

cityofnovi.org

CITY of NOVI CITY COUNCIL

Agenda Item I
January 23, 2012

SUBJECT: Approval to award an amendment to the engineering services contract for the Water Storage Feasibility Study to Orchard, Hiltz & McCliment, Inc. in the amount of \$4,500 for additional study of a shared water storage tank option with Commerce Township.

SUBMITTING DEPARTMENT: Department of Public Services, Engineering Division ^{R24} *BTC*

CITY MANAGER APPROVAL: *[Signature]*

EXPENDITURE REQUIRED	\$ 4,500
LINE ITEM NUMBER	592-592.00-805.000 (Water & Sewer Fund)

BACKGROUND INFORMATION:

An engineering contract was awarded to Orchard Hiltz & McCliment, Inc. in August 2011 to further review and refine the recommendations of the 2008 Water System Master Plan related to water storage. Water storage was recommended in the 2008 study to maintain a consistent water supply from Detroit Water and Sewerage Department (DWSD) and potentially reduce DWSD bulk water rates. The scope of the Water Storage Feasibility Study includes a financial/feasibility study of the recommended storage tank and other available options to provide water storage and/or decreased water supply costs from DWSD. These options include:

- Construct the 8 million gallon water storage tank and appurtenances within the City of Novi as recommended by the 2008 Water Study.
- Construct a smaller water storage tank (or tanks) in Novi to achieve better water management.
- Partner with another DWSD customer(s) (such as Commerce Township, Walled Lake, Wixom, West Bloomfield, Farmington Hills, etc.) to decrease water costs (possibly by constructing a shared water storage tank).
- Join an existing water authority to decrease water costs.
- Do nothing.

The attached draft study provides the results of the completed review of water storage options and makes the following conclusions and recommendations:

- The water demand management program requiring customers to irrigate between 11 PM and 5 AM has been effective in significantly reducing the metered maximum day and peak hour flows, which in turn has reduced the recommend storage volume for a tank to 1 million gallons.
- An elevated water storage tank with a capacity of 1 million gallons would meet the peak hour requirements of the system to allow Novi to become a maximum day customer with DWSD and thereby be eligible to receive a further reduction in the bulk water rate.

- Construction of a 1 million gallon tank in Novi would result in cost savings of approximately \$1.7 million per year based on the current rate methodology. The tank would have a payback period of approximately 3.2 years.
- A shared water storage tank with Commerce could be a possibility and would result in a cost savings of approximately \$1.7 million per year and a payback period of approximately 2.4 years.

As part of the study, Engineering staff have met with the engineers for Commerce Township and the Oakland County Water Resource Commissioner's office (OCWRC) regarding the feasibility of shared water storage. Through these meetings, it has been determined that shared storage may be feasible but warrants additional study. The additional study would focus on DWSD requirements for shared storage, engineering feasibility of connecting the two water distribution systems, modeling of the systems, and providing a final report with findings. The additional scope to review the engineering feasibility of shared storage is outlined in the attached letter from OHM at an estimated fee of \$4,500.

The final report, incorporating the analysis of shared storage with Commerce Township, is anticipated to be completed in March 2011.

RECOMMENDED ACTION: Approval to award an amendment to the engineering services contract for the Water Storage Feasibility Study to Orchard, Hiltz & McCliment, Inc. in the amount of \$4,500 for additional study of a shared water storage tank option with Commerce Township.

	1	2	Y	N
Mayor Gatt				
Mayor Pro Tem Staudt				
Council Member Casey				
Council Member Fischer				

	1	2	Y	N
Council Member Margolis				
Council Member Mutch				
Council Member Wrobel				



January 10, 2012

City of Novi
Engineering Department
Mr. Ben Croy, PE
26300 Delwal Drive
Novi, MI 48375

Re: Novi / Commerce Storage Tank - Feasibility

Dear Mr. Croy:

OHM is pleased to submit this cost estimate to review the feasibility of forming an authority between Novi and Commerce Township for the construction of a Novi / Commerce Storage Tank.

PROJECT UNDERSTANDING

The work will include the following tasks:

- Task 1 – Update Cost Estimates
- Task 2 – Attend two Additional Meetings
- Task 3 – List of Pros and Cons for Shared Storage versus Novi Alone
- Task 4 – Miscellaneous Modeling of the Haggerty Connection
- Task 5 – Attend Council Meeting
- Task 6 – Do Write-Up for WRC Report and Review Final Report

FEE PROPOSAL

The services outlined above are estimated at total cost of \$4,500.

Respectfully,
Orchard, Hiltz & McCliment, Inc.

Vyto Kaunelis, PE
Principal

Summary and Conclusions

The City of Novi Water System Master Plan was completed by Stantec in 2008. One recommendation from the study included the construction of an 8 million gallon ground storage tank with an 18.6 million gallon per day pump station on City-owned property near West Park Drive and West Road. The City decided to explore alternatives in more detail and retained Orchard, Hiltz and McCliment, Inc. (OHM) to provide a financial/feasibility study of the available options to provide water storage and/or decreased water supply costs from DWSD. The results from this study are expected to be used in the City's capital improvement plan and in planning for upcoming water rates.

Recent water usage data was analyzed to determine storage volume requirements. The addition of storage and appropriate ancillary facilities would enable the City to maintain a steady flow from DWSD on a hot, high usage day, commonly referred to as a maximum day. Essentially, this allows the City to maintain a peak hour flow rate that is no greater than the average flow on the maximum day. This will result in significant cost savings based on the existing DWSD rate methodology. Using the City of Novi maximum day, which was July 21, 2011, the required storage volume to provide maximum day equalization was 0.8 million gallons (mg). Allowing for imperfections in control system strategies, a standard tank size of 1 mg was utilized as the base storage amount.

The recent water usage pattern was significantly affected by the City's Demand Management Program. The Demand Management Program requires automatic sprinkling systems to be run between 11 PM and 5 AM and to run no more often than every other day on an odd/even basis. This has resulted in significant decreases in the metered maximum day and peak hour flows. To determine the effect of the Demand Management Program on sizing of a water storage tank, data from 2007, which preceded the Novi Demand Management Program, was analyzed to determine a required storage volume. The calculations indicate the need for 2.2 mg of storage, which would result in a 2.5 mg standard size tank. This demonstrates the effectiveness of the demand management program and also illustrates the importance of continuing to pursue this program into the future.

When a storage tank is provided, it is important to consider other potential uses in addition to maximum day equalization. Typical other uses include fire flow storage and reliability for unusual problems, such as power outage. It is important to recognize that DWSD currently has a 10 million gallon ground storage facility at Haggerty Road, near 14 Mile Road, with a 70 million gallon per day pump station. Although the back-up power supply did not function as expected in 2003, DWSD has assured the communities the facilities and operational plans have been improved since then and should be available in the event of power failure. Although a significant event has not occurred to test the facilities, it is apparent DWSD has evaluated the facilities and is comfortable that appropriate actions have been taken. Therefore, additional storage to duplicate the existing DWSD facility was not considered necessary as part of this evaluation.

Several sites and types of storage tanks were evaluated as part of this study. Elevated storage is more expensive to construct, but has significantly lower energy, operation and maintenance expenses, which result in a lower life-cycle cost. Elevated storage also provides greater reliability, since the water in storage does not depend upon pumping for utilization. Ground storage with a pump station is generally more cost-effective when a very large amount of storage is required. It is easier to blend into the landscape, so it is generally considered more aesthetically pleasing. Commerce Township is also considering providing storage. Novi and Commerce are fed from the same DWSD transmission main, so this simplifies the technical ability to share storage. Therefore, alternatives were also considered for providing a joint facility with Commerce Township.

