Water

Town of Kindersley

Waterworks System Assessment Round 3
Final Report

Prepared by:

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Project Number:

60335905 (501)

Date:

October, 2016

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October 13, 2016

Kim Vogel
Director of Transportation & Environmental Services
Town of Kindersely
Box 1269, 106 5th Avenue East
Kindersley, SK S0L 1S0

Dear Kim:

Project No: 60335905 (501)
Regarding: Waterworks System Assessment Round 3 Final Report

Please find enclosed two copies of the FINAL report of the 2015 Waterworks System Assessment Update for the Town of Kindersley. A copy of this report has also been sent to Rod Lemon at the Saskatchewan Water Security Agency for his review.

We have enjoyed working with the Town on this important assessment and report and we look forward to further assisting the Town with their waterworks needs. If you should have any questions or concerns, please don't hesitate to contact the undersigned.

Sincerely,
AECOM Canada Ltd.

Ryan King
Municipal Infrastructure Manager
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RCK\vec
Encl.
cc: Rod Lemon, Water Security Agency

Distribution List

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2	Yes	Town of Kindersley
1	Yes	Rod Lemon, Water Security Agency

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1		September 8, 2016	Draft Report Submission
2		October 13, 2016	Final Report Submission

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1. Background

In accordance to Section 35 of The Water Regulations, 2002 assessments of waterwork systems are to be undertaken by owners of water system in Saskatchewan. These assessments are required on a 5 year interval and be done in accordance to the Waterworks System Assessment Standards (EPB 233).

The 2015 WSA Update has been prepared according to the Water Security Agency Waterworks System Assessment Standards, EPB 233. Information from the 2010 WSA (Round 2), by Pinter & Associates, is utilized where possible throughout this document as well as available documents that were supplied by the Town. AECOM and Associated Engineering were retained by the Town of Kindersley to compete an Infrastructure Capacity Assessment. The November 2014 Infrastructure Capacity Assessment report, provided additional information that was incorporated in this report. Major upgrades to the waterworks system have occurred since the 2010 Round 2 WSA.

The existing water treatment plant WTP was constructed in 1958 at its current location at the corner of Ditson Drive and Thompson Drive. In 1964 the E-K raw water supply system was constructed to supply the Town of Kindersley and Town of Eston with a permanent raw water supply from the South Saskatchewan River. In 1972 an additional circular treated water reservoir was added just north of the existing water treatment plant site.

In 1986 a major upgrade and expansion was undertaken to the WTP. The upgrades are summarized as follows:

- New raw water supply line from Motherwell Reservoir
- 17.4m x 18.9m building expansion
- Addition of Filters No.1, No.2 and No. 3
- Construction of new Clarifier No. 2
- New treated water distribution pumps
- New disinfection room (chlorine)
- Addition of alum and aerator to treatment process
- New electrical room
- Addition of Clearwell (2A) and Pumpwell (2B)

In 2010 – 2012 the water system underwent major upgrades again, including:

- Pumping upgrades to the River Wells Pumping Station (RWPS)
- Additional shield and production wells
- Twinning of portion of existing raw water supply line between the RWPS and Snipe Lake Pumping Station
- New Snipe Lake Raw Water Pumping Station (SNPS)
- Twinning of a portion of existing raw water supply line between the SNPS and the CN Reservoir
- New CN Reservoir Pumping Station
- New earthen raw water storage reservoir cell at the CN Reservoir
- Twinning of raw water supply line between the CN Reservoir and the Kindersley WTP

- Replacement of the single upflow clarifier with a dual train high rate clarification process (ACTIFLO™)
- Upgrades to Filters 1,2,3 which included new AWI underdrain and media
- Addition of UV disinfection
- New high lift treated water distribution pump
- Replacement of chlorine disinfection system with new automated system
- Removal of aerator from process treatment system
- Implementation of SCADA within the WTP and with all components of the raw water supply system
- Discontinuance of raw water supply from the Motherwell Reservoir

2. Waterworks System Overview

2.1 Process Descriptions

The Town's existing waterworks system consists of three major components:

- Raw water supply
- Water treatment
- Distribution and storage

The raw water supply system for Kindersley is somewhat complex and unique in that the raw water source is located 55 kilometers south from the Town and the Water Treatment Plant (WTP). Raw water is supplied from induced surface water infiltration wells along the shore line of the South Saskatchewan River. Four (4) production wells, three (3) duty and one (1) standby comprise the raw water infiltration system at the South Saskatchewan River. The production wells supply the pumpwell located at the River Well Pumping Station (RWPS).

The RWPS has three large high lift pumps which pump raw water northwards (out of the South Saskatchewan River valley) to the Snipe Lake Pumping Station (SLPS). There are two raw water pipelines between RWPS and Snipe Lake (200mm and 300mm diameters) which convey the raw water between these facilities. Once the raw water reaches Snipe Lake it is discharged into the pumpwell below the pumping station.

The SLPS supplies raw water to two municipalities; Town of Eston (pumping to the east) and Town of Kindersley (pumping to the north). We will not discuss further the supply to the Town of Eston (beyond this mention) as it is discussed in detail in their specific WSA report. SLPS pumps water through two raw water pipelines northwards (200mm and 250mm diameters) to the CN Reservoir and Pumping Station. Once the raw water reaches the CN reservoir it is discharged jointly into the pumpwell beneath the pumping station and also the adjacent earthen raw water storage reservoir.

