WHITEWATER TOWNSHIP BOARD
AGENDA FOR SPECIAL MEETING – NOVEMBER 17, 2022
1:00 p.m. at the Whitewater Township Hall
5777 Vinton Road, Williamsburg, MI 49690
Phone 231-267-5141/Fax 231-267-9020

At this time, the Board invites everyone to silence their electronic devices.

Whitewater Zoom is inviting you to a scheduled Zoom meeting.

Topic: Board Meeting
Time: Nov 17, 2022 09:00 AM Eastern Time (US and Canada)

Join Zoom Meeting
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Meeting ID: 893 5000 7756; Passcode: 467573
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Whitewater Township will provide necessary reasonable auxiliary aids and services to individuals with disabilities upon reasonable advance notice. Contact the Township Clerk at 231.267.5141 Ext. 24 at least 5 days in advance of the meeting.

A. Call to Order

B. Roll Call of Board Members

C. Set/Adjust Meeting Agenda

D. Declaration of Conflict of Interest

E. Public Comment. Any person shall be permitted to address a meeting of the township board. Public comment shall be carried out in accordance with the following board rules and procedures:
   1. Comments shall be directed to the board, with questions directed to the chair.
   2. Any person wishing to address the board shall speak from the lectern and state his or her name and address.
   3. Persons may address the board on matters that are relevant to township government issues.

4. No person shall be allowed to speak more than once on the same matter, excluding the time needed to answer board member's questions. The chair shall control the amount of time each person shall be allowed to speak, which shall not exceed five (5) minutes.

F. Agenda Items as Listed in the Special Meeting Notice

1. Feasibility Study – Township Facilities and Water Supply

G. Board Comments/Discussion

H. Public Comment

I. Adjournment

Whitewater Township will provide necessary reasonable auxiliary aids and services to individuals with disabilities who are planning to attend. Contact the township clerk at 231-267-5141.

Feasibility Study

Township Facilities and Water Supply
Whitewater Township

August 1, 2022

c2ae
architecture • engineering

123 W. Main St. Suite 200
Gaylord, MI 49735

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EXECUTIVE SUMMARY

Whitewater Township has performed a Township infrastructure and facility needs planning analysis including, but not limited to visioning, needs identification, infrastructure and facility conditional assessment, space and programing needs assessment, and specified asset feasibility analysis. In simpler terms, “what do we have”, “what do we need”, and begin laying out “how do we get there.”

The Township has experienced significant growth over the last several decades and anticipates this growth to continue. With growth is the need to address critical infrastructure and physical facilities to support the needs of community residences and businesses. Presently Township assets include; a township hall, a fire department, local roads, and numerous parks, trails, outdoor spaces and ancillary equipment. The purpose of this study is to: understand and document the vision of Whitewater Township; identify community needs; and address specific requested asset needs.

The planning process for community infrastructure and facilities needs analysis followed a nine step process of: visioning; needs identification (programming); design workshop (analysis); concept creation; schematic design; technical development; final design; final review; and final documents. To meet the Township’s request C2AE addressed the visioning and the needs identifications to facilitate an understanding of the “big picture” to help with all future planning and capital improvement endeavors. Additionally, to address more urgent community needs for water services and facility space, C2AE has developed a preliminary Township building programming and water system design.

The Township desired a sound, actionable, and fiscally responsible plan that supports Township residents and businesses with safe, reliable water for drinking and safety. The focus of this initial plan is limited to properties presently zoned industrial. However, design consideration was given to supporting future commercial, industrial and high density residential growth in both Whitewater Township and the far eastern end of Acme Township along the M-72 corridor from Bates Road to the west to Cook/Broomhead Roads to the east. Potential well field, storage and treatment needs were based on existing data and are preliminary in nature to assist in estimating potential capital costs.

The Township also was interested in a facility space analysis of their existing township hall and public safety facility. The Township desired a facilities plan that supports current government organization operating in these two specified buildings. The analysis focused on the preservation and potential redevelopment and/or readapting of current facilities, as well as the identification of and/or planning for new facilities to establish a framework for the anticipated Township needs.

TOWNSHIP FACILITIES PLANNING

Township Offices – 5777 Vinton Road

The current township office building was constructed in the late 19th century (1889) as a township office and is still in use today. It was expanded in the early 21st century with a small addition at the rear (west side) of the building for two private offices, a single occupancy ADA restroom, and mechanical room. The building is approximately 2400 sq. ft. and has been well maintained, however, has several physical challenges, such as its *size* (too small for staff needs and growth, proper storage, public hearings and voting, and social distancing (COVID)), *poor heating & cooling systems* (electric heating in ceiling/cooling with window units), and *age/construction* (requires routine maintenance, drafty windows, and old wood constructions viability for expansion and modification). The current building houses the Council Chambers/Meeting Room, Clerks Office (2 work stations), Clerk's storage (ballot, voting equipment, clerk records, etc.), single occupancy ADA Restroom, Treasurer's Office (shared with assessor & building inspector) with file storage, small Supervisors Office, and small Mechanical Room.

Programmatically the facility needs to potentially triple in size which would compromise the historic character and charm of the original structure. Also not ideal is the expansion of an old wood structure, though appears in good condition, with a wood framed addition to which we would recommend adding a fire suppression system (water) throughout. Increasing the current floor area by more than double would require the existing historic structure to be updated physically to all current building and life safety codes. Another important consideration is its current location in a residential neighborhood and whether relocation to a more 'civic' minded site would be best for the future of the townships growth and development.

The facility is serviced by an on-site water well, sewage drainage field, and single phase electrical power from Vinton Street. There is a natural gas utility line in Vinton Street, but the building is not 'hooked-up' at this time. The property is approximately 1.5 acres on the west side of Vinton Road. The parking lot is paved with HMA (blacktop) and has parking for 20+/- vehicles. There is no storm water collection system, so rain water sheet drains to the rear yard area. There are 3 large recycling bins along the west end of the parking lot.

The north 'half' of the property is vacant and could allow for a sizable building addition (triple current size) and an additional 20+/- parking spaces. This would maximize the site development with 75% to 80% lot coverage, but not allow for an open-air storm water detention basin, thereby mandating underground storage (more costly than 'open-air' basin storage). The expanded facility would require municipal water and sewer unless additional property was purchased to allow for the required setbacks/distancing, for a new water well and drain field areas.

Interviews with township staff has indicated a need for approximately 7700 sq. ft. for a new township administrative office building. It was also suggested that a separate 1200 sq. ft. (30 x 40') Maintenance Building should be included in planning. The new township administrative office building is roughly 3 sq. ft./capita which is well within the norm of new facility design practices and planning allowing for future growth along with the population. Population projections show Whitewater Township growing to roughly 3000 residents by 2040 (18 years) which seems somewhat conservative compared to the growth and development of nearby Traverse City/Acme areas and the village of Kalkaska along the M72 corridor.

Township staff also suggested the desire to combine the proposed new township office facility with the new fire station to potentially share some administrative functions, meeting area, and utilities. A single shared site would reduce the acreage and infrastructure needed for two separate sites further reducing the funding burden to township residents.
It is C2AE's recommendation to build a new township office facility in a commercial district, potentially in combination with the new fire department, and repurpose the current building into a Community Center for smaller gatherings/activities that are more appropriate for the surrounding residential neighborhood. A site size of 2.5 to 3.0 net usable acres is ideal for the new building of 7700 sq. ft. and parking for 35 cars, plus area for future expansion of 50% of gross floor area (3900 sq. ft.) and parking (15 spaces) and allow for open–air storm water retention and reasonable green space.

