhaps impossible, to obtain approval for an Intra-Basin transfer for Alternative 3, which includes obtaining 4 MGD from ECWA (Lake Erie Basin),if the wastewater is discharged to the Lake Ontario Basin.

This alternative was eliminated from consideration because of the high build-out cost, level of uncertainty and lack of Developer control over potential mitigation measures, as well as potential schedule delays and cost increases associated with those risks.

Water Supply Alternative 4B – 4 MGD from Genesee County and 8 MGD from NCWD

Alternative 4B (4 MGD from Genesee County and 8 MGD from NCWD) is the only alternative which offers a reduced estimated capital cost associated with Phase 1. All other alternatives utilize connections with NCWD infrastructure for Phase 1, and therefore have the same Phase 1 costs. Alternative 4B utilizes connections with multiple-sources within Genesee County for Phase 1, which results in the lowest Phase 1 construction cost alternative; $10.4 million less than the NCWD Phase 1 alternatives. However, as with Alternatives 2 and 3, there is a significant level of uncertainty, including:

- The uncertainty related to the timing of the Genesee County Water Project, and an inability to provide the required Phase 1 4 MGW without implementation of the Genesee County Water Project;
- Assurance that 4 MGD of water will be available on a consistent basis;
- The uncertainty regarding the bulk water rates that would be charged by MCWA.

Additional considerations include:

- An opportunity to generate revenue to fund subsequent site development from the sale of water purchased from NCWD at a lower rate than available from MCWD would be lost.
- The selection of Alternative 4B for Phase 1 would also eliminate the opportunity to defer decisions related to the final 4 MGD until a later date.

While Alternatives 2 and 3 were more of a future risk, Alternative 4B poses a more immediate schedule risk because of the uncertainty in acquiring even the most basic amount of water necessary to initially construct the site and serve the first manufacturing facility. These uncertainties and considerations resulted in elimination of Alternative 4B.

4.2 Recommended Water Supply Alternatives

The two remaining alternatives are Alternative 1 (12 MGD from NCWD) and Alternative 4A (8 MGD from NCWD and 4 MGD from Genesee County). NCWD supplies a portion of the water for each of the four viable water alternatives, and supplies a minimum of 8 MGD for each. NCWD provides Phase 1 water supply for all alternatives, except for Alternative 4B. As a result, the evaluation of the alternatives resulted in a recommendation that Phase 1 water supply should be obtained from NCWD. It is also recommended that Phase 1 should include construction of the pipeline with a capacity to convey the full 12 MGD of water to the STAMP site, as well as the pump station upgrades necessary to transmit 8 MGD (conceptual routing shown in Figure 4-1). This initial 8 MGD water supply capacity from NCWD will accommodate construction and operation of the first two manufacturing facilities (including associated site development), as well as any ancillary support facilities.

Phase 1 of the water supply should be obtained from NCWD, and should include the following:

- Construction of pipeline capacity required to supply the full 12 MGD of water to STAMP;
- Completion of pump station upgrades necessary to transmit 8 MGD.

Based on the discussions with the client and the consultant team, the selection of the preferred Phase 2 alternative should not be based solely on cost. Instead, the selection should be based on a combination of cost, discussions with the potential water suppliers, regulatory challenges, as well as the client and consultant team understanding of the local issues and drivers.

By implementing Phase 1 as recommended above, the decision on how to supply the remaining 4 MGD of water supply required to meet the build-out demand of 12 MGD can be deferred until a later date. This is true because there are two viable alternatives remaining. One Phase 2 alternative would be to receive the final 4 MGD (12 MGD total) from NCWD and would utilize the spare capacity of the pipeline installed as part of Phase 1. The other alternative would be to receive the final 4 MGD from new connections within Genesee County. The advantages of utilizing NCWD for Phase 1 improvements include:

- Development of transmission capacity to deliver the full 12 MGD of water supply and the pumping improvements to deliver 8 MGD at the initial stage of site development (Phase 1). This will allow for flexibility of two options to provide the final 4 MGD, and will demonstrate to potential tenants that all required water demands can be met while maintaining the ability to defer some of the capital costs for several years.
- A phased construction approach, combined with the possible creation of a new water supply entity, provides an opportunity to develop a capital improvement fund to help finance construction of the Phase 2 system.
- With the 12 MGD capacity transmission pipeline and necessary pump station improvements for 8 MGD in place under Phase 1, the selection of the Phase 2 alternative can be safely postponed until after the first and possibly second stage of site development is completed, as well as the future site development schedule and needs are better defined. This may also allow the opportunity to leverage CIP projects identified within the various water districts, depending on the final date of construction.

- NCWD representatives have indicated that they are an interested and willing partner.

Based on the current assumption that the site needs to be shovel ready by mid-2015, the preliminary pipeline routing study must begin immediately, followed closely by design development and the preparation of construction documents. It would also be prudent to conduct a project risk assessment workshop early in the planning phase to identify major project risks (i.e. permitting issues, third party concerns, etc.), followed by the development of a project risk mitigation plan.

As acknowledged previously in this document, selection of the preferred alternative(s) is based on quantifiable parameters (i.e. costs and schedule), as well as less tangible considerations (i.e. third-party stakeholder concerns). During project Workshop Number 2, consensus was reached that delivery of the full 12 MGD of water will require participation by NCWD, which would account for at least two-thirds (8 MGD) of the total 12 MGD required, regardless of which alternative was ultimately implemented. NCWD has indicated that they are very interested in working with the Developer to provide water to the STAMP site, including potential cost sharing in areas where the project is consistent with NCWA's existing Capital Improvement Plan (CIP). NCWD has an adequate supply of water, can provide up to 8 MGD without significant source and treatment upgrades, and has a competitive rate base for bulk sales.

A more detailed description of the required NCWD infrastructure improvements to support Phase 1 development is presented below, with further description in Appendix A.

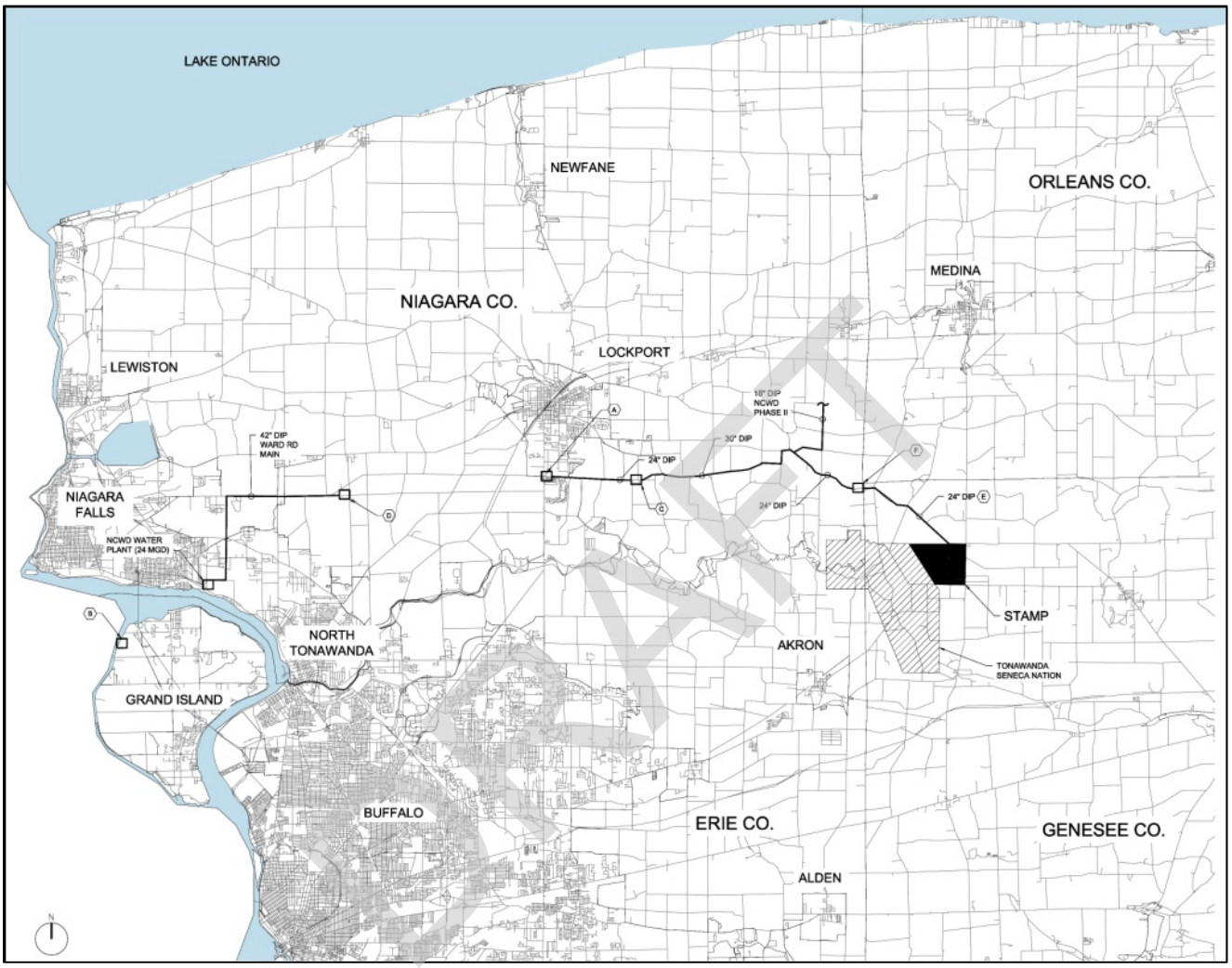
Water Supply Alternative 1 and 4A, Phase 1 - System Requirements

To provide at least 8 MGD, the following capital improvements must be made:

1. Improvements to transmission lines between the treatment plant and Ward Road;
2. Installation of 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit;
3. Installation of 31,000 LF of new water line from the Royalton meter pit to Johnson Creek Road to a 30-inch line;
4. Construction of 16,000 LF of 24-inch line from Johnson Creek to the Niagara/Genesee County line;
5. Improvements to NCWD's Robinson Road Pump Station;
6. Improvements to NCWD's Shawnee Road Pump Station;
7. Installation of 21,000 LF of new 24-inch transmission line from the county line to the STAMP site (this portion of the project could be under the auspices of the MCWA, which has the current franchise approval to serve water within Genesee County);
8. Construction of elevated storage tank(s) with a minimum of one day's storage capacity for each phase of site development.

Figure 4-1 shows a conceptual routing for the Phase 1 transmission system.

Figure 4-1: Recommended Water Supply Conceptual Routing | Alternative 1 and 4A – Phase 1



The improvements referenced above will provide a pipeline capacity of 12 MGD, but only up to 8 MGD can be supplied without additional pumping and treatment plant improvements. Additional improvements will be required to provide the full 12 MGD water supply. These additional improvements will complete either Alternative 1 or Alternative 4B;

Water Supply Alternative 1, Phase 2 - System Requirements

1. Upgrading the NCWD high service pump station;
2. Upgrading the NCWD raw water pump station to a firm capacity of 60 MGD;
3. Major improvements to the NCWD treatment plant process, which will be further defined at a later date.

Water Supply Alternative 4A, Phase 2 - System Requirements

1. Improvements within the Town of Alabama water project to increase the capability to move water to the STAMP site.
2. Installation of 28,200 LF of new 16 inch transmission main on Route 77 and connection to Pembroke system;

3. Installation of 18,000 LF of new 12 inch transmission line along Galloway Road to connect to Village of Oakfield system;
4. Installation of 15,000 LF of new 16 inch transmission main along Maple (Galloway to Judge) within the Village of Oakfield system;
5. Installation of 3,000 LF of new 12 inch transmission main along North Pembroke Road, from Phelps Road to Galloway Road;
6. Provide pump capacity improvements with the ECWA and MCWA connections in Genesee County.

4.4 Recommended Water Supply Alternative | Estimated Construction Cost

Table 4-1 presents a Class 4/5 total cost estimate comparison of the major project components for Alternative 1 and 4A. The estimates include capital construction costs, a 4% escalation to 2014 dollars, and an allowance of 18% for additional project costs including design, permitting, legal, and engineering services during construction.

Table 4-1: Recommended Water Supply Cost Summary – Alternative 1 and 4A

Alternatives	Quantity	Technical Requirements	Estimated 2014 Capital Costs (Millions)	Total Costs (Millions)*
Alternative 1 NCWD (12 MGD)	12 MGD	Intake Treatment Pumping Transmission Storage	$67.7	$79.9
Alternative 4A NCWD (8 MGD) / Genesee Co. (4 MGD)	8 MGD/4 MGD	Pumping, Transmission, Storage	$63.3	$74.7

*Notes:
1. All capital cost estimates are Class 4/5 cost estimates. Class 4/5 cost estimates are consistent with the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The majority of items will be Class 4 – Rough Order of Magnitude, with a -30% to +50% level of accuracy, some additional items will in the estimates will be at Class 5 – Rough Order of Magnitude, with a -50% to +100% level of accuracy.
2. All construction costs were standardized to include a 20% contingency, with engineering costs included separately.
3. Pre-Construction engineering costs of 10% are included for each alternative. These pre-construction engineering costs include planning, design, permitting, legal, and miscellaneous.
4. Engineering during construction costs of 8% are included for each alternative. These costs include inspections, contract administration, and other general services during construction.
5. A 4% escalation factor was included to project the cost to 2014 dollars.
6. All alternatives assume $6 million in capital cost sharing with NCWD Main Construction.

An additional consideration from the prospective user would be the cost of bulk rate water might be less with Alternative 1 vs. 4A with an annual cost estimate of $7.8M vs. $11.2M respectively. Funding and payback costs are other considerations to be factored by the controlling water commission entity in setting the final rates to a prospective user. See Table 2-8.

The NCWD Capital Improvement Plan (CIP) includes construction of a 31,000 LF, 16-inch water pipeline from NCWD's Royalton meter pit to Johnson Creek Road. To achieve a 12 MGD capacity, the Developer may only be responsible for the costs to upgrade from a 16-inch to a 30-inch pipeline. However, if this upgrade is not coordinated prior to the installation of the 16-inch pipeline, the construction costs will increase by approximately $6 million above what is shown.

The decision to implement the improvements required to increase the water supply capacity from 8 to 12 MGD can be deferred until a later time. The final total cost will vary depending on selection of the Phase 2 alternative. Table 4-2 indicates potential costs by phase for Phase 2 options.

Table 4-2: Recommended Water Supply Cost Summary by Phase | Alternative 1 and 4A

WATER SUPPLY				
	Phase 1	Phase 2		Build-out Total
	Alternatives 1 and 4A	Alternative 1	Alternative 4A	
Estimated 2014 Capital Costs (Millions)	$39.2	$28.5	$24.1	$63.3 – 67.7
Engineering Total (Millions)	$7.1	$5.1	$4.3	$11.4 – 12.2
Total Costs (Millions)	**$46.3**	**$33.6**	**$28.4**	**$74.7 – 79.9**

4.5 Water Supply Conclusion

The development of the water supply system for the STAMP site should be done in two different phases. Phase 1 would be to make the necessary improvements in the NCWD to obtain 8 MGD to the STAMP site, including constructing the pipeline capacity required to supply the full 12 MGD of water to the STAMP site and the pump station upgrades necessary to transmit 8 MGD. The decision on how to supply the remaining 4 MGD of water supply required to meet the build-out demand of 12 MGD should be deferred until a later date because there are two cost-effective options available. One Phase 2 option would be to receive the final 4 MGD from NCWD and another would be to get it from improved and new connections within Genesee County.

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Section 5.0 | Wastewater Management Conclusions and Recommendations

5.1 Elimination of Viable Wastewater Management Alternatives

Overview

The ability to demonstrate the availability of a reliable and cost-effective wastewater management system is as essential to attracting site tenants as a water supply. As with the water supply system, it is imperative that the Developer has the ability to implement the construction of the wastewater management infrastructure within the next two to three years. Unlike the water supply system which is proposed as phased construction, the physical requirements of the viable proposed wastewater alternatives leads to a recommendation for completing construction in a single phase.

Similar to the water supply evaluation discussed in the previous section, the four wastewater alternatives identified in Section 3 are technically viable but they each have their own unique set of risks. As part of the evaluation process, a preliminary qualitative risk assessment was performed on each alternative. This assessment was performed by a team of technical, legal, and regulatory permitting professionals to identify and evaluate both the tangible and intangible potential risks including such parameters as engineering, capital, and long-term operating costs; project delivery schedules; understanding of local stakeholder concerns; and anticipated permitting issues. In addition, risk mitigation measures were also identified and evaluated. This risk identification and mitigation assessment exercise demonstrated that lowest capital cost alone was not a suitable means for selecting a preferred alternative, although the recommended alternative did ultimately prove to be the lowest cost. This process resulted in the elimination of three alternatives: 1, 2, and 4 as described below:

Wastewater Management Alternative 1 – 12 MGD to Bird Island WWTP

From a risk management perspective, initial discussions with local regulatory agencies appeared to identify Alternative 1 (12 MGD to Bird Island WWTP) as a low risk alternative; however it was not the lowest cost alternative. Based on initial discussions with the Buffalo Sewer Authority (BSA), the Bird Island facility was identified as having adequate treatment capacity and the system design only requires a low technology approach consisting essentially of a pump station and pipeline. The 1 MGD of total sanitary effluent and total 11 MGD of pre-treated process effluent would be combined and sent to the plant for treatment. However, subsequent discussions with the NYSDEC revealed major concerns regarding the impact of additional wastewater flow on BSA's existing combined sewer overflow (CSO) issues and the potential for untreated process effluent being discharged directly into Buffalo area waterways during wet-weather events. The NYSDEC indicated potential significant capital cost and permitting issues to overcome. These issues were identified as being similar to those for Alternative 3 (1 MGD to Medina and 11 MGD to Lake Ontario). Due to this uncertainty, the potential impact on the site development schedule, and the inability of the Developer to mitigate this risk directly, and comparative costs associated with this alternative, this alternative was eliminated.

Wastewater Management Alternative 2 – 12 MGD to Van Lare WWTP

With adequate permitting capacity and a regional operational model, Alternative 2 (12 MGD to the Van Lare WWTP) was identified as having a slightly lower risk profile than the other alternatives. However, it is the highest cost alternative, with a costs ranging from approximately $5 million to $45.5 million more than the other three alternatives. Given that the risks associated with Alternative 2 are not significantly less than other Alternatives which all have significantly lower cost, this alternative was eliminated based primarily on cost considerations.

Wastewater Management Alternative 4 – 4.5 MGD to Medina WWTP and 11 MGD to Lake Ontario

Initially, Alternative 4 (4.5 MGD to Medina WWTP and 11 MGD to Lake Ontario) was evaluated due to the potential benefits of using a WWTP that was closer to the STAMP site than the other alternatives. This alternative also provided an opportunity to phase the wastewater management system construction by sending up to 4.5

MGD of combined sanitary and process effluent to the Village of Medina plant in a first phase. The risk assessment, however, revealed the following:

- Increasing the discharge from the Medina WWTP could trigger a review of their existing SPDES permit and subsequently cause the implementation of stricter discharge limits;
- Increasing the volume of wastewater by 4.5 MGD would require significant capital improvements to the WWTP infrastructure. These improvements result in an estimated capital cost of nearly $100 million.

Given the risk of uncertain schedule impacts due to anticipated permitting issues, as well as the fact that two other significantly lower cost viable alternatives were available (roughly $23.3 to $42.7 million less), this alternative was eliminated from consideration.

5.2 Recommended Wastewater Management Alternative

Alternative 3 (1 MGD to Medina WWTP and 11 MGD to Lake Ontario) is the recommended alternative. This alternative splits wastewater flows, sending up to 1 MGD of sanitary effluent to the Village of Medina WWTP and up to 11 MGD of pre-treated process effluent to Lake Ontario for direct discharge.

The selection of the preferred alternative is based on quantifiable parameters (i.e. cost and schedule) and less tangible considerations (i.e. third party stakeholder concerns). Alternative 3 has the lowest total estimated capital cost at $67.0 million. Based on discussions during project Workshop Number 2, local conditions that favored the selection of this alternative were also identified. During this workshop, the client and consultant team reached consensus that Alternatives 1 and 3 should be pursued in parallel until permitting uncertainties were better understood, and a clear favorite emerged. Subsequent meetings with NYSDEC provided a better understanding of those concerns, and it was determined that permitting risks for Alternative 3 are no more significant than those associated with Alternative 1.

Although Alternative 3 is the preferred alternative, there are several uncertainties related to permitting issues that must be accounted for, including:

- Detailed analysis of the pre-treated effluent is recommended to better assess the permitting risk associated with directly discharging into Lake Ontario. However, the pre-treated effluent characterization may not be available until much later in the STAMP project.
- Semiconductor manufacturing processes have evolved significantly in recent years, and information on those processes, as well as specific composition of the waste streams, is not public information. Therefore, confirmation of the assumed semiconductor manufacturer effluent discharge parameters identified in this report is a recommended first step.
- Detailed analysis of the discharge location will be required to prevent impact on drinking water intakes and beaches on Lake Ontario.
- Discharge to Lake Ontario will be permitted by a SPDES permit, and will be subject to monitoring, recording, reporting, and 5-year permit renewal applications.

  Discharge of any water drawn from the Lake Erie Basin to the Lake Ontario Basin would require an Intra-Basin approval under the Great Lakes Compact and NYSDEC regulations (6NYCRR Part 601).

A more detailed description of the required infrastructure improvements is presented below, with further description in Appendix B.