The CN Pumping Station pumps water to the Kindersley WTP through two water supply pipelines (200mm and 250mm diameters) and enter the WTP through a common 400mm diameter supply header. Potassium permanganate ($KMnO_4$) is injected into the raw water as it is pumped from the CN Reservoir to Kindersley WTP. The contact time in the pipeline provides opportunity for the $KMnO_4$ to oxidize the iron and manganese in the raw waters for filtration at the WTP. Alum is dosed to the raw water within the WTP as water enters the facility.

The water treatment process consists of two major treatment stages. As raw water enters the WTP it is directed towards the dual train high rate ballasted flocculation ACTIFLO^{TM} clarifiers where the process water is dosed with microsand and polymer in the series of coagulation, maturation, settling and recycle tanks. Once the water has been processed in the ACTIFLO^{TM}, the clarified water is discharged to the gravity filters. The filtration consists of three dual media gravity filters. Fluoride is dosed to the filtered water prior to disinfection and storage in the clearwells.

UV reactors and chlorine dosing provide disinfection prior to water being discharged in the clearwells. The clearwells are a series of separate compartments located beneath or adjacent to the WTP. High lift pumps located in the lower level of the WTP provide a supply to the town's distribution system through a single 400mm primary main. The primary main feeds the elevated water tower and is also connected to the distribution system.

2.2 Upgrades Since Last Water System Assessment

Since the Round 2 WSA completed in 2010, significant upgrades and investment have been made to the waterworks system. The upgrades that have been completed since 2010 are:

2.2.1 Water West Regional Water Project (2010 – 2013)

- Upgrades to River Wells Pumping Station
  - Installation of new 300 hp Raw Water Pump (RWP-1331) to supplement two existing raw water pumps. Rated pumping capacity of 63 L/s.
  - Installation of new HVAC system to provide cooling within the building
  - Installation of soft starters and variable frequency drives (VFD) for all raw water pumps (RWP-1311,1321,1331)
- Snipe Lake Pumping Station
  - Construction of a new 10.4m x 5.4m raw water pumping station c/w below grade reinforced concrete pump well
  - Demolition of two existing pumping stations which served Kindersley and Eston
  - Conversion of existing earthen storage reservoir to a surge pond only
  - Installation of two (300 hp) raw water pumps (RWP 101 & 102) to supply the CN Reservoir (Kindersley). Rated pumping capacity of 48 L/s.
  - Installation of MCC c/w VFD's for the raw water pumps
  - Installation of HVAC system (fresh air supply and exhaust fans)
  - Installation of two (7.5 hp) raw water pumps (RWP 103 & 104) to supply the Town of Eston
  - Installation of VFD's on 7.5 hp Eston raw water supply pumps
  - Installation of raw water truckfill
- CN Reservoir & Pumping Station
  - Construction of a new 7.9m x 7.9m raw water pumping station c/w below grade reinforced concrete pump well
  - Demolition of existing raw water pumping station
  - Construction of earthen raw water storage cell
  - Installation of two (50 hp) raw water pumps (RWP 502 & 503) to supply the Kindersley WTP. Rated duty point of 69.6 L/s.
  - Installation of MCC c/w VFD's for raw water pumps
  - Installation of (fresh air supply and exhaust fans)
  - Installation of $KMnO_4$ dosing system
- Kindersley Water Treatment Plant
  - Demolition of existing aeration system
  - Discontinued supply from Motherwell Reservoir to the WTP
  - Existing clarifier was decommissioned and demolished. An ACTIFLO™ dual train high rate ballasted flocculation clarifier treatment system was constructed in place of the existing clarifier.
  - New polymer dosing system
  - New fluoride dosing system
  - New alum dosing skid

- New chlorine gas chlorination scales, storage and dosing system
- Existing lime and dry alum feeders decommissioned
- Implementation of full SCADA system within the WTP. The SCADA system includes full (real time) communication and control with all facilities in the system (RWPS, SLPS, CN Reservoir).
- Upgrades to Filters 1, 2 and 3 included new AWI underdrains and sand/anthracite media. A new blower was installed complete with new piping to each filter.
- Installation of one (1) (75 hp) treated water high lift distribution pump (Pump 327). Rated pumping capacity of 70 L/s
- Installation of new MCC panels c/w VFD's for distribution pump 327 and 104.
- Installation of UV disinfection system
- Installation of new HVAC system for the facility

- Raw Water Supply Pipeline Upgrades
  - Twin existing 200mm steel raw water supply pipeline with 300mm HDPE lined steel pipeline for a distance of 6.2 kilometers to provide additional pumping capacity between RWPS and SLPS.
  - Twin existing 200mm steel raw water supply pipeline with 250mm HDPE lined steel pipeline for a distance of 11.6 kilometers to provide additional pumping capacity between SLPS and CN Reservoir & Pumping Station
  - Twin existing 200mm steel raw water supply pipeline with 250mm HDPE pipeline for a distance of 4.7 kilometers to provide additional pumping capacity between CN Reservoir