Township Fire Station #3 – 8380 Old M-72 Hwy

The Whitewater Township Fire Department Station #3 is nearing 48 years of age and has a total of 5000 sq. ft. and not nearly big enough to hold the current fire vehicles, equipment, and amenities needed for a modern fire department. The original structure is a 40' x 80' wood post frame structure ('pole-barn') that was expanded with an 1800 sq. ft. wood frame addition in 2017 across the back of the original structure (80'). The west end (20' +/-) of the fire station was remodeled the same time of the addition construction into a new Chief's Office, work/reports area with a restroom, kitchen, and dining area. The Apparatus Bay has four (4) 10'w x 12'h OVD's with power operators and houses the support equipment and general storage is along the back wall. The trucks are parked tight to the OVD doors to allow as much space behind for circulation and the support equipment, which is still dangerously tight. Gear lockers it kept on along the east wall with minimal space to access between them and the pumper/tanker truck. The trucks have to be backed in which is dangerous to firefighters present in the apparatus bay. There is no room for adequate support equipment storage necessary for a modern fire department to operate effectively. The west portion (20' +/-) of 2017 addition contains the Day Room and 2 bedrooms. The east 60' steps down into a Fitness Room (~20' x 20') with access to the heated garage for the smaller rescue equipment (boat/trailer, snowmobile/trailer, ATV/trailer, etc.).

The site is located along old M-72 (south side) within the former village of Williamsburg adjacent to the Williamsburg Cedar Rapids Cemetery to the east and the USPS service building to the west across a narrow driveway. A cellular phone tower is located immediately south of the fire station. There is a narrow gravel drive along the cemetery fence that allows access to the garage door (OHD) of the 2017 addition equipment storage garage. There are 3 parking spaces (FD staff & public) along the front of the building west of the apparatus bay doors with several more in the back. The building is served with municipal water and gas. There is a drainage field at the rear of the property adjacent to the cell tower enclosure. Electrical power available is single phase.

The front (north) of the fire station is only 20' south of the old M-72 R.O.W. (66') and trucks parked outside are just barely off the road. The site is ~120' wide by ~160' deep (0.44 acres) including the 50' x 50' area for the cell tower & perimeter fence. The small land-locked site cannot support any additional building expansion as it currently exceeds the allowable lot coverage criteria and is dangerously close to Old M-72 traffic.

Programming determined the need to effectively quadruple the size of the current fire station from 5000 sq. ft. to 19,300 sq. ft. It should be noted that the space needed to accommodate the station as it operates today should be at least 8000 sq. ft. using modern best practices fire station design guidelines. The current size of 5000 sq. ft. is woefully inadequate and the fire fighters are to be commended for working in such a cramped, i.e. unsafe, facility. EMS support, equipment, and staff areas are included in the programming and account for 3000 sq. ft. of the total floor area.

The site size required for a new Fire/EMS Facility of 19,300 sq. ft. (plus 50% future expansion of 9700 sq. ft.), 40 parking spaces (plus 50% increase of 20 spaces), adequate apparatus maneuverability and outdoor parking/display, open-air storm water detention basin(s), and reasonable green space should be in the range of 5.0 – 5.5 net acres (not including R.O.W.'s or any restrictive easements).

New Site Requirements

A combined facility of Township Offices (11,600 sq. ft. and 45 parking spaces with 50% future expansion); Fire/EMS Facility (29,000 sq. ft. and 60 parking spaces with 50% future expansion); and new Maintenance Building (2400 sq. ft. with 100% future expansion) would require a new site to support a total of 43,000 sq. ft. of building and 110 parking spaces, along with the other considerations/zoning requirements mentioned above. A site of 7.5 to 8.5 net usable acres with a depth of no less than 500' (i.e. 660' to 800' long x 500' deep) would be adequate to support such a development.

Initial development will consist of the Township Administration Office (7700 sq. ft. with 30 parking spaces), the Maintenance building (1200 sq. ft. with 5 parking spaces), and the Fire Station (19,300 sq. ft. with 40 parking spaces) for a total of 28,200 sq. ft. with 75 parking spaces.

Budget Costs

New administrative office project costs range from $500/sq. ft. to $550/sq. ft. for good quality construction materials and systems. The new maintenance building project costs range from $200/sq. ft. for a heated wood pole-frame structure to $250/sq. ft. for a PEMB structure. New fire station project costs in this region, post pandemic, range from $375/sq. ft. for simple PEMB (Pre Engineered Metal Building) to $425/sq. ft. for conventional construction with higher quality materials and systems. These are “all-in” costs which include FF&E, project contingencies, out-of-pocket owner costs (insurances, permits, approvals, testing, commissioning, geo-tech, site survey, etc.), and professional fees. Therefore, the project budget will range from $10.5M to $12.0M not including site purchase costs, inflationary cost increases, required off-site utility extensions, or required roadway improvements.

WATER SUPPLY FEASIBILITY

Part of a community's vitality is the stability of its commercial and industrial base. The foundation of economic development and growth is based on retention, expansion and attraction. When it comes to commercial and industrial business leaders and decision makers often the availability of public infrastructure such as drinking water, sanitary sewer, and transportation network loom large in site selection and growth.

It is the Township's desire to develop a sound, actionable, and fiscally responsible plan that supports Township residents and businesses with safe, reliable water for drinking and safety. The focus of this initial plan is limited to properties presently zoned industrial. However, consideration is given to supporting future commercial, industrial and high density residential growth in both Whitewater Township and the far eastern end of Acme Township along the M-72 corridor from Bates Road to the west to Cook/Broomhead Roads to the east. It is our understanding that initially the water system would be comprised of approximately 250 connections with an additional 1,200 connections in the future for a total of 1,450 users. Additionally, the township would like firefighting capabilities.

Any public water system is generally comprised of three main elements; supply, storage and distribution. Water supply and storage are interdependent as the storage volume necessary is somewhat dictated by the supply rate. The distribution system is typically driven by demand rate and fire flow requirements.

Supply

There are limited options for water supply consisting of the following:

1. Township development of their own ground water supply via wells and potential treatment.
2. Establishing an agreement to purchase water from an existing water system

Groundwater Wells

The availability of groundwater will dictate what firm capacity can be provided and whether or not fire protection can be provided directly from wells or if elevated storage is necessary to meet fire demand. For purposes of this feasibility study, it is assumed that a firm capacity of 200 to 500 gallons per minute (GPM) is the target for the proposed well field. As part of this study, area water well records and geologic information have been reviewed to assess the potential for developing water wells capable of yielding 200 - 500 GPM on property owned by the Whitewater Township. Two township-owned parcels were considered: 1) the park property located on the north side of M-72 and west of Elk Lake Road; and 2) an approximate 11-acre vacant parcel located on the east side of Elk Lake Road, south of Clam Road. Based on the dimensions of the park property, it does not appear that developing a well field there allows maintaining the

State-required 200-foot isolation distances to property lines. Consequently, the park is not being considered for developing the well field. The 11-acre parcel has sufficient room to develop a two or three-well field to supply the township.

According to the Michigan Department of Environment, Great Lakes and Energy (EGLE) GeoWebFace web site, the glacial geology of the area around Williamsburg consists of end moraines of coarse textured glacial till. These deposits are described as gray to grayish brown or reddish brown non-sorted glacial debris. The matrix is dominantly sandy clay loam to silt loam texture, with variable amounts of cobbles and boulders. Locally the deposits resemble outwash except for sporadic occurrence of non-sorted clayey or silty lenses and lack of stratification, with varying amounts of cobbles and boulders. These occur in narrow linear belts of hummocky relief marking former stillstands of ice-contact margin. The deposit may include small areas of ground moraine as well as glacial outwash. Glacial deposits in the northern part of the township are shown as being coarse textured glacial till, which have similar matrix as the end moraines but lack the hummocky relief. Glacial outwash and post-glacial alluvium are shown being present in the southern part of the township.