Wastewater Management Alternative 3 – System Requirements

Alternative 3 assumes that the semiconductor manufacturer will pre-treat the process effluent per industry standards, including removing specific inorganic constituents such as fluoride, copper, and total suspended solids (TSS), and adjust the pH. In this alternative, the sanitary effluent will be separated from the pre-treated process

effluent at the STAMP site. The sanitary effluent will be sent to the Village of Medina WWTP and the process effluent will be directly discharged to Lake Ontario.

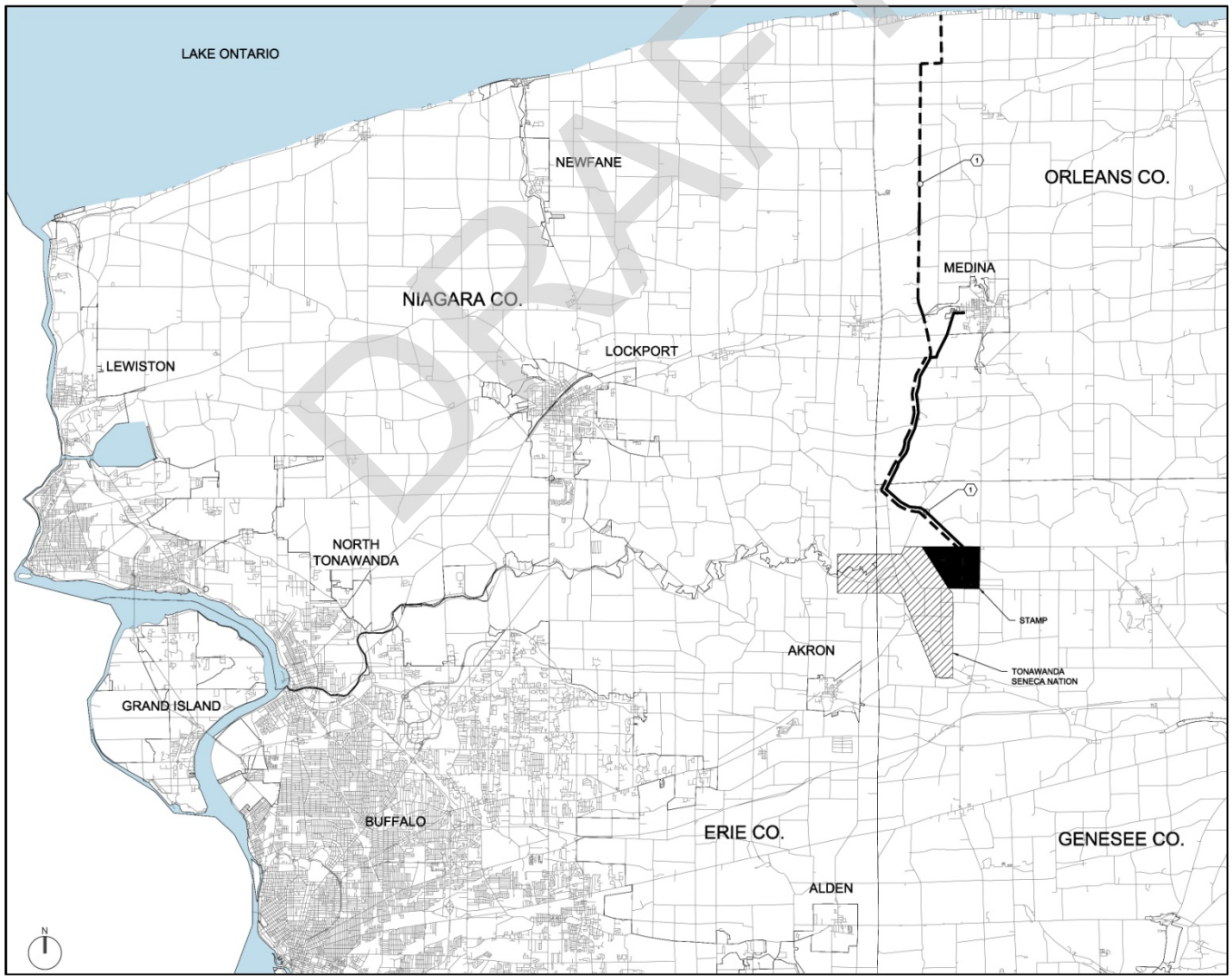
The infrastructure required includes:

1. Installation of approximately 23.7 miles of conveyance pipeline with an 11 MGD capacity between the STAMP site and an outfall into Lake Ontario;
2. Installation of approximately 12.0 miles of conveyance pipeline with a 1 MGD capacity between the STAMP site and Medina WWTP, including a Canal Crossing;
3. Construction of a 12 MGD pump station at the STAMP site.

The 1 MGD sewer line from STAMP is assumed to connect to the existing sewer receiving system at the Medina WWTP to avoid adding to the wet-weather overflows in the city's combined sewer system.

5-1 shows a conceptual routing of the Alternative 3 wastewater conveyance system.

Figure 5-1: Recommended Wastewater System Conceptual Routing | Alternative 3



Regulatory Considerations – Alternative 3 – Medina / Lake Ontario

Based on our preliminary analysis and a follow-up meeting with NYSDEC staff on May 17, 2013, a discharge of up to 11 MGD of pre-treated industrial effluent to Lake Ontario could likely be permitted.

According to the Division of Water Technical and Operational Guidance Series (1.3.1) entitled “Total Maximum Daily Loads and Water Quality-based Effluent Limits” by NYSDEC, a default dilution ratio of 10:1 for Lake Ontario would be applicable if mixing were incomplete. Based on an initial discussion with DEC staff, a dilution ratio could be as high as 30:1, if a well-designed diffuser system were used to enhance the mixing process. Therefore, use of diffuser systems with a dilution ratio of 10:1, or above, could reduce the concentrations in the pretreated effluent below the applicable standards for dissolved water quality parameters of 30 mg/l of biochemical oxygen demand (BOD) and TSS, and 1 mg-P/l of total phosphorus.

A key requirement for direct discharge is the absence of bio-accumulative chemicals of concern shown on EPA’s banned list for mixing zone in the Great Lakes. This is because EPA regulation prohibits new discharges of bio-accumulative chemicals into mixing zones and phases out the use of existing mixing zones in the Great Lakes over the next ten years. Based on the information available, typical semiconductor effluent does not contain any of the listed bio-accumulative chemicals.

In addition to the concerns above, any discharge of water drawn from the Lake Erie Basin to the Lake Ontario Basin would require an Intra-Basin approval under the Great Lakes Compact and NYSDEC regulations (6NYCRR Part 601). Such an approval would be difficult and time-consuming.

5.3 Recommended Wastewater Management Alternative | Estimated Construction Cost

Estimated Construction Cost | Alternative 3 – Medina / Lake Ontario

Pipeline average diameters of 23.9 inches between the STAMP site and Lake Ontario, and 8.4 inches between the STAMP site and the Medina WWTP were used to estimate capital and annual costs associated with this alternative. The estimated the capital cost of this alternative to be approximately $56.8 million, including 20% contingency, and 4% escalation. Assuming $10.2 million for engineering costs, which includes pre-construction engineering at 10% for design, permitting and legal as well as 8% for engineering services during construction, the total cost is estimated at $67.0 million.

Although phased construction of the manufacturing facilities will not require conveyance of the entire 11MGD to Lake Ontario until build-out, analysis has shown that it is much more cost-effective to initially install a pipeline sized to accommodate the full 11MGD during Phase 1 than to install an additional parallel pipeline in Phase 2.

A summary of the cost estimate for phasing Alternative 3 is presented below in Table 5-2:

Table 5-1: Recommended Wastewater Management Alternative Cost Summary | Alternative 3

Alternative	Quantity	Technical Requirements	Estimated 2014 Capital Costs (Millions)	Total Cost (Millions)*
Alternative 3 Medina WWTP / Lake Ontario	1/11 MGD	Pumping, Transmission	$56.8	$67.0

Notes:
1. All capital cost estimates are Class 4/5 cost estimates. Class 4/5 cost estimates are consistent with the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The majority of items will be Class 4 – Rough Order of Magnitude, with a -30% to +50% level of accuracy, some additional items will in the estimates will be at Class 5 – Rough Order of Magnitude, with a -50% to +100% level of accuracy.
2. All construction costs were standardized to include a 20% contingency, with engineering costs included separately.
3. Pre-Construction engineering costs of 10% are included for each alternative. These pre-construction engineering costs include planning, design, permitting, legal and miscellaneous.
4. Engineering during construction costs of 8% is included for each alternative. These costs include inspections, contract administration, and other general services during construction.
5. A 4% escalation was also included to project the cost to 2014 dollars.

Table 5-2 summarizes the operation and maintenance costs associated with pumping, conveying, and discharging wastewater for Alternative 3 at the anticipated conveyance for each manufacturing facility, in phases of 4, 8, and 12 MGD. The notes on the table describe the assumptions for each of the cost line items. A privately owned pipe of 30-40 miles may also have costs associated with the right-of-way use and possibly insurance considerations. These costs are not included.

Table 5-2: Annual Wastewater Cost Estimate Summary (2013 dollars)

	4 MGD ($/Year)	8 MGD ($/Year)	12 MGD ($/Year)
Alternative 3: 1 MGD to Medina WWTP and 11 MGD to Lake Ontario			
Treatment and Discharge[1]	$0.78 M	$1.56 M	$2.34 M
Labor[2]	$0.25 M	$0.25 M	$0.25 M
Energy[3]	$0.23 M	$0.46 M	$0.69 M
Maintenance[4]	$0.29 M	$0.29 M	$0.29 M
Asset Fund[5]	$1.40 M	$1.40 M	$1.40 M
Annual Cost	**$1.60 M**	**$2.60 M**	**$3.60 M**
Cost ($/1,000 gallons)	**$1.07**	**$0.88**	**$0.82**

Notes:
[1] Annual cost of treatment and discharge was based on a current rate of $2.47/1000 gallons for non-residential users outside the City of Buffalo, and a rate of $4.01/1000 gallons plus 1.6 surcharge rate provided by the Village of Medina.
[2] Annual cost is based on 2-man-hours.
[3] Energy is based on a total discharge pressure of 150 psi, 70% efficient motors, and $0.09/kWhr.
[4] Maintenance was set at 0.5% of capital cost of infrastructure.
[5] Asset fund was based on the capital cost of infrastructure, 50 years life-time for conveyance infrastructure and 20-year life-time for pumping stations.

5.4 Wastewater Management Conclusion

The development of the wastewater system for the STAMP site should be done in one phase which will accommodate the full 12 MGD of process and sanitary effluent. Construction of the preferred alternative will accommodate the conveyance of up to 1 MGD of sanitary effluent to the Village of Medina WWTP, and up to 11 MGD of pre-treated process effluent to Lake Ontario for direct discharge. Initial phases of site development will not need the entire capacity, but it is much more cost effective to install piping for the ultimate build-out, than it is to install an additional parallel pipe at a later date.

Appendix A – Technical Memorandum – Water

Western New York Science and Technology Advanced Manufacturing Park (STAMP)

Conceptual Water and Wastewater Engineering Study Comparative Analysis Technical Memorandum - Water Supply

PREPARED FOR: Genesee Gateway Local Development Corporation (GGLDC)

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PREPARED BY: IDCA/CH2M Hill

DATE: March 19, 2013

PROJECT NUMBER: 458659

Scope of Study

The purpose of this Technical Memorandum is to present a comparative analysis of the various alternatives to provide up to 12 million gallons per day (MGD) of potable water supply to the Western New York Science and Technology Advanced Manufacturing Park (STAMP) site. This Memorandum expands on the information presented in the Draft Evaluation and Conceptual Design Memorandum issued by IDC Architects (IDCA) on November 23, 2012 and incorporates GGLDC review comments received during Workshop No. 1 held on November 27, 2012. IDCA has worked with GGLDC's consultants, specifically Clark Patterson Lee (CPL), Conservation Connects, LLC, and Phillips Lytle, as well as local water suppliers to incorporate their local knowledge, past and current efforts on this project and their technical experience into the study.

Executive Summary

This memorandum provides a summary of potential water supply source options to provide up to 12 MGD of potable water to the STAMP site. IDCA, in conjunction with CPL, has identified multiple alternatives and conducted an analysis of the advantages and disadvantages of each alternative. Detailed narratives that provide an overview of the background discussions with the potential water suppliers, system requirements, and level Class 4/5 cost estimates (capital, engineering design, and engineering services during construction) are included in the subsequent sections of this memorandum.

Based on our assessment of technical viability, estimated capital and engineering cost, and consideration of local issues and drivers, IDCA has identified four alternatives that warrant further study. These four alternatives include:

1. Receiving the full 12 MGD of water supply from the Niagara County Water District (NCWD)
2. Receiving 8 MGD from NCWD and 4 MGD from the City of Lockport (Lockport)
3. Receiving 8 MGD from NCWD and 4 MGD from the Erie County Water Authority (ECWA)
4. Receiving 8 MGD from NCWD and 4 MGD from Genesee County

Three additional alternatives were also evaluated, including water supplied by Monroe County Water Authority (MCWA), a new water treatment plant constructed near Lake Ontario with pipeline, and partial supply from the City of Batavia. These three alternatives were all deemed undesirable, primarily due to excessive cost, and it was determined they would not be studied any further.

Table 1 below provides a summary of all evaluated alternatives.

TABLE 1:
Water Supply Alternative Summary

Alternative	Quantity	Technical Needs	Estimated 2014 Capital Costs (Millions)	Total Costs (Millions)[1]	Further Study
1) NCWD	12 MGD	Intake Treatment Pumping Transmission Storage	$67.7	$79.9	Yes
2) NCWD/Lockport	8 MGD/4 MGD	Pumping, Transmission, Storage	$53.2	$62.7	Yes
3) NCWD/ECWA	8 MGD/4 MGD	Pumping, Transmission, Storage	$71.7	$84.7	Yes
4) NCWD/Genesee Co.[2]	8 MGD/4 MGD	Pumping, Transmission, Storage	$63.2	$74.7	Yes
5) MCWA	12 MGD	Pumping, Transmission, Storage	$179	$200 +	No
6) Lake Ontario	12 MGD	Intake, Treatment, Transmission, Storage	$200+	$200 +	No
7) Batavia	6 MGD	Treatment, Transmission, Source Replacement	$100+	$100 +	No

1. Total Costs includes 18% Engineering costs (planning, design, legal, miscellaneous, and services during construction).
2. There are two options for alternative 4: 4A and 4B, for which the total costs are the same, but the construction phases are reversed.

Based on the assumption that the STAMP project will be built out in three phases requiring 4, 8 and 12 MGD, respectively, a reduction in up front capital expenditures can be realized by constructing each of the four alternatives in phases as demands increase at the STAMP site over time. The most likely scenario would be to first construct the piping and pumping capacity needed by the NCWD to provide 6-8 MGD to the Niagara/Genesee County line. In this first phase it would also be necessary to install the transmission line from the Niagara/Genesee County line to the STAMP site and construct at least one-day of storage on-site. While constructing the NCWD portion first as Phase 1 is the only phasing option available in Alternatives 1-3, the order could be reversed in Alternative 4. The improvements within Genesee County could be completed first to meet the initial 4 MGD followed by the NCWD connections as Phase 2 when the second phase of the manufacturing facility is ready to come online (Alternative 4B).

Table 2 below provides a summary of the phased approaches:

TABLE 2
Water Supply Phased Alternative Cost Summary

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)[1]	Total Costs (Millions)
Alternative 1			
Phase 1	$39.2	$7.1	$46.3
Phase 2	$28.5	$5.1	$33.6
Total	**$67.7**	**$12.2**	**$79.9**

TABLE 2
Water Supply Phased Alternative Cost Summary

	Estimated 2014 Capital Costs (Millions)	Engineering Total (Millions)[1]	Total Costs (Millions)
Alternative 2			
Phase 1	$39.2	$7.1	$46.3
Phase 2	$13.9	$2.5	$16.4
Total	**$53.1**	**$9.6**	**$62.7**
Alternative 3			
Phase 1	$39.2	$7.1	$46.3
Phase 2	$32.5	$5.9	$38.4
Total	**$71.7**	**$12.9**	**$84.7**
Alternative 4B			
Phase 1	$30.4	$5.5	$35.9
Phase 2	$32.9	$5.9	$38.8
Total	**$63.3**	**$11.4**	**$74.7**

1. Engineering Costs includes 18% of estimated capital costs for planning, design, legal, miscellaneous, and services during construction.

If the project were constructed in phases, it may also be possible to establish water rates that could generate capital to complete later phases of the project. Any specifics would have to be negotiated with the water supplier(s) and approved by the applicable regulatory authorities. Table 3 below provides a summary of water rates paid by other semiconductor facilities:

TABLE 3
Example Water Rates Summary

Location	Chandler, AZ	Saratoga County, NY	East Fishkill, NY	NCWD	ECWA	MCWA	Industry Average
Annual Average Cost/1000 gallons	$2.53	$2.05	$2.91[1]	$1.50[2]	$2.49/$2.12[3]	$4.00-$4.15[4]	$5.00[5]

Note(s):
1. Cost includes annual O&M charge, administrative charge, and capital replacement charge; assuming Water Purchased= Water Purchase Forecast @ $1.93/1,000 gal. If the usage was lower than the predicted volume, the fabricator would pay $1.80/1,000 gal for the unused amount.
2. Base on current 2012 rates. Final costs would be dependent on actual contract negotiations with the water suppliers.
3. Base on current 2012 rates; $2.49/1,000 gallons for first 2.5 million gallons, then $2.12 per 1,000 gallons thereafter.
4. Current Western Genesee County rate which will apply if the MCWA is the supplier of record, regardless of the Alternative
5. SEMATECH International, Fab Utility Cost Vales for Cost of Ownership (COO) Calculations, "Table 1 Industry Average Utility Purchase Costs", page 12, 2002

The annual cost of supplying water to the STAMP site will ultimately be based on negotiations with the suppliers. For comparison purposes, Table 4 below summarizes annual water costs based on current rates for the various alternatives:

TABLE 4
Annual Water Cost Summary

	4 MGD	8 MGD	12 MGD
MCWA as the Supplier[1]	**($/Year)**	**($/Year)**	**($/Year)**
Alternative 1: NCWD 12 MGD	$5.8M	$11.7M	$17.5M
Alternative 2: NCWD/Lockport	$5.8M	$11.7M	$17.5M
Alternative 3: NCWD/ECWA	$5.8M	$11.7M	$17.5M
Alternative 4A: NCWD/Genesee Co.	$5.8M	$11.7M	$17.7M
Alternative 4B: Genesee Co./NCWD	$6.1M	$11.9M	$17.7M
New Entity as the Supplier[2]			
Alternative 1: NCWD 12 MGD[3]	$2.6M	$5.1M	$7.8M
Alternative 2: NCWD/Lockport[4]	$2.6M	$5.1M	$11.1M
Alternative 3: NCWD/ECWA[4]	$2.6M	$5.1M	$11.1M
New Entity and MCWA as the Supplier			
Alternative 4A: NCWD/Genesee Co.[5]	$2.6M	$5.1M	$11.2M
Alternative 4B: Genesee Co./NCWD[6]	$6.1M	$8.7M	$11.2M

1. If MCWA is the water supplier of record (based on their current franchise agreement) it is assumed that their current Western Genesee County rate of $4.00/1,000 gallons would apply, regardless of the MCWD or ECWA bulk rate.
2. Assumes that MCWA does not hold the franchise and a new entity is created to deliver water to the STAMP site.
3. Assumes a bulk rate of $1.75/1,000 gallons that includes $1.50/1,000 gallons for NCWD purchase plus $0.25/1,000 gallons for estimated O&M.
4. Assumes a bulk rate of $1.175/1,000 gallons per (3) above for the first 8 MGD (phases 1&2) plus an additional $2.30/1,000 gallon for purchase of either Lockport or ECWA water(total of $4.05/1,000 gallons) for remaining 4 MGD required for phase 3.
5. Assumes that a new entity is formed as in (2) above to deliver first 8 MGD (phases 1&2) at $1.75/1,000 gallons as in (3) above and the remaining 4MGD (phase 3) will be delivered at $4.15/1,000 gallons by MCWA under a revised franchise agreement.
6. Assumes that the first 4MGD (phase 1) is supplied at the MCWA franchise rate of $4.15/1,000 gallons and the remaining 8 MGD (phases 2&3) will be delivered by the new entity at $1.75/1,000 gallons.

Final recommendations for the preferred alternative(s) will be developed in Workshop No. 2. In this workshop, the entire team will review all the technical, financial, and stakeholder influences to determine which alternative(s) will be incorporated into the Alternative Analysis Recommendations Report.

Background

IDCA and CPL conducted a review of potential water supply sources for providing up to 12 MGD of potable quality water to the STAMP site. Seven potential sources of potable water were identified and assessed, either as sole sources or as part of a blended source of supply. These sources include water supplied by:

- Niagara County Water District
- City of Lockport
- Monroe County Water Authority
- Erie County Water Authority
- City of Batavia

- Interconnections within Genesee County with existing supplies
- A new intake on Lake Ontario near Lyndonville, New York

Under Task 1.3 of the Conceptual Water & Wastewater Engineering Study, IDCA and CPL staff conducted a preliminary assessment of required treatment and conveyance system upgrades to five existing public water treatment plant (WTP) facilities, as well as a potential new intake and treatment facility on Lake Ontario and potential groundwater sources. CPL contacted the potential public water suppliers (Monroe County Water Authority, Niagara County Water District, Erie County Water Authority and the City of Lockport) to obtain their assessments for the potential of providing up to 12 MGD of water to the STAMP site. Upon receipt of this data from the suppliers, CPL coordinated and arranged follow-up meetings with the suppliers and IDCA staff to review the potential alternatives.