2.2.2 Distribution System Upgrades

- 12th Avenue West Watermain Installation – 734 lineal meters of watermain (2010)
- Holland Commercial Park Development – 1030 lineal meters of watermain (2011)
- MacNash Industrial Park Development – 1055 lineal meters of watermain (2012)
- 13th Avenue East Subdivision Develop. – 635 lineal meters of watermain (2013)
- 5th Avenue West (3rd St. to 4th St. W) – 159 lineal meters of watermain (2013)
- 4th Street West (Railway Ave. to 5th Ave. W) – 202 lineal meters (2013)
- 5th Street Back Alley (4th to 6th Ave. W) – 250 lineal meters (2013)
- 3rd Avenue W. Back Alley (2nd to 3rd Street W.) – 185 lineal meters (2013)
- Railway Avenue Back Alley (2nd to 4th Street W.) – 351 lineal meters (2014)
- Brookhollow Estates Subdivision Develop. – 1,480 lineal meters of watermain (2014)
- 11th Avenue E. (Walmart to Hwy 7) – 638 lineal meters of watermain (2014)
- Rosedale Phase 7 (Coleman Cres. Extenstion) – 19 lineal meters (2015)
- 5th Street W. (2nd Ave. W to 5th Street Cres.) – 312 lineal meters (2015)
- Queen Drive (2nd Street W to Carmicheal Ave.) – 193 lineal meters (2015)
- Queen Drive Looping on Carmichael Avenue (to 1st Street W.) – 83 lineal meters (2015)
- 2nd Ave/3rd Ave Back Alley (Main Street to 1st Street W.) – 133 lineal meters (2015)
- Thomson Drive Feeder Main (Water Treatment Plant to McEwen Dr.) – 337 lineal meters (2015)

2.2.3 Standby Generators

The Town sourced and implemented standby power generators for the WTP and CN Pumping Station. A 100 kW Genco natural gas generator was installed at the WTP and a 60 kW Genco diesel generator was installed at the CN Pumping Station. Installation of the generators started in the fall of 2014 and they are fully commissioned and operational as of August 2016. These generators will automatically transfer electrical service in the event of a power outage and provide electrical service to the facility.

2.3 Planned Upgrades

The November 2014 AECOM / AE *"Infrastructure Capacity Assessment"* report includes an evaluation of the Towns current waterworks capacity and also provides recommendations for upgrades to the system to meet short and medium term water demands assuming the historical population rapid growth of 2.65% annually will occur. Upgrades were also identified to service an ultimate population of 10,000 persons.

The report identified upgrades to the system are required by 2021 which are dependant on actual population growth and corresponding water demands. The upgrades identified below will provide sufficient capacity in the waterworks system to meet the Town's projected water demands until 2029.

2.3.1 Raw Water Supply Upgrades

These upgrades are required by year 2021 and will provide capacity until year 2029. In order to have the upgrades fully implemented and operational by 2021 engineering activities such as preliminary design should commence in 2017.

- One production well and one shield well 3.8 kilometers of raw water supply pipeline twinning between RWPS and SLPS
- Raw water pump replacement and upgrades at SLPS
- 12 kilometers of raw water supply pipeline twinning between RWPS and CN Reservoir
- Installation of additional raw water pump at the CN Pumping Station

2.3.2 Water Treatment Upgrades

The upgrades below have been outlined in the report identified above and presented in this section. These upgrades are required by year 2021(if a 2.65% growth rate occurs) and will provide capacity until year 2036. In order to have the upgrades fully implemented and operational by 2021, engineering activities, such as preliminary design, should commence in 2017.

- Additional single train ACTIFLO^{TM} high rate ballasted flocculation clarifier treatment system
- Construction of additional Filter (No. 6)
- Installation of additional high lift distribution pump
- Installation of backwash and sludge transfer lift station
- Sludge ponds and forcemain
- Building expansion at existing WTP for additional ACTIFLO^{TM} and filter units
- Redundant backwash pumping capability for filters

2.3.3 Distribution System Upgrades

These upgrades are necessary to address the following requirements:

- Improve fire flow to meet minimum flow/pressure requirements
- Install new watermains to provide looping and eliminate dead ends providing improved circulation

The following is a summary of the current upgrades required:

- 4th Avenue - 100mm cast iron watermain replacement at specific locations identified
- Main Street Replacement – upgrade watermain to 250mm dia. to increase flow out of the water tower,
- Highway 21 Crossing – upgrades of the crossings at 7th Avenue and 11th Avenue to 250mm diameter

3. Review of Available Information

3.1 Population and Historical Water Demands

AECOM has reviewed the Town's historical population and water usage records on several occasions, the most recent review occurring in the November 2014 AECOM / AE *Town of Kindersley - Infrastructure Capacity Assessment* report. The Town's population data was analyzed from various sources including Statistics Canada and the Saskatchewan Ministry of Health (MOH) databases and records. Section 3.1.1 below presents the population details for the Town of Kindersley in further detail including population projections for future growth within the community.

Historical data of annual and seasonal precipitation from (2001 to 2013) was studied to determine average precipitation. Seasonal precipitation from (May to September) is important to differentiate as it has an impact on the Town's water demands due primarily to irrigation which increases the average annual water usage during dry years and reduces annual average water usage during wet years. Of the years that were reviewed, the driest year was 2001 with a total seasonal precipitation of 77.2mm. The wettest year was 2012 with a total seasonal precipitation of 239mm. The 2001 through 2013 average seasonal precipitation was calculated to be 163mm.