Review of area water well records indicate that the glacial deposits are comprised of interbedded sand, gravel, and clay. Residential wells are generally completed at depths between 90 and 120 feet. The water well at Turtle Creek Casino is completed at 313 feet and is screened within a sand deposit that is present from 280 to 313 feet. A Type II well (also listed as an irrigation well on the well record) at High Point Development (5500 Bates Road) is completed at a depth of 234 feet and encountered sand from 120 to 234 feet. An irrigation well located at 7464 Crisp Road is completed at a depth of 223 feet and encountered sand from 203 to 223 feet. Static water levels vary from less than 10 feet to more than 50 feet below grade and are dependent on the elevation of the property and which aquifer is tapped by the well. Water level in the well at the Whitewater Township ball park was 21 feet below grade when completed. Copies of the well records can be found in the Appendix B

The water well records reviewed show that the glacial geology is highly variable throughout the area. There are significant thicknesses of aquifer material present in several wells in the area. The well at the casino tested at 380 GPM, the well at 5500 Bates Road tested at 300 GPM, and the Crisp Road well tested at 100 GPM. This information suggests that there is a reasonable expectation that a 200+/- GPM and possibly up to 500 GPM well can be developed. It will be necessary to drill a test hole at the proposed well field location to make the final determination if adequate aquifer material is present to supply the Township's needs. In general, the process for establishing a groundwater supply consists of the following:

1. Drill test holes at each proposed production well site for collection of formation samples for design of the well screens and filter pack.
2. Drill a test well and pump at a rate equal to 150% of the desired well capacity for an aquifer test.
3. Collect water samples for testing
4. Complete a hydrogeological report for the well field including field data, maps, geology cross sections, maximum yield, pumping levels and potential interference with other area water users
5. While not required by regulations it is highly recommended that a Wellhead Protection Plan be developed for the well field.

Purchase Water from an Existing System

The only system in the vicinity which offers an opportunity to purchase water is the one developed by the Grand Traverse Band of Ottawa and Chippewa Indians. The casino has a Type I water supply that is equipped to provide 300 GPM to the Turtle Creek Casino & Hotel and some other nearby areas. The production well (and it is assumed that there is a backup well of equal capacity) is equipped to pump 300 GPM. The well was tested after completion at a rate of 380 GPM for eight hours with the resulting pumping level recorded at 194 feet. The well screen installed in that well has an estimated transmitting capacity of 500 GPM. In order for the township to use this water supply, it would be necessary for the township to demonstrate to EGLE that the water supply meets the requirements for a municipal supply (even though that may not be required for wells on tribal lands). The first requirement would be to run an EGLE-acceptable aquifer test (minimum of 24-hour pumping period with 8 hours of pre-test data and 8 hours of recovery data. If the aquifer test data proved that the wells were capable of yielding the total desired volume of water, the wells at the casino would have to be reconfigured to supply the increased demand.

Using the specific capacity of the casino well (2.69 GPM per foot of drawdown), the well at the casino has a theoretical maximum capacity of 600+ GPM, however, the actual maximum capacity would be limited to the well screen transmitting capacity, which is 500 GPM. We do not know the casino's actual usage rate, but would assume they equipped their wells to supply the needed demands. Additional work needs to be done to assess the casino's actual usage, but it would appear, at a minimum, the wells would have to be tested at the combined rate for the casino and township to meet EGLE requirements, and new pumps capable of the increased pumping rate would be required. Obviously, connection to the casino system will require an agreement between the Township and the tribe. We recommend discussing the option with EGLE early on to determine their specific requirements.

Water Storage

Water storage facilities are integral to a public water supply system and provide the following contributions:

1. Provide positive pressure for the water system.
2. Provide the water needed when demand exceeds the supply capacity (e.g. peak hour usage)
3. Provide water for fire fighting
4. Emergency volume to maintain positive water pressure in the event of an emergency (e.g. water main break)

In order to provide and maintain positive water pressure the tank will need to be located at an elevation higher than the system distribution. This can be accomplished via terrain relief or be constructed as an elevated tank on a pedestal.
For the Whitewater Township system we'll assume a supply capacity of 250 GPM. As the actual user types are not fully established we've assumed 1.3 Residential Equivalent Users (REU) per connection and a water use of 250 gallons per day (GPD) per REU. This results in an average day demand of 81,250 GPD or approximately 60 GPM. Applying a peaking factor of 4, we arrive at a peak hour use of 240. With a supply rate of 250 GPM the supply would be capable of meeting peak hour demands under the initial conditions.

With peak hour demands being met by supply, the initial required storage volume will be what is needed to maintain positive pressure and fire flows. Typical fire flows for these types of systems is 2,500 GPM for a period of two hours to fight a fire. Therefore, the volume of water needed for firefighting purposes is 300,000 gallons. For the initial conditions the storage facility volume required is 300,000 gallons.

In the future buildout of 1,450 connections the peak hour demand rises to 1,300 GPM. This value exceeds the supply available and therefore the storage facility will need to supplement the supply during peak hour demands and have capacity for firefighting. Using the fire flow rate of 2,500 GPM, the peak demand rate of 1,300 GPM and an emergency volume of 30,000 gallons the total system water storage needs rises to approximately 585,000 gallons. Therefore, at full buildout in the future an additional water storage tank with a volume of at least 300,000 will be needed.

Distribution

According to Ten States Standards, the minimum water main size for systems providing fire protection is six inches. However, the headloss (i.e. pressure drop) in a 6-inch water main during fire flows of 2,500 GPM is approximately 15 pounds per square inch (psi) per 100 feet of length. This level of pressure drop is too high to provide any reasonable fire flows. In comparison, the headloss in a 12-inch water main is approximately ½ psi and is the reason that most modern water systems utilize a minimum 12-inch water main for transmission with smaller mains, typically 8-inch, as it enters smaller areas like subdivisions etc. In commercial and industrial areas, the smallest main is typically 12-inch.

For the Whitewater system, 12-inch mains are used for the initial phase as it will be supplying primarily commercial and industrial users. Future expansion areas may be reduced to 8- inch depending on user type and demands.

Cost Estimate

Project: Whitewater Water Distribution
Preparer: C2AE
Date: July 2022

Item	Description	Unit	Qty.	Unit Cost	Total
	Water System Upgrades				
1	12" Dia, DIP Water Main	LFT	29,000	$ 70	$ 2,030,000
2	12" Dia, Gate Valve	EACH	39	$ 2,800	$ 109,200
3	1" Diameter Tapping Saddle & Corporate Stop	EACH	250	$ 500	$ 125,000
4	1" Diameter Type K Service Lead	LFT	4,493	$ 30	$ 134,790
5	1" Diameter Curb Stop & Box	EACH	123	$ 500	$ 61,500
6	Hydrant Assembly	EACH	49	$ 4,300	$ 210,700
7	Well	EACH	2	$ 170,000	$ 340,000
8	300,000 Gal. Elevated Storage Tank	EACH	1	$ 2,400,000	$ 2,400,000
	Additional Costs			Subtotal	$ 5,411,190
				Contingency	$ 1,352,798
				Legal	$ 270,560
				Engineering	$ 1,014,598
				Total	$ 8,049,145