Based on these discussions, an analysis of the capabilities of the water suppliers and a review of preliminary cost and regulatory challenges, IDCA and CPL eliminated three of the potential alternatives, and identified four alternatives for further study and conceptual designs. These conceptual designs included; a narrative of the potential alternatives, transmission route schematics, pumping requirements and storage needs. In addition, IDCA provided a Class 4/5 construction cost estimate for each alternative. The four alternatives were:

1. Obtaining 12 MGD from the Niagara County Water District (NCWD).
2. Obtaining up to 8 MGD from the NCWD and another 4-6 MGD from the City of Lockport (Lockport) via the NCWD distribution system.
3. Obtaining up to 8 MGD from the NCWD with another 4-6 MGD from the Erie County Water Authority (ECWA) via the NCWD distribution system.
4. Obtaining 8 MGD from the NCWD and 4 MGD from existing Genesee County water suppliers via their Monroe County Water Authority (MCWA) and ECWA connections.

In addition to meeting the water supply and wastewater demands for the proposed manufacturing facilities at the STAMP site, GGLDC is also committed to providing incentives to the local community. Under each of the proposed alternatives, one of the first steps will be to install the necessary water lines and connections to provide public drinking water to the Town of Alabama as well as a supply of water to the STAMP site to meet construction needs.

Water Supply Alternatives and General Assumptions

A detailed description and Class 4/5 construction cost estimate for each of the alternatives follows. For comparison purposes, a description and construction cost estimates for three additional alternatives that were eliminated from consideration as a result of Workshop No. 1 are also provided. In order to provide consistency among the alternatives, a series of assumptions were identified. These assumptions include the following;

- All capital cost estimates are Class 4/5 cost estimates. Class 4/5 cost estimates are consistent with the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The majority of items will be Class 4 – Rough Order of Magnitude, with a -30% to +50% level of accuracy, some additional items will in the estimates will be at Class 5 – Rough Order of Magnitude, with a -50% to +100% level of accuracy.
- All construction costs were standardized to include 20% contingency, with engineering costs included separately.
- Pre-Construction engineering costs of 10% are included for each alternative. These pre-construction engineering costs include planning, design, permitting, legal and miscellaneous.
- Engineering during construction costs of 8% are included for each alternative. These cost include inspections, contract administration, and other general services during construction.
- A 4% escalation was also included to project the cost to 2014 dollars.
- All alternatives assume $6 million in capital cost sharing with NCWD Main Construction.

Potential Alternatives

Alternative 1: Niagara County Water District (NCWD): 12 MGD

Overview

In this alternative, it is anticipated that NCWD will provide the full 12-MGD required for full build-out at the STAMP site.

The NCWD obtains its water supply from the West Branch of the Niagara River and provides conventional filtration treatment. NCWD's treatment facility is rated at 48 MGD and currently provides an average of approximately 15 MGD, with a maximum day peak of 36 MGD, to roughly 150,000 people in Niagara, Erie and Orleans Counties. The treatment facility is located approximately 33 miles west of the STAMP site.

System Requirements

On October 18, 2012 IDCA, CPL and GGLDC met with representatives of the NCWD and Wendel Engineers (Wendel). The purpose of this meeting was to review Wendel's projections (copy included as Appendix A) and assess NCWD's potential as a water-supplier for the STAMP project. Two scenarios for obtaining water from NCWD were discussed:

1. Obtaining the full 12 MGD from NCWD.
2. A partial solution of obtaining 6-8 MGD from NCWD, with the additional 4-6 MGD being supplied from another source.

The discussion revealed that supplying the 12 MGD required for full build-out at the STAMP site would require pump station and transmission improvements, intake improvements and treatment plant upgrades. It was also determined that supplying the 6-8 MGD would require pump station and transmission improvements, but not substantial improvements to their intake or treatment facilities. Details of the 6-8 MGD solutions are discussed later in Alternatives 2, 3 and 4. Refer to Figure 1 for the proposed routing from the NCWD to the STAMP site for the 12 MGD solution. Improvements required include:

<u>Pump station and transmission improvements:</u>

1. Improvements to transmission lines between the treatment plant and Ward Road.
2. Installation of 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
3. Installation of 31,000 LF of new waterline from the Royalton meter pit to Johnson Creek Road to a 30-inch line.
4. Construction of 16,000 LF of 24-inch line from Johnson Creek to the county line.
5. Improvements to their Robinson Road Pump Station.
6. Improvements to their Shawnee Road Pump Station.
7. Installation of 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
8. Construction of a 12 MG (one-day) Elevated Storage Tank.

<u>Intake improvements:</u>

1. Upgrading their High Service Pump Station.
2. Upgrading their Raw Water Pump Station to a firm capacity of 60 MGD.

<u>Treatment plant upgrades:</u>

1. Major improvements to their treatment plant process.

Cost

At the request of CPL, the NCWD's engineer (Wendel) provided an assessment and cost projections for providing 2, 4, 6 and 12 MGD to the STAMP project. These assessments and cost projections will be used within Alternatives 1, 2, 3 and 4. These assessments and projections showed the following;

- 2 MGD could be provided to the Genesee County line through distribution line improvements and extensions at a cost of approximately $3.4 million.
- 4 MGD would require some pumping improvements in addition to distribution line improvements and extensions at a cost of approximately $12.8 million.
- 6 MGD, in addition to distribution line improvements and extensions utilizing larger pipe lines, additional pumping and treatment facility improvements would be required at a total approximate cost of $18.5 million.
- 12 MGD, the NCWD would need to make substantial improvements in their intake and treatment facilities as well as the pumping and transmission improvements mentioned above, increasing the projected costs to approximately $50 million.

Significant cost reductions would likely be available if the project is delivered in conjunction with currently planned NCWD system improvements. Improvements are already identified in the existing NCWD Capital Improvement Plan (CIP) and are planned to be constructed over the next few years. Specifically, the CIP includes plans to construct the 31,000 LF of 16-inch water line from the NCWD's Royalton meter pit to Johnson Creek Road. Since the CIP already anticipates constructing this 16-inch line, GGLDC would likely only be responsible for costs associated with upgrading that 16-inch line to a 30-inch line, thereby reducing the construction costs by approximately $6 million. The cost tables below reflect potential cost-savings which are likely to be realized as a result of this partnership.

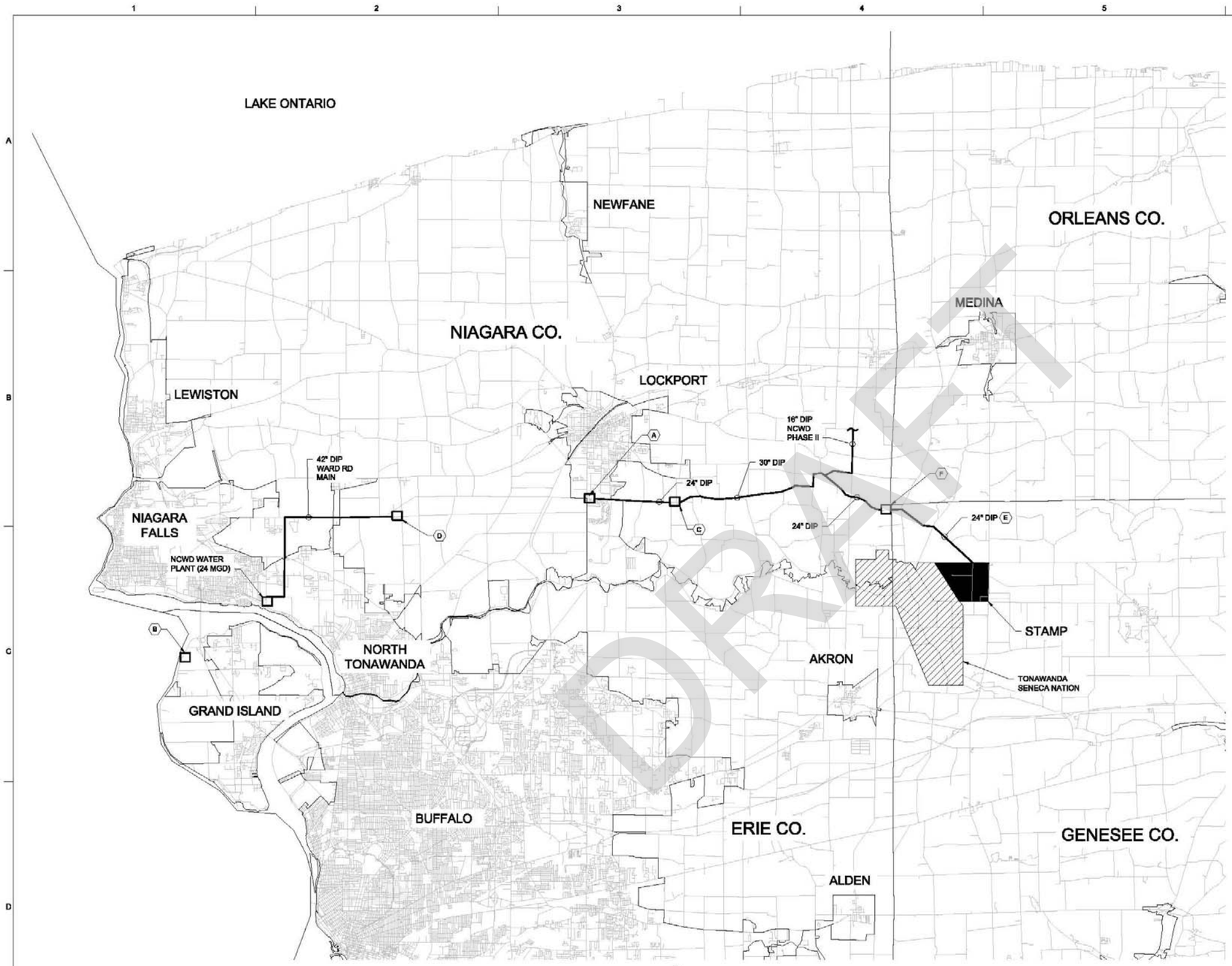
Additional costs will be incurred to bring the water from the county line to the STAMP site, and to construct one-day of storage at the site. This portion of the project could be under the auspices of the MCWA, which has the current franchise approval to serve water within Genesee County.

Wendel's total projected cost for improvements to supply 12 MGD to the county was estimated to be in the $50M range. When factoring in additional costs and reductions related to items identified above, this alternative is estimated to require approximately $67.7 million in capital costs, including 20% contingency with a 4% escalation factor to account for 2014 dollar costs. Engineering costs of 18% ($12.2 million); 10% for pre-construction design, permitting and legal and 8% for services during construction are projected.

In addition, this alternative could reliably supply 12 MGD to the STAMP site from a single source – this is the only alternative to do so.

TABLE 5
Alternative 1: Cost Summary
Alternative 1: 12 MGD NCWD

Item	Take-off Quantity	Total
Main Construction - NCWD	68,000 LF	$15,170,000
Pump Station Improvements		$8,420,000
Transmission Improvements		$8,830,000
Treatment Plant Improvements		$7,666,000
Intake Upgrades		$2,750,000
Transmission from Genesee County Line	21,000 LF	$5,670,000
Storage	12 MG	$5,750,000
Capital Costs Subtotal (2012 dollars)		*$54,256,000*
Contingency - 20%		$10,851,200
Escalation - 4%		$2,604,288
Capital Costs Total (2014 dollars)		**$67,711,488**
Engineering – 10% (design/permitting)		$6,771,149
Engineering – 8% (construction)		$5,416,919
Engineering Total		**$12,188,068**



ALTERNATIVE 1
12 MGD FROM NCWD

N
1" = 10,000'

CODED NOTES

- (A) NCWD ROBINSON RD. PUMP STATION
- (B) NCWD INTAKE STRUCTURE (36 MGD)
- (C) ROYALTON METER PIT
- (D) NCWD SHAWNEE RD PUMP STATION
- (E) TRANSMISSION MAIN IN GENESEE CO. BY MCWA
- (F) NEW METER PIT

GENERAL NOTES:

1. ALL TRANSMISSION MAINS ARE ASSUMED TO BE DUCTILE IRON PIPE (DIP).
2. 21,000LF OF NEW TRANSMISSION MAIN FROM ROBINSON RD PUMP STATION TO ROYALTON METER PIT.
3. 31,000 LF OF NEW TRANSMISSION MAIN FROM ROYALTON METER PIT TO JOHNSON CREEK.
4. 16,000 LF OF NEW TRANSMISSION MAIN FROM JOHNSON CREEK TO NIAGARA COUNTY LINE.
5. 21,000 LF OF NEW TRANSMISSION MAIN FROM NIAGARA COUNTY LINE TO STAMP.
6. ROBINSON RD PUMP STATION IMPROVEMENT TO INCREASE BY 12 MGD TO SUPPLY STAMP.
7. SHAWNEE RD PUMP STATION IMPROVEMENTS.
8. TRANSMISSION IMPROVEMENTS FROM WATER PLANT TO WARD RD.
9. PLANT IMPROVEMENT INCLUDING PH CONTROL, CLEAR WELL EXPANSION, ELECTRICAL UPGRADE, HIGH SERVICE PUMPING, IMPROVEMENT TO FIRM PUMPING CAPACITY OF 57 MGD.
10. INTAKE IMPROVEMENTS TO FIRM CAPACITY OF 60 MGD.

NO.	DATE	REVISION	CHK	DR	APVD	BY	APVD

CH2MHILL
438 GENESEE STREET
SUITE 400
SYRACUSE, NY 13203

WESTERN NEW YORK STAMP
CONCEPTUAL WATER STUDY

CIVIL
ALTERNATIVE 1

VERIFY SCALE
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Alternative 2: NCWD: 6-8 MGD and City of Lockport (Lockport) 4-6 MGD

Overview

In this alternative, it is anticipated that NCWD will provide 6-8 MGD, and that the City of Lockport will provide 4-6 MGD, to meet the required 12 MGD for full build-out at the STAMP site.

A description of the NCWD water supply and system is provided in Alternative 1. As indicated in the overview of Alternative 1, the NCWD has excess capacity to meet this need.

The City of Lockport obtains its water supply from the East Basin of the Niagara River and provides conventional filtration treatment. Lockport's treatment facility is designed for 16 MGD but is rated at 12 MGD; and currently provides an average of approximately 5 MGD, with a maximum day of 7 MGD. There is potentially up to 5-9 MGD of excess capacity at the Lockport treatment facility. Lockport also has a 20-inch emergency interconnection with the NCWD. While there is insufficient excess capacity within the Lockport system to provide the required 12 MGD for a full STAMP site build-out, the excess capacity in the Lockport system could be used to supplement water from the NCWD to meet the full STAMP needs.

On October 18, 2012 IDCA, CPL and GGLDC staff met with representatives of the City of Lockport and their engineers from CRA to assess the possibility of obtaining water for the STAMP project. The Lockport representatives were confident that they could provide 4-6 MGD via the NCWD distribution system to the STAMP site. However, a number of challenges were identified including:

- The ability to get a long term agreement between Lockport and NCWD, which currently relies, although to an increasingly smaller degree, on Lockport's excess capacity to meet unusually high summer demands.
- The condition of the Lockport treatment facility – which is aging and in need of repairs.
- The condition of the Lockport 13 mile intake line, of which 3 miles are currently under review and inspection. If the cost to repair the intake line is excessive, it could jeopardize the future of the Lockport treatment facility.

System Requirements

Similarly to Alternative 1 (which provides 12 MGD from NCWD), significant improvements to the NCWD pumping capabilities and distribution lines will still be required to provide 6-8 MGD. However in contrast to Alternative 1, substantial improvements to their intake or treatment facilities would not be required.

Within this alternative, the additional 4-6 MGD required for full 12 MGD project build-out would be obtained from the City of Lockport. Supplying 4-6 MGD would require transmission improvements to convey water from Lockport to the NCWD's distribution system, as well as treatment plant upgrades to the Lockport water treatment facility. Refer to Figure 2 for the proposed routing of this solution. Improvements required include:

<u>NCWD pump station and transmission improvements:</u>

1. Installation of 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Installation of 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30-inch line.
3. Construction of 16,000 LF of 24-inch line from Johnson Creek to the county line.
4. Improvements to their Robinson Road Pump Station.
5. Improvements to their Shawnee Road Pump Station.
6. Installation of 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
7. Construction of a 12 MG (one-day) Elevated Storage Tank.

NCWD treatment plant upgrades:

1. Minor improvements to the water treatment plant.

Lockport transmission improvements:

1. Installation of a new 11,000 LF of 24-inch transmission line to bring water from Lockport to the NCWD Robinson Road Pump Station.

Lockport treatment plant upgrades:

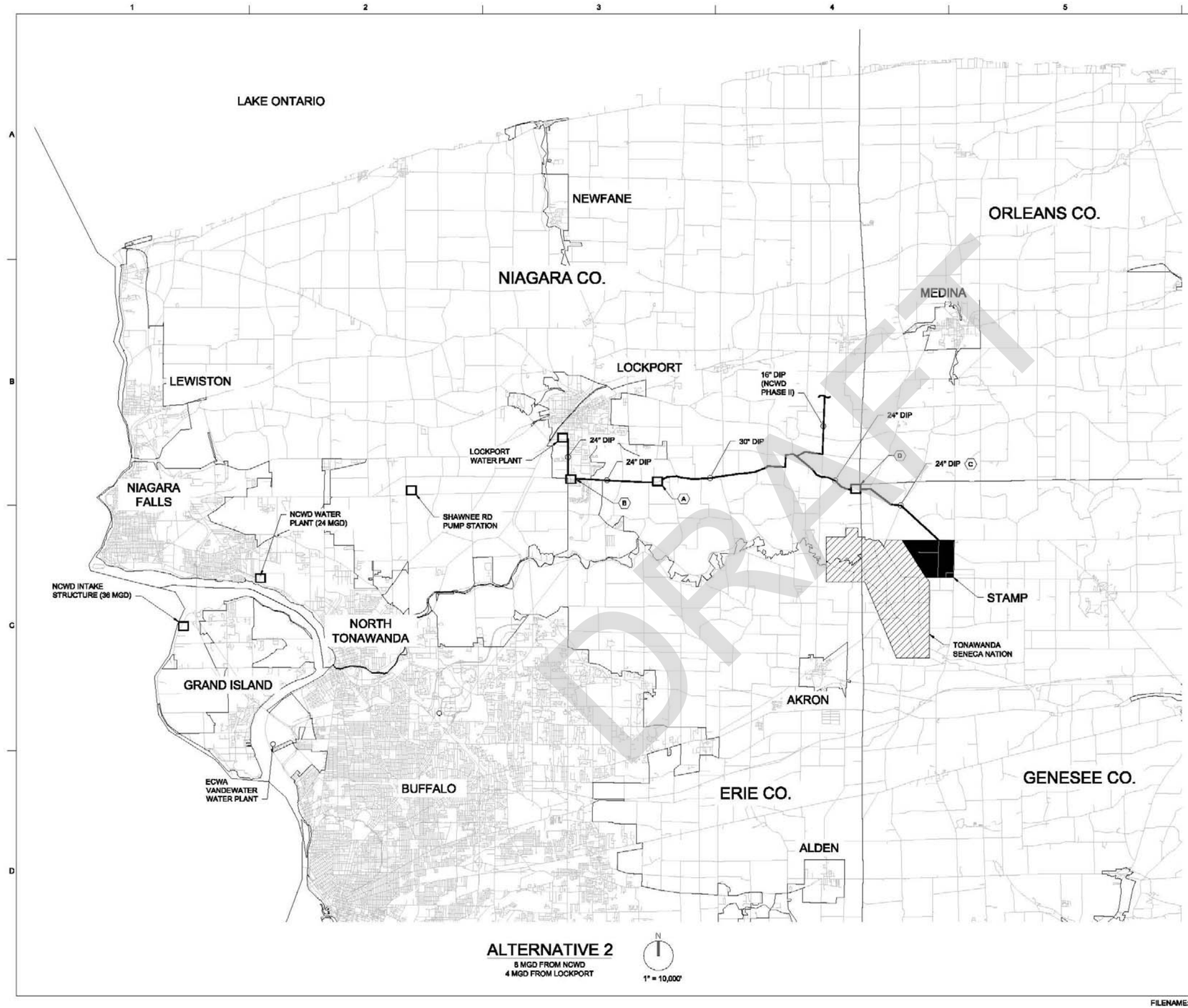
1. Assumes $5 million in improvements to Lockport treatment plant, pumping capability and connections to increase production by 4 MGD.

Cost

Wendel's total projected cost for improvements to supply 6 MGD to the county was estimated to be in the $18.5 million range. When factoring in additional costs related to items identified above, this alternative is estimated to require approximately $53.1 million in capital costs, including 20% contingency with a 4% escalation factor to account for 2014 dollar costs. Engineering costs of 18% ($9.6 million); 10% for pre-construction design, permitting and legal and 8% for post-construction are projected.