3.1.1 Population

Population data was obtained from published records from the MOH and Statistics Canada. The information is summarized in Table 3.1 below.

Table 3.1: Population Statistics

Year	Ministry of Health	Statistics Canada
1995	4,869	
1996	4,996	4,679
1997	5,050	
1998	5,083	
1999	5,146	
2000	4,861	
2001	4,887	4,548
2002	4,890	
2003	4,736	
2004	4,811	
2005	4,825	
2006	4,730	4,412
2007	4,809	
2008	4,966	
2009	4,894	
2010	5,273	
2011	5,330	4,678
2012	5,321	
2013	5,349	
2014	5,462	
2015	5,357	
Average Population (2011 – 2015)	5,364	
Annual Growth (2006 - 2011) (%)		1.21%
Annual Growth (2010 - 2015) (%)	0.33%	
Annual Growth (2005 - 2015) (%)	1.09%	
Annual Growth (2011 - 2015) (%)	0.14%	

Population statistics from MOH are based on the number of residents in the community who accessed health services in the area but could live outside of Kindersley's boundary. This results in a slightly higher population estimate than the Statistics Canada data, as residents from surrounding areas who use the health care facilities are included in the MOH population estimate.

According to the MOH data, the population for the Town has been relatively stable since 2011 with a population around 5,350 and an average annual growth rate of 0.33%. Historically, the average annual growth over the last five and ten year periods has been 0.33% and 1.09%, respectively. This has been attributed to a larger population increase in 2010. The Statistics Canada five year average annual growth rate from 2006 to 2011 is 1.21% which is comparable to the data from MOH.

3.1.2 Historical Water Consumption

Total annual treated water volumes as well as Peak Day Demands (PDD) were obtained from the Town's *Daily Totals and Averages* reports from 2012 to 2015.

Water demand data is obtained from the water meter on the distribution header at the WTP. Raw water use from 2012 to 2015 data is obtained from the water meters located before each train of the ACTIFLO™ units. The raw water consumption data was tabulated into the total volume of water consumed monthly in Table 3.2 and average daily consumption in Table 3.3. Total monthly and average daily total potable water consumption is tabled in Table 3.4 and Table 3.5 respectively.

Table 3.2: Total Monthly Kindersley Raw Water Consumption

Month	2012 (m^3)	2013 (m^3)	2014 (m^3)	2015 (m^3)	Average (m^3)
January	62,902	71,584	85,342	81,865	75,423
February	59,268	74,197	79,762	76,112	72,335
March	59,468	70,246	73,870	72,861	69,111
April	60,401	61,078	63,267	76,929	65,419
May	65,475	82,279	90,511	101,090	84,839
June	70,932	81,987	91,687	109,208	88,454
July	81,571	101,847	96,549	96,925	94,223
August	85,168	94,684	94,043	88,531	90,607
September	81,603	85,678	89,377	74,361	82,755
October	70,891	78,638	86,538	77,374	78,360
November	65,943	73,781	82,691	65,111	71,882
December	67,304	-	73,184	64,770	68,419
Total	**830,926**	**876,000**	**1,006,820**	**985,137**	**941,827 (78,486)**
% Annual Change	**-**	**5.4%**	**14.9%**	**-2.2%**	**6.0%**

Table 3.3: Average Daily Kindersley Raw Water Consumption

Month	2012 (m^3/day)	2013 (m^3/day)	2014 (m3/day)	2015 (m3/day)	Average(m^3/day)
January	2,029	2,309	2,753	2,641	2,433
February	2,117	2,650	2,849	2,718	2,584
March	1,918	2,266	2,383	2,350	2,229
April	2,013	2,036	2,109	2,564	2,181
May	2,112	2,654	2,920	3,261	2,737
June	2,364	2,733	3,056	3,640	2,948
July	2,631	3,285	3,114	3,127	3,039
August	2,747	3,054	3,034	2,856	2,923
September	2,720	2,856	2,979	2,479	2,759
October	2,287	2,537	2,792	2,496	2,528
November	2,198	2,459	2,756	2,170	2,396
December	2,171	-	2,614	2,089	2,291
Average	**2,276**	**2,621**	**2,780**	**2,699**	**2,587**

Table 3.4: Total Monthly Kindersley Potable Water Consumption

Month	2001 (m^3)	2004 (m^3)	2007 (m^3)	2012 (m^3)	2013 (m^3)	2014 (m^3)	2015 (m^3)	Average (m^3)
January	51,293	47,930	45,860	50,613	60,751	73,187	66,627	56,609
February	48,676	48,891	41,327	48,117	61,873	67,665	62,612	54,166
March	53,477	48,350	47,436	48,078	57,706	59,142	58,653	53,263
April	50,473	53,845	44,794	47,608	48,532	49,800	61,805	50,980
May	52,332	71,130	59,675	53,654	69,607	75,104	88,962	67,209
June	50,237	75,861	55,643	56,264	69,475	75,464	94,819	68,252
July	50,921	64,474	91,288	68,384	87,113	80,311	77,979	74,353
August	54,771	64,667	69,578	71,107	81,891	78,066	72,520	70,371
September	59,031	55,812	57,311	70,730	73,284	74,478	60,579	64,461
October	54,802	52,883	52,184	60,076	67,631	72,053	59,442	59,867
November	48,115	47,722	46,173	56,260	63,121	67,893	50,661	54,278
December	50,056	47,979	48,619	56,180		60,371	50,090	52,216
Total	**624,184**	**679,544**	**659,888**	**687,070**	**740,983**	**833,534**	**804,749**	**726,025 (60,502)**
% Annual Change	**-**	**-**	**-**	**-**	**7.8%**	**12.5%**	**-3.5%**	**5.6%**