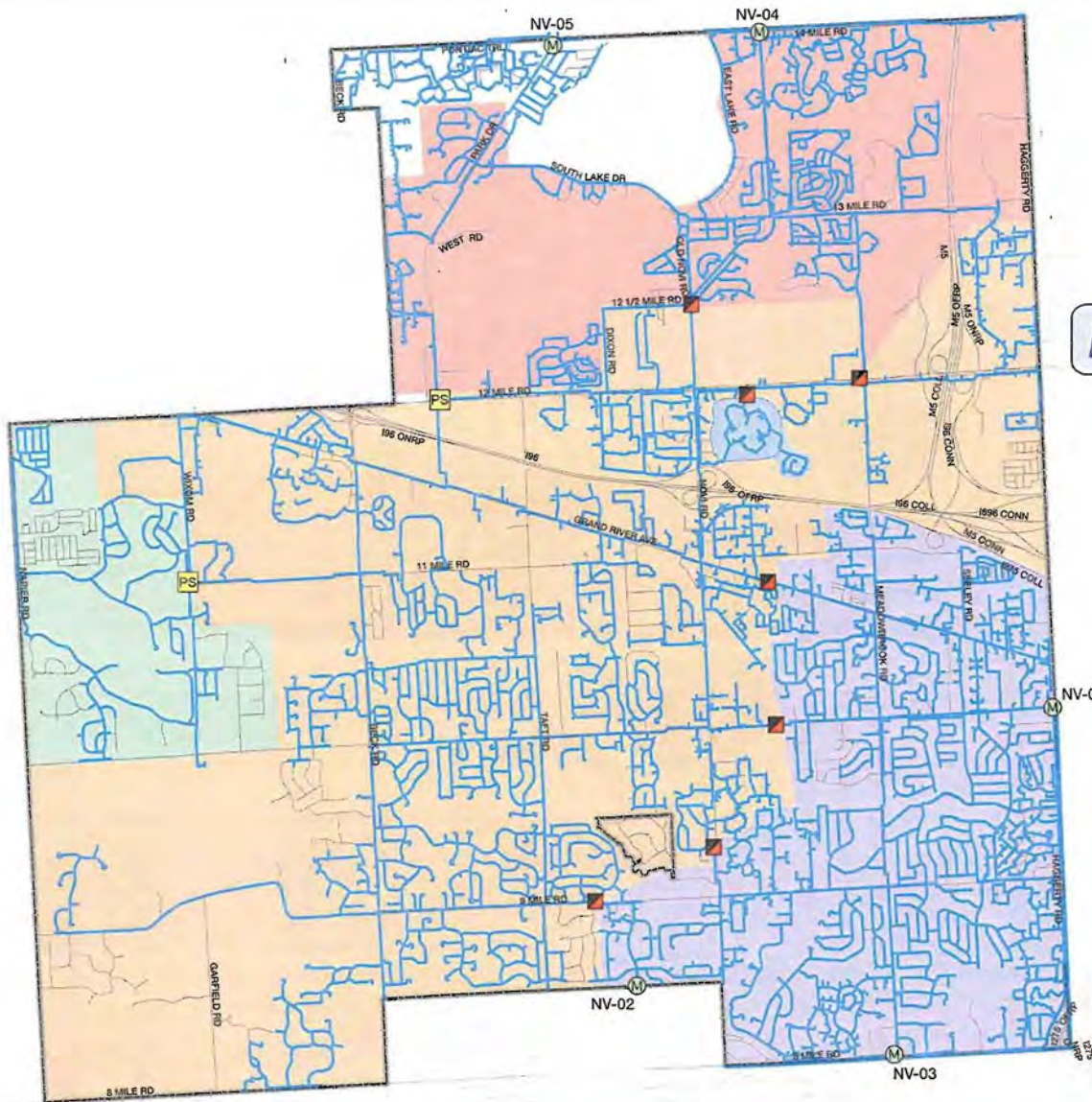
If Novi chooses to build a storage tank on its own, a 1 mg elevated storage tank in Section 17 appears to be the most cost-effective solution. This location is in the City's intermediate pressure district which can utilize existing pressure reducing valves (PRVs) to control flows. Some upgrades to the PRVs would be needed and it is expected the storage tank would also provide an opportunity to simplify operations in this district. The capital cost is estimated to be \$5.3 million and the cost savings in DWSD rates is expected to be \$1.7 million/year, based on the existing rate methodology. Considering the increased operation and maintenance costs, the pay-back period is estimated to be 3.2 years.

A joint storage tank by Novi and Commerce was estimated at a 3 mg size, 1 mg for Novi and 2 mg for Commerce. Both communities are initially leaning towards elevated storage. Initial technical discussions with Commerce indicates they are considering several sites, but seem to prefer a site near Sinai Hospital, to provide greater reliability to this critical location. It is also anticipated the communities would join as a water authority to simplify operation of the tank and minimize the need for physical connection from the tank to the Novi water distribution system. Creation of authorities is allowed by the DWSD contract. The role of the authority would likely include construction and operation of the storage facility, and interaction with DWSD. The Oakland County Water Resource Commission operates the Commerce Township water system, and could be considered to implement and operate the facility on behalf of the authority. For initial evaluations, we have utilized a split in costs based on the proportional storage volume, which results in one-third Novi, two-thirds Commerce. Initial cost estimates are more approximate for the collaboration alternatives, since detailed discussions have not yet occurred between the communities. The Novi share of the capital cost for a joint tank is estimated to be \$4.2 million and the cost savings in DWSD rates is expected to be \$1.7 million/year, based on the existing rate methodology. Considering the increased operation and maintenance costs shared in the same proportion, the pay-back period is estimated to be 2.4 years.

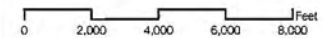
FIGURE 1 Water System

Water System Feasibility Study
City of Novi

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- PRV
- Meter
- Pump Station
- Water Main
- Pressure Districts
 - HIGH
 - INTERMEDIATE
 - ISLAND LAKE
 - LOWER
 - TWELVE OAKS



Source: Data provided by Oakland County and the City of Novi. Orchard, Hiltz and McCliment does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: Michigan South NAD 1983 State Plane International Feet

Map Published: October 5, 2011



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**City of Novi
Storage Tank Feasibility Study**

List of Appendices

Appendix A – Diurnal Patterns

Appendix B – Storage Sizing

Appendix C – Storage Alternatives

Appendix D – Rate Calculations

Appendix E – Cost Estimates

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Appendix A
Diurnal Pattern

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Water Demands

In order to size the facilities, the water system demands for City of Novi over the past five years were reviewed and summarized in Table 1.

Table 1: City of Novi Water Demands

Year	Average Flow		Maximum Flow		Peak Hour Flow	
	MGD	gpm	MGD	gpm	MGD	gpm
2007*	6.64	4,611	15.26	10,597	29.92	20,778
2008	6.58	4,569	13.32	9,250	26.11	18,132
2009	5.98	4,153	12.72	8,833	18.99	13,188
2010	5.48	3,806	12.79	8,880	17.91	12,439
2011	5.94	4,125	15.32	10,639	24.81	17,229

*Pre-demand management program

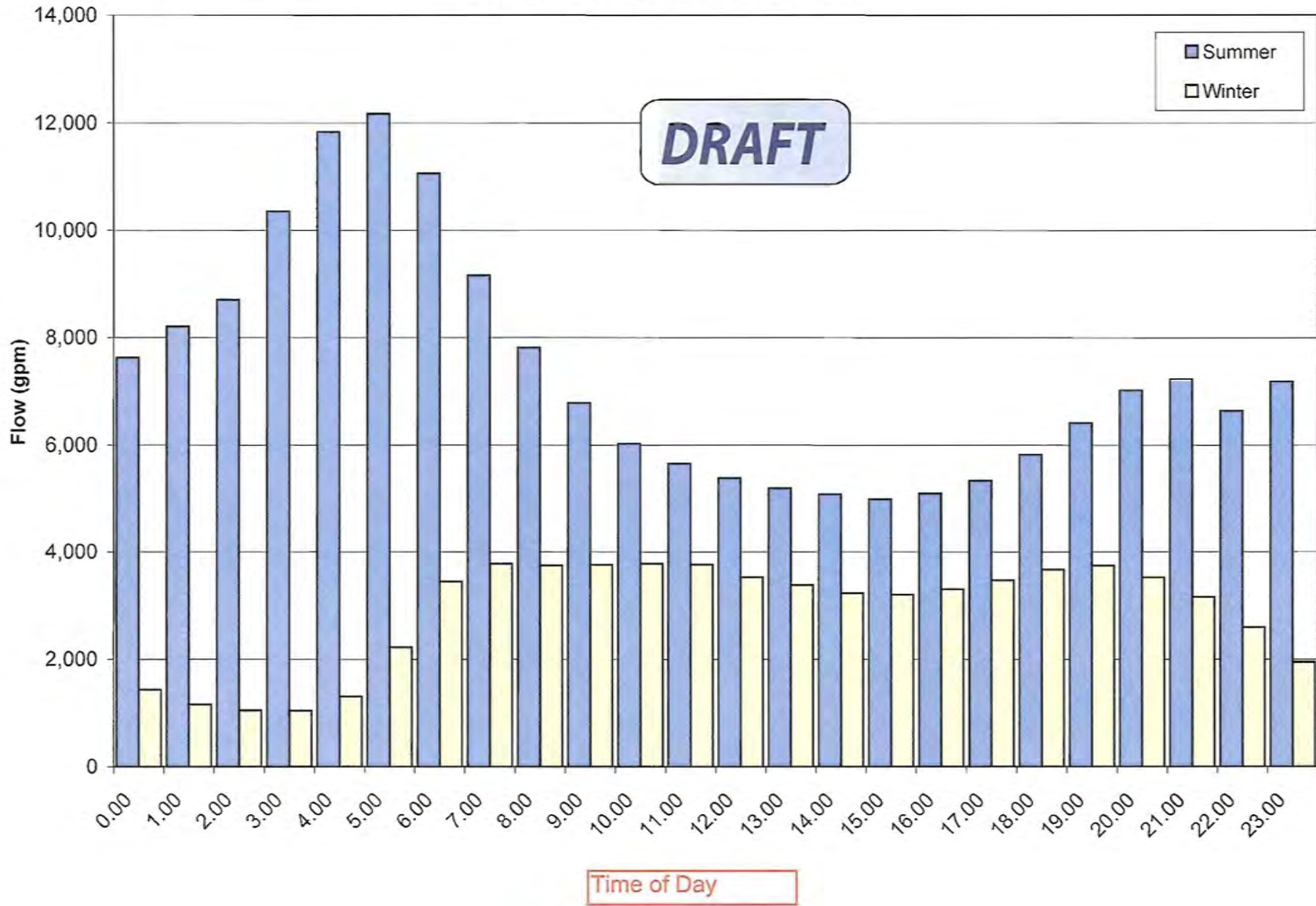
As part of the DWSD rate methodology communities have been defining contract capacities that are needed to adequately serve their customers. For City of Novi, this results in an average daily flow of 5.9 MGD, maximum daily flow of 17.3 MGD, and a peak hour flow of 25.5 MGD for the rate calculations. A comparison of the City's summer usage and their winter usage indicates that a large amount of the City's summer usage can be attributed to irrigation. The increased summer demand, particularly during morning hours, can usually be attributed to grass watering. The City also has a large increase in water usage between dry summer conditions and wet summer conditions (see attached).