APPENDIX A

	Space Name	Size (SF)	Qty	Subtotal	Adjacency	Notes
1	Vestibule/Lobby	200	1	200	Parking	Waiting area for 3-4
2	Public Restrooms	150	2	300	Conf./Training	2 Lavs, 2 W.C.'s each
3	Training/Jt.Task Force Rm	800	1	800	Lobby/RR's	25 at tables & chairs, Emergency Shelter, multi-purpose
4	Table/Chair/Equip. Storage	300	1	250	Training Rm.	CPR mannequin/equip.
5	Janitor Closet	50	2	100	Vest./App. Bay	1 Public side/1 FF side
6	Administrative Asst./Recept.	100	1	100	Vestibule	
7	Offices	150	5	750	Vestibule	Chief, EMS Dir., Fire Marshall, Central Emer. Office. w/library, Study/Future Office
8	Work/Supplies Room	150	1	150	Study, Offices	paper storage, MFP
9	Conference room	200	1	200	Offices	6 - 10 people
10	File Room	150	1	150	Offices	1+ 2 + 1, 12 lateral files
11	Staff Restroom	75	1	75	Offices	
12	Kitchen	150	1	150	Day Rm/Dining	commercial quality w/island
13	Pantry	50	1	50	Kitchen	
14	Dining area	150	1	150	Kitchen/Day Rm	8 people
15	Patio - outdoor	150	1	0	Day Rm/Dining	outdoor dining
16	Day Room	250	1	250	Dining/Dorm	6 recliners, TV
17	Dorms	125	4	500	Day/Apparatus	bed, desk, three wardrobes for shifts
18	Shower Rooms	100	2	200	Dorms/Fitness	changing plus unisex shower
19	Fitness	800	1	800	Dorms	12 pieces
20	Aux. Lockers	100	1	100	Dorms/Fitness	
21	Apparatus Bay (Fire)	1,620	4	6,480		pull thru, two deep, utilities, exhaust capture, 90' L.
22	Apparatus Bay (EMS)	540	2	1,080		pull thru two deep, 60' L., or side by side
23	Reporting	100	1	100	Apparatus Bay	2 people at counters/pc's (alcove fine)
24	Dispatch	100	1	100	Reporting	Combine w/Reporting OK
25	EMS Storage	150	1	150	EMS Bay	comsumables
26	Workshop (fire)	150	1	150	Apparatus Bay	tools, bench, air compressor
27	Decon	100	1	100	Apparatus bay	Eyewash station
28	Gear Storage	150	1	150	Apparatus Bay	mezzanine, 28 sets
29	Fire Storage	200	1	200	Apparatus Bay	consumables
30	Hose Storage	150	1	150	Apparatus Bay	good ventilation, (50) 50' segments, (5) 100' of 5"
31	SCBA	100	2	200	Apparatus Bay	near outside, room for future breathing air cascade system, also compressor for oxygen
32	Gear Wash	100	1	100	Apparatus bay	gear and laundry (commercial W/D)
33	Turnout gear lockers	200	1	200	Apparatus bay	20 lockers full and part time
34	MDF	50	1	50	Office Area	
35	Mechanical	150	1	150		water heater/boilesr/water softener(?)
36	Electrical	150	1	150		
37	FP Riser	50	1	50	Mechanical	sprinkle building
38	General Storage	400	1	400	Everywhere	Office area, Day room, Dorms, App bays (mezzanine?)
39	Outdoor Equip. Storage	150	1	150	Apparatus bay	lawn equipment
	Net Total			15,385	Square Feet	
	25% Net to Gross			3,846	Square Feet	
	Grand Total			**19,231**	**Square Feet**	
	Assume a program area of ~19,300 square feet					
	Site					
	Common site with new Township Offices (separate FF/EMS truck circualtion from Township office/public)					
	Site needs to be large enough to support 'drive-thru' apparatus bays					
	FF, EMS, Public, Training/Conf. Rm: 40 parking spaces					