Table 3.5: Average Daily Kindersley Treated Water Consumption

Month	2001 (m^3/day)	2004 (m^3/day)	2007 (m^3/day)	2012 (m^3/day)	2013 (m^3/day)	2014 (m^3/day)	2015 (m^3/day)	Average (m^3/day)
January	1,655	1,546	1,479	1,633	1,960	2,361	2,149	1,826
February	1,738	1,746	1,476	1,718	2,210	2,417	2,236	1,934
March	1,725	1,560	1,530	1,551	1,861	1,908	1,892	1,718
April	1,682	1,795	1,493	1,587	1,618	1,660	2,060	1,699
May	1,688	2,295	1,925	1,731	2,245	2,423	2,870	2,168
June	1,675	2,529	1,855	1,875	2,316	2,515	3,161	2,275
July	1,643	2,080	2,945	2,206	2,810	2,591	2,515	2,399
August	1,767	2,086	2,244	2,294	2,642	2,518	2,339	2,270
September	1,968	1,860	1,910	2,358	2,443	2,483	2,089	2,159
October	1,768	1,706	1,683	1,938	2,182	2,324	1,981	1,940
November	1,604	1,591	1,539	1,875	2,104	2,263	1,689	1,809
December	1,615	1,548	1,568	1,812	-	2,156	1,616	1,719
Average	**1,711**	**1,862**	**1,804**	**1,882**	**2,217**	**2,302**	**2,216**	1,993

It is important to note that Kindersley's waterworks system also supplies water to the RM of Kindersley Rural Water Utility (RMKRWU) as a large user external to the Town's boundaries. Water is delivered to RMKRWU through three connections to the Town's distribution system.

Table 3.6: Average Daily RM of Kindersley Potable Water Consumption

Month	2008 (m^3/day)	2009 (m^3/day)	2010 (m^3/day)	2011 (m^3/day)	2012 (m^3/day)	2013 (m^3/day)	2014 (m^3/day)	Average (m^3/day)
January	-	47.0	69.9	66.0	94.0	65.1	70.8	68.8
February	-	52.0	77.4	73.1	104.1	72.1	70.8	74.9
March	-	47.0	69.9	66.0	94.0	65.1	70.8	68.8
April	-	75.7	122.1	97.9	109.4	129.9	115.2	108.4
May	-	73.3	118.2	94.7	105.9	125.7	115.2	105.5
June	-	75.7	122.1	97.9	109.4	129.9	115.2	108.4
July	59.6	109.4	72.5	94.7	105.2	134.0	-	95.9
August	59.6	109.4	72.5	94.7	105.2	134.0	-	95.9
September	61.6	113.1	74.9	97.9	108.7	138.5	-	99.1
October	70.1	56.0	82.7	78.2	65.2	-	77.6	71.6
November	72.5	57.9	85.5	80.8	67.3	92.6	77.6	76.3
December	70.1	56.0	82.7	78.2	65.2	89.6	77.6	74.2
Average	**65.6**	**72.7**	**87.5**	**85.0**	**94.5**	**98.0**	**87.9**	**87.3**

The RMKRWU consumes an average of 4.0% of the WTP potable water output and an average of 31,864 m^3/year, as shown in Table 3.6 above. The volume of water consumption by the RMKRWU is low enough that it was not removed during calculations of consumption per capita but it does add a buffer to per capita consumption. The system was expanded in 2015 and further water will be drawn by the rural users as the system expansion comes online and potential future users are added.

The potable WTP records from 2012 through 2015 were analyzed to determine the Average Day Demand (ADD) and the Maximum Day Demand (MDD) for each year. The average ADD and MDD were 2,169 and 3,529 m^3/day, respectively. Table 3.7 below shows the results for each year where water records were provided. The ADD and MDD were calculated from flow leaving the WTP and; therefore, include water losses within the distribution system and are not limited to metred water usage.

Table 3.7: Summary of Potable Water Demand

Year	ADD (m^3/day)	MDD (m^3/day)	Peaking Factor	MDD Date
2012	1,872	2,989	1.60	August 21
2013	2,221	3,555	1.60	August 15
2014	2,301	3,708	1.61	July 15
2015	2,281	3,863	1.69	June 5
Average	**2,169**	**3,529**	**1.63**	

3.1.2.1 Average Day Demand

The ADD ranged from 1,872 to 2,301 m^3/day from 2012-2015. The ADD value of 2,221 m^3/day occurred in 2013 which was the average year in respect to both annual and seasonal precipitation. Therefore, the ADD has been established as 2,221 m^3/day and this value will be used as the 2015 baseline for evaluating capacities within the waterworks system as it is the most representative of normal conditions for the Kindersley area.

3.1.2.2 Maximum Day Demand

The Maximum Day Demand (MDD) gradually increased from 2012 to 2015 similar to the ADD. The MDD from 2013 was 3,555 m^3/day. The peaking factor was consistently 1.6 over the four years. The peaking factor is the ratio of MDD over the ADD.