TABLE 6
Alternative 2: Cost Summary
Alternative 2: 8 MGD NCWD; 4 MGD Lockport

Item	Take-off Quantity	Total
Main Construction - NCWD	68,000 LF	$15,170,000
Pump Station Improvements		$8,420,000
Treatment Plant Improvements		$416,000
Lockport Treatment Improvements		$4,170,000
Lockport Main Construction	11,000 LF	$3,000,000
Transmission from Genesee County Line	21,000 LF	$5,670,000
Storage	12 MG	$5,750,000
Capital Costs Subtotal (2012 dollars)		*$42,596,000*
Contingency - 20%		$8,519,200
Escalation - 4%		$2,044,608
Capital Costs Total (2014 dollars)		**$53,159,808**
Engineering – 10% (design/permitting)		$5,315,981
Engineering – 8% (construction)		$4,252,785
Engineering Total		**$9,568,765**



CODED NOTES

- (A) ROYALTON METER PIT
- (B) ROBINSON RD. BOOSTER STATION
- (C) BY MCWA
- (D) NEW METER PIT

GENERAL NOTES:

1. ALL TRANSMISSION MAINS ARE ASSUMED TO BE DUCTILE IRON PIPE (DIP).
2. 21,000 LF OF NEW TRANSMISSION MAIN FROM ROBINSON RD PUMP STATION TO ROYALTON METER PIT
3. 31,000 LF OF NEW TRANSMISSION MAIN FROM ROYALTON METER PIT TO JOHNSON CREEK RD
4. 16,000 LF OF NEW TRANSMISSION MAIN FROM JOHNSON CREEK RD TO NIAGARA COUNTY LINE.
5. 21,000 LF OF NEW TRANSMISSION MAIN FROM NIAGARA COUNTY LINE TO STAMP.
6. ROBINSON RD PUMP STATION IMPROVEMENT TO SUPPLY 12 MGD TO STAMP.
7. SHAWNEE RD PUMP STATION IMPROVEMENT.
8. 11,000 LF OF NEW TRANSMISSION MAIN FROM LOCKPORT WATER PLANT TO ROBINSON RD PUMP STATION.

ALTERNATIVE 2

8 MGD FROM NCWD
4 MGD FROM LOCKPORT

N
1" = 10,000'

NO.	DATE	REVISION	CHK	APVD	BY	APVD
DSGN		DR				

CH2M HILL
420 GENESEE STREET
SUITE 400
SYRACUSE, NY 13202

CIVIL
ALTERNATIVE 2

WESTERN NEW YORK STAMP
CONCEPTUAL WATER STUDY

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Alternative 3: NCWD: 6-8 MGD and Erie County Water Authority (ECWA): 4-6 MGD

Overview

In this alternative, it is anticipated that NCWD will provide 6-8 MGD, and that the ECWA will provide 4-6 MGD, to meet the required 12 MGD for full build-out at the STAMP site.

A description of the NCWD water supply and system is provided in Alternative 1. As indicated in the overview of Alternative 1, the NCWD has excess capacity to meet this need.

ECWA obtains its water supply from Lake Erie and the Niagara River and provides conventional filtration treatment at two treatment facilities; Sturgeon Point (Lake Erie), approximately 56 miles from the STAMP site, and Van De Water (Niagara River), approximately 34 miles from the STAMP site. ECWA currently serves more than a half million people with an average daily demand of approximately 67MGD. The two treatment facilities have rated capacities of 55-50 MGD respectively. The average demand from the Van De Water facility is estimated at 20 MGD with a maximum day of 40 MGD. From the Van De Water facility ECWA provides service to customers in Erie, Wyoming and Genesee Counties, while customers in Erie, Cattaraugus and Chautauqua Counties are served by the Sturgeon Point facility. There is excess capacity at both facilities, but not enough to reliably supply 12 MGD without significant treatment plant upgrades.

On October 18, 2012 IDCA, CPL and GGLDC met with representatives of the ECWA and their engineers, Nussbauer and Clarke, to review their projections and assess the possibility of obtaining water from ECWA. While the direct delivery of 12 MGD of water from ECWA to the STAMP project (county line) was determined to be prohibitively expensive due to the extensive transmission lines required and the need for significant treatment plant upgrades, a potentially less expensive option of moving 4-6 MGD from the ECWA system into the NCWD distribution system for delivery to the STAMP site was identified for further assessment.

System Requirements

The concept that evolved at the October 18 meeting was for the ECWA to construct a transmission line and make the necessary pumping improvements to deliver water to the Niagara County line. From there the NCWD would bring the water to its Robinson Road Pump Station and then to the Genesee County line.

As described previously in Alternative 2, significant improvements to the NCWD pumping capabilities and distribution lines will be required to provide 6-8 MGD, but substantial improvements to their intake or treatment facilities would not be required. However, improvements beyond those identified in Alternative 2 would be required by NCWD, to bring the water to its Robinson Road Pump Station and then to the Genesee County line.

Within this alternative, the additional 4-6 MGD required for full 12 MGD project build-out would be obtained from the ECWA. System improvements would be required to convey water from ECWA to the NCWD's distribution system. Supplying 4-6 MGD would require pump station improvements and the installation of a transmission main to move water from the Niagara/Erie County line to their Robinson Road Pump Station, which includes an Erie Canal crossing. Refer to Figure 3 for the proposed routing of this solution. Improvements required include:

<u>NCWD pump station and transmission improvements:</u>

1. Installation of 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Installation of 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30-inch line.
3. Construction of 16,000 LF of 24-inch line from Johnson Creek to the county line.
4. Improvements to their Robinson Road Pump Station.
5. Improvements to their Shawnee Road Pump Station.
6. Installation of 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
7. Construction of a 12 MG (one-day) Elevated Storage Tank.
8. Installation of 35,000 LF of new 30-inch transmission line, including crossing the Erie Canal.

NCWD treatment plant upgrades:

1. Minor improvements to the water treatment plant.

ECWA pump station and transmission improvements:

1. Construction of a dedicated pump station at Campbell Blvd.
2. Provisions for an additional pump at their Ball Pump Station.
3. Installation of 17,000 LF of 24-inch transmission main, including crossing Route 90 and a meter pit.

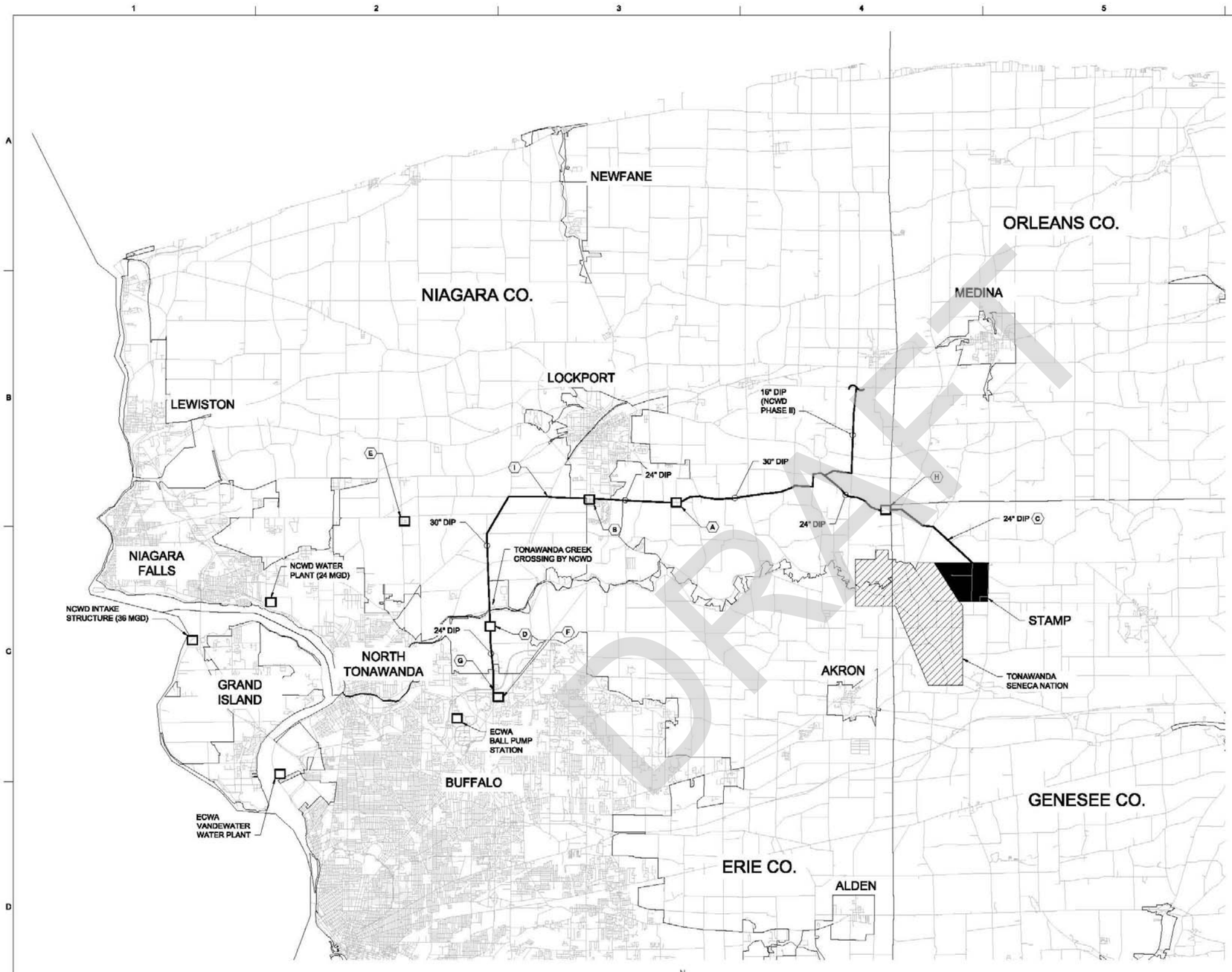
Cost

Nussbauer and Clark's projected cost for ECWA pump station and transmission improvements to supply 4-6 MGD to be approximately $17.0 million. Wendel projected a cost of $21.0 million for the NCWD system improvements to supply 6-8 MGD. Wendel also estimated an additional $20-$30 million to deliver the 12 MGD from the ECWA system to the NCWD system. The combination of these estimates gives a range of $58-$68 million.

CH2M HILL also provided an opinion of cost. When factoring in additional costs related to items identified above, this alternative is estimated to require approximately $71.8 million in capital costs, including 20% contingency with a 4% escalation factor to account for 2014 dollar costs. Engineering costs of 18% ($12.9 million); 10% for pre-construction design, permitting and legal and 8% for post-construction are projected.

TABLE 7
Alternative 3: Cost Summary
Alternative 3: 8 MGD NCWD; 4 MGD ECWA

Item	Take-off Quantity	Total
Main Construction - NCWD	68,000 LF	$15,170,000
Pump Station Improvements		$8,420,000
Treatment Plant Improvements		$416,000
Transmission Main from Niagara County Line - NCWD	35,000 LF	$11,800,000
Pump Station Improvements - ECWA		$4,170,000
Transmission Line to Niagara County Line - ECWA	17,000 LF	$6,100,000
Transmission from Genesee County Line	21,000 LF	$5,670,000
Storage	12 MG	$5,750,000
Capital Costs Subtotal (2012 dollars)		*$57,496,000*
Contingency - 20%		$11,499,200
Escalation - 4%		$2,759,808
Capital Costs Total (2014 dollars)		**$71,755,008**
Engineering – 10% (design/permitting)		$7,175,501
Engineering – 8% (construction)		$5,740,401
Engineering Total		**$12,915,901**



ALTERNATIVE 3

8 MGD FROM NCWD
4 MGD FROM ECWA

N
1" = 10,000'

CODED NOTES

- (A) ROYALTON METER PIT
- (B) ROBINSON RD. PUMP STATION 11 MGD 3MGAL STORAGE
- (C) BY MCWA
- (D) NEW ECWA METER PIT
- (E) SHAWNEE RD 24 MGD PUMP STATION 3MGAL STORAGE
- (F) NEW ECWA PUMP STATION
- (G) I-990 CROSSING BY ECWA
- (H) NEW METER PIT
- (I) ERIE CANAL CROSSING BY NCWD

GENERAL NOTES:

1. ALL TRANSMISSION MAINS ARE ASSUMED TO BE DUCTILE IRON PIPE (DIP).
2. 21,000 LF OF NEW DI TRANSMISSION MAIN FROM ROBINSON RD PUMP STATION TO ROYALTON METER PIT
3. 31,000 LF OF NEW DI TRANSMISSION MAIN FROM ROYALTON METER PIT TO JOHNSON CREEK RD.
4. 16,000 LF OF NEW DI TRANSMISSION MAIN FROM JOHNSON CREEK RD TO NIAGARA COUNTY LINE.
5. 21,000 LF OF NEW DI TRANSMISSION MAIN FROM NIAGARA COUNTY LINE TO STAMP.
6. ROBINSON RD PUMP STATION IMPROVEMENT TO SUPPLY 12 MGD TO STAMP.
7. SHAWNEE RD PUMP STATION IMPROVEMENTS.
8. ECWA ADD ANOTHER PUMP AT BALL PUMP STATION.
9. ECWA CONSTRUCT NEW PUMP STATION AT CAMPBELL BLVD.
10. 17,000 LF OF NEW TRANSMISSION MAIN FROM NEW ECWA PUMP STATION TO NIAGARA COUNTY LINE.
11. 35,000 LF OF NEW TRANSMISSION MAIN FROM NEW ECWA METER PIT TO ROBINSON RD PUMP STATION

NO.	DATE	DSGN	REVISION	CHK	APVD
				BY	APVD

CH2MHILL
420 GENESEE STREET
SUITE 400
SYRACUSE, NY 13202

WESTERN NEW YORK STAMP
CONCEPTUAL WATER STUDY

CIVIL
ALTERNATIVE 3

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Alternative 4: NCWD: 8 MGD and Genesee County Water Suppliers: 4 MGD

Overview

In this alternative, it is anticipated that NCWD will provide 8 MGD, and that a combination of existing local Genesee County water suppliers will provide 4 MGD, to meet the required 12 MGD for full build-out at the STAMP site.

A description of the NCWD water supply and system is provided in Alternative 1. As indicated in the overview of Alternative 1, the NCWD has excess spare capacity to meet this need.

The additional 4 MGD needed for a full build-out would be obtained through a combination of existing local systems within Genesee County. It would include connections with the Town of Alabama project, Town of Pembroke, Village of Oakfield, and Monroe and Erie County Water Authority systems. These alternatives were outlined in the CPL's Water Service Preliminary Report dated February, 2011.

System Requirements

This alternative will require a similar set of improvements for NCWD systems as described previously in Alternatives 2 and 3. As previously described, significant improvements to the NCWD pumping capabilities and distribution lines will be required to provide 6-8 MGD, but substantial improvements to their intake or treatment facilities would not be required.

Within this alternative, the additional 4 MGD required for full 12 MGD project build-out would be obtained from enhanced interconnections with existing local systems within Genesee County, which currently receive water from either the MCWA or ECWA. It includes upgrades in the Town of Alabama project, connections and transmission main extensions from the Town of Pembroke and Village of Oakfield systems, and improvements in the Monroe and Erie County Water Authority connections envisioned in the Genesee County Phase II water project. Refer to Figure 4 for the proposed routing of this solution. Improvements required include:

<u>NCWD pump station and transmission improvements:</u>

1. Installation of 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Installation of 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30-inch line.
3. Construction of 16,000 LF of 24-inch line from Johnson Creek to the county line.
4. Improvements to their Robinson Road Pump Station.
5. Improvements to their Shawnee Road Pump Station.
6. Installation of 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
7. Construction of a 12 MG (one-day) Elevated Storage Tank.

<u>NCWD treatment plant upgrades:</u>

1. Minor improvements to the water treatment plant.

<u>Town of Alabama project improvements:</u>

1. Improvements within the Town of Alabama water project to increase the capability to move water to the STAMP site.

<u>Pembroke system transmission improvements:</u>

1. Installation of 28,200 LF of new 16 inch transmission main on Route 77 and connection to Pembroke system.

Village of Oakfield transmission improvements:

1. Installation of 18,000 LF of new 12 inch transmission line along Galloway Road to connect to Village of Oakfield system.
2. Installation of 36,000 LF of new 16 inch transmission main along Maple(Galloway to Judge).
3. Installation of 3,000 LF of new 12 inch transmission main along North Pembroke Rd, from Phelps Rd to Galloway Rd.

ECWA and MCWA pump station improvements:

1. Provide pump capacity improvements with the ECWA and MCWA connections in Genesee County.

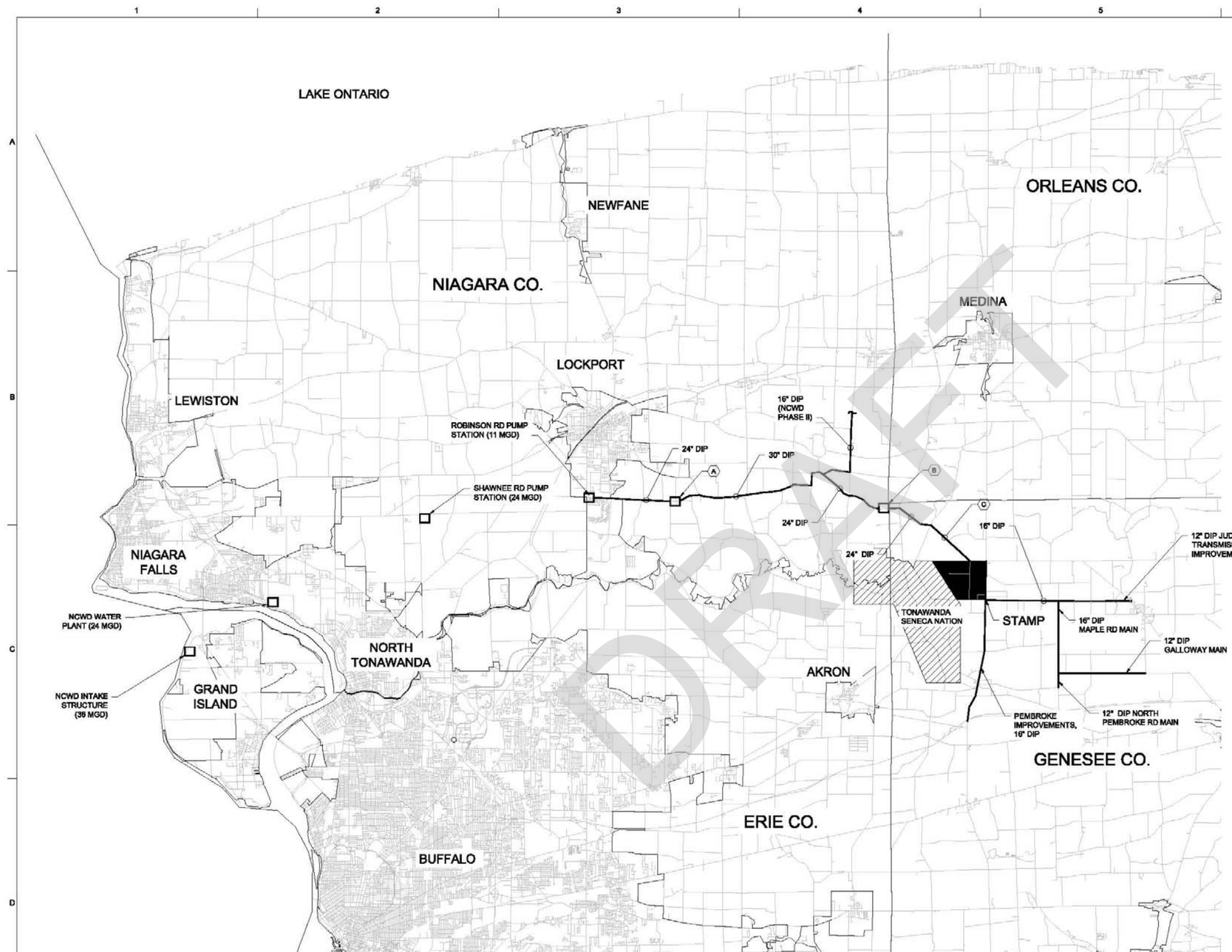
Cost

Pipe estimates for smaller size pipes (12 and 16 inch) are based on previous costs for local projects.

When factoring in additional costs related to items identified above, this alternative is estimated to require approximately $63.2 million in capital costs, including 20% contingency with a 4% escalation factor to account for 2014 dollar costs. Engineering costs of 18% ($11.3 million); 10% for pre-construction design, permitting and legal and 8% for post-construction are projected.

TABLE 8
Alternative 4A: Cost Summary
Alternative 4: 8 MGD NCWD; 4 MGD Genesee County

Item	Take-off Quantity	Total
Main Construction - NCWD	68,000 LF	$15,170,000
Pump Station Improvements		$5,500,000
Transmission from Genesee County Line	21,000 LF	$5,670,000
Transmission Main in Genesee County	64,200 LF	$9,000,000
Alabama System Upgrades		$1,250,000
MCWA / ECWA Connection Upgrades		$8,330,000
Storage	12 MG	$5,750,000
Capital Costs Subtotal (2012 dollars)		*$50,670,000*
Contingency - 20%		$10,134,000
Escalation - 4%		$2,432,160
Capital Costs Total (2014 dollars)		**$63,236,160**
Engineering – 10% (design/permitting)		$6,323,616
Engineering – 8% (construction)		$5,058,893
Engineering Total		**$11,382,509**



CODED NOTES

- (A) ROYALTON METER PIT
- (B) NEW METER PIT
- (C) BY MCWA

GENERAL NOTES:

1. ALL TRANSMISSION MAINS ARE ASSUMED TO BE DUCTILE IRON PIPE (DIP).
2. 21,000 LF OF NEW TRANSMISSION MAIN FROM ROBINSON RD PUMP STATION TO ROYALTON METER PIT
3. 31,000 LF OF NEW TRANSMISSION MAIN FROM ROYALTON METER PIT TO JOHNSON CREEK RD.
4. 16,000 LF OF NEW TRANSMISSION MAIN FROM JOHNSON CREEK RD TO NIAGARA COUNTY LINE
5. 21,000 LF OF NEW TRANSMISSION MAIN FROM NIAGARA COUNTY LINE TO STAMP.
6. ROBINSON RD PUMP STATION IMPROVEMENT TO SUPPLY 8 MGD TO STAMP
7. SHAWNEE RD PUMP STATION IMPROVEMENTS
8. 28,200 LF OF NEW TRANSMISSION MAIN FROM THE PEMBROKE SYSTEM VIA RTE 77 (ALLEGHENY RD).
9. 18,000 LF OF NEW TRANSMISSION MAIN CONNECTING THE VILLAGE OF OAKFIELD SYSTEM, VIA RTE 83 (JUDGE RD).
10. 18,000 LF OF TRANSMISSION MAIN TO CONNECT GALLOWAY RD TO RTE 63/JUDGE RD, VIA MAPLE RD.