Demand Management

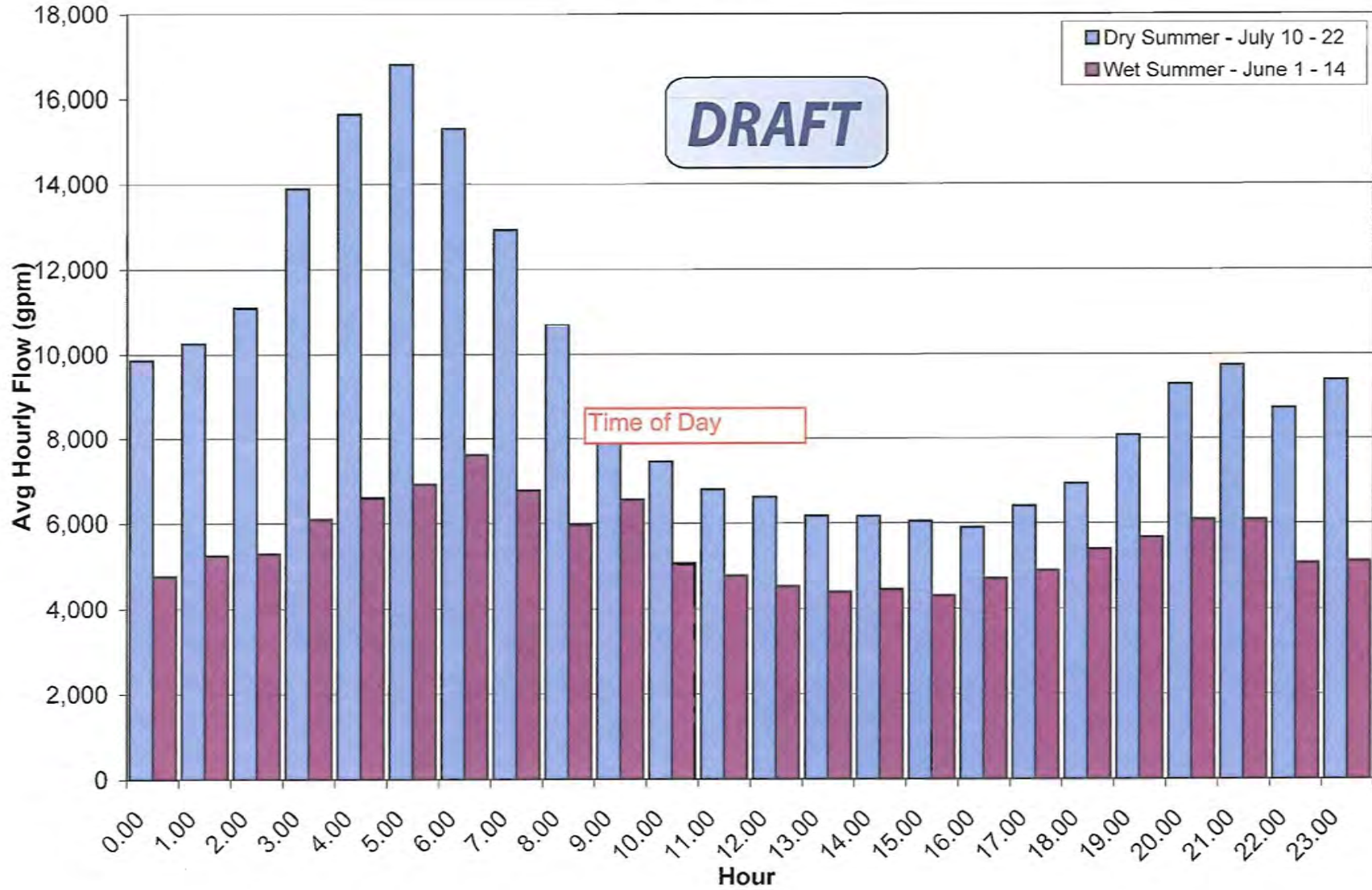
In an effort to reduce their peak water usage the City of Novi created a marketing plan. As part of this marketing plan, the City implemented an aggressive public education plan. This aggressive education plan along with the economic downturn resulted in drastically reduced peak water rates. Some of this reduction may be due to weather conditions or the economic downturn, however, part of the change is the timing of automatic sprinkler systems. Typically set at 6 a.m or 7 a.m. previously, now being asked to set them at 4 a.m. The shifting of the peak from 6-10 a.m. to earlier in the morning is evidence that the communities' actions are making a difference in water usage. This can be seen in the City's flow profile and a comparison of 2007 (pre demand management) and 2011 (post demand management) maximum day diurnal patterns (see Attached).

This shift in usage has allowed the City to decrease its DWSD contract capacities to save money. The City desires to continue its demand management practices and is interested in further decreasing peak usage in the future. The City has set aggressive goals in the DWSD contract (see attached Table) and Staff is poised to put forth the effort needed to meet these goals.