The Water Security Agency recommends a peaking factor of 2.00 for communities ranging from 3,000 to 10,000 in their Community Water Use Records published in February of 2013. Using the Water Security Agency recommended peaking factor of 2.00, which is close to the 1.60 determined in this review, generates a 2015 baseline MDD of 4,442 m^3/day. The Water Security Agency recommended peaking factor is not considered unreasonable and will be used to determine future water consumption demands.

The graph below in Figure 3.1 summarizes the daily output of potable water from the WTP in comparison to the ADD and MDD determined within the previous sections.

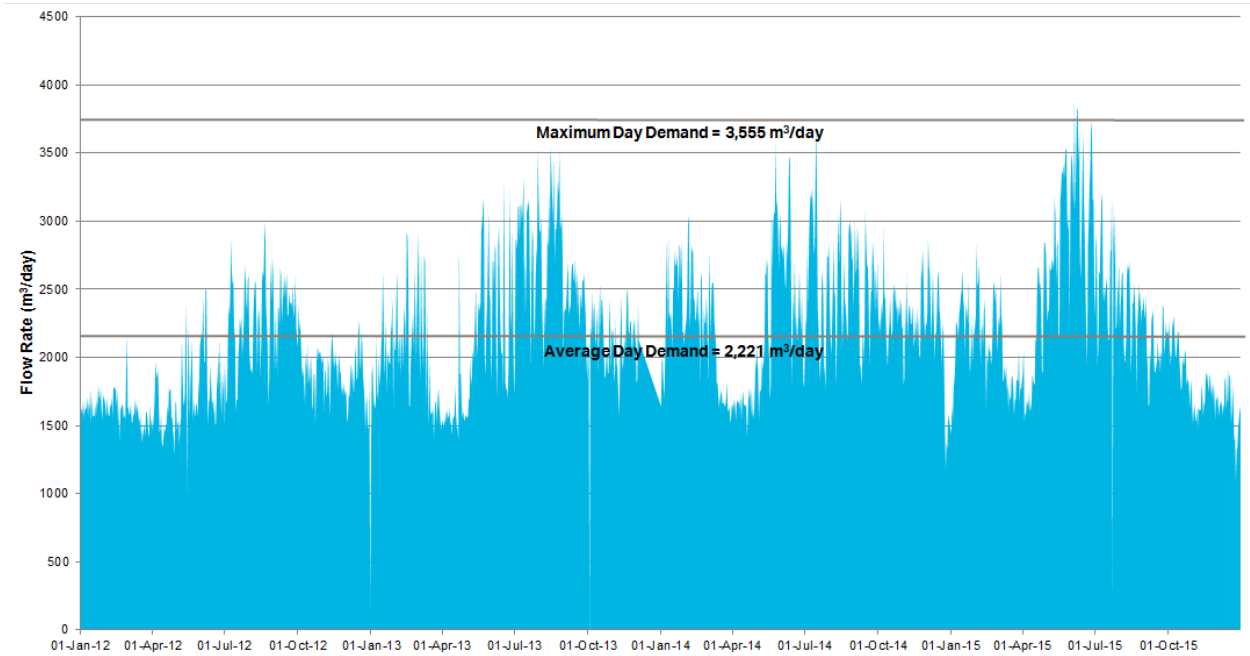


Figure 3.1: Daily Water Treatment Plant Potable Water Production

3.1.2.3 Peak Hour Demand

Historical PHD data was not available from the WTP records. Therefore, PHD was estimated by multiplying the ADD from 2013 by 3.0, as recommended by the Water Security Agency water consumption report published in 2013, which results in a 2015 baseline PHD of 6,663 m^3/day. The PHD will be used to assess the capacity and performance of the system during the peak demand periods and to estimate residual pressure under fire flow operating scenarios.

Table 3.8: Summary of 2015 Baseline Treated Water ADD, MDD and PHD

ADD	MDD		PHD	
(ML/day)	Peaking Factor	(M^3/day)	Peaking Factor	(M^3/day)
2,221	2.0	4,442	3.0	6,663

3.1.3 Process Wastewater

WTP process wastewater is generated by the hydrocyclone process of the ACTIFLO™ clarifiers and from filter backwashing. There is no metering on the hydrocyclone wastewater piping, but the filter backwash water is recorded. As such wastewater volumes have been estimated by subtracting the WTP raw water volumes from the treated water volumes and these estimates are presented in Table 3.9.

Table 3.9: Total Monthly Kindersley WTP Waste Water Production

Month	2012 (m^3)	2013 (m^3)	2014 (m^3)	2015 (m^3)	Average (m^3)
January	12,289	10,879	12,155	15,238	11,759
February	11,210	12,325	12,097	13,500	11,857
March	11,412	12,540	14,728	14,208	12,886
April	12,793	12,546	13,467	15,124	12,935
May	12,242	12,672	15,407	14,476	13,300
June	14,668	12,517	16,223	14,390	14,468
July	13,187	14,734	16,238	18,946	14,720
August	14,061	12,793	15,977	16,012	14,277
September	10,874	12,394	14,899	13,782	12,722
October	10,815	11,236	14,485	15,422	12,102
November	9,715	10,660	14,798	14,450	11,714
December	11,185		12,813	14,680	11,969
Total	**144,451**	**135,296**	**173,287**	**154,709**	**160,127 (13,344)**