ALTERNATIVE 4

8 MGD FROM NCWD
4 MGD FROM MCWA AND ECWA
VIA LOCAL IMPROVEMENTS

N
1" = 10,000'

NO.	DATE	REVISION	BY
DSGN		DR / CHK	APVD

CH2M HILL
430 GENESEE STREET
SUITE 400
SYRACUSE, NY 13202

WESTERN NEW YORK STAMP
CONCEPTUAL WATER STUDY

CIVIL
ALTERNATIVE 4

VERIFY SCALE
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Phased Approaches

It is possible to utilize a phased approach for each of the four alternatives, to meet water supply needs as demands increase at the STAMP site over time. It is projected that the proposed manufacturing facilities will be built out in three phases, each requiring 4 MGD of water supply.

When considering a phased approach to construction, the most likely scenario for a first phase is to construct and install the piping and pumping capacity needed by the NCWD to provide 6-8 MGD to the Niagara/Genesee County line. In this first phase it would also be necessary to install the transmission line from the Niagara/Genesee County line to the STAMP site and construct at least one-day of storage on-site. It may be possible to phase construction of the storage as well; 4 MGD in the first phase and the remaining 8 MGD in Phase 2. However, it isn't cost-effective to phase in the size of the transmission piping. Installing smaller piping and then installing larger piping at a later date would be cost-prohibitive, so the pipe size necessary to provide the full 12 MGD should be installed in Phase 1.

While constructing the NCWD portion as Phase 1 is the only phasing option available in Alternatives 1-3, the order could be reversed in Alternative 4. The improvements within Genesee County could be completed first to meet the initial 4 MGD followed by the NCWD connections as Phase 2 when the second phase of the manufacturing facility is ready to come online.

If the project were constructed in phases, it may also be possible to establish water rates that could generate capital to complete later phases of the project. Any specifics would have to be negotiated with the water supplier(s) and approved by the applicable regulatory authorities.

Alternative 1: 12 MGD NCWD

Phase 1: NCWD: 4 MGD

1. Install 21,000 LF of new 24 -inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Install 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30 inch line.
3. Install 16,000 LF of new 24-inch line from Johnson Creek to the county line.
4. Improve the pumping capabilities of the Robinson Road Pump Station.
5. Improve the pumping capabilities of the Shawnee Road Pump Station.
6. Install 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
7. Construct at least 4 MG of Elevated Storage Tank at the STAMP site.

Phase 2: NCWD 12 MGD

1. Improve transmission lines between the NCWD treatment plant and Ward Road.
2. Improve NCWD's water treatment capabilities.
3. Upgrade NCWD's High Service Pump Station.
4. Upgrade NCWD's Raw Water Pump Station to assure a firm capacity of 60 MGD.
5. Provide an additional 8 MGD of storage at the STAMP site.

TABLE 9
Alternative 1: Phased Cost Summary
Alternative 1: 12 MGD NCWD

Item	Take-off Quantity	Phase 1	Phase 2	Total
Main Construction - NCWD	68,000 LF	$15,170,000		$15,170,000
Pump Station Improvements		$4,420,000	$4,000,000	$8,420,000
Transmission Improvements			$8,830,000	$8,830,000
Treatment Plant Improvements		$416,000	$7,250,000	$7,666,000
Intake Upgrades			$2,750,000	$2,750,000
Transmission from Genesee County Line	21,000 LF	$5,670,000		$5,670,000

TABLE 9
Alternative 1: Phased Cost Summary
Alternative 1: 12 MGD NCWD

Item	Take-off Quantity	Phase 1	Phase 2	Total
Storage	12 MG	$5,750,000		$5,750,000
Capital Costs Subtotal (2012 dollars)		*$31,426,000*	*$22,830,000*	*$54,256,000*
Contingency - 20%		$6,285,200	$4,566,000	$10,851,200
Escalation - 4%		$1,508,448	$1,095,840	$2,604,288
Capital Costs Total (2014 dollars)		**$39,219,648**	**$28,491,840**	**$67,711,488**
Engineering – 10% (design/permitting)		$3,921,965	$2,849,184	$6,771,149
Engineering – 8% (construction)		$3,137,572	$2,279,347	$5,416,919
Engineering Total		**$7,059,537**	**$5,128,531**	**$12,188,068**

Alternative 2: 8 MGD NCWD; 4 MGD City of Lockport

Phase 1: NCWD

1. Install 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Install 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30-inch line.
3. Install 16,000 LF of new 24-inch line from Johnson Creek to the county line.
4. Improve the pumping capabilities of the Robinson Road Pump Station.
5. Improve the pumping capabilities of the Shawnee Road Pump Station.
6. Minor improvements to the water treatment plant.
7. Install 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
8. Construct at least 4 MG of Elevated Storage Tank at the STAMP site.

Phase 2: Lockport

1. Installation of 11,000 LF of new 24-inch transmission line to bring water from Lockport to the NCWD Robinson Road Pump Station.
2. Improvements to the Lockport water treatment plant and interconnections.
3. Provide an additional 8 MGD of storage at the STAMP site.

TABLE 10
Alternative 2: Phased Cost Summary
Alternative 2: 8 MGD NCWD; 4 MGD Lockport

Item	Take-off Quantity	Phase 1	Phase 2	Total
Main Construction - NCWD	68,000 LF	$15,170,000		$15,170,000
Pump Station Improvements		$4,420,000	$4,000,000	$8,420,000
Treatment Plant Improvements		$416,000		$416,000
Lockport Treatment Improvements			$4,170,000	$4,170,000
Lockport Main Construction	11,000 LF		$3,000,000	$3,000,000
Transmission from Genesee County Line	21,000 LF	$5,670,000		$5,670,000
Storage	12 MG	$5,750,000		$5,750,000
Capital Costs Subtotal (2012 dollars)		*$31,426,000*	*$11,170,000*	*$42,596,000*
Contingency - 20%		$6,285,200	$2,234,000	$8,519,200

TABLE 10
Alternative 2: Phased Cost Summary
Alternative 2: 8 MGD NCWD; 4 MGD Lockport

Item	Take-off Quantity	Phase 1	Phase 2	Total
Escalation - 4%		$1,508,448	$536,160	$2,044,608
Capital Costs Total (2014 dollars)		**$39,219,648**	**$13,940,160**	**$53,159,808**
Engineering – 10% (design/permitting)		$3,921,965	$1,394,016	$5,315,981
Engineering – 8% (construction)		$3,137,572	$1,115,213	$4,252,785
Engineering Total		**$7,059,537**	**$2,509,229**	**$9,568,765**

Alternative 3: 8 MGD NCWD; 4 MGD ECWA

Phase 1: NCWD

1. Install 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Install 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30 inch line.
3. Install 16,000 LF of new 24-inch line from Johnson Creek to the county line.
4. Improve the pumping capabilities of the Robinson Road Pump Station.
5. Improve the pumping capabilities of the Shawnee Road Pump Station.
6. Minor improvements to the water treatment plant.
7. Install 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
8. Construct at least 4 MG of Elevated Storage Tank at the STAMP site.

Phase 2: ECWA

1. Construct a dedicated pump station at Campbell Blvd.
2. Provide an additional pump at their Ball Pump Station.
3. Install of 17,000 LF of 24-inch transmission main, including crossing Route 90 and a meter pit.
4. Provide an additional 8 MGD of storage at the STAMP site.

Phase 2: NCWD

1. Installation of 35,000 LF of new 30-inch transmission line, including crossing the Erie Canal.

TABLE 11
Alternative 3: Phased Cost Summary
Alternative 3: 8 MGD NCWD; 4 MGD ECWA

Item	Take-off Quantity	Phase 1	Phase 2	Total
Main Construction - NCWD	68,000 LF	$15,170,000		$15,170,000
Pump Station Improvements		$4,420,000	$4,000,000	$8,420,000
Treatment Plant Improvements		$416,000		$416,000
Transmission Main from Niagara County Line - NCWD	35,000 LF		$11,800,000	$11,800,000
Pump Station Improvements - ECWA			$4,170,000	$4,170,000
Transmission Line to Niagara County Line - ECWA	17,000 LF		$6,100,000	$6,100,000
Transmission from Genesee County Line	21,000 LF	$5,670,000		$5,670,000
Storage	12 MG	$5,750,000		$5,750,000
Capital Costs Subtotal (2012 dollars)		*$31,426,000*	*$26,070,000*	*$57,496,000*

TABLE 11
Alternative 3: Phased Cost Summary
Alternative 3: 8 MGD NCWD; 4 MGD ECWA

Item	Take-off Quantity	Phase 1	Phase 2	Total
Contingency - 20%		$6,285,200	$5,214,000	$11,499,200
Escalation - 4%		$1,508,448	$1,251,360	$2,759,808
Capital Costs Total (2014 dollars)		**$39,219,648**	**$32,535,360**	**$71,755,008**
Engineering – 10% (design/permitting)		$3,921,965	$3,253,536	$7,175,501
Engineering – 8% (construction)		$3,137,572	$2,602,829	$5,740,401
Engineering Total		**$7,059,537**	**$5,856,365**	**$12,915,901**

Alternative 4A: 8 MGD NCWD; 4 MGD Genesee County Connections

Phase 1: NCWD

1. Install 21,000 LF of new 24-inch transmission line from the Robinson Road meter pit to the Royalton meter pit.
2. Install 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30 inch line.
3. Install 16,000 LF of new 24-inch line from Johnson Creek to the county line.
4. Improve the pumping capabilities of the Robinson Road Pump Station.
5. Improve the pumping capabilities of the Shawnee Road Pump Station.
6. Install 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
7. Construct at least 4 MG of Elevated Storage Tank at the STAMP site.

Phase 2: Genesee County Connections

1. Connect and install 28,200 LF of transmission main on Route 77 with the Pembroke system.
2. Connect and install 18,000 LF of transmission line on Route 63 with the Village of Oakfield system.
3. Connect and install 15,000 LF of transmission main along Galloway to Judge.
4. Connect and install 3,000 LF of transmission main along Galloway to Kelsey.
5. Upgrade connections and transmission mains within Town of Alabama project to improve delivery to STAMP site.
6. Provide pumping capacity improvements with the ECWA and MCWA connections in Genesee County.
7. Provide an additional 8 MGD of storage at the STAMP site.

TABLE 12
Alternative 4A: Phased Cost Summary
Alternative 4: 8 MGD NCWD; 4 MGD Genesee County

Item	Take-off Quantity	Phase 1	Phase 2	Total
Main Construction - NCWD	68,000 LF	$15,170,000		$15,170,000
Pump Station Improvements		$5,500,000		$5,500,000
Transmission from Genesee County Line	21,000 LF	$5,670,000		$5,670,000
Transmission Main in Genesee County	64,200 LF		$9,000,000	$9,000,000
Alabama System Upgrades			$1,250,000	$1,250,000
MCWA / ECWA Connection Upgrades			$8,330,000	$8,330,000
Storage	12 MG		$5,750,000	$5,750,000
Capital Costs Subtotal (2012 dollars)		*$26,340,000*	*$24,330,000*	*$50,670,000*
Contingency - 20%		$5,268,000	$4,866,000	$10,134,000
Escalation - 4%		$1,264,320	$1,167,840	$2,432,160

TABLE 12
Alternative 4A: Phased Cost Summary
Alternative 4: 8 MGD NCWD; 4 MGD Genesee County

Item	Take-off Quantity	Phase 1	Phase 2	Total
Capital Costs Total (2014 dollars)		**$32,872,320**	**$30,363,840**	**$63,236,160**
Engineering – 10% (design/permitting)		$3,287,232	$3,036,384	$6,323,616
Engineering – 8% (construction)		$2,629,786	$2,429,107	$5,058,893
Engineering Total		**$5,917,018**	**$5,465,491**	**$11,382,509**

Alternative 4B: 4 MGD Genesee County Connections; 8 MGD NCWD

Phase 1: Genesee County Connections:

1. Connect and install 28,200 LF of transmission main on Route 77 with the Pembroke system.
2. Connect and install 18,000 LF of transmission main on Route 63 with the Village of Oakfield system.
3. Connect and install 15,000 LF of transmission main along Galloway to Judge.
4. Connect and install 3,000 LF of transmission main along Galloway to Kelsey.
5. Upgrade connections and transmission mains within Town of Alabama project to improve delivery to STAMP site.
6. Provide pumping capacity improvements with the ECWA and MCWA connections in Genesee County.
7. Construct at least 4 MG of Elevated Storage Tank at the STAMP site.

Phase 2: NCWD:

1. Install a new 21,000 LF of 24 transmission inch line from their Robinson Road meter pit to their Royalton meter pit.
2. Install 31,000 LF of proposed waterline from the Royalton meter pit to Johnson Creek Road to a 30 inch line.
3. Install a new 16,000 LF of 24-inch line from Johnson Creek to the county line.
4. Improve the pumping capabilities of the Robinson Road Pump Station.
5. Improve the pumping capabilities of the Shawnee Road Pump Station.
6. Install 21,000 LF of new 24-inch transmission line from the county line to the STAMP site.
7. Provide an additional 8 MGD of storage at the STAMP site.

The costs for Alternative 4B are essentially the same as shown for Alternative 4A above, except the costs for the phases would be reversed.

Eliminated Alternatives:

Three potential water supply alternatives were eliminated from consideration early in the study, primarily as a result of cost. A brief discussion of those alternatives is provided below.

Monroe County Water Authority (MCWA): 12 MGD

With the construction of its new water treatment facility in Eastern Monroe County, the MCWA estimates that it has 40 MGD of excess capacity. MCWA obtains its water supply from Lake Ontario and provides conventional filtration treatment. Approximately 47 miles of a 30-36 inch transmission line would be required for MCWA to supply water to the STAMP site from their Shoremont Water Treatment Facility. This dedicated main would provide an advantage; they would not have to contend with intermediate pressure zones associated with other customers along the route. A dedicated STAMP transmission main from MCWA could also serve the Batavia area and eliminate the need for many of the proposed Genesee County Phase II Water Supply Project upgrades. However, this would involve increasing the size of the projected transmission mains, additional pumping improvements and additional piping to supply Batavia.

There are also sub-alternatives for obtaining MCWA water through existing or planned up-graded lines within Genesee County. In the CPL February 2011 “STAMP Water Service Preliminary Report”, a number of alternatives for providing up to 3 MGD to the STAMP site were identified. These alternatives included water supply

improvements within Genesee County, including improvements to MCWA line. These improvements were included as part of Alternative 4, earlier in this document.

MCWA's retail Out-of-County Class rates of $2.82/1,000 gallons plus a daily meter charge would apply if MCWA supplied the water directly, however, their current Western Genesee County Class rate is $3.97/1000 gallons plus a daily meter charge, and is a more likely rate.

Anticipated improvements included the construction of roughly 47 miles of 36 or 42-inch transmission lines, two new pumping stations to deliver 12 MGD to the STAMP site, and a 12 Million Gallon storage tank at the STAMP site. CH2M HILL has estimated the cost to construct this alternative would likely exceed $179 million, well beyond the acceptable range of the STAMP project.

Lake Ontario – New Intake and Treatment Facility: 12 MGD

Another alternative eliminated from consideration was the development of a new intake into Lake Ontario; construction of a new water treatment facility, likely a membrane facility; and a new 24 mile transmission line from Lake Ontario (near the Town of Lyndonville) to the STAMP site. In a preliminary review of requirements to support a demand of 12 MGD, CPL estimated a cost of more than $150 million for treatment and transmission alone. In addition to excessive high cost, this alternative presents a significant regulatory permitting challenge as well. A permit may not be granted for a new intake in Lake Ontario. And even if the permit was granted, considerable time and delays would likely be needed to obtain these permits.

Anticipated improvements included the construction of a new intake in Lake Ontario, a 12 MGD treatment facility, and the necessary pumping and transmission mains to bring the water 25 miles to the STAMP site. CH2M HILL has estimated the cost to construct this alternative would likely exceed $200 million, well beyond the acceptable range of the STAMP project.

City of Batavia: 6 MGD

Batavia obtains its water supply from two primary wells and is supplemented with water from Tonawanda Creek. The City also has an emergency interconnection with MCWA. The well water is softened and disinfected, while conventional filtration treatment is provided for the Tonawanda Creek source. Batavia currently provides approximately 2.5 MGD on an average day to more than 15,000 people, at an average water rate of $4.31/1000 gallons.

For the STAMP project to access the Batavia well field as a primary source, an alternative source for the City of Batavia would first have to be identified. A transmission line, pumping capacity and appropriate treatment would have to be constructed to bring Batavia well field water to the STAMP site. The only available alternative identified for the City of Batavia is the construction of a water transmission line and pumping capacity to bring water to the City of Batavia from the MCWA. There is an existing proposal to do just that, at a cost of roughly $30 million. Even with these improvements, the available capacity of the Batavia well field is expected to be less than 6 MGD. Since there are other potential developments being pursued by the county that would rely on this source, the STAMP project would likely still need to obtain more than 6 MGD elsewhere.

Based on the excessive costs, limited capacity of the Batavia well field, uncertain water quality from the wells and the difficulties expected in negotiating with the City, County and MCWA for access to the wells plus obtaining an alternate source for the City of Batavia this alternative was eliminated from consideration.

Water Rates Analysis

The preferred water supplier must be identified to estimate potential water rates for the STAMP site. Water rates will include the cost of purchasing water, offsetting capital costs and any operation and maintenance costs assumed by the GGLDC or its entities. While all three of the potential suppliers sell water on a bulk basis, the actual selling price to the manufacturer at the STAMP site will be established by the water supplier. Under Alternatives 1-3 described above, the water supplier will either be the MCWA, which has franchise approval to sell water in Genesee County, or a new public water entity created by the GGLDC or Genesee County to deliver and sell water in the county. Under Alternative 4, the MCWA will also be involved in setting the water rates for water obtained from existing and soon to be created water suppliers within Genesee County (Town of Pembroke, Village of Oakfield and the Town of Alabama).

If the MCWA is determined to be the supplier, they would be involved in the design, construction and operation and maintenance as well as regulatory compliance of the transmission main from the Niagara County line to the STAMP site as well as the storage at the site. They would purchase water from the NCWD at a negotiated bulk rate and then sell it to the end users at the STAMP site. While the MCWA currently offers a bulk rate of $2.82/1,000 gallons, in Genesee County their Western Genesee County Class rate would likely apply. While there is not a current agreement between the NCWD and MCWA for selling water in Genesee County, we assume that a similar mark-up as exists for ECWA would apply; which is currently approximately $4/1,000 gallons. Four million gallons per day (MGD) (Phase 1) would cost approximately $16,000 a day or $5.8 million per year. At a full build out of 12 MGD the annual water charge would approach $17.5 million. For Alternative 4 the water rate for water obtained from existing and new connections within Genesee County would likely be higher than the existing Western Genesee County Class rate, perhaps at $4.15/1,000 gallons.

If it is determined that the MCWA's franchise approval in Genesee County is not exclusive, the GGLDC or Genesee County would have the option of creating its own water supplier entity to directly purchase water from the NCWD and deliver it to the STAMP site. This new entity would be a public non-transient non-community water system under the New York State Sanitary Code and subject to Health Department oversight. Non-transient, non-community water systems are systems that regularly serve potable water to at least 25 of the same people, four hours or more per day, for four or more days per week, for 26 or more weeks per year. This new entity would be responsible for the operation and maintenance of the transmission main from the Niagara County line to the STAMP site as well as the storage at the site and regulatory compliance. They could operate the system themselves or contract operations and maintenance to an existing supplier, such as the Town of Batavia. The annual operation and maintenance costs would be reflected in the water rates charged to end users at the STAMP site.

The current bulk rate charged by the NCWD is approximately $1.50/1,000 gallons and is negotiable, depending on the needs of specific accounts. This rate would apply to the 8 MGD obtained from the NCWD in Alternatives 1 through 4. For Alternatives 2 and 3 there would be an additional charge for the 4 MGD obtained from the City of Lockport or ECWA. The current bulk rate at the ECWA is $2.49/1,000 gallons for the first 2.5 million gallons and $2.12/1,000 gallons thereafter. While there isn't currently a specific negotiated bulk rate for Lockport, it will likely be similar to the ECWA rate. Operation and maintenance costs for the Genesee County portion would not be excessive - assume a man-year plus periodic pipe and tank maintenance and tank painting, plus regulatory monitoring and reporting costs. We estimate that this could result in an annualized cost of approximately $200,000. The resulting water rate for the first 8 MGD of water supplied under Alternatives 1-4A could be as low as $1.75/1,000 gallons. However, for Alternatives 2 and 3 we estimate the additional charge for Lockport or ECWA water would be another $2.30/1,000 gallons. Alternative 4A would include the annualized costs for 8 MGD of NCWD water at $1.75/1,000 gallons as well as 4 MGD from the MCWA through existing and new connections within Genesee County. For these connections the MCWA Out-of- County Class rate would apply, which is currently $2.82/1,000 gallons. However, given the necessary improvements that will have to be instituted by the MCWA to achieve the desired 4 MGD capacity, this charge will likely increase to from $4 to$4.15/1,000 gallons, similar to the Western Genesee County Class rate. Table 13 provides a summary of annual water cost at each phase (4, 8 and 12 MGD) of site development under the various scenarios described above:

General Assumptions

- Assumes similar bulk rate for water from City of Lockport as ECWA.
- Assumes MCWA's Genesee County Class rate will increase to $4.15/1,000 gallons.
- All water rates in 2012 dollars.