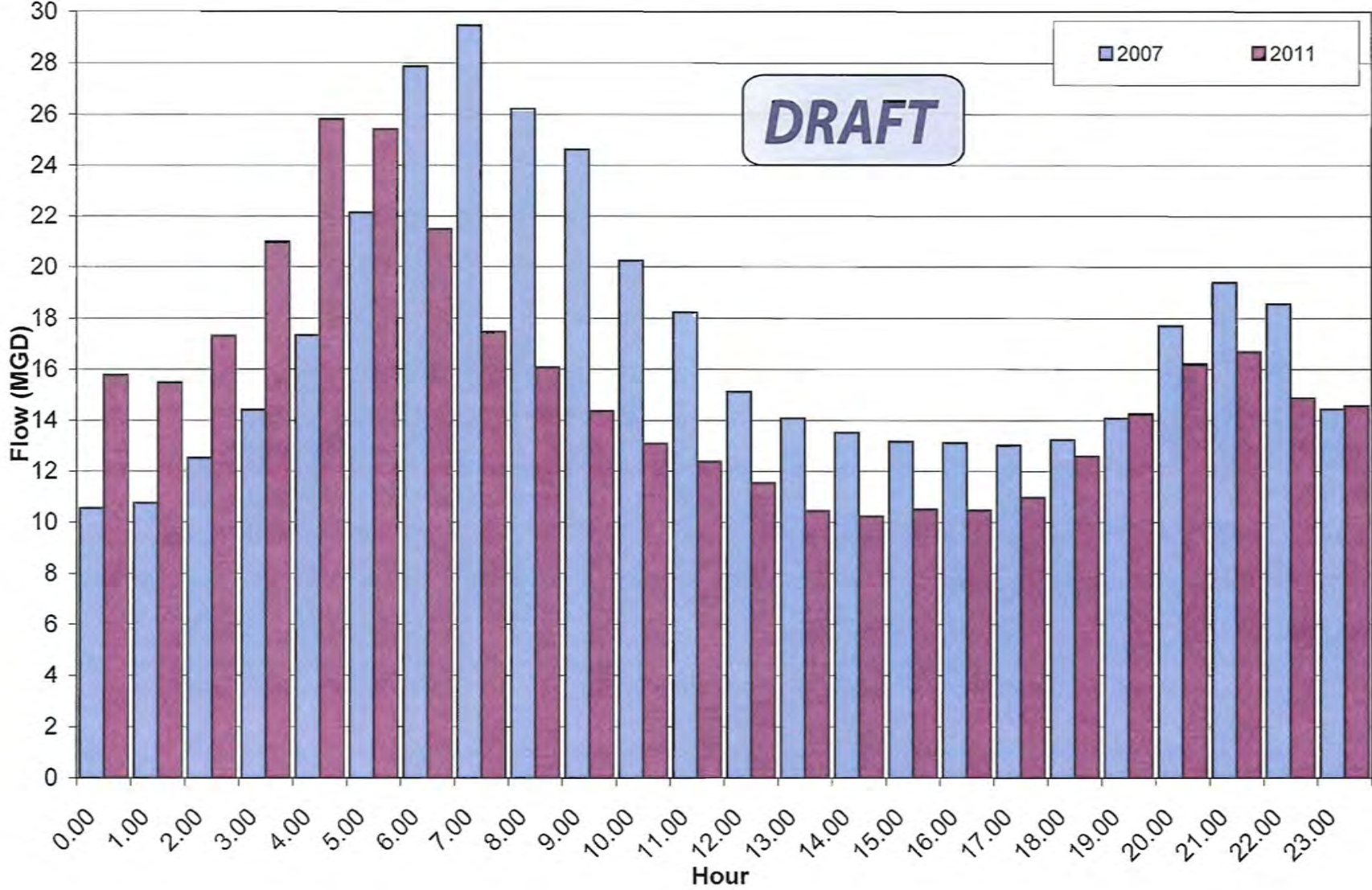
Diurnal Pattern - Summer vs Winter



Diurnal Flows



City Max Day Flows



CITY OF NOVI
Projected Contract Values

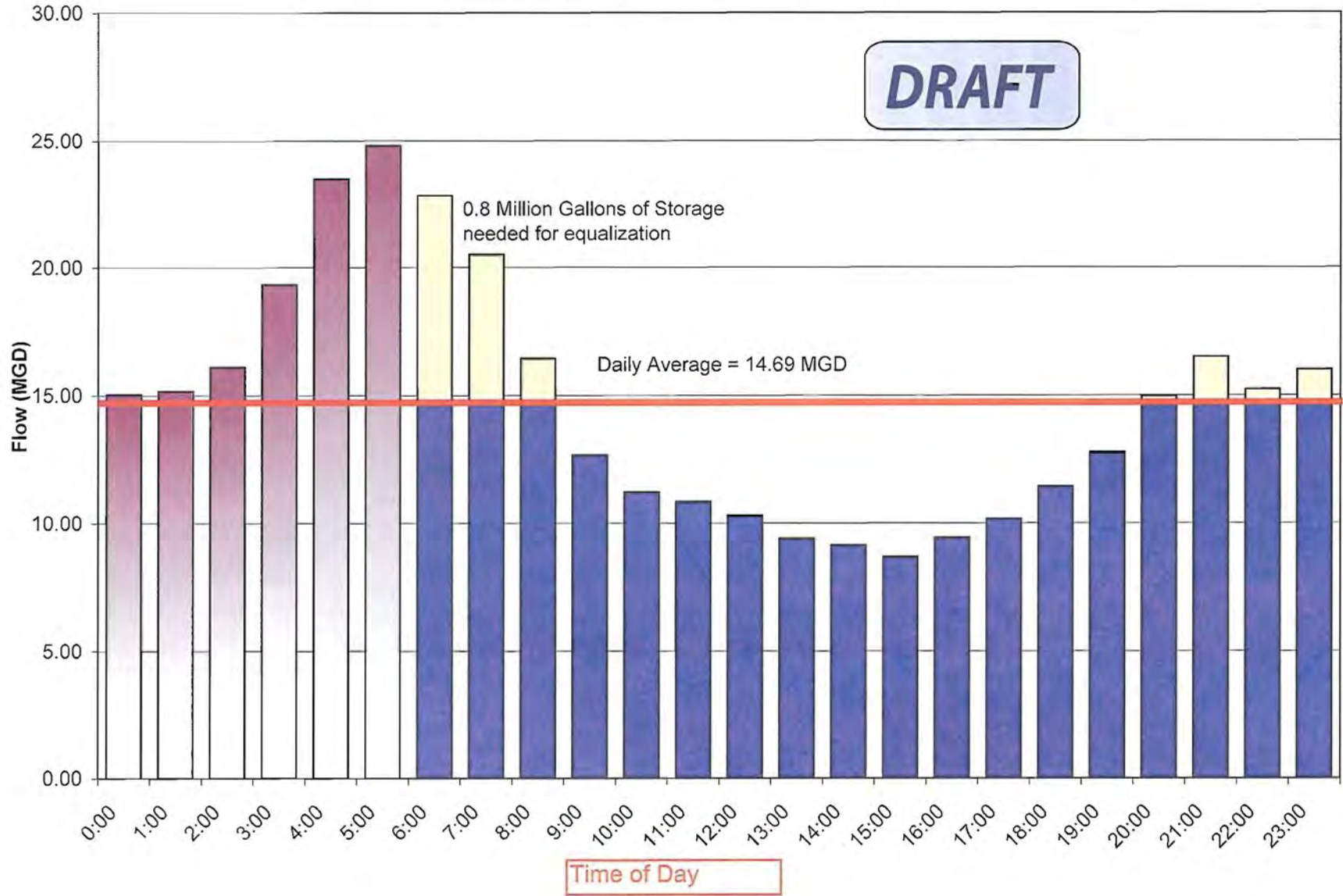
YEAR	Average (MCF)	Average Day (MGD)	Mx Day (MGD)	Pk Hr (MGD)
2011	281,800	5.78	17.30	25.50
2012	281,800	5.78	16.80	24.50
2013	281,800	5.78	16.30	23.50
2014	285,050	5.84	16.49	23.77
2015	288,300	5.91	16.68	24.04
2016	291,551	5.98	16.86	24.31
2017	294,801	6.04	17.05	24.58
2018	298,051	6.11	17.24	24.86
2019	301,301	6.18	17.43	25.13
2020	304,551	6.24	17.62	25.40
2021	307,802	6.31	17.80	25.67
2022	311,052	6.38	17.99	25.94
2023	314,302	6.44	18.18	26.21
2024	317,552	6.51	18.37	26.48
2025	320,803	6.58	18.56	26.75
2026	324,053	6.64	18.74	27.02
2027	327,303	6.71	18.93	27.29
2028	330,553	6.77	19.12	27.57
2029	333,803	6.84	19.31	27.84
2030	337,054	6.91	19.50	28.11
2031	340,304	6.97	19.68	28.38
2032	343,554	7.04	19.87	28.65
2033	346,804	7.11	20.06	28.92
2034	350,054	7.17	20.25	29.19
2035	353,305	7.24	20.44	29.46
2036	356,555	7.31	20.62	29.73
2037	359,805	7.37	20.81	30.01
2038	363,055	7.44	21.00	30.30