Table 3.10: Average Daily Kindersley WTP Waste Water Production

Month	2012 (m^3/day)	2013 (m^3/day)	2014 (m^3/day)	2015 (m^3/day)	Average (m^3/day)	% of Raw Water
January	396	351	392	492	408	17%
February	400	440	432	482	439	17%
March	368	405	475	458	427	19%
April	426	418	449	504	449	21%
May	395	409	497	467	442	16%
June	489	417	541	480	482	16%
July	425	475	523	611	509	17%
August	454	413	516	517	475	16%
September	362	413	496	459	433	16%
October	349	362	468	497	419	17%
November	324	355	493	482	414	17%
December	361	-	458	474	431	19%
Average	396	405	478	494	444	**17%**

The results in Table 3.9 and Table 3.10 show an increase in wastewater starting in 2012 which is attributable to the start-up of the ACTIFLO^{TM} process. It also represents considerable backwashing of the filters since the filter backwashes is not being controlled by head loss or turbidity readings in the filter and is being triggered manually be the oeprators. The average raw water volume from 2012 to 2015 is 2,587 m^3/day and the average process waste water is 444 m^3/day and represents 17% wastewater from the treatment processes in the WTP.

3.2 Future Estimated Water Demands

For the purposes of this report, an annual future growth rate of 1.50% will be used which is based on the population statistics, the annual change in water consumption from 2012 to end of 2014 was an average of 10% annually which is not realistic or sustainable. It should be noted that an annual growth rate of 2.65% was used in the November 2014 *Infrastructure Capacity Assessment* report however that was calculated by with a theoretical 2040 population of 10,000 persons which equates to 2.65% annually over a 25 year period starting in 2015. The 2.65% growth rate is an aggressive growth rate and based on recently declining economic and employment conditions for Kindersley and the province we are suggesting using the moderate growth rate of 1.50%. We will utilize a 2015 population of 5,544 persons using the 2014 population value of 5,362 and the 1.5% annual growth rate. The future estimated demands are presented in Table 3.11.

Although a PDF of 1.6 is the historic average for the Town, the Water Security Agency recommends a PDF of 2.0 for a community of this size. According to the historical records, a PDF of 2.0 is not unreasonable; therefore, this PDF will be used to forecast future water demands. The Water Security Agency recommends a Peak Hour Factor (PHF) of 3.0 be used to estimate Peak Hour Demands (PHD) for a community with a population between 3,001 and 10,000, so this value will be used to estimate future PHD values for the Town.

Raw water demands have been calculated based the WTP wastewater processes accounting for 17% of the total raw water demand.

Table 3.11: Future Raw and Treated Water Demand Estimates

Year	Estimated Population	Raw			Treated					Annual Growth Rate (%)
		ADD		PDD	ADD		PDD	PHD	2 x ADD	
		(m^3)	(L/s)	(L/s)	(m^3)	(L/s)	(L/s)	(L/s)	(m^3)	
2015	5,544	2,553	29.5	59.1	2,221	24.7	49.3	74	4,442	1.50
2020	5,972	2,750	31.8	63.7	2,393	27.7	55.4	83.1	4,785	1.50
2025	6,434	2,962	34.3	68.6	2,578	29.8	59.7	89.5	5,155	1.50
2030	6,931	3,191	36.9	73.9	2,777	32.1	64.3	96.4	5,554	1.50
2035	7,467	3,438	39.8	79.6	2,991	34.6	69.2	103.9	5,983	1.50

*Note: (1) PDD = ADD * 2.0*
*(2) PHD = ADD * 3.0*

3.3 Raw Water Quality

Raw water quality test results are recorded daily at the Kindersley WTP. Data from 2007 to present have been compiled and reviewed. A summary of the results for key water quality is included in Table 3.12. The parameter values are compared to Saskatchewan Drinking Water Quality Standards & Objectives (SDWQSO). The results below have been sourced from the 2009 Water West Design Brief and the 2014 Infrastructure Capacity Assessment.

Table 3.12: Key Raw Water Quality Data

Parameter	Unit	Average	Min	Max	SDWQSO Limit	
					Criteria(1)	Value
Alkalinity (as $CaCO_3$)	mg/L	217	20	360	AO	500
Iron, Fe	mg/L	0.39	0.2	0.64	AO	0.3
Organic Carbon	mg/L	1.8	1.8	1.8	-	-
pH	pH Units	7.58	6.69	10.04	AO	6.5 – 9.0
Hardness (as $CaCO_3$)	mg/L	335	190	450	AO	800
Turbidity	NTU	3.65	0.13	49	MAC	0.3 – 1.0(2)
Conductivity	µS/cm	715	461	1400	-	-
Total Dissolved Solids	**mg/L**	**387**	**276**	**631**	**AO**	**1500**

Notes: (1) MAC = Maximum Acceptable Concentration, AO = Aesthetic Objective
(2) When monthly source water average is 1.5 NTU or more. Less than 0.3 NTU, 95% of the time if continuous monitoring employed. Never to exceed 1.0 NTU.

The raw water parameters which exceed the SDWQSO guidelines include iron and turbidity.

3.4 Treated Water Quality

Table 3.13 below presents a summary of the treated water quality results from 2012 to 2015. It should be noted that the WTP upgrades were complete and commissioned in spring 2012, some of the results post upgrades are different and improved from that point forward. We have utilized the the 2015 annual notice to consumers and water quality test results found on the SaskH_2O website.