Table 13

Annual Water Cost Summary

	4 MGD	8 MGD	12 MGD
MCWA as the Supplier[1]	**($/Year)**	**($/Year)**	**($/Year)**
Alternative 1: NCWD 12 MGD	$5.8M	$11.7M	$17.5M
Alternative 2: NCWD/Lockport	$5.8M	$11.7M	$17.5M
Alternative 3: NCWD/ECWA	$5.8M	$11.7M	$17.5M
Alternative 4A: NCWD/Genesee Co.	$5.8M	$11.7M	$17.7M
Alternative 4B: Genesee Co./NCWD	$6.1M	$11.9M	$17.7M
New Entity as the Supplier[2]			
Alternative 1: NCWD 12 MGD[3]	$2.6M	$5.1M	$7.8M
Alternative 2: NCWD/Lockport[4]	$2.6M	$5.1M	$11.1M
Alternative 3: NCWD/ECWA[4]	$2.6M	$5.1M	$11.1M
New Entity and MCWA as the Supplier			
Alternative 4A: NCWD/Genesee Co.[5]	$2.6M	$5.1M	$11.2M
Alternative 4B: Genesee Co./NCWD[6]	$6.1M	$8.7M	$11.2M

1. If MCWA is the water supplier of record (based on their current franchise agreement) it is assumed that their current Western Genesee County rate of $4.00/1,000 gallons would apply, regardless of the MCWD or ECWA bulk rate.
2. Assumes that MCWA does not hold the franchise and a new entity is created to deliver water to the STAMP site.
3. Assumes a bulk rate of $1.75/1,000 gallons that includes $1.50/1,000 gallons for NCWD purchase plus $0.25/1,000 gallons for estimated O&M.
4. Assumes a bulk rate of $1.175/1,000 gallons per (3) above for the first 8 MGD (Phases 1&2) plus an additional $2.30/1, 000 gallon for purchase of either Lockport or ECWA water(total of $4.05/1,000 gallons) for remaining 4 MGD required for Phase 3.
5. Assumes that a new entity is formed as in (2) above to deliver first 8 MGD (Phases 1&2) at $1.75/1,000 gallons as in (3) above and the remaining 4MGD (Phase 3) will be delivered at $4.15/1,000 gallons by MCWA under a revised franchise agreement.
6. Assumes that the first 4MGD (Phase 1) is supplied at the MCWA franchise rate of $4.15/1,000 gallons and the remaining 8 MGD (Phases 2&3) will be delivered by the new entity at $1.75/1,000 gallons.

Appendix B – Technical Memorandum – Wastewater B

Western New York Science and Technology Advanced Manufacturing Park (STAMP)

Conceptual Water and Wastewater Engineering Study Comparative Analysis Technical Memorandum - Wastewater Management

PREPARED FOR: Genesee Gateway Local Development Corporation (GGLDC)

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PREPARED BY: IDCA/CH2M Hill

DATE: March 19, 2013

PROJECT NUMBER: 458659

Scope of Study

The purpose of this Technical Memorandum is to present a comparative analysis of several alternatives to treat and dispose of 11 million gallons per day (MGD) of pre-treated industrial effluent and 1 MGD of sanitary sewer effluent from the Western New York Science and Technology Advanced Manufacturing Park (STAMP) site. This Memorandum expands on the information presented in the Draft Evaluation and Conceptual Design Memorandum issued by IDC Architects (IDCA) on November 23, 2012 and incorporates GGLDC review comments received during Workshop Number 1 held on November 27, 2012 and Workshop Number 2 held on January 18, 2013. IDCA has worked with GGLDC's consultants, specifically Clark Patterson Lee (CPL), Conservation Connects, LLC, and Phillips Lytle, to incorporate their local knowledge, past and current efforts on this project and their technical experience into the study.

Executive Summary

This memorandum provides a summary of potential wastewater treatment and disposal options to manage 11 MGD of pre-treated industrial effluent and 1 MGD of sanitary sewer effluent for the STAMP site. IDCA, in conjunction with CPL, identified multiple alternatives and conducted a preliminary analysis of the advantages and disadvantages of each alternative. This preliminary analysis identified five alternatives for further study, while eliminating several other alternatives from consideration.

IDCA then performed an additional assessment of technical viability, estimated capital and engineering cost, and took into consideration local issues and drivers. This assessment resulted in the elimination of two more alternatives from consideration, leaving three remaining alternatives for final study, plus a variant.

These four alternatives were:

1. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Bird Island Wastewater Treatment Plant in Buffalo, owned by the Buffalo Sewer Authority.
2. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Van Lare Wastewater Treatment Plant in Rochester, owned by Pure Waters/Monroe County.
3. Pumping 11 MGD of pre-treated process effluent to Lake Ontario, and pumping 1 MGD of sanitary sewer to the Medina Wastewater Treatment Plant (WWTP).
4. Pumping 4.5 MGD of pre-treated process effluent to the Medina WWTP in a first phase. After STAMP flows exceeded 4.5 MGD, pumping all pre-treated process effluent to Lake Ontario, and pumping 1 MGD of sanitary sewer to the Medina WWTP.

The two alternatives eliminated from considerations were; pumping the 12 MGD of effluent to the Lockport wastewater treatment plant, and; construction of a new on-site plant with discharge to local receiving water. After preliminarily being identified for further study, both of these alternatives were eliminated from consideration during Workshop Number 1 due to a combination of factors including: an estimated capital cost exceeding $150 million; regulatory considerations associated with discharging into Eighteen Mile and Tonawanda Creek; and permitting and approvals related to these discharges.

Detailed narratives that provide an overview of the background discussions and potential wastewater management options, system requirements, and level 4/5 cost estimates (capital, engineering design, and engineering services during construction) are included in subsequent sections of this memorandum.

Table 1 below provides a summary of the six alternatives:

TABLE 1
Wastewater Treatment and Disposal Alternative Summary

Alternative for Treatment/Disposal	**Capacity (MGD)**	**Technical Needs**	**Estimated 2014 Capital Costs (Millions)**	**Phase 1 Costs[1] (Millions)**	**Total Costs[1] (Millions)**	**Further Study[2]**
1) Bird Island WWTP	12	Pumping, Transmission	$73.2	N/A	$86.4	Yes
2) Van Lare WWTP	12	Pumping, Transmission,	$95.4	N/A	$112.5	Yes
3) Medina WWTP/ Lake Ontario	1/11	Pumping, Transmission	$56.8	N/A	$67.0	Yes
4) Expanded-Medina WWTP/Lake Ontario	4.5/11	Pumping, Transmission, WWTP Improvements	$93.0[3]	$60.5	$109.7	Yes
5) Lockport WWTP	12	Pumping, Transmission WWTP Improvements	>$120	N/A	>$150	No
6) On-site WWTP to Tonawanda Creek	12	Pumping, Transmission	>$120	N/A	>$150	No

1 Total Costs includes 18% of capital cost for engineering, planning, design, legal, and services during construction.
2 For cost comparison purposes, an alternative was not considered for further study if the estimated capital cost exceeded $150 million.
3 Combined Capital Cost for Phase 1 and Phase 2.

Alternative 4, the Expanded-Medina WWTP/Lake Ontario, offers the opportunity to spread the infrastructure investment to better match the anticipated STAMP wastewater step-flow increases from 4 to 8 and to 12 MGD. Expansion of the Medina WWTP is required because the facility is currently permitted for 4.5 MGD, and treats an average of 2 MGD, and significantly larger wet-weather flows. The Expanded Medina WWTP/Lake Ontario has a Phase 1 Cost of $60.5 million, which is lower than the cost of the other three alternatives. However, at final build-out, this alternative ranks highest in terms of Total Cost at $109.7 million. In addition to the high cost, the Expanded-Medina WWTP/Lake Ontario alternative has a higher regulatory risk than the other alternatives because:

1. Medina WWTP discharges to Oak Orchard Creek, and the low 10-year flow for this stream is 0.45 MGD upstream of the Village of Medina. The 4.5 MGD of combined STAMP effluent could dominate the water quality of the Oak Orchard Creek, especially during low flow periods.
2. A new State Pollutant Discharge Elimination System (SPDES) permit is required, and the terms could increase the estimated cost of the expansion.
3. The cost of the expansion depends on the characteristics of the pre-treated industrial effluent, which cannot be established until later in the project.

Alternative 3 (direct discharge of 11 MGD of pre-treated effluent to Lake Ontario and 1 MGD of sanitary effluent to Medina WWTP) has the lowest Total Cost at $67.0 million. The second lowest Total Cost is Alternative 1 (12 MGD combined effluent to Bird Island WWTP) at $86.4 million, which is approximately $19.4 million more. Alternative 1, however, does not have the same regulatory risks associated with the permitting and monitoring process required for a direct discharge to Lake Ontario. A detailed analysis of the pre-treated effluent is recommended to better assess the permitting risk associated with directly discharging to Lake Ontario. However, the pre-treated effluent characterization may not be available until much later in the STAMP project.

The operation and maintenance costs associated with pumping, conveying and discharging sewer are also addressed in this memorandum. Table 2 summarizes the annual costs associated with the 12 MGD to Bird Island and the 11 MGD to Lake Ontario/1 MGD to Medina WWTP at the anticipated build-out of 4, 8 and 12 MGD.

TABLE 2
Annual Sewer Cost Estimates Summary (2013 dollars)

Alternative	4 MGD ($/year)	8 MGD ($/year)	12 MGD ($/year)
12 MGD to Bird Island (Alternative 1)			
Treatment and Discharge [1]	$3.61 M	$7.21 M	$10.82 M
Labor [2]	$0.25 M	$0.25 M	$0.25 M
Energy [3]	$0.23 M	$0.46 M	$0.69 M
Maintenance [4]	$0.35 M	$0.35 M	$0.35 M
Asset Fund [5]	$1.60 M	$1.60 M	$1.60 M
Annual Cost	**$4.40 M**	**$8.30 M**	**$12.1 M**
Cost ($/1,000 gallons)	**$3.04**	**$2.83**	**$2.77**
1 MGD to Medina WWTP and 11 MGD to Lake Ontario (Alternative 3)			
Treatment and Discharge [1]	$0.78 M	$1.56 M	$2.34 M
Labor [2]	$0.25 M	$0.25 M	$0.25 M
Energy [3]	$0.23 M	$0.46 M	$0.69 M
Maintenance [4]	$0.29 M	$0.29 M	$0.29 M
Asset Fund [5]	$1.40 M	$1.40 M	$1.40 M
Annual Cost ($/year)	**$1.60 M**	**$2.60 M**	**$3.60 M**
Cost ($/1,000 gallons)	**$1.07**	**$0.88**	**$0.82**

Notes:
1. Annual cost of treatment and discharge was based on a current rate of $2.47/1000 gallons for non-residential users outside the City of Buffalo, and a rate of $4.01/1000 gallons plus 1.6 surcharge rate provided by the Village of Medina.
2. Annual cost is based on 2-man-hours.
3. Energy is based on a total discharge pressure of 150 psi, 70% efficient motors, and $0.09/kWhr.
4. Maintenance was set at 0.5% of capital cost of infrastructure.
5. Asset fund was based on the capital cost of infrastructure, 50 years life-time for conveyance infrastructure and 20-years life-time for pumping stations.

Background

IDCA and CPL conducted a review of potential alternatives for providing treatment and disposal of 11 MGD of pre-treated industrial effluent and 1 MGD of sanitary sewage effluent from the STAMP site. Initially, five potential wastewater management scenarios were identified and assessed. These scenarios were:

- Construct an on-site treatment facility and discharge via pipeline to an off-site location beyond the local area.
- Pump the full 12 MGD to the City of Lockport wastewater treatment plant.
- Construct an on-site wastewater treatment facility with discharge to a local receiving water.
- Construct an on-site treatment facility with deep-well injection of effluent.
- Evaluate potential reuse alternatives.

The original concept of an on-site treatment plant did not provide the treatment required to discharge pre-treated industrial effluent, nor address the concentration of total dissolved solids (TDS). Under Task 3.3 of the Conceptual Water & Wastewater Engineering Study, IDCA and CPL staff conducted a preliminary assessment of alternatives within the five scenarios referenced above, as well as variations of those alternatives. During the course of this analysis, regulatory constraints, water quality concerns, and/or apparent high capital cost were identified for these alternatives. Based on this analysis and discussion with GGLDC during Workshop Number 1, all alternatives within these scenarios were eliminated from further consideration. At that time, it was determined that only scenarios which included discharge to a body of water large enough to provided adequate dilution could meet both regulatory compliance and the proposed budget. The original concept of using an on-site wastewater treatment plant did not provide a cost effective means of treating the anticipated concentrations of TDS and would have required development of a brine management system that would escalate the costs even further.

As a result, three new alternatives were identified for consideration. The three alternatives were:

1. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Bird Island Wastewater Treatment Plant in Buffalo, owned by the Buffalo Sewer Authority.
2. Pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Van Lare Wastewater Treatment Plant in Rochester, owned by Pure Waters/County of Rochester.
3. Pumping 11 MGD of pre-treated process effluent to Lake Ontario, and pumping 1 MGD of sanitary sewer to the Medina WWTP.

Initial study revealed that all three of these scenarios held promise, and conceptual designs were prepared to provide additional information for comparison. These conceptual designs include: a narrative of the potential alternatives, transmission route schematics, and pumping requirements. In addition, IDCA provided a Class 4/5 construction cost estimate for each alternative.

Wastewater Treatment/Disposal Alternatives and General Assumptions

A detailed description and class 4/5 construction cost estimate for each of the alternatives follows. For comparison purposes, a description and construction cost estimates for two additional alternatives that were eliminated from consideration as a result of Workshop Number 1 are also provided. In order to provide consistency among the alternatives, a series of assumptions were identified. These assumptions include the following;

- All capital cost estimates are Class 4/5 cost estimates for construction costs. Class 4/5 cost estimates are consistent with the Association for the Advancement of Cost Engineering (AACE) Cost Estimate

Classification System. The majority of items will be Class 4 – Rough Order of Magnitude, with a -30% to +50% level of accuracy, some additional items in the estimates will be at Class 5 – Rough Order of Magnitude, with a -50% to +100% level of accuracy.

- All construction costs were standardized to include a 20% contingency, with engineering costs shown separately.
- Pre-construction engineering costs of 10% are included for each alternative. These engineering costs include planning, design, permitting, legal and miscellaneous.
- Engineering during construction costs of 8% are included for each alternative. These costs include inspections, contract administration, and other general services during construction.
- A 4% escalation was also included to project the costs to 2014 dollars.
- Cost of conveyance was based on one pump station at the STAMP site and assumed a combination of force main and gravity conveyance. Pipeline length was based on a routing along secondary roads.
- A pipeline average diameter was used to estimate comparable capital and annual costs across alternatives. The average diameter for each alternative was calculated based on a pump discharge pressure of 150 psi, 20 percent minor headlosses, and cement lined-ductile iron pipe. Linear regression of installed costs for 8-in, 10-in, 24-in, and 30-in lines was used to estimate the cost of the average diameter pipeline. Pipe routing and line sizes will be optimized during detailed design of the selected alternative(s).
- For each alternative, it is assumed that the cost of pretreatment of the process wastewater effluent will be the responsibility of and paid for by the semiconductor manufacturer and is not included in the estimates. The semiconductor manufacturer will segregate and dispose of high strength organic solvents and concentrated or toxic metals, and provide for fluoride, ammonia, copper and TSS removal to reach the concentrations levels presented in Table 3.

TABLE 3
Typical Wastewater Quality Ranges For Semiconductor Manufacturing*

Parameter	Units	Typical Range
Potential hydrogen (pH)	s.u.	6-9
Total Dissolved Solids (TDS)	mg/l	1,200-2,200
Chemical Oxygen Demand (COD)	mg/l	200-400
Biochemical Oxygen Demand (BOD)	mg/l	40-150
Ammonia-N	mg/l	20-100
Nitrate N (NO3 -N)	mg/l	5-50
Phosphorus (P - Total)	mg/l	2-5
Total Suspended Solids (TSS)	mg/l	5-200
Fluoride	mg/l	2-10

*NOTES:
1. Pretreatment typically provided on-site for fluoride, ammonia, copper and TSS to reach these levels
2. On-site segregation and disposal of high strength organic solvents and concentrated / toxic metals
3. TDS and ions in effluent dependent on feed water levels
4. Manufacturing wastewater only; domestic not included

Potential Alternatives

Alternative 1: 12 MGD to the Bird Island WWTP

Overview

This alternative entails pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Bird Island WWTP in Buffalo, New York, owned and operated by the Buffalo Sewer Authority (BSA).

Bird Island WWTP serves a population of 675,000 and is the second largest plant in New York State with a design average flow of 180 MGD. This facility is also the largest discharger to the Niagara River. Preliminary discussions with BSA staff indicated that the plant can readily accept and treat the 12 MGD STAMP site build-out flow.

System Requirements

Under this alternative, the semiconductor manufacturer would pre-treat the process effluent per industry standards, including removing specific inorganic constituents such as fluoride, copper, and total suspended solids (TSS), and adjust the pH. There is no benefit in segregating the sanitary and process wastewater, so to reduce cost the sanitary effluent will be combined with the pre-treated process effluent at the STAMP site.

The required infrastructure includes:

1. Installation of approximately 32 miles of conveyance pipeline between the Scajaquada Tunnel Interceptor near Schiller Park in Buffalo, New York and the STAMP site, and
2. Construction of a 12 MGD pump station at the STAMP site.

A pipeline average diameter of 25.8 inches was used to estimate capital and annual costs associated with this alternative.

Based on discussions with BSA staff, the Scajaquada Tunnel Interceptor is the preferred point of connection to their gravity sewer system. This location will reduce impact during wet-weather flow to their combined storm overflow (CSO) system.

As directed by GGLDC during Workshop Number 1, IDCA evaluated phase construction of each alternative. Phasing the construction of this alternative, however, has relatively no cost benefit. This is because the pipeline between the STAMP site and Scajaquada Tunnel Interceptor, which accounts for roughly 93% of the capital cost of this alternative, must be completed all at once with the pipeline sized to account for the total 12 MGD build-out flows.

Regulatory Considerations

Currently, the majority of existing semiconductor facilities discharge to large public owned treatment works (POTWs). Pumping pre-treated process effluent to a POTW such as the Bird Island WWTP with large influent flows dilutes the impact of process effluent constituents, such as TDS, in the treatment process and in plant effluent. Based on our discussion with BSA staff, our anticipated TDS concentrations of up to 1,200 – 2,200 mg/L should not adversely impact their operation.

While the total projected cost for this alternative is relatively high, it does not require GGLDC, the County, or the semiconductor manufacturer to obtain a SPDES permit. The semiconductor manufacturer would, however, have to obtain an industrial pre-treatment agreement with BSA that would establish flows, pre-treatment requirements, and quality standards.

Capital Cost

CH2M HILL estimated the capital cost for this alternative to be approximately $73.2 million in 2014 dollars, including 20% contingency, and 4% escalation. Assuming $13.2 million for engineering costs, which includes pre-construction engineering at 10% for design, permitting and legal as well as 8% for engineering services during construction, the total cost for this alternative is estimated at $86.4 million.

A summary of the Alternative 1 cost estimate is presented below in Table 4:

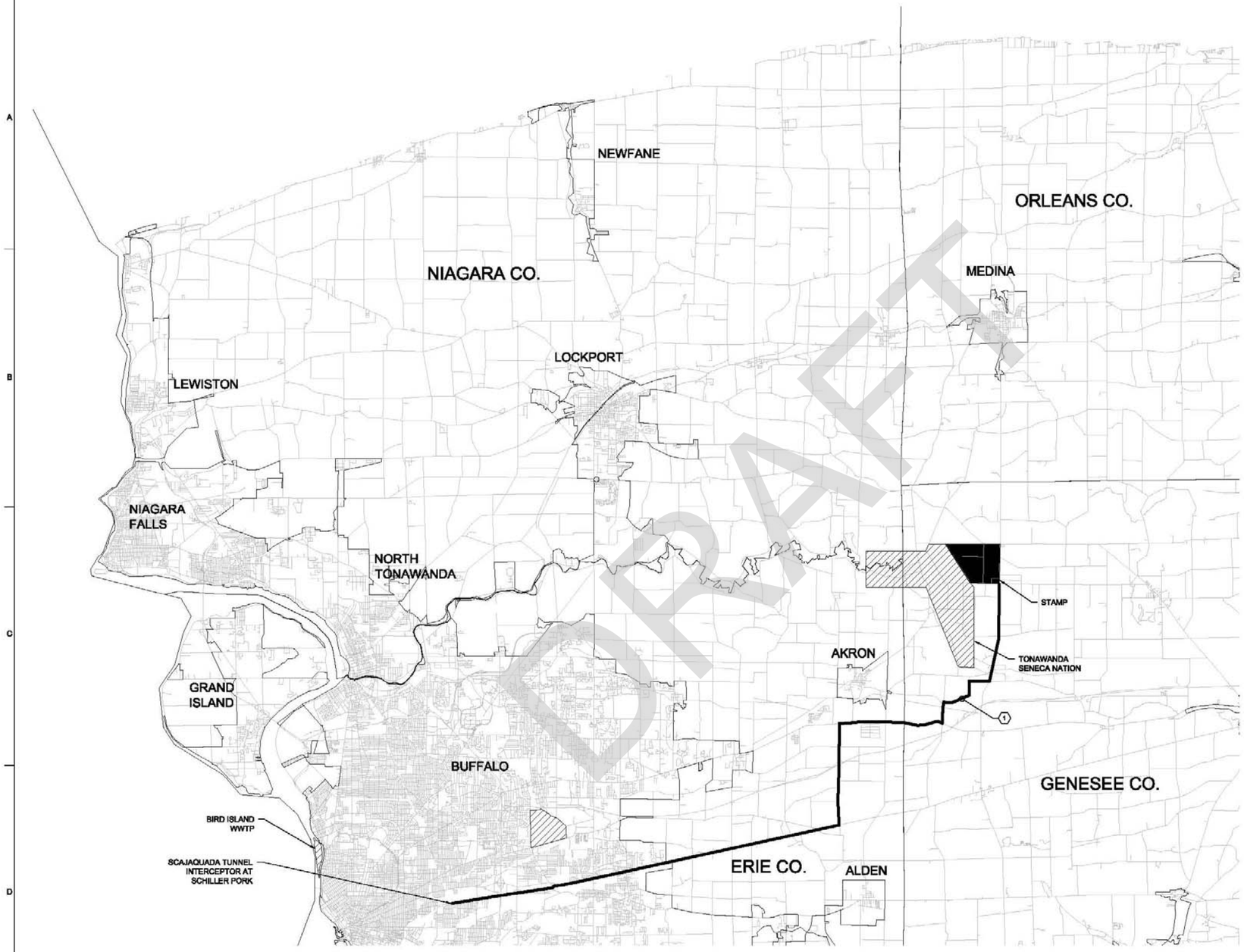
TABLE 4
Alternative 1 Cost Estimate
Alternative 1: 12 MGD to Bird Island WWTP

Item	Takeoff Quantity	Total
Pumping Station	1	$5,300,000
12 MGD sewer line	20 miles	$30,400,000
12 MGD sewer line (urban routing)	12 miles	$23,000,000
Capital Costs Subtotal (2012 dollars)		$58,700,000
Contingency - 20%		$11,700,000
Escalation - 4%		$2,800,000
Capital Costs Total (2014 dollars)		**$73,200,000**
Engineering – 10% (design/permitting)		$7,300,000
Engineering – 8% (construction)		$5,900,000
Engineering Total		**$13,200,000**

Figure 1 shows the proposed routing from the STAMP site to Scajaquada Tunnel Interceptor.