Appendix B
Storage Sizing

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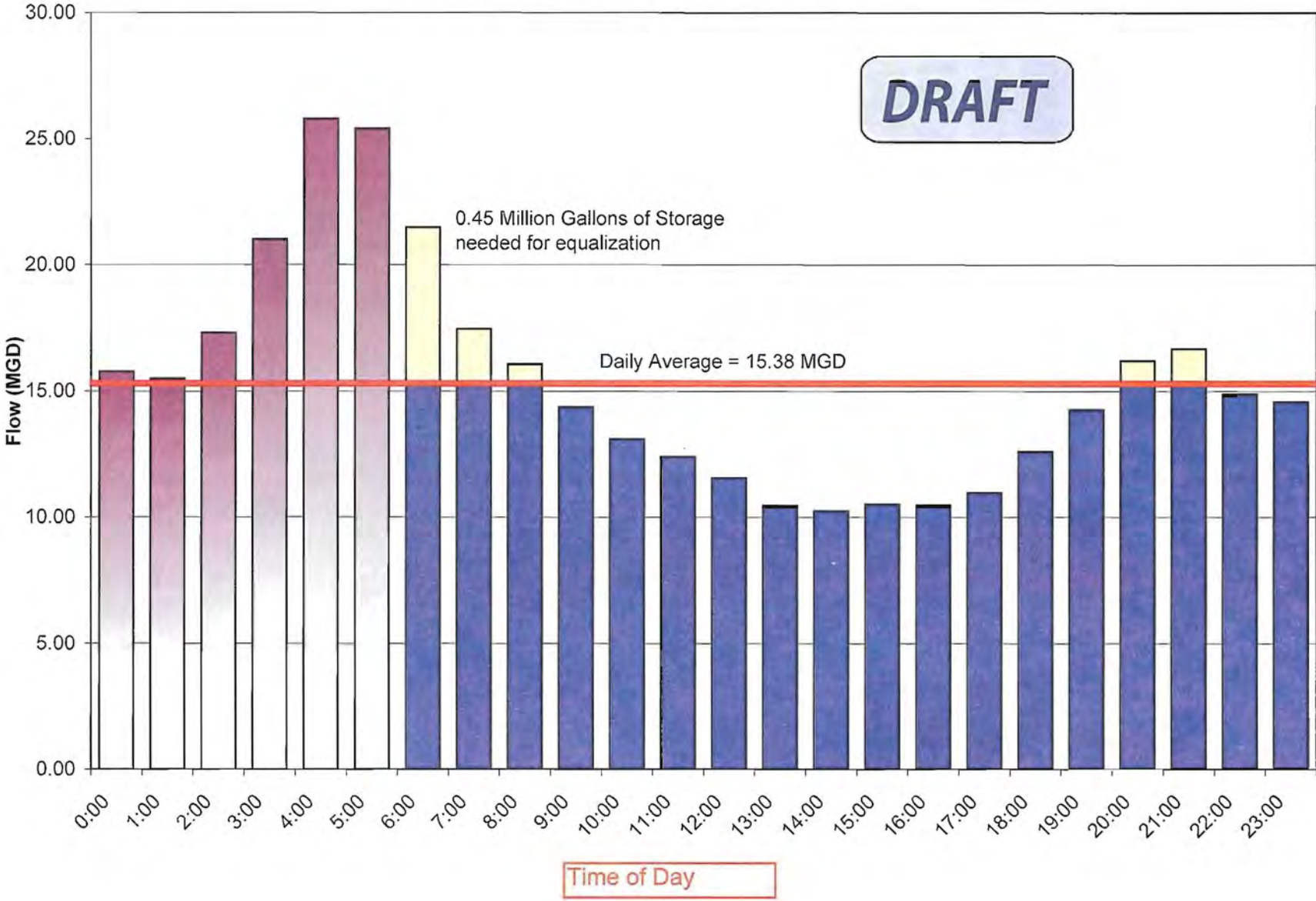
DWSD Maximum Day - July 21, 2011 EDT

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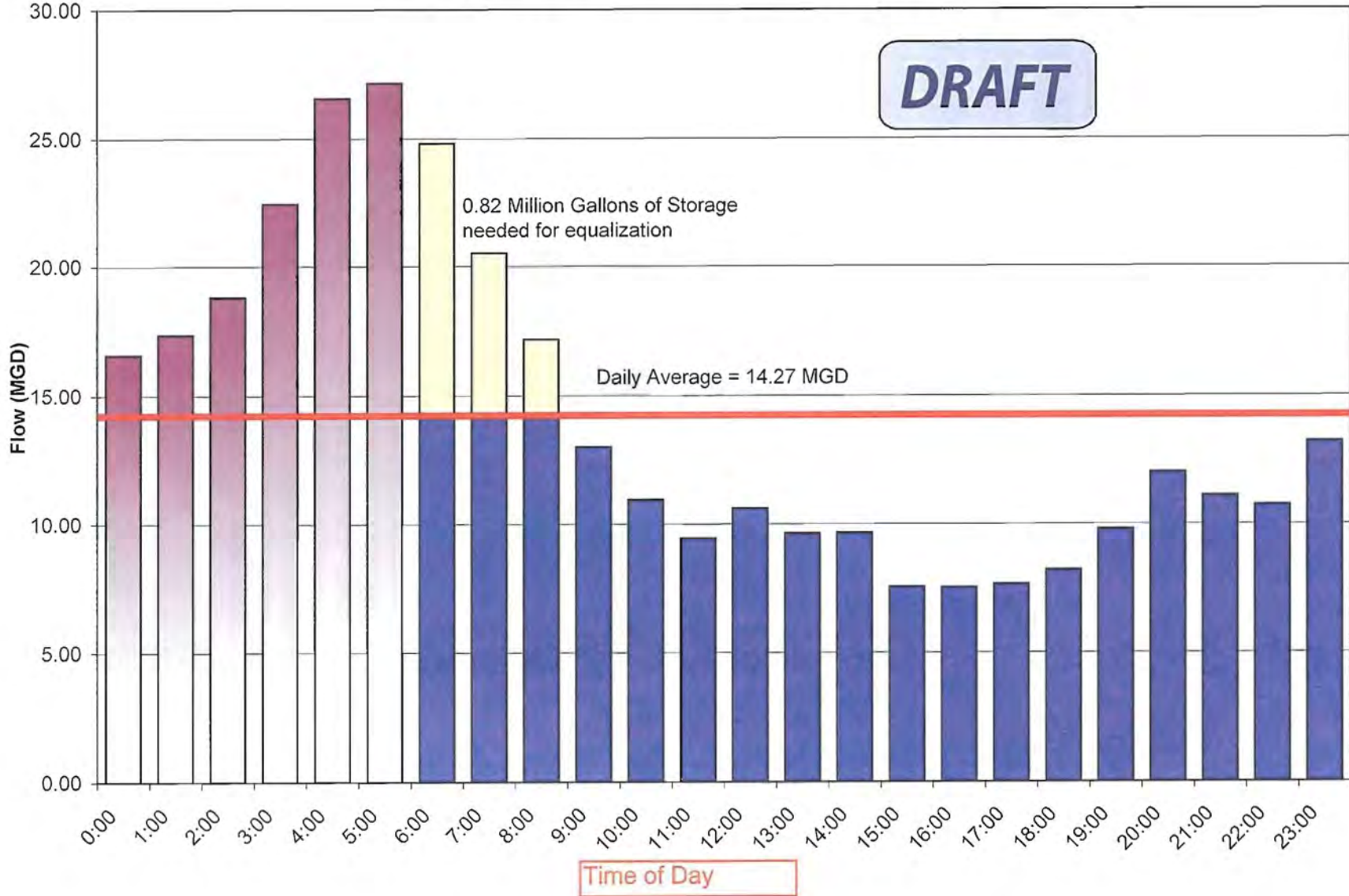
City Maximum Day - July 17, 2011 EDT

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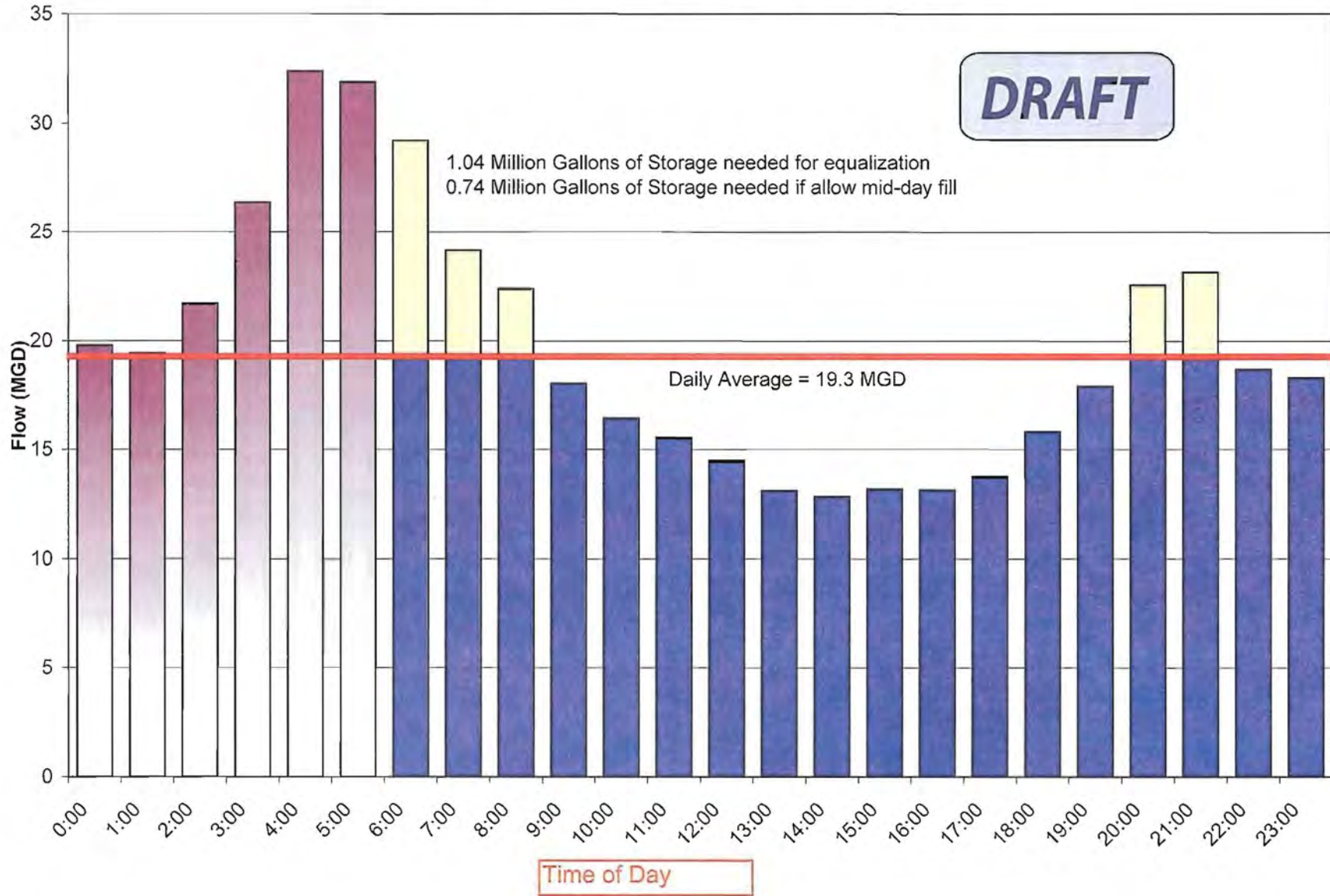