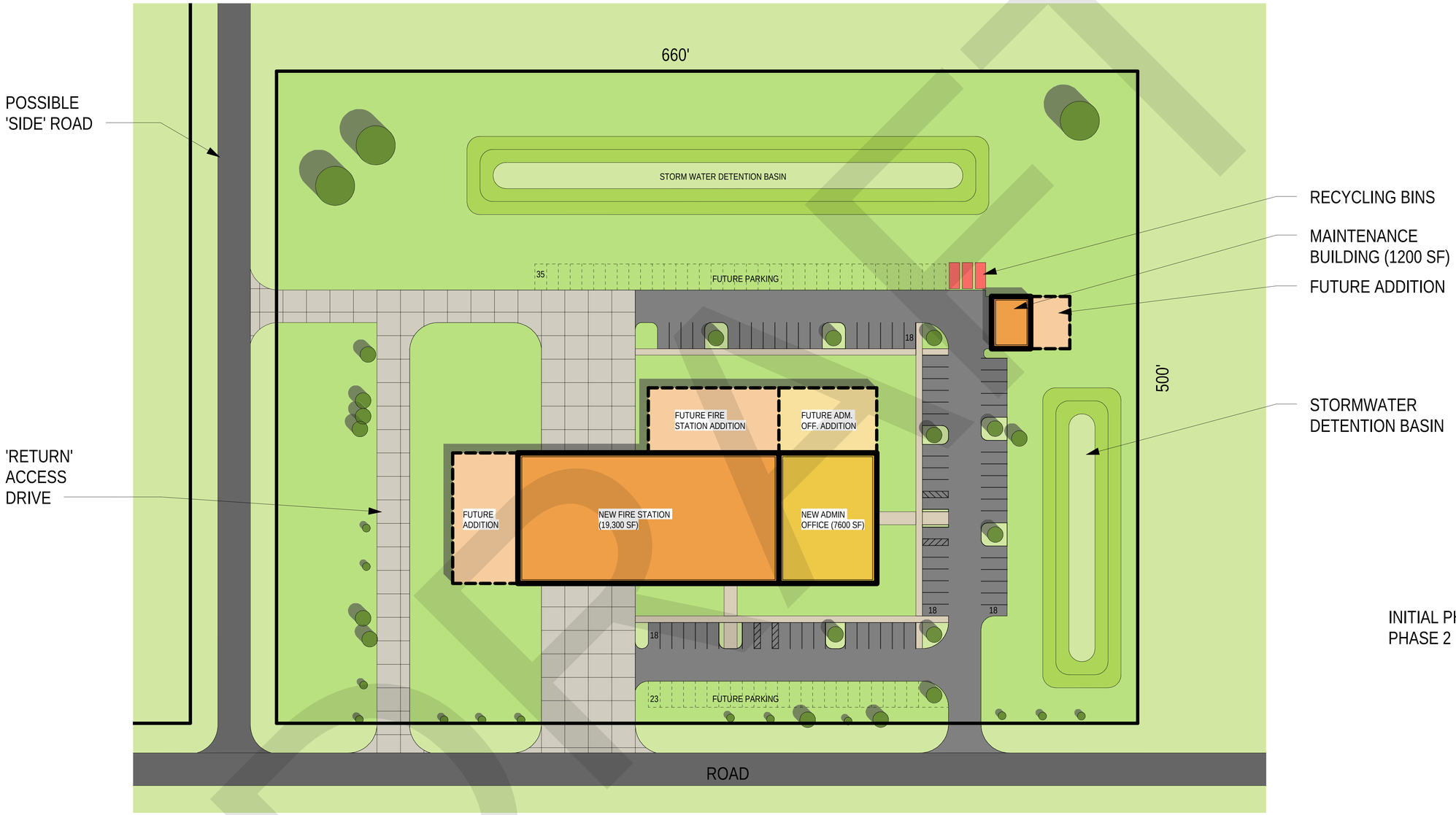
Notes

See Township Office Program for additional site details

	Space Name	Size (SF)	Qty	Subtotal	Adjacency	Notes
1	Vestibule	100	1	100	Parking Lot	Front (Public) Entry Air lock
2	Utility/Janitor Room	100	1	100	Vestibule	Jan. sink, front door maintenance equip/supplies
3	Lobby/Waiting	200	1	200	Vest/Council	4-6 seating w/Security Doors (elec. locks)
4	Public Restrooms	150	2	300	Lobby/Council	2 Lavs/2 W.C.'s each
5	Council/Comm./M.P. Room	1,000	1	1,000	Restrooms	Bench (8 seats), public seating for 50, 16 voting stations
6	Reception/Service Counter	100	1	100	Offices/Lobby	Roll up shutter or glass for security (future receptionist)
7	Open Office	125	6	750	Recept/Offices	Centrally located to private offices: Deputy Clerk & Asst.; Building Insp./ Assessor; Future work stations (2)
8	Offices	200	4	800	Open Offices	Supervisor, Clerk, Treasurer/Dep. Treas., Future/Swing (Public Works) w/ quick access File Storage in each office
9	Small Staff Conference Rm	125	1	125	Office area	4 - 6 people
10	Work/Supplies Room	200	1	200	Office area	Office Supplies, MFP, coffee (w/sink)
11	Conference/AVCB room	300	1	300	Office area	10 - 12 people/AVCB equipment (w/restroom?)
12	MDF	100	1	100	Office area	
13	Mechanical	150	1	150		water heater/boiler/water softener(?)
14	Electrical Service & Panels	100	1	100		
15	File/Vault/Records Room	300	1	300	Clerks Office	Accessed thru Clerks Office for security, incl. election pole equip. & ballot records
16	File/Vault/Records Room	150	1	150	Treas. Office	Accessed thru Treasurer Office for security
17	General Storage	300	1	300	Mech/Elec Rms	
18	Staff Break Room	200	1	200	Office area	Kitchenette & tables for 4-6
19	Table & Chair Storage	200	1	200	Council Room	
20	Assessor/Bldg. Insp. Stor.	100	1	100	Open Offices	Flat Files for blue prints & File Cabinets
21	Staff Restroom	75	1	75	Office area	Single Occupancy
	Net Total			5,650	Square Feet	
	35% Net to Gross			1,978	Square Feet	
	Grand Total			**7,628**	**Square Feet**	
	Assume a program area of 7,700 square feet					
	Site					
	Ammenities					Bike rack, picnic benches, recycling, drop boxes, etc.
	Twp. Maintenance Building	1200	1	1,200		Future (in Current Fire Barn Addn., or New 30'x40'?)
	Utilities Available					Power, sanitary, water, gas, B-U Generator
	Refuse Enclosure					For waste bins
	Storm Water Detention					On-site basin (underground if site limited)
	Parking					Staff, visitors, public, council/community room (25 cars)

Notes

Limit public access to Lobby, Council/Community/Multi-Purpose Room & Public Restrooms
Potential Emergency Shelter in Coucil/Community/Multi-Purpose Room?
Combined with new Fire Station?
Plan for future expansion of both uses
Repurpose current Twp. Office and Fire Station buildings



INITIAL PHASE PARKING: 72 CARS
PHASE 2 PARKING: 58 CARS

HYPOTHETICAL SITE PLAN
SD_102

WHITEWATER TOWNSHIP
HYPOTHETICAL SITE

c2ae
architecture • engineering

APPENDIX B

Initial Condition:		
No. Connections	250	
REU/Connection	1.3	
Total REU	325	
Flow per REU (GPD)	250	
Average Day Demand (GPD)	81,250	
Peak Hr Demand (gpm)	226	
Well Supply Firm Capacity (gpm)	250	
Fire Flow Req'd (gpm)	2,500	
Duration (hrs)	2.0	
Volume (gallons)	300,000.0	
Well Qty Available at Peak Hour (gpm)	24	
Well Volume Available for Fire Flow (gal)	2,917	
Recommend 300,000 gallon storage		
Future Conditions:		
No. Connections	1,450	
REU/Connection	1.3	Estimated
Total REU	1,885	
Flow per REU (GPD)	250	Estimated
Average Day Demand (GPD)	471,250	
Peak Hour Demand (gpm)	1,309	Peaking Factor of 4
Well Supply Firm Capacity (gpm)	250	Ed's notes
Peak Hour supply Needed from Tank (gal)	254,167	
Fire Flow Demand	300,000	
Emergency Demand	30,000	
Total Storage Required (gal)	584,167	
Recommend a second tank at least 300,000 gallons		

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No: 03AJ03	**Permit No:**	**County:** Grand Traverse	**Township:** Whitewater

Well ID: 28000010339

Elevation:

Latitude: 44.77305321

Longitude: -85.43221851

Method of Collection: Interpolation-Map

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
28N 09W	32	Active		#1

Distance and Direction from Road Intersection:
2340 FEET NORTH OF M72; 1680 FEET EAST OF ARNOLD RD

Well Owner: GTB EDC

Well Address:
M-72
WILLIAMSBURG, MI

Owner Address:
2331 NORTH WEST BAYSHORE DRIVE

Drilling Method: Rotary
Well Depth: 330.00 ft. **Well Use:** Type I public
Well Type: New **Date Completed:** 2/20/2003

Casing Type: Steel - unknown **Height:** 2.00 ft. above grade
Casing Joint: Welded
Casing Fitting: None

Diameter: 12.00 in. to 293.00 ft. depth

Borehole: 21.00 in. to 291.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 30.00
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: A14B60008 **Pump Capacity:** 300 GPM
Drop Pipe Length: 189.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 53.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Test pump
Pumping level 194.21 ft. after 8.00 hrs. at 380 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Clay	220.00	220.00
Clay & Sand	47.00	267.00
Gray Clay	8.00	275.00
Sand	1.00	276.00
Clay	4.00	280.00
Sand	34.00	314.00
Clay	1.00	315.00
Sand	4.00	319.00
Clay Sandy	5.00	324.00
Clay	6.00	330.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 12.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	**Length**	**Set Between**
30.00	20.00 ft.	293.00 ft. and 313.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	**Bags**	**Additives**	**Depth**
Neat cement	0.00	None	0.00 ft. to 283.00 ft.

Wellhead Completion: Other

Nearest Source of Possible Contamination:

Type	**Distance**	**Direction**
Septic tank	1760 ft.	East

Geology Remarks:

Drilling Machine Operator Name: C FELL
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 33-1686
Business Name: HART WELL DRLG CO
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: OWNER OF WELL: TURTLE CREEK CASINO; EMPLOYEE: R HEILER

Other Remarks: Wellhead Completion:2 FEET ABOVE GRADE

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No:	**Permit No:**	**County:** Grand Traverse	**Township:** Whitewater

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
27N 09W	4	Active	2034128	001

Well ID: 28000002667

Elevation: 761.15 ft.
Latitude: 44.7699338593
Longitude: -85.4132828628
Method of Collection: GPS Differential (DGPS)

Distance and Direction from Road Intersection:

Well Owner: GRAND TRAVERSE PLASTICS

Well Address:
5780 MOORE RD
WILLIAMSBURG, MI 49690

Owner Address:
5780 MOORE RD
WILLIAMSBURG, MI 49690

Drilling Method: Rotary
Well Depth: 110.00 ft. **Well Use:** Type II public
Well Type: New **Date Completed:** 3/28/1995

Casing Type: PVC plastic **Height:**
Casing Joint: Threaded & coupled
Casing Fitting: None

Diameter: 5.00 in. to 105.00 ft. depth

Borehole: 7.88 in. to 110.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: F.E. Myers **Pump Type:** Submersible
Model Number: S2J102 **Pump Capacity:** 26 GPM
Drop Pipe Length: 85.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 43.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Topsoil Fill	2.00	2.00
Sand Gravel Clay	31.00	33.00
Sand & Gravel	47.00	80.00
Red Sand & Clay Stringers	20.00	100.00
Sand & Gravel Coarse	10.00	110.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 4.00 in. **Blank:** 2.00 ft. Above
Screen Material Type: Unknown
Screen Installation Type: Unknown

Slot	**Length**	**Set Between**
20.00	5.00 ft.	105.00 ft. and 110.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	**Bags**	**Additives**	**Depth**
Bentonite slurry	0.00	None	0.00 ft. to 105.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	**Distance**	**Direction**
Septic tank	50 ft.	