CODED NOTES

1. PRELIMINARY PIPE ROUTING FINAL ROUTING AND PIPELINE SIZES SHALL BE DEFINED DURING DETAIL DESIGN



ALTERNATIVE 1

N
1" = 10,000'

DRAFT

NO.	DATE	DSGN	DR.	REVISION	CHK	APVD	BY	APVD

CH2MHILL.
433 GENESEE STREET
SUITE 400
SYRACUSE, NY 13202

WESTERN NEW YORK STAMP
CONCEPTUAL WASTEWATER STUDY

C3/L
ALTERNATIVE 1

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE
PROJ
DWG A-1
SHEET of

FILENAME: PLOT DATE: $PLOTDATE PLOT TIME: $PLOTTIME

Alternative 2: 12 MGD to the Van Lare WWTP

Overview

This alternative entails pumping 12 MGD of combined pre-treated process effluent and sanitary sewer to the Van Lare WWTP in Rochester, New York, which is owned and operated by Pure Waters. This alternative is similar to Alternative 1 because the full 12 MGD flow would be sent to a large WWTP, but the distance between STAMP and the sewer connection is approximately 35 percent longer. The pretreatment requirements for the industrial manufacturer are similar to Alternative 1.

Pure Waters/Monroe County, Department of Environmental Services, manages two large wastewater treatment plants: the Northwest Quadrant WWTP, and the Frank E. Van Lare WWTP. The Northwest Quadrant WWTP serves the western service areas of the County and is closer to the STAMP site. This is, however, a medium-size facility (15 MGD average, 22 MGD peak) and could not absorb an additional 12 MGD of flow from the STAMP site. The Van Lare WWTP serves the City of Rochester and other Monroe County communities, has an operating permit for 135 MGD, and the capacity to handle up to 660 MGD during storm events.

Preliminary discussions with Pure Waters staff indicated that the Van Lare facility can treat the 12 MGD build-out flow. The preferred point of connection to their sewer collection system to reduce CSO impacts is at a 52-inch gravity sewer trunk near the intersection of Brooks Avenue and Genesee St, near the Rochester airport. Other sewer branches closer to Genesee County are too small for connection of the 30-inch pipeline.

System Requirements

Similar to Alternative 1, this alternative requires industrial pre-treatment of the effluent and significant infrastructure investment in pipeline and pump station installation.

The infrastructure required includes:

1. Installation of approximately new 43 miles of conveyance pipeline between the STAMP site and the sewer interceptor near the Rochester airport, and
2. Construction of a 12 MGD pump station at the STAMP site.

A pipeline average diameter of 27.4 inches was used to estimate capital and annual costs associated with this alternative.

As with Alternative 1, IDCA evaluated phase construction. Phasing the construction of this alternative, however, has relatively no cost benefit. This is because the pipeline between the STAMP site and interceptor, which accounts for roughly 93% of the capital cost of this alternative, must be completed all at once with the pipeline sized to account for the total 12 MGD build-out flows.

Regulatory Considerations

The regulatory considerations for this alternative are essentially the same as those for Alternative 1 described above.

Cost

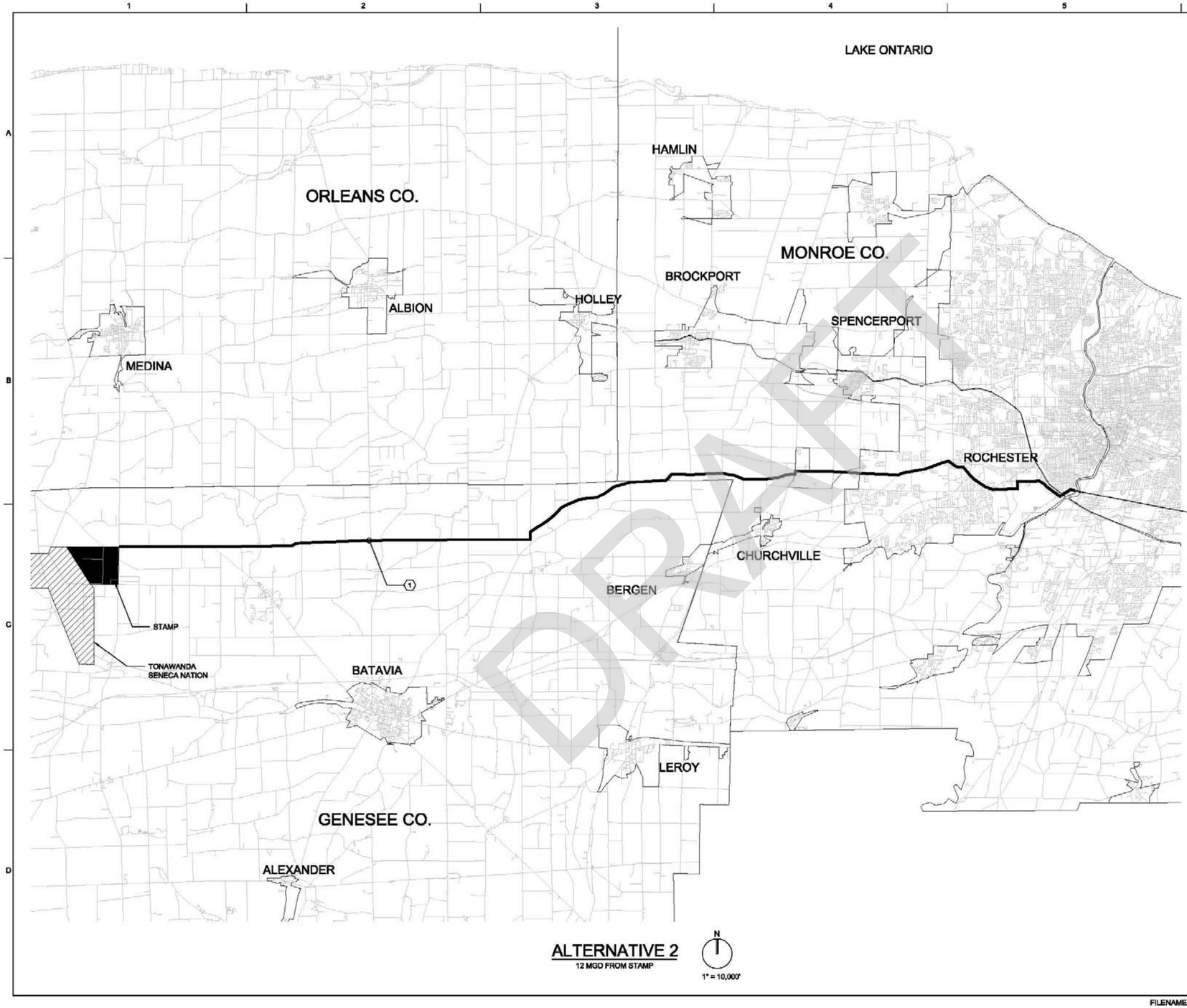
CH2M HILL estimated the capital cost for this alternative to be approximately $95.4 million in 2014 dollars, including 20% contingency, and 4% escalation. Assuming $17.1 million for engineering costs, which includes pre-construction engineering at 10% for design, permitting and legal as well as 8% for engineering services during construction, the total cost for this alternative is estimated at $112.5 million.

A summary of the Alternative 2 cost estimate is presented below in Table 5:

TABLE 5
Alternative 2 Cost Estimate
Alternative 2: 12 MGD to Van Lare WWTP

Item	Takeoff Quantity	Total
Pump Station	1	$5,300,000
12 MGD sewer line	40 miles	$64,300,000
12 MGD sewer line (urban routing)	3 miles	$6,900,000
Capital Costs Subtotal (2012 dollars)		$76,500,000
Contingency - 20%		$15,200,000
Escalation - 4%		$3,700,000
Capital Costs Total (2014 dollars)		**$95,400,000**
Engineering – 10 % (design/permitting)		$9,500,000
Engineering – 8% (construction)		$7,600,000
Engineering Total		**$17,100,000**

Figure 2 shows the proposed routing from the STAMP site to the Brooks-Genesee Interceptor.



CODED NOTES:

1. PRELIMINARY PIPE ROUTING FINAL ROUTING AND PIPELINE SIZES SHALL BE DEFINED DURING DETAIL DESIGN

ALTERNATIVE 2

12 MGD FROM STAMP

N

1" = 10,000'

NO.	DATE	DSGN	DR	CHK	APVD	BY	APVD
				REVISION			

CH2MHILL
439 GENESEE STREET
SUITE 400
SYRACUSE, NY 13202

WESTERN NEW YORK STAMP
CONCEPTUAL WASTEWATER STUDY

CIVIL
ALTERNATIVE 2

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE
PROJ
DWG A-2
SHEET of

FILENAME: PLOT DATE: $PLOTDATE PLOT TIME: $PLOTTIME

Alternative 3: 11 MGD to Lake Ontario and 1 MGD to Medina WWTP

Under this alternative, 11 MGD of pre-treated effluent will be direct-discharged into Lake Ontario and the 1 MGD of sanitary sewer will be treated at the Medina WWTP. The Medina WWTP has a design capacity of 4.5 MGD, treats an annual average of less than 2 MGD, and therefore is expected to have sufficient spare capacity to treat 1 MGD from STAMP.

The facility is located on a peninsula on the north side of the Erie Canal and discharges to Oak Orchard Creek. The Medina WWTP was selected because it is the closest POTW with available capacity, and is located approximately halfway between the STAMP site and the closest shoreline effluent discharge point at Lake Ontario.

System Requirements

Similar to Alternative 1 and 2, this alternative requires industrial pre-treatment of the effluent and significant infrastructure investment in pipeline and pump station installation.

The infrastructure required includes:

1. Installation of approximately 23.7 miles of conveyance pipeline for 11 MGD between the STAMP site and an outfall into Lake Ontario.
2. Installation of approximately 12.0 miles of conveyance pipeline for 1 MGD between the STAMP site and Medina WWTP.
3. Construction of a 12 MGD pump station at the STAMP site.

The 1 MGD sewer line from STAMP was assumed to connect to the existing sewer receiving system at the Medina WWTP to avoid wet-weather overflows in the city's combined sewer system.

Pipeline average diameters of 23.5 inches between the STAMP site and Lake Ontario, and 8.3 inches between the STAMP site and the Medina WWTP were used to estimate capital and annual costs associated with this alternative.

Regulatory Considerations

Based on our preliminary analysis and a follow up discussion with Department of Environmental Conservation (DEC) staff, a discharge of up to 11 MGD of pre-treated industrial effluent to Lake Ontario could be permitted.

According to the Division of Water Technical and Operational Guidance Series (1.3.1) entitled "Total Maximum Daily Loads and Water Quality-based Effluent Limits" by NYSDEC, a default dilution ratio of 10:1 for Lake Ontario would be applicable if mixing were incomplete. Based on an initial discussion with DEC staff, a dilution ratio could be as high as 30:1, if a well-designed diffuser system were used to enhance the mixing process. Therefore, use of diffuser systems with a dilution ratio of 10:1, or above, could reduce the concentrations in the pretreated effluent below the applicable standards for dissolved water quality parameters of 30 mg/L of biochemical oxygen demand (BOD) and TSS, and 1 mg-P/L of total phosphorus.

A key requirement for direct discharge is the absence of bioaccumulative chemicals of concern shown on EPA's banned list for mixing zone in the Great Lakes. This is because EPA regulation prohibits new discharges of bioaccumulative chemicals into mixing zones and phases out the use of existing mixing zones in the Great Lakes over the next ten years. Based on the information available, typical semiconductor effluent does not contain any of the listed bioaccumulative chemicals. However, the manufacturing processes in semi-conductor facilities have evolved significantly in recent years, and information on manufacturing process and composition of the waste streams is not public information.

Therefore, confirmation of this assumption by the semi-conductor manufacturer identified by STAMP is recommended.

A detailed analysis of the discharge location would also be required to prevent impact on drinking water intakes and beaches. Routing of the force main to the diffuser would have to avoid wetland areas.

The discharge to Lake Ontario would be permitted by a SPDES permit and will be subject to monitoring, recording and reporting, and 5-year permit renewal applications.

Cost

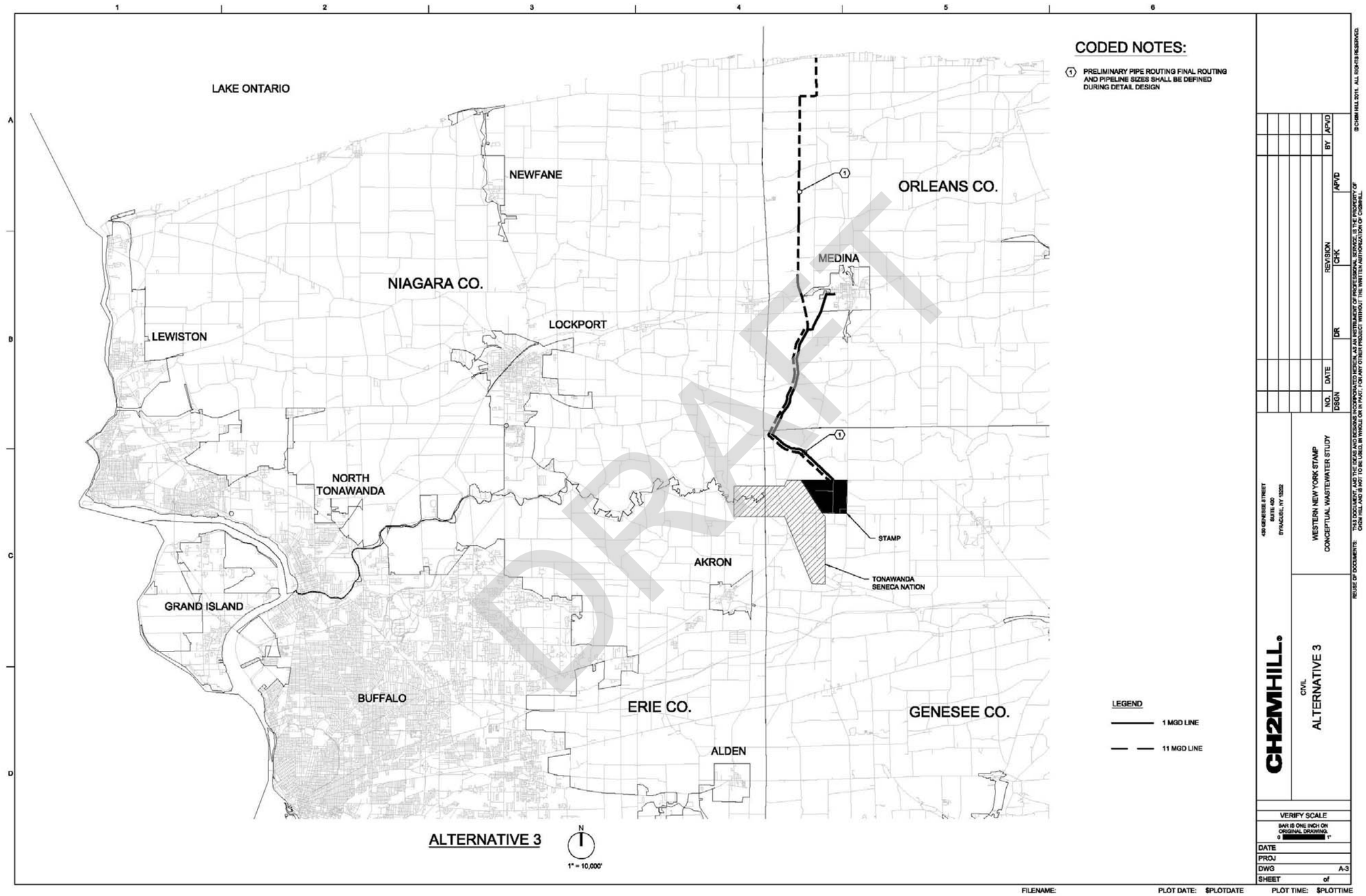
CH2M HILL estimated the capital cost of this alternative to be approximately $56.8 million, including 20% contingency, and 4% escalation. Assuming $10.2 million for engineering costs, which includes pre-construction engineering at 10% for design, permitting and legal as well as 8% for engineering services during construction, the total cost is estimated at $67.0 million.

A summary of the cost estimate for phasing Alternative 3 is presented below in Table 6:

TABLE 6
Alternative 3 Cost Estimate
Alternative 3: 11 MGD to Lake Ontario and 1 MGD to Medina WWTP

Item	Takeoff Quantity	Total
Pump Station	1	$5,300,000
11 MGD line from STAMP to Lake Ontario (includes Lake Ontario Outfall and Canal Crossing)	23.7 miles	$33,400,000
1 MGD line to Medina WWTP (urban, includes Canal Crossing)	1.7 miles	$1,400,000
1 MGD line to Medina	10.3 miles	$5,400,000
Capital Costs Subtotal (2012 dollars)		$45,500,000
Contingency - 20%		$9,100,000
Escalation - 4%		$2,200,000
Capital Costs Total (2014 dollars)		**$56,800,000**
Engineering – 10 % (design/permitting)		$5,700,000
Engineering – 8% (construction)		$4,500,000
Engineering Total		**$10,200,000**

The proposed routing from the STAMP site to the Medina WWTP and Lake Ontario is presented in Figure 3.



Alternative 4: 4.5 MGD to Medina WWTP and 12 MGD to Lake Ontario

Overview

This alternative spreads construction expenditures over two phases to reduce the initial capital investment. Phase 1 includes infrastructure to convey 4.5 MGD of combined pre-treated and sanitary sewer effluents from the STAMP site to the Medina WWTP. The 4.5 MGD would be treated and discharged by the Medina WWTP to Oak Orchard. The cost to expand the Medina WWTP to treat 4.5 MGD of STAMP sewer flow is included under Phase 1. Phase 2 includes infrastructure required to direct-discharge 11 MGD of pre-treated effluent into Lake Ontario. The 1 MGD of sanitary sewer would continue to be treated at the Medina WWTP because the concentrations of pollutants in this wastewater exceed what would be permissible for direct-discharge to Lake Ontario.

The liquid treatment processes at the existing Medina WWTP are screening, grit-removal, primary clarification and secondary treatment in rotating biological contactors (RBCs). Ferric chloride is added for phosphorus removal, and the primary and secondary solids are thickened, digested and dewatered in belt-filter pressed. Wet-weather flows are frequently above 4.5 MGD, and are conveyed to a rotating micro-screen, bypassing other liquid treatment processes.

The facility's current permit (SPDES Number NY-002 1873) limits ammonia concentrations in the plant effluent to 16 mg/L (November 1- April 30) and 50 mg/L (May 1- October 31). The BOD and TSS limits are 30 and 45 mg/L for monthly and 7-day averages, respectively. These permit levels are in line with the treatment capacity provided by the RBCs. Recent renewals of WWTP permits in the state of New York, suggests that DEC would impose stricter discharge requirements for TSS, BOD and ammonia than those in the current permit if the facility were upgraded to treat flows above 4.5 MGD.

System Requirements

In a first phase, a pump station and one sewer line is required to convey up to 4.5 MGD of combined sanitary sewer and pre-treated process effluent from the STAMP site to the Medina WWTP.

To treat the additional 4.5 MGD flow, and maintain the equivalent load for effluent ammonia, the capacity of the Medina WWTP would have to be expanded by at least 3.2 MGD. The minimum of 3.2 MGD is based on the ammonia load in the latest permit (16 mg/L at 4.5 MGD), an ammonia concentration of 20 mg/L in the STAMP effluent (lowest concentration for ammonia presented in Table 2), and complete removal of ammonia (nitrification). If the concentration of ammonia in the STAMP pre-treated effluent were higher than 20 mg/L, DEC could request for an expansion of 4.5 MGD.