City Highest Peak Hour - July 22, 2011 EDT

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City Max Day Diurnal Shape - Future Demand Conditions



Appendix C
Storage Alternatives

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Storage Facility

The addition of storage and appropriate ancillary facilities to the City of Novi water system would enable the City to maintain a steady flow from DWSD by putting the flow into storage during low usage periods and draining from the storage tank during high usage. Essentially this allows the City to maintain a peak hour flow rate approximately equal to the maximum day flow rate. Utilizing the maximum day demand curve, it is estimated that a minimum of 0.8 million gallons storage would be required. Allowing for a typical safety factors a 1.0 million gallon storage facility is recommended. It is assumed that the 10% of growth projected in the master plan will maintain the same diurnal patten and the City could develop a mid day fill over time such that additional storage would not be needed in the future.

There are several alternatives for storage facilities within the City of Novi. Five (5) storage alternatives are addressed below.

Alternative 1A: 1.0 Million Gallon Ground Storage Tank \$4,500,000

This alternative involves a million gallon ground storage tank and 10.5 MGD booster pumping station located near West Park and 12 Mile Roads in quarter section 9SE. This storage tank is the equivalent to that sized in the 2008 master plan. The reduction in size is due to the City's demand management plan, elimination of some conservative assumptions and additional information from DWSD's automated water meter read (WAMR) website. The storage tank will be designed to fill at night between midnight and six in the morning in accordance with DWSD's exclusionary period. The station will pump from the storage facility during peak usage periods in order to limit the peak flow from the City.

Advantages of this alternative include low upfront costs, easy system control and the City owns the property at the proposed location. Long term concerns are the increased operation and maintenance cost associated with a pump station. Due to the high operational costs this alternative has a Total Present Worth for a 20 year projection of over \$7 million.

Alternative 1b: 3.0 Million Gallon Ground Storage Tank \$3,220,000

This alternative involves a three million gallon ground storage tank and 20 MGD booster pumping station located near West Park and 12 Mile Roads in quarter section 9SE. One million gallons will be allocated to the City of Novi and 2.0 million gallons allocated to Commerce Township. The storage tank will be designed to fill at night between midnight and six in the morning in accordance with DWSD's exclusionary period. The station will pump from the storage facility during peak usage periods in order to limit the peak flow from the City.

Advantages of this alternative include low upfront costs shared between two communities, easy system control, the City owns the property at the proposed location, and operations and maintenance costs will be shared between two communities. Long term concerns are the increased operation and maintenance cost associated with a pump station but this is mitigated between the two communities. There is also additional costs and maintenance associated with the interconnection between the two communities and potentially with the authority. Due to the high operational costs this alternative has a Total Present Worth for a 20 year projection of over \$13 million. The City of Novi's share of the storage costs is \$4.34 million.

Alternative 2: 1.0 Million Gallon Elevated Storage Tank Intermediate District \$5,320,000

This alternative involves a million gallon elevated storage tank located on the northwest portion of the City's Intermediate Pressure District (section 17). The storage tank will be controlled by the West Park Booster Pump Station and the three pressure reducing valves located between the High Pressure District and the Intermediate Pressure District. The desired long term goal for this district is to maintain a hydraulic gradeline (HGL) of 1,091 ft. Therefore, the storage tank will be 145 ft to top capacity line (TCL). The storage tank will be designed to fill at night between midnight and six in the morning in accordance with DWSD's exclusionary period. The station will drain by gravity from the storage facility during peak usage periods in order to limit the peak flow from the City.

Advantages of this alternative low operational (energy) costs and the potential to locate the storage facility on City owned property or negotiate with neighboring land owners for land acquisition. The controls for this storage facility may be complicated as the filling and draining will be controlled by four different devices. If this alternative is chosen, the City could look into the possibility of eliminating one or more of these connections as part of the Storage Tank Basis of Design. Another disadvantage of this alternative is the relatively high upfront costs compared to the ground storage tank and those options with costs shared with Commerce Township. This alternative has a Total Present Worth for a 20 year projection of \$4.57 million.

Alternative 3A: 1.0 Million Gallon Elevated Storage Tank High Pressure District \$6,910,000

This alternative involves a million gallon elevated storage tank located west of M-5 at an elevation of 1,000 feet in the High Pressure District within section 1. Two control valves will need to be added at the DWSD connection NV-04 and NV-05. The storage tank will be designed to maintain an HGL between 1,103 and 1,143 ft, which is a 140 ft to TCL. The storage tank will be designed to fill at night between midnight and six in the morning in accordance with DWSD's exclusionary period. The station will drain by gravity from the storage facility during peak usage periods in order to limit the peak flow from the City.

The advantage of this alternative is the low operational (energy) costs. The controls for this storage facility is less complicated than the storage alternative located in the Intermediate District but still involves two control valves at the DWSD connections. A disadvantage of this alternative is the relatively high upfront costs compared to the other alternatives. This alternative has a Total Present Worth for a 20 year projection of \$5.91 million.

Alternative 3B: 3.0 Million Gallon Elevated Storage Tank High Pressure District \$4,175,000

This alternative involves a three million gallon elevated storage tank located west of M-5 at an elevation of 1,000 feet in the High Pressure District (section 17). Two control valves will need to be added at the DWSD connection NV-04 and NV-05 in addition to the meter pit and control valve between Commerce Township and the City of Novi. The storage tank will be designed to maintain an HGL between 1,103 and 1,143 ft, which is a 140 ft to TCL. The storage tank will be designed to fill at night between midnight and six in the morning in accordance with DWSD's exclusionary period. The station will drain by gravity from the storage facility during peak usage periods in order to limit the peak flow from the City.

The advantage of this alternative is the low operational (energy) costs and the lowest total present worth calculation of all of the alternatives. The controls for this storage facility is less complicated than the storage alternative located in the Intermediate District but still involves two control valves at the DWSD connections and the connection to Commerce Township, which is not at the same hydraulic grade line at the City. Disadvantages include potential land acquisition and coordination with Commerce Township. This alternative has a Total Present Worth for a 20 year projection of \$3.43 million.

Alternative 4: Old Expo Center Elevated Storage Tank \$650,000

This alternative involves utilizing the existing Expo Design Center elevated storage tank located in the Intermediate district. The City is not aware of the size or elevation of the storage facility. The storage tank will be controlled by the West Park Booster Pump Station and the three pressure reducing valves located between the High Pressure District and the Intermediate Pressure District.

There are still too many unknown factors associated with this facility to know if it is a viable option. Assuming that the storage tank's elevation is sufficient for operation in the Intermediate Pressure District, there may be several advantages and disadvantages to this alternative. The advantages of this alternative are the low upfront costs and it utilizes an existing facility. Disadvantages include that the controls for this storage facility may be complicated and the storage facility may not be large enough to make the City of Novi a

maximum day customer. Another disadvantage is that while the storage facility may be obtained at minimal cost there are still significant costs associated with adding the control to the booster pump station, existing facility and the three pressure reducing valves. This alternative has a Total Present Worth for a 20 year projection of \$1.96 million assuming that there is no salvage value for the existing storage tank after an additional 20 years.