Geology Remarks:

Drilling Machine Operator Name: ROBERT STACHNIK
Employment: Unknown

Contractor Type: Unknown **Reg No:** 28-2168
Business Name:
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No: 03AJ03	**Permit No:**	**County:** Grand Traverse	**Township:** Whitewater

Well ID: 28000010339

Elevation:

Latitude: 44.77305321

Longitude: -85.43221851

Method of Collection: Interpolation-Map

Town/Range:	**Section:**	**Well Status:**	**WSSN:**	**Source ID/Well No:**
28N 09W	32	Active		#1

Distance and Direction from Road Intersection:
2340 FEET NORTH OF M72; 1680 FEET EAST OF ARNOLD RD

Well Owner: GTB EDC

Well Address:
M-72
WILLIAMSBURG, MI

Owner Address:
2331 NORTH WEST BAYSHORE DRIVE

Drilling Method: Rotary
Well Depth: 330.00 ft. **Well Use:** Type I public
Well Type: New **Date Completed:** 2/20/2003

Casing Type: Steel - unknown **Height:** 2.00 ft. above grade
Casing Joint: Welded
Casing Fitting: None

Diameter: 12.00 in. to 293.00 ft. depth

Borehole: 21.00 in. to 291.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:** 30.00
Manufacturer: Grundfos **Pump Type:** Submersible
Model Number: A14B60008 **Pump Capacity:** 300 GPM
Drop Pipe Length: 189.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 53.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Test pump
Pumping level 194.21 ft. after 8.00 hrs. at 380 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Clay	220.00	220.00
Clay & Sand	47.00	267.00
Gray Clay	8.00	275.00
Sand	1.00	276.00
Clay	4.00	280.00
Sand	34.00	314.00
Clay	1.00	315.00
Sand	4.00	319.00
Clay Sandy	5.00	324.00
Clay	6.00	330.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 12.00 in. **Blank:**
Screen Material Type: Stainless steel-wire wrapped
Screen Installation Type: Attached

Slot	**Length**	**Set Between**
30.00	20.00 ft.	293.00 ft. and 313.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	**Bags**	**Additives**	**Depth**
Neat cement	0.00	None	0.00 ft. to 283.00 ft.

Wellhead Completion: Other

Nearest Source of Possible Contamination:

Type	**Distance**	**Direction**
Septic tank	1760 ft.	East

Geology Remarks:

Drilling Machine Operator Name: C FELL
Employment: Employee

Contractor Type: Water Well Drilling Contractor **Reg No:** 33-1686
Business Name: HART WELL DRLG CO
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks: OWNER OF WELL: TURTLE CREEK CASINO; EMPLOYEE: R HEILER

Other Remarks: Wellhead Completion:2 FEET ABOVE GRADE

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID: 28270906402

Tax No:	Permit No:	County: Grand Traverse	Township: Acme

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
27N 09W	6	Active	2025228	002

Well ID: 28000002676

Elevation: 793.95 ft.
Latitude: 44.7610542922
Longitude: -85.4366254638
Method of Collection: GPS Differential (DGPS)

Distance and Direction from Road Intersection:
2025228, 2 -- IRRIGATION WELL #2 .4 MI FROM M-72

Well Owner: HIGHPOINT DEVELOPMENT CO

Well Address:
5500 BATES RD
MI

Owner Address:
5500 BATES RD
WILLIAMSBURG, MI 49690

Drilling Method: Rotary
Well Depth: 234.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 9/26/1987

Casing Type: PVC plastic **Height:** 2.00 ft. above grade
Casing Joint: Welded
Casing Fitting: None

Diameter: 8.00 in. to 199.00 ft. depth

Borehole: 15.00 in. to 234.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: Other **Pump Type:** Unknown
Model Number: **Pump Capacity:** 0 GPM
Drop Pipe Length: 146.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 45.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown
Pumping level 61.00 ft. after 4.00 hrs. at 300 GPM

Formation Description	Thickness	Depth to Bottom
Sand	3.00	3.00
Sand Gravel Clay	15.00	18.00
Sand	32.00	50.00
Gravel & Sand	3.00	53.00
Clay Gravel Sand	67.00	120.00
Sand	114.00	234.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 6.00 in. **Blank:** 2.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
30.00	35.00 ft.	199.00 ft. and 234.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	0.00	None	5.00 ft. to 30.00 ft.

Geology Remarks:

Wellhead Completion: Other, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Unknown	50 ft.	Northeast

Abandoned Well Plugged: No
Reason Not Plugged:

Drilling Machine Operator Name: ROBERT MILLER
Employment: Unknown

Contractor Type: Unknown **Reg No:** 45-0795
Business Name:
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks: Wellhead Completion:12 inch Above Grade, Pump Manufacturer:PLEUGER

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No: 281300501800	**Permit No:** 37296	**County:** Grand Traverse	**Township:** Whitewater

Well ID: 28000015446

Elevation:

Latitude: 44.765191

Longitude: -85.422218

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
27N 09W	5	Active		

Distance and Direction from Road Intersection:
Crisp Rd S of M-72

Well Owner: MI Local Hops, LLC

Well Address:
7464 Crisp Rd
Williamsburg, MI 49690

Owner Address:
250 E Front St Ste 402
Traverse City, MI 49684

Drilling Method: Rotary
Well Depth: 223.00 ft. **Well Use:** Irrigation
Well Type: New **Date Completed:** 6/15/2016

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: None

Diameter: 6.90 in. to 188.00 ft. depth SDR: 21.00

Borehole: 10.00 in. to 223.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 7/21/2016 **HP:** 10.00
Manufacturer: Franklin Electric **Pump Type:** Submersible
Model Number: 2363129020 **Pump Capacity:** 100 GPM
Drop Pipe Length: 189.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 3.00 in. **Drilling Record ID:**
Draw Down Seal Used: No **LQW Reg. No:** 4343-20165-16

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder
Manufacturer: Well-Rite-Flexcon
Model Number: WR140 **Tank Capacity:** 44.0 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 95.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 145.00 ft. after 0.50 hrs. at 100 GPM

Formation Description	Thickness	Depth to Bottom
Sand	10.00	10.00
Gravel	7.00	17.00
Clay & Sand	5.00	22.00
Sand	13.00	35.00
Clay	10.00	45.00
Stones	25.00	70.00
Clay	5.00	75.00
Sand	98.00	173.00
Clay	30.00	203.00
Sand	20.00	223.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 5.00 in. **Blank:** 1.00 ft. Above
Screen Material Type: Stainless steel-slotted
Screen Installation Type: Attached

Slot	Length	Set Between
12.00	15.00 ft.	208.00 ft. and 223.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	16.00	None	0.00 ft. to 198.00 ft.