To avoid the impact of the large wet-weather flows received by the city's combined sewer system, and thereby reduce the peak flow associated with the added 3.2 MGD expansion, it was assumed that the new infrastructure at the Medina WWTP would be dedicated to wastewater flows from the STAMP site.

The 3.2 MGD expansion includes primary clarification, fine screening, secondary treatment in a membrane biological reactor (MBR), thickening of waste activated sludge, ferric addition for phosphorus removal, caustic addition for pH control, and anaerobic digestion. The 3.2 MGD expansion does not include dewatering of digested biosolids because the existing belt-filter is operated below 50 percent of its capacity. Disinfection of the final effluent is also not included in this analysis because DEC and EPA have not included that requirement in recent permit renewals.

These processes described above would be installed within the existing WWTP site. The MBR facility and secondary treatment tanks would be installed where the existing ferric chloride facility is located. Relocation of the ferric chloride facility is included in the cost estimated. The expanded facilities can fit within the existing site because the MBR has a smaller footprint than other secondary systems (it operates at higher concentrations of mixed liquor solids- 10,000 mg/L versus 4,000 mg/L).

Phase 2 of this alternative includes installing an 11 MGD sewer line from the STAMP site to Lake Ontario. It is assumed that the 1 MGD flow of sanitary sewage from STAMP (at build-out) would be conveyed by the sewer line installed in Phase 1. Lower velocities in the sewer line at 1 MGD could require modifications that are not included in this analysis.

Pipeline average diameters of 23.5 inches between the STAMP site and Lake Ontario, and 14.6 inches between the STAMP site and the Medina WWTP were used to estimate capital and annual costs associated with this alternative.

Regulatory Considerations

This alternative shares the same regulatory considerations as Alternative 3 with respect to the direct-discharge to Lake Ontario. In addition to those, the pumping of 4.5 MGD of combined industrial and sanitary sewer to the Medina WWTP in Phase 1 has a two-fold impact on the regulator risk:

1. Requires a new SPDES permit to increases permit flow from 4.5 MGD to at least 6.5 MGD, and possibly 9 MGD. The new permitting process could possibly lead to stricter treatment requirements than those assumed above. One potential outcome would be a requirement to provide 4.5 MGD of expanded infrastructure - rather than the 3.2 MGD.
2. Increases the TDS concentration in the effluent to Oak Orchard above current levels. Based on an anticipated 1200 mg/L of TDS in the pre-treated industrial effluent (the lowest concentration in the range presented in Table 2), a flow of 3 MGD of pre-treated effluent would increase the concentration of TDS in a total flow of 6.5 MGD of Medina WWTP effluent by more than 550 mg/L (1200 mg/L x 3 MGD/6.5 MGD= 556 mg/L). In addition this TDS, salts added for phosphorus and alkalinity control at the WWTP would also increase the TDS concentration in the Medina WWTP effluent. The TDS increase associated with phosphorus and alkalinity control depends on wastewater characteristics. If the facility were to nitrify 100 mg/L of ammonia (the highest concentration in the range presented in Table 2) in 3 MGD of industrial effluent, alkalinity control would add approximately 150 mg/L of TDS to the final effluent.

Cost

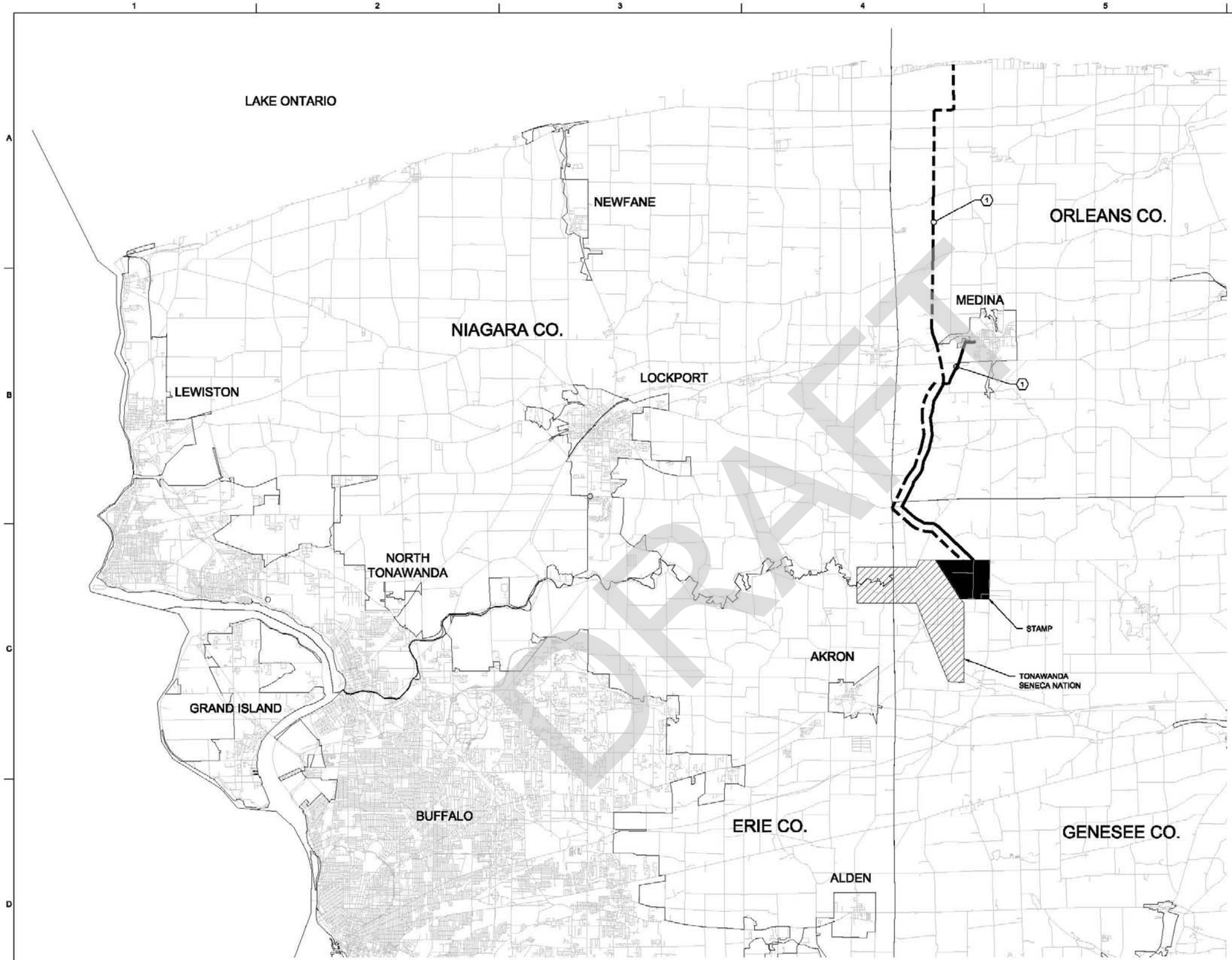
CH2M HILL estimated the capital cost for Phase 1 of this alternative to be approximately $51.3 million and Phase 2 to be approximately $41.7 million in 2014 dollars, including 20% contingency, and 4% escalation. Assuming $9.2 million (Phase 1) and $7.5 million (Phase 2) for engineering costs, which includes pre-construction engineering at 10% for design, permitting and legal as well as 8% for engineering services during construction, the total Phase 1 cost is estimated at $60.5 million and the total Phase 2 cost is estimated at $49.2 million. The total combined Phase 1 and 2 costs are estimated at $109.7 million.

A summary of the cost estimate for phasing Alternative 4 is presented below in Table 7:

TABLE 7
Alternative 4 Cost Estimate
Alternative 4: 4.5 MGD to Medina WWTP and 11 MGD to Lake Ontario

Item	Takeoff Quantity	Phase 1	Phase 2	Total
3.2 MGD expansion of Medina WWTP	1	$24,600,000	N/A	$24,600,000
Pump Station	1	$5,300,000	N/A	$5,300,000
11 MGD sewer from STAMP to Lake Ontario (includes Lake Ontario Outfall and Canal Crossing)	23.7 miles	N/A	$33,400,000	$33,400,000
4.5 MGD sewer to Medina WWTP (urban, includes Canal Crossing)	1.7 miles	$2,200,000	N/A	$2,200,000
4.5 MGD sewer to Medina	10.3 miles	$9,000,000	N/A	$9,000,000
Capital Costs Subtotal (2012 dollars)		$41,100,000	$33,400,000	$74,500,000
Contingency - 20%		$8,200,000	$6,700,000	$14,900,000
Escalation - 4%		$2,000,000	$1,600,000	$3,600,000
Capital Costs Total (2014 dollars)		**$51,300,000**	**$41,700,000**	**$93,000,000**
Engineering – 10 % (design/permitting)		$5,100,000	$4,200,000	$9,300,000
Engineering – 8% (construction)		$4,100,000	$3,300,000	$7,400,000
Engineering Total		**$9,200,000**	**$7,500,000**	**$16,700,000**

The proposed routing from the STAMP site to the Medina WWTP and Lake Ontario is analogous to Alternative 3.



CODED NOTES:

(1) PRELIMINARY PIPE ROUTING FINAL ROUTING AND PIPELINE SIZES SHALL BE DEFINED DURING DETAIL DESIGN

LEGEND

PHASE 1 - 4.5 MGD LINE

PHASE 2 - 11 MGD LINE

ALTERNATIVE 4

N

1" = 10,000'

NO.	DATE	REVISION	BY	APVD
DSGN		DR	CHK	APVD

CH2MHILL
439 GENESEE STREET
SUITE 400
SYRACUSE, NY 13202

WESTERN NEW YORK STAMP
CONCEPTUAL WASTEWATER STUDY

CIVIL
ALTERNATIVE 4

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE
PROJ
DWG A-4
SHEET of

FILENAME: PLOT DATE: $PLOTDATE PLOT TIME: $PLOTTIME

Eliminated Alternatives

Alternative 5: 12 MGD to Lockport WWTP

Alternative 5 is conceptually analogous to the two first alternatives. There are, however, some important differences including:

1. The Lockport WWTP has a smaller capacity than the Van Lare and the Bird Island WWTPs, and
2. The Lockport WWTP discharges to the Eighteen Mile Creek, instead of directly to a large lake or river.

This alternative requires significant infrastructure investment, and phasing the design capacity has relatively no impact on the initial cost because a minimum of 70 MGD of wet-weather improvements at the facility would be necessary to accommodate a first phase flow of 4.5 MGD. In summary, this list of infrastructure required by this alternative includes:

1. Installation of approximately 18 miles of a 30-inch transmission line between the STAMP site and the Lockport WWTP,
2. Construction of a 12 MGD pump station at the STAMP site, and
3. 80 MGD of wet-weather improvements at the Lockport WWTP.

The Lockport WWTP has an average design capacity of 22 MGD and the current average flow is less than 10 MGD. However, the peak flow to the facility is approximately 88 MGD and the maximum 30-day average is 20.8 MGD due to wet-weather flows. The facility would require significant improvements to process the full build-out flow of 12 MGD from the STAMP site. Currently, the city does not plan to separate its sanitary and storm systems to reduce peak flows. Based on the current peak flow of 88 MGD, a maximum 30-day flow of 21 MGD, and the 12 MGD of STAMP flow, the improvements for wet-weather treatment would have to adequately treat approximately 80 MGD (88 MGD-22MGD+12MGD) of flow. Based on discussions with facility staff, improvements to capture 80 MGD of wet-weather flow would have to focus on wet-weather flow treatment at the Lockport WWTP, rather than in the collection system.

The on-site treatment of the wet-weather flow could be achieved by using a ballasted flocculation system. This system is compact, very effective at handling wet-weather flows, and has received regulatory approval in several states. This type of system is also typically less expensive than conventional treatment. However, the 80 MGD wet-weather system required to free up 12 MGD of capacity would represent a major infrastructure investment.

A regulatory challenge to a discharge to Eighteen Mile Creek is the recent (March, 2012) addition of the creek to the Superfund National Priorities List of the country's most hazardous waste sites. Sediment in some areas of the creek is contaminated with harmful chemicals, including polychlorinated biphenyls (PCBs), heavy metals and dioxin. Specific causes of contamination have not been determined, but possible sources may include releases from hazardous waste sites or contaminated properties, industrial and municipal wastewater discharges, and stormwater and combined sewer overflow discharges. The addition of the creek to the superfund list could impact the level of pretreatment required from a major industrial discharger and could also tie an industrial discharger to investments in future remediation efforts.

Overall, Alternative 5 has the highest regulatory acceptance risk factor of all six alternatives.

CH2M HILL estimated the infrastructure cost for this alternative to be in excess of $150 million. The combination of regulatory acceptance risk and the high cost eliminated this alternative from future consideration.

Alternative 6: On-site 12 MGD STAMP WWTP with Discharge to Tonawanda Creek

Alternative 6 was developed as the option that minimizes the length of force main required to dispose of the 12 MGD of effluent.

The selected discharge site based on a preliminary analysis was the Tonawanda Creek downstream of the Tonawanda Seneca Nation reservation. At this location, the minimum average 7-day flow over 10 years (7Q10) is reported as 9.8 cubic feet per second (cfs), or 6.33 MGD, and is the highest among other alternative creeks. Other evaluated options included:

- Whitney Creek (1.4 miles from STAMP, flowing to the Tonawanda State Park), which was eliminated due to the lack of updated hydraulic information,
- Oak Orchard Creek (5.6 miles from STAMP, flowing North to Erie Canal), which was eliminated due low 10-year flows (0.7 cfs/0.45 MGD), and
- Tonawanda Creek Upstream of Tonawanda Seneca Nation reservation (5.4 miles from STAMP, flowing West to Erie Canal), which was eliminated due to the need to obtain endorsement from Nation representatives.

This alternative includes a new on-site wastewater treatment facility to treat the 12 MGD of combined pre-treated process effluent and sanitary sewage. A membrane biological reactor (MBR) was selected as the main liquid treatment process because conventional secondary clarifiers are not as effective solid-liquid-separators as membrane filtration when treating semiconductor industrial effluent. Treatment of the combined industrial effluent and the sanitary sewage was selected because past experience indicates that some of the organic contaminants in the industrials wastewater appear to be metabolized in WWTPs but are resilient when the organic influent load to the biological process is too low. In some cases, supplemental carbon has been added to maintain adequate levels of biological activity in wastewater plants treating this type of effluent. In addition to an MBR, the liquid process treatment was assumed to also include grit removal and fine screening. Solids handling processes were assumed to include thickening, anaerobic digestion, and dewatering.

An on-site treatment facility was assumed because characterization of the industrial wastewater indicated that the effluent would not meet the preliminary discharge parameters set by DEC based on a waste assimilative capacity analysis (WAC) for Tonawanda Creek, which is summarized below in Table 8 :

TABLE 8
WAC Analysis Based Effluent Limits

Pollutants	Effluent Limit – mg/l	Limit Type	Comment
BOD5	**5**	**Daily Max.**	
Suspended Solids	10	Daily Max.	
Ammonia, Total [b]	1.5	Daily Max.	@ pH= 7.5, T=25 ^{o}C
Ammonia, Total [a]	2.2	Daily Max.	@ pH= 7.5, T=10 ^{o}C
Chlorine Residual	0.020	Daily Max.	Limit = PQL
Phosphorus	1.0	Monthly Average	GLWQA

[a] Summer Period: 1 May – 31 October, [b] Fall/Winter/Spring Period: 1 November – 30 April
GLWQA- Great Lakes Water Quality Agreement
PQL- Practical quantitation level

This option would require the owner of the on-site WWTP to hold a SPDES permit. From a regulatory standpoint, the discharge of 12 MGD to Tonawanda Creek would dominate its water quality, especially during low flow periods, and could expose the semiconductor manufacturer to potential stringent treatment requirements, including limitations on constituents that exceed ambient concentrations. One of the constituents in the wastewater that has been under scrutiny by regulatory agencies is the TDS concentration. Typical TDS concentrations in similar semiconductor process effluent range from 1200-1800 mg/L, while the ambient concentration goal of TDS could be 500 mg/L. A TDS limit in the effluent lower than the 1200-1800 mg/L would require additional investment in reverse osmosis and brine management, which would increase the cost of infrastructure significantly.

Overall, this alternative requires significant infrastructure investment. Phasing the capacity of the new on-site WWTP could spread out the infrastructure investment, but Phase1 would be expected to cost at least 50% of the total present cost. Phasing the project would not have a significant impact on the cost of the pump station and force main between the STAMP site and the discharge point.

CH2M HILL estimated the infrastructure cost for this alternative to be in excess of $150 million. The combination of regulatory acceptance risk and the high cost eliminated this alternative from future consideration.

Additional Alternative Eliminated from Consideration: Deep-well Injection

Deep-well injection was also evaluated as potential wastewater management alternatives. While EPA and New York State do not have a regulatory ban on deep well injection, this option is not technically viable due to the geology of the STAMP site, which is primarily deep shale/ Lockport Dolomite – with no likely zones for recharge.

Additional Alternative Eliminated from Consideration: Potential Reuse Alternative

On-site reuse of treated effluent is extremely limited because microchip manufacturers do not want the added expense and uncertainty of treating water with potentially changing chemical properties.

Off-site reuse has been eliminated from further consideration because the two primary options, irrigation and disposal in the Erie Canal, do not provide consistent year-round use of the effluent between the months of November and April.

Sewer Rates Analysis

Sewer rates can vary significantly across municipalities, and reflect differences in operation and maintenance costs of the sewer system, including conveyance, wet-weather management, and treatment and disposal of the wastewater.

GGLDC or Genesee County would have the option of creating an entity to convey the sanitary sewer and the pre-treated industrial effluent wastewater from the STAMP site to either a wastewater treatment plant and/or Lake Ontario. This entity would be responsible for the operation and maintenance of the pumping station at the STAMP site, the conveyance infrastructure and regulatory compliance. The cost of treatment and disposal of the wastewater, and the annual operation and maintenance costs incurred by the conveyance would be reflected in the sewer rates charged to end users at the STAMP site.

Based on the two recommended alternatives, the rate would include the cost treatment and disposal of the wastewater by either the City of Buffalo or the Village of Medina. For industrial and commercial users, the rate is based on flow and wastewater characteristics. Surcharges are typically added for high-strength wastewater. Based on the "Final Schedule of Sewer Rents and Other Charges for 2012-2013" for the City of Buffalo, the rate for premises outside city limits is $48.30 per quarter of the year, plus $1.48/1000 gallons ($11.09/1000 cubic-ft) for volume above 4,000 cubic-ft of water. The village of Medina rate $4.01/1000 gallons ($30.00/ 100 cubic-ft), with an out-of-district surcharge of 1.6 times the base rate. The village of Medina does not currently have contracts with any large industrial users, but has indicated that it would apply lower rates to larger volumes. The rates listed above are provided for guidance purposes only. A special contract is typically negotiated for industrial dischargers based on flows and the characteristics of the wastewater.

Operation and maintenance are essential to extend the life-time of infrastructure, to ensure normal functioning and to identify potential problems. Most maintenance activities are associated with the pumping station. However, gravity lines may require regular flushing depending on velocities and sewer characteristics. Force-main performance is directly related to the performance of the pumping station. Typical maintenance activities include route inspection, integrity inspection where exposed for condition of connections, noise, vibration, valve leakage, measurement of discharge pump rates and suction and discharge pressures.

Table 9 summarizes the main costs associated with each of the two recommended alternatives. The notes on the table describe the assumptions for each of the cost line items. A privately owned pipe of 30-40 miles may also have costs associated with the right of way use and possibly insurance considerations. These costs are not included in Table 9.

TABLE 9
Annual Sewer Cost Estimates Summary (2013 dollars)

Alternative	4 MGD ($/year)	8 MGD ($/year)	12 MGD ($/year)
12 MGD to Bird Island (Alternative 1)			
Treatment and Discharge [1]	$3.61 M	$7.21 M	$10.82 M
Labor [2]	$0.25 M	$0.25 M	$0.25 M
Energy [3]	$0.23 M	$0.46 M	$0.69 M
Maintenance [4]	$0.35 M	$0.35 M	$0.35 M
Asset Fund [5]	$1.60 M	$1.60 M	$1.60 M
Annual Cost	**$4.40 M**	**$8.30 M**	**$12.10 M**
Cost ($/1,000 gallons)	**$3.04**	**$2.83**	**$2.77**
1 MGD to Medina WWTP and 11 MGD to Lake Ontario (Alternative 3)			
Treatment and Discharge [1]	$0.78 M	$1.56 M	$2.34 M
Labor [2]	$0.25 M	$0.25 M	$0.25 M
Energy [3]	$0.23 M	$0.46 M	$0.69 M
Maintenance [4]	$0.29 M	$0.29 M	$0.29 M
Asset Fund [5]	$1.40 M	$1.40 M	$1.40 M
Annual Cost ($/year)	**$1.60 M**	**$2.60 M**	**$3.60 M**
Cost ($/1,000 gallons)	**$1.07**	**$0.88**	**$0.82**

Notes:
1. Annual cost of treatment and discharge was based on a current rate of $2.47/1000 gallons for non-residential users outside the City of Buffalo, and a rate of $4.01/1000 gallons plus 1.6 surcharge rate provided by the Village of Medina.
2. Annual cost is based on 2-man-hours.
3. Energy is based on a total discharge pressure of 150 psi, 70% efficient motors, and $0.09/kWhr.
4. Maintenance was set at 0.5% of capital cost of infrastructure.
5. Asset fund was based on the capital cost of infrastructure, 50 years life-time for conveyance infrastructure and 20-years life-time for pumping stations.

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