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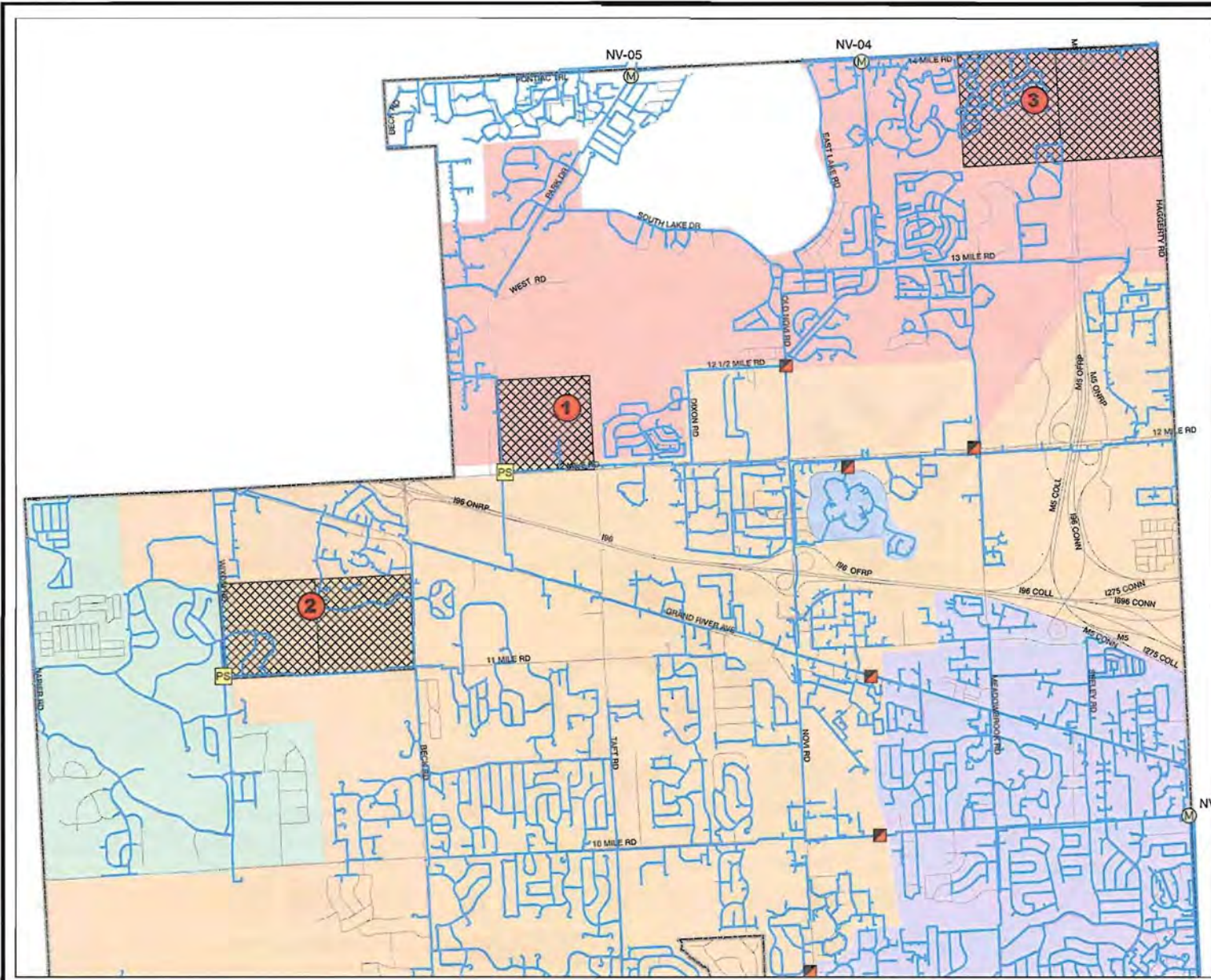
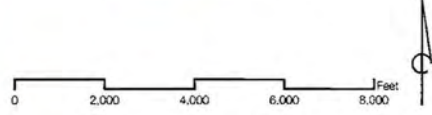


FIGURE C1 Site Locations

Water System Feasibility Study
City of Novi

- PRV
 - Meter
 - Pump Station
 - Water Main
 - SDE.Novi_QtrSectionLine
- Pressure Districts
- HIGH
 - INTERMEDIATE
 - ISLAND LAKE
 - LOWER
 - TWELVE OAKS



Source: Data provided by Oakland County and the City of Novi. Orchard, Hiltz and McCimant does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: Michigan South NAD 1983 State Plane International Feet
Map Published: October 5, 2011



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Appendix D
Water Rate Calculations

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Water Rates

The City's DWSD required revenue for fiscal year 2011-2012 is \$7.88 million or an equivalent rate of \$27.96 per 1,000 cubic feet (Mcf). This rate is based on an annual usage of 281,800 Mcf, a maximum day usage of 17.3 MGD and a peak hour usage of 25.5 MGD. Several scenarios were evaluated to determine potential cost savings associated with the implementation of the storage project.

A conservative scenario was developed by assuming that the DWSD estimate of 18.6 MGD for maximum day flow is reasonable and the peak hour flow would be equal to that of the maximum day. This peak usage reduction will be achievable with 1.0 million gallons in storage. The new revenue requirement for the City of Novi associated with the reduction in peak usage will be \$6.14 million or an equivalent rate of \$21.80 / Mcf. Based on the City's yearly usage for 2010-2011, the savings from this rate reduction would be \$1,735,000 annually.

Other scenarios were developed based on varying levels of conservative estimate of maximum day usage and more aggressive control of the flows through demand management. See Table below for the various flow scenarios.

Table 1: Revenue Requirements

Scenario	Revenue Requirements	Savings	% Reductions
FY 2011-2012	\$ 7,878,754		
Max Day 18.6	\$ 6,143,068	\$1,735,686	22%
Max Day 17.3	\$ 5,788,659	\$2,090,095	27%
Max Day 16.8	\$ 5,666,817	\$2,211,937	28%

The three scenarios evaluated primarily differ in the choice of the maximum day flow rate. The maximum daily flow rate is usually influenced quite a bit by irrigation practices. Continued diligence and enforcement of the City's mandatory grass watering ordinance controls is an important part of the above assumptions.

**Appendix E
Cost Estimates**

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City of Novi, Michigan
Storage Tank Feasibility Cost Analysis

	1.0 MG ground West Park & 12 <u>Alt 1A</u>	3.0 MG Ground 12 and West Park <u>Alt 1B</u>	1.0 MG Elevated Providence <u>Alt 2</u>	1.0 MG Elevated M-5 <u>Alt. 3A</u>	3.0 MG Elevated M-5 <u>Alt 3B</u>
Storage Tank (See Note 1)	\$755,000	\$1,560,000	\$2,040,000	\$2,050,000	\$5,100,000
Land Acquisition	\$0	\$0	\$0	\$330,000	\$330,000
Site Improvements for Storage Tank	\$100,000	\$100,000	\$75,000	\$100,000	\$100,000
Blasting and Painting Containment			\$120,000	\$120,000	\$0
System Controls			\$75,000	\$75,000	\$75,000
Altitude Valve	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000
Cathodic Protection	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
Booster Station	\$1,830,000	\$3,650,000	\$0	\$0	\$0
Distribution/Transmission Improvements	\$220,000	\$1,030,000	\$840,000	\$220,000	\$1,030,000
Control Valves					
NV-04 - New Vault and Control Valves	\$0	\$0	\$0	\$810,000	\$810,000
NV-05 - New Vault and Control Valves	\$0	\$0	\$0	\$810,000	\$810,000
PRV - 9	\$0	\$0	\$100,000	\$0	\$0
PRV - 7 & 11	\$0	\$0	\$100,000	\$0	\$0
PRV - 16 & 17	\$0	\$0	\$100,000	\$0	\$0
Subtotal Construction Costs	\$3,000,000	\$6,435,000	\$3,545,000	\$4,610,000	\$8,350,000
Contingency (20%)	\$600,000	\$1,287,000	\$709,000	\$922,000	\$1,670,000
Total Construction Cost	\$3,600,000	\$7,722,000	\$4,254,000	\$5,532,000	\$10,020,000
Engineering and Legal Costs (25%)	\$900,000	\$1,930,500	\$1,063,500	\$1,383,000	\$2,505,000
Total Project Cost	\$4,500,000	\$9,652,500	\$5,317,500	\$6,915,000	\$12,525,000
Novi Project Share	\$4,500,000	\$3,217,500	\$5,317,500	\$6,915,000	\$4,175,000

Notes:

- 1.) Assumes that suitable soil bearing pressure (5000-6000 psf) is available.