Geology Remarks:

Wellhead Completion: Other

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Drilling Machine Operator Name: Adam Anderson
Employment: Employee
Pump Installer: Bob Dean

Contractor Type: Water Well Drilling Contractor **Reg No:** 45-2259
Business Name: B & Z Well Drilling Co
Business Address: 233 E. Kasson Rd., Maple City, MI, 49664

Water Well Contractor's Certification

This well and/or pump installation was performed under my registration.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks: Wellhead Completion:Well Seal

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID: 28281013401

Tax No:	Permit No:	County: Grand Traverse	Township: Acme

Well ID: 28000007391

Elevation: 587.26 ft.
Latitude: 44.741462
Longitude: -85.350893
Method of Collection: QQQ - Centroid

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
27N 09W	13	Active	2000528	001

Distance and Direction from Road Intersection:
2000528, 1 -- SAYLOR PARK BATHHOUSE

Well Owner: ACME TWP

Well Address:
YUBA PARK RD
MI

Owner Address:
ACME, MI 49610

Drilling Method: Rotary
Well Depth: 285.00 ft. **Well Use:** Type II public
Well Type: New **Date Completed:** 8/26/1989

Casing Type: PVC plastic **Height:**
Casing Joint: Welded
Casing Fitting: None

Diameter: 5.00 in. to 183.00 ft. depth

Borehole: 7.38 in. to 285.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: **Pump Type:** Submersible
Model Number: **Pump Capacity:**
Drop Pipe Length: 160.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 6.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Sand	25.00	25.00
Clay	257.00	282.00
Sand	3.00	285.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 4.00 in. **Blank:** 5.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
10.00	2.00 ft.	283.00 ft. and 285.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	0.00	None	0.00 ft. to 0.00 ft.

Wellhead Completion: Pitless adapter, Other

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	100 ft.	

Geology Remarks:

Drilling Machine Operator Name: ROBERT NELSON
Employment: Unknown

Contractor Type: Unknown **Reg No:** 28-0481
Business Name:
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID: 28271003411

Tax No: 280110302420	**Permit No:**	**County:** Grand Traverse	**Township:** Acme

Well ID: 28000002735

Elevation: 597.11 ft.
Latitude: 44.770766
Longitude: -85.381237
Method of Collection: QQQ - Centroid

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
27N 09W	3	Inactive	2029728	001

Distance and Direction from Road Intersection:
2029728, 1 -- HORIZON VIDEO

Well Owner: SCHEPPE, DAVID C

Well Address:
5872 N US 31
ACME, MI 49610

Owner Address:
2413 PINE HILL CT
TRAVERSE CITY, MI 49684

Drilling Method: Rotary
Well Depth: 90.00 ft. **Well Use:** Type II public
Well Type: New **Date Completed:** 6/30/1994

Casing Type: Steel - black **Height:**
Casing Joint: Unknown
Casing Fitting: None

Diameter: 4.00 in. to 62.00 ft. depth
3.00 in. to 86.00 ft. depth

Borehole: 7.88 in. to 62.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: **Pump Type:**
Model Number: **Pump Capacity:**
Drop Pipe Length: **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 999.99 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Topsoil	1.00	1.00
Lithology Unknown	15.00	16.00
Red Clay	10.00	26.00
Sand	4.00	30.00
Red Clay	1.00	31.00
Sand	5.00	36.00
Gray Clay	23.00	59.00
Sand	2.00	61.00
Clay	11.00	72.00
Sand	18.00	90.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 3.00 in. **Blank:** 2.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
10.00	5.00 ft.	85.00 ft. and 90.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	0.00	None	0.00 ft. to 62.00 ft.

Wellhead Completion: Pitless adapter, 12 inches above grade

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	75 ft.	

Geology Remarks:

Drilling Machine Operator Name: ANTHONY S RIVARD
Employment: Unknown

Contractor Type: Unknown **Reg No:** 28-2168
Business Name:
Business Address:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID: 28270904404

Tax No: 281300401210	**Permit No:**	**County:** Grand Traverse	**Township:** Whitewater

Well ID: 28000002669

Elevation: 764.43 ft.
Latitude: 44.7691262594
Longitude: -85.4133728531
Method of Collection: GPS Differential (DGPS)

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
27N 09W	4	Inactive	2021528	001

Distance and Direction from Road Intersection:
2021528, 1 --TRAVERSE PRECISION

Well Owner: TRAVERSE PRECISION INC.

Well Address:
5770 MOORE RD
MI

Owner Address:
5770 MOORE RD

Drilling Method: Rotary
Well Depth: 120.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 5/4/1993

Casing Type: PVC plastic **Height:** 0.00 ft. below grade
Casing Joint: Unknown
Casing Fitting: None

Diameter: 5.00 in. to 115.00 ft. depth

Borehole: 7.88 in. to 0.00 ft. depth

Pump Installed: No
Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 37.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	45.00	45.00
Clay & Sand	10.00	55.00
Sand	5.00	60.00
Clay & Sand	13.00	73.00
Sand	11.00	84.00
Clay & Sand	12.00	96.00
Sand & Gravel	24.00	120.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 4.00 in. **Blank:** 0.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
20.00	5.00 ft.	115.00 ft. and 120.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Unknown	0.00	None	0.00 ft. to 15.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter, Other

Drilling Machine Operator Name: ANTHONY S RIVARD
Employment: Unknown

Nearest Source of Possible Contamination:

Type	Distance	Direction
None		

Contractor Type: Unknown **Reg No:** 40-1908
Business Name:
Business Address:

Abandoned Well Plugged: No
Reason Not Plugged:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID: 28280933402

Tax No: 281313301700 | **Permit No:** | **County:** Grand Traverse | **Township:** Whitewater

Well ID: 28000007185

Elevation: 733.26 ft.
Latitude: 44.7739130501
Longitude: -85.4068465647
Method of Collection: GPS Differential (DGPS)

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
28N 09W	33	Active	2036328	002

Distance and Direction from Road Intersection:
2036328, 2 -- WHITEWATER BALL PARK WEST WELL, AT NW COR

Well Owner: WHITEWATER TWP

Well Address:
NER OF OLD M-72 & ELK LK RD
MI

Owner Address:
5777 VINTON RD
WILLIAMSBURG, MI 49690

Drilling Method: Auger/Bored
Well Depth: 105.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 5/2/1996

Casing Type: Steel - black **Height:** 1.50 ft. above grade
Casing Joint: Threaded & coupled
Casing Fitting: None

Diameter: 4.00 in. to 100.00 ft. depth

Borehole: 7.00 in. to 0.00 ft. depth
0.00 in. to 105.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: **HP:**
Manufacturer: Goulds **Pump Type:** Submersible
Model Number: **Pump Capacity:** 0 GPM
Drop Pipe Length: 40.00 ft. **Pump Voltage:**
Drop Pipe Diameter: **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: No
Pressure Relief Valve Installed: No

Static Water Level: 21.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Unknown
Pumping level 25.00 ft. after 1.00 hrs. at 25 GPM

Formation Description	Thickness	Depth to Bottom
Tan Clay & Sand	20.00	20.00
Sand	8.00	28.00
Gray Clay	4.00	32.00
Sand Silty	8.00	40.00
Gray Clay	10.00	50.00
Sand	6.00	56.00
Gray Clay	40.00	96.00
Sand Coarse	9.00	105.00

Screen Installed: Yes **Filter Packed:** No
Screen Diameter: 4.00 in. **Blank:** 0.00 ft. Above
Screen Material Type:
Screen Installation Type: Unknown

Slot	Length	Set Between
10.00	5.00 ft.	100.00 ft. and 105.00 ft.

Fittings: None

Well Grouted: Yes **Grouting Method:** Unknown

Grouting Material	Bags	Additives	Depth
Bentonite slurry	0.00	None	0.00 ft. to 75.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Septic tank	0 ft.	

Drilling Machine Operator Name: MIKE SHRYOCK
Employment: Unknown

Contractor Type: Unknown **Reg No:** 08-1771
Business Name:
Business Address:

Abandoned Well Plugged: No
Reason Not Plugged:

Water Well Contractor's Certification

This well was drilled under my supervision and this report is true to the best of my knowledge and belief.

Signature of Registered Contractor **Date**

General Remarks:
Other Remarks:

Water Well And Pump Record

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Import ID:

Tax No: 281303200400	**Permit No:** 36654	**County:** Grand Traverse	**Township:** Whitewater

Well ID: 28000015053

Elevation:

Latitude: 44.69336

Longitude: -85.43045

Method of Collection: GPS Std Positioning Svc SA Off

Town/Range:	Section:	Well Status:	WSSN:	Source ID/Well No:
27N 09W	32	Active		

Distance and Direction from Road Intersection:
1/2 MI. E. OF ISLAND LAKE RD. OR 1/10 MI. W. OF MUNCIE LK. RD. ON S. SIDE OF SUPPLY RD.