City of Novi, Michigan
Storage Tank Feasibility Cost Analysis

	1.0 MG ground West Park & 12	3.0 MG Ground 12 and West Park	1.0 MG elev Providence	1.0 MG M-5	3.0 MG Elevated M-5	Expo M-5
INPUTS	Alt 1A	Alt 1B	Alt 2	Alt. 3A	Alt 3B	Alt 3B
Design and Construction Costs	\$4,500,000	\$9,652,500	\$5,317,500	\$6,915,000	\$12,525,000	\$675,000
EPA Discount Rate (i) - less than 4% use 4%	4.000%	4.000%	4.000%	4.000%	4.000%	4.000%
Life Expectancy (lexp)	50	50	50	50	50	50
Cost Recovery Period - Years (n):	20	20	20	20	20	20

SALVAGE VALUE (Straight Line Depreciation)						
Constant Yearly Depreciation (Dx) (Design & Const Costs/lexp):	\$90,000.00	\$193,050.00	\$106,350.00	\$138,300.00	\$250,500.00	\$13,500.00
Value Remaining After 20 years (Vn = Dx*(lexp-n))	\$2,700,000.00	\$5,791,500.00	\$3,190,500.00	\$4,149,000.00	\$7,515,000.00	\$405,000.00
Present Worth Factor of Remaining Value: PWf = (1+i)^-n	0.4564	0.4564	0.4564	0.4564	0.4564	0.4564
Present Worth of Salvage Value (PWsalv=PWf * Vn):	\$1,232,244.75	\$2,643,165.00	\$1,456,102.55	\$1,893,549.44	\$3,429,747.90	\$184,836.71

OPERATION, MAINTENANCE and REPLACEMENT (OM&R)						
Present Worth Factor for uniform series of payments PWf = ((1+i)^n*-1) / (i * (1+i)^n)	13.59	13.59	13.59	13.59	13.59	13.59
Annual OM&R Costs						
Annual Operations Cost	\$79,500.00	\$79,500.00	\$24,000.00	\$24,000.00	\$28,000.00	\$0.00
Pump Station Replacement Cost (\$/year)	\$60,000.00	\$80,000.00				
Storage Tank Maintenance Cost (\$/year)	\$20,000.00	\$79,500.00	\$22,000.00	\$22,000.00	\$25,000.00	\$0.00
Valve Maintenance Cost (\$/year)	\$0.00	\$9,100.00	\$4,500.00	\$18,200.00	\$36,400.00	\$0.00
Annual Power Consumption	\$117,000.00	\$194,000.00	\$1,800.00	\$1,200.00	\$1,800.00	\$1,200.00
Projected Annual OM&R Costs (Aomr) - Total	\$277,000.00	\$442,000.00	\$52,000.00	\$65,400.00	\$91,000.00	\$52,000.00
Projected Annual OM&R Costs (Aomr) - Novi Share	\$277,000.00	\$147,000.00	\$52,000.00	\$65,400.00	\$30,000.00	\$52,000.00
Present Worth for OM&R: Pwomr = Aomr * PWf	\$3,764,520.40	\$1,997,777.97	\$706,696.97	\$888,807.34	\$407,709.79	\$706,696.97

TOTAL PRESENT WORTH						
Total Present Worth (Pwtot) = Design & Construction Cost + Pwomr - Pwsalv	\$7,032,276	\$13,016,259	\$4,568,094	\$5,910,258	\$10,331,972	\$1,196,860
Total Present Worth (Pwtot) - NOVI Share	\$7,032,276	\$4,338,753	\$4,568,094	\$5,910,258	\$3,443,991	\$1,196,860

City of Novi, Michigan
Storage Tank Feasibility Cost Analysis

Flow Scenario 1 (Q = 18.6 MGD) \$1,735,686

Alternative 1 - 1.0 Ground Storage Tank

Year	Investment (T=0)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Cost	-\$5,055,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000	-\$285,000
DWSD Rate Savings		\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686
Cumulative		-\$3,604,314	-\$2,153,628	-\$702,942	\$747,744	\$2,198,430	\$3,649,116	\$5,099,802	\$6,550,488	\$8,001,174	\$9,451,860	\$10,902,546	\$12,353,232	\$13,803,918	\$15,254,604	\$16,705,290	\$18,155,976	\$19,606,662	\$21,057,348	\$22,508,034	\$23,958,720	\$25,409,406
Net Cash Inflow	-\$5,055,000	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686	\$1,450,686
NPV	\$14,096,439																					
Rate	4.0%																					
Payback	3.5 years																					

Alternative 1b - 3.0 Ground Storage Tank

Year	Initial Investment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Cost	-\$3,077,500	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	\$1,47,000	
DWSD Rate Savings		\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	
Cumulative		-\$1,194,814	\$687,872	\$2,570,558	\$4,453,244	\$6,335,930	\$8,218,616	\$10,101,302	\$11,983,988	\$13,866,674	\$15,749,360	\$17,632,046	\$19,514,732	\$21,397,418	\$23,280,104	\$25,162,790	\$27,045,476	\$28,928,162	\$30,810,848	\$32,693,534	\$34,576,220	\$36,458,906	\$38,341,592
Net Cash Flow	-\$3,077,500	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686	\$1,882,686
NPV	\$21,643,093																						
Rate	4.0%																						
Payback	1.6 years																						

Alternative 2 - 1.0 Elevated Storage - Providence

Year	Initial Investment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Cost	-\$5,317,500	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	-\$52,000	
DWSD Rate Savings		\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	
Cumulative		-\$3,633,814	-\$1,950,128	-\$266,442	\$1,417,244	\$3,100,930	\$4,784,616	\$6,468,302	\$8,151,988	\$9,835,674	\$11,519,360	\$13,203,046	\$14,886,732	\$16,570,418	\$18,254,104	\$19,937,790	\$21,621,476	\$23,305,162	\$24,988,848	\$26,672,534	\$28,356,220	\$30,039,906	\$31,723,592
Net Cash Flow	-\$5,317,500	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686	\$1,683,686
NPV	\$16,888,791																						
Rate	4.0%																						
Payback	3.2 years																						

Alternative 3 - 1.0 Elevated Storage - 14 Mile

Year	Initial Investment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Cost	-\$6,915,000	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	-\$65,400	
DWSD Rate Savings		\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	
Cumulative		-\$5,244,714	-\$3,574,428	-\$1,904,142	-\$233,856	\$1,436,430	\$3,106,716	\$4,777,002	\$6,447,288	\$8,117,574	\$9,787,860	\$11,458,146	\$13,128,432	\$14,798,718	\$16,469,004	\$18,139,290	\$19,809,576	\$21,479,862	\$23,150,148	\$24,820,434	\$26,490,720	\$28,161,006	\$29,831,292
Net Cash Flow	-\$6,915,000	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286	\$1,670,286
NPV	\$15,177,627																						
Rate	4.0%																						
Payback	4.1 years																						

Alternative 3b - 3.0 Elevated Storage - 14 Mile

Year	Initial Investment	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Cost	-\$4,175,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	
DWSD Rate Savings		\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	\$1,735,686	
Cumulative		-\$2,309,314	-\$643,628	\$1,122,058	\$2,887,744	\$4,653,430	\$6,419,116	\$8,184,802	\$9,950,488	\$11,716,174	\$13,481,860	\$15,247,546	\$17,013,232	\$18,778,918	\$20,544,604	\$22,310,290	\$24,075,976	\$25,841,662	\$27,607,348	\$29,373,034	\$31,138,720	\$32,904,406	\$34,670,092
Net Cash Flow	-\$4,175,000	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686	\$1,765,686
NPV	\$19,058,893																						
Rate	4.0%																						
Payback	2.4 years																						



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September 29, 2011

To: Carrie Ricker Cox, P.E.
OHM
34000 Plymouth Road
Livonia, MI 48150

RE: **Elevated Budgetary Estimates for
Novi, MI (Rev 1)**

Dear Carrie:

Per your request, I have revised our budget pricing for the elevated water storage tank opportunity in Novi, Michigan as follows:

1000 MG x 140' TCL Waterspheroid - \$2,050,000 (40' Headrange)
1000 MG x 140' TCL Composite - \$2,040,000 (40' Headrange)
1000 MG x 145' TCL Waterspheroid - \$2,075,000
1000 MG x 145' TCL Composite - \$2,060,000
3000 MG x 145' TCL Composite - \$5,075,000 (50' Headrange)

Budget Pricing Includes:

- AWWA D100-05 Tank w/ Overflow Height as specified above
- Seismic Design - Zone 1, also compliance with IBC 2000
- Shop priming
- Epoxy/ Urethane Paint
- Spread Footing Foundation
- Basic Electrical
- Anchor Bolts (If Required)
- Ladders w/ safety climb
- SS Inlet (CS for WSO)
- SS Overflow to Grade (CS for WSO)
- Prevailing Wages

Alt. Site/Project Specific Items not Included

- Cathodic Protection
- Telemetry
- Piping Outside the Foundation
- Altitude Valves
- Valve Vault
- Site Work
- Tank Signage / Logo's
- Pile / Pier Foundation (< 4000 psf soil)
- Containment for Blasting and Painting



The global steel market is experiencing unprecedented price increases. The current market conditions make predicting material prices highly uncertain. The budget estimate offered herein is based on present day pricing and availability of materials, and may be subject to change outside of CB&I control.

Please be sure to add for any alternate site or project specific items that I have excluded above. If you should have any questions please contact me at (815) 439-3112. Thank you once again for your continued interest in CB&I.

Very Truly Yours,
CB&I

Mike Allison

Michael S. Allison
Business Development Manager

DRAFT