Well Owner: WOODLAND SCHOOL

Well Address:
7224 SUPPLY ROAD
TRAVERSE CITY, MI 49686

Owner Address:
7224 SUPPLY ROAD
TRAVERSE CITY, MI 49686

Drilling Method: Rotary
Well Depth: 199.00 ft. **Well Use:** Type II public
Well Type: Replacement **Date Completed:** 1/29/2015

Casing Type: PVC plastic **Height:** 1.00 ft. above grade
Casing Joint: Solvent welded/glued
Casing Fitting: None

Diameter: 5.00 in. to 191.00 ft. depth SDR: 21.00

Borehole: 8.50 in. to 199.00 ft. depth

Pump Installed: Yes **Pump Installation Only:** No
Pump Installation Date: 2/10/2015 **HP:** 0.75
Manufacturer: F.E. Myers **Pump Type:** Submersible
Model Number: 2ST72-12 **Pump Capacity:** 12 GPM
Drop Pipe Length: 120.00 ft. **Pump Voltage:** 230
Drop Pipe Diameter: 1.00 in. **Drilling Record ID:**
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Diaphragm/bladder (Buried)
Manufacturer: Goulds
Model Number: 140BG **Tank Capacity:** 45.2 Gallons
Pressure Relief Valve Installed: Yes

Static Water Level: 59.00 ft. Below Grade
Well Yield Test: **Yield Test Method:** Air
Pumping level 189.00 ft. after 0.50 hrs. at 30 GPM

Formation Description	Thickness	Depth to Bottom
Sand & Gravel	91.00	91.00
Clay	96.00	187.00
Sand & Gravel	12.00	199.00

Screen Installed: Yes **Filter Packed:** Yes
Screen Diameter: 4.00 in. **Blank:** 2.00 ft. Above
Screen Material Type: PVC-wire wrapped
Screen Installation Type: Telescoped

Slot	Length	Set Between
12.00	8.00 ft.	191.00 ft. and 199.00 ft.

Fittings: Neoprene packer

Well Grouted: Yes **Grouting Method:** Grout pipe outside casing

Grouting Material	Bags	Additives	Depth
Bentonite slurry	15.00	None	0.00 ft. to 181.00 ft.

Geology Remarks:

Wellhead Completion: Pitless adapter

Nearest Source of Possible Contamination:

Type	Distance	Direction
Drainfield/Dry well	100 ft.	North-Northwest

Abandoned Well Plugged: Yes

Latitude: 44.69336 **Longitude:** -85.43045
Casing Diameter: 4 in. **Casing Removed:** Yes
Plugging Material: Bentonite chips/pellets
No. of Bags: 9.00 **Well Depth:** 83 ft.

Drilling Machine Operator Name: MIKE KILINSKI
Employment: Employee
Pump Installer: KEN NOVAK

Contractor Type: Water Well Drilling Contractor **Reg No:** 28-2187
Business Name: Cluff Well Drilling Company
Business Address: 6410 Center Rd, Traverse City, MI, 49686

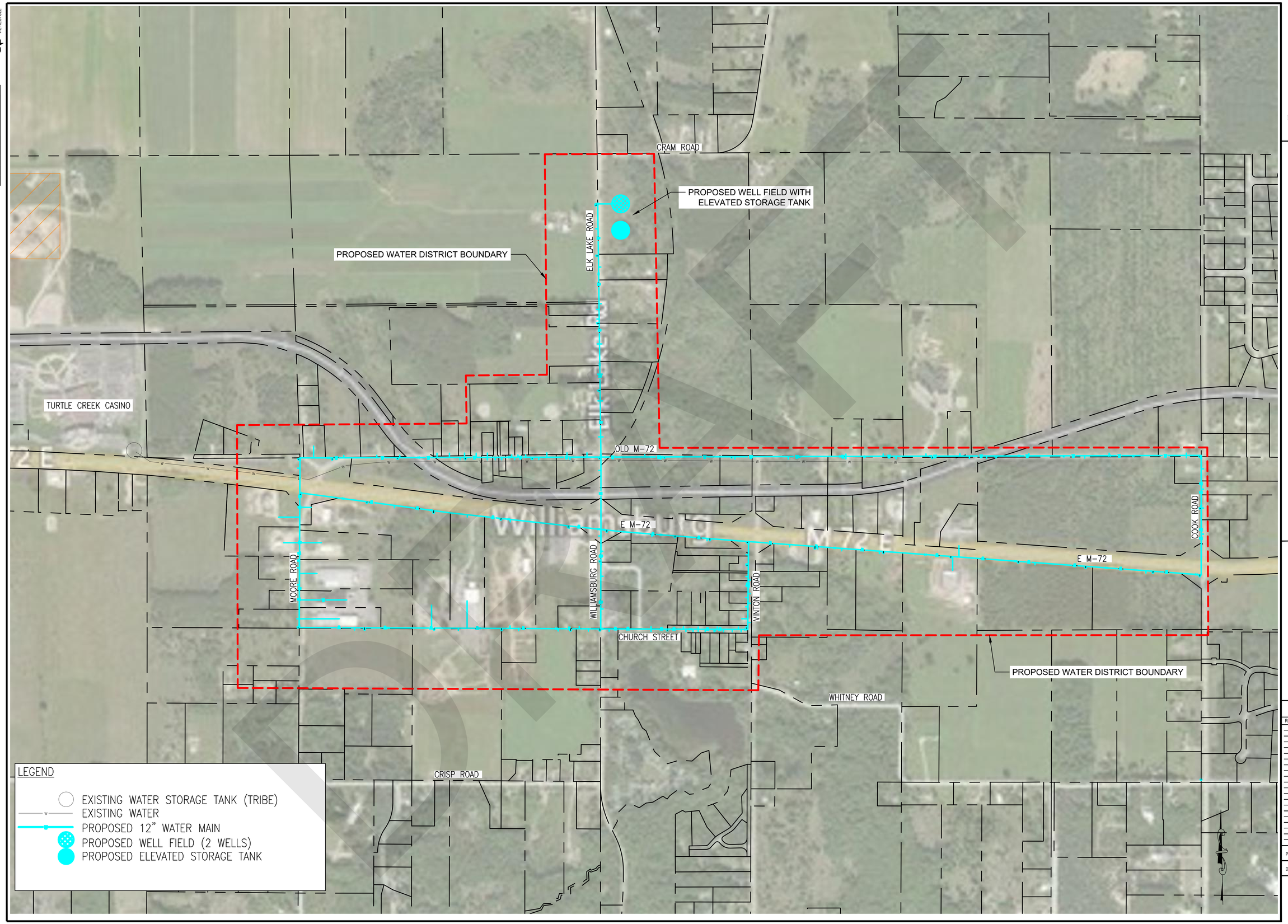
Water Well Contractor's Certification

This well/pump was constructed under my supervision and I hereby certify that the work complies with Part 127 Act 368 PA 1978 and the well code.

Signature of Registered Contractor **Date**

General Remarks:

Other Remarks:



THE BAR BELOW SHOWS GRAYSCALE FROM WHITE TO SOLID BLACK

WHITE BLACK

WE RECYCLE

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WHITEWATER TOWNSHIP
WATER INFRASTRUCTURE STUDY
GRAND TRAVERSE COUNTY, MI

OVERALL MAP

REVISIONS

REV	DESCRIPTION	DATE

PROJ. #: 210417

DATE: MAY 2022

SHEET