Table 3.13: Treated Water Quality

Parameter	Units	Treated Water[3]			SDWQSO [1]	
		Min	Max	Average	Criteria [2]	Limit
Free Chlorine	mg/L	0.21	2.88	0.72	-	0.1 [6]
Total Chlorine	mg/L	0.15	4.26	0.97	-	0.5 [6]
Iron	mg/L	n/a	n/a	n/a	AO	0.3
Manganese	mg/L	n/a	n/a	n/a	AO	0.05
Chloride	mg/L	21.1	36.5	27.9	AO	250
Fluoride	mg/L	0.10	1.66	0.29	MAC	1.5
Sodium (Dissolved)	mg/L	48	106	79.9	AO	300
Total Dissolved Solids	mg/L	490	921	748.4	AO	1,500
Turbidity (Filters)	NTU	-	-	-	MAC	0.3
Turbidity (Distribution)	NTU	.01	12.0	0.27	-	-
pH	pH units	6.9	7.7	7.43	AO	6.5-9.0
Conductivity	µs/cm	682	1177	968.9	-	-
Trihalomethanes	µg/L	30.1	108 [5]	52.9	MAC	100
Aluminum	µg/L	20.6	57.6	31.6	-	NA [4]
Arsenic	µg/L	< 0.23	0.6	0.9	MAC	10
Barium	µg/L	31.9	55.5	47.4	MAC	1000
Cadmium	µg/L	<.03	<.03	<.03	MAC	5
Chromium	µg/L	<.03	<.11	<.04	MAC	50
Copper	µg/L	<2.71	104	15.5	AO	1000
Lead	mg/L	< .01	4.5	.52	MAC	0.01
Selenium	µg/L	< .08	0.20	0.72	MAC	10
Uranium	µg/L	1.8	3.4	2.62	MAC	20
Zinc	µg/L	3.62	14.2	7.32	AO	5000
Haloacetic Acids	µg/L	12.0	21.0	16.15	MAC	80
Hardness (as $CaCO_3$)	mg/L	244	432	357	AO	800
Total Alkalinity (as $CaCO_3$)	mg/L	112	210	183	AO	500

(1) Saskatchewan Drinking Water Quality Standards and Objectives (Water Security Agency)

(2) AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration; IMAC = Interim Maximum Acceptable Concentration

(3) From January 2012 to December 2015 SaskH2O.

(4) Guidelines for Canadian Drinking Water Quality sets a maximum of 0.1 mg/L for conventional treatment as an Operational Guideline

(5) This THM value was recorded in 2011 prior to the new water treatment process being implemented. All values post upgrades (2012 +) were significantly lower and below the limit.

(6) Minimum Values identified in Kindersley's Permit to Operate

3.5 Environmental Protection Officer Discussion and Inspection Reports

There are mandatory inspections by Water Security Agency Environmental Protection Officers (EPO) twice annually. The following inspections were downloaded from the SaskH_2O website and are the most recent inspections:

- December 9, 2015
- May 19, 2015
- November 20, 2014

- April 1, 2014
- December 9, 2013
- May 9, 2013

The November, 2012 inspection report was also reviewed, but it was written immediately after upgrades had been completed and optimizing the treatment system and completing construction activities were still active. Inspections completed from 2013 to 2015 were considered on this basis and all previous reports were not included in this WSA report. The inspection reports cover three general categories which are equipment, operations and reporting. The reports did not identify any items, issues or components which were not in compliance. A summary of the reports since May 9, 2013 is provided below:

- Equipment
  - No non-compliant items were noted in any reports
- Operations
  - No non-compliant items were noted in any of the reports
- Reporting
  - No non-compliant items were noted in any of the reports

4. Regulatory Context

4.1 Water Security Agency Objectives and Drinking Water Guidelines

The potable waterworks system must meet many standards and guidelines which include both provincial and federal laws and regulations to maintain its compliance with regulatory agencies. A summary of the applicable acts are as follows:

- Saskatchewan:
  - The Water Security Agency Act
  - Environmental Management and Protection Act
  - Saskatchewan Occupational Health and Safety Act
- Federal:
  - Navigation Protection Act
  - Fisheries Act
  - Canadian Environmental Protection Act

The primary and most applicable act by which the Water Security Agency evaluates municipalities and their waterworks systems is the Saskatchewan Waterworks and Sewage Works Regulations which supersedes The Water Regulations, 2002. The Water Security Agency publishes a number of guidelines and fact sheets which are publically accessible on their SaskH_2O web site. Along with these documents, links are available to Waterworks and Sewage Works Regulations, Environmental Management and Protection Act and EPO contact information. The following information from the SaskH_2O website are the primary documents from this site that were used for this WSA:

- Waterworks and Sewage Works Regulations
- EPB 501: Waterworks Design Standard
- EPB 507: Saskatchewan's Drinking Water Quality Standards and Objectives
- EPB 202: Municipal Drinking Water Quality Monitoring Guidelines
- EPB 233A: Waterworks System Assessment Standards (WSA) – Round 3
- EPB 542: Quality Assurance and Quality Control for Water Treatment Utilities Drinking Water Quality Management
- EPB 265: Guidelines for Chlorine Gas Use in Water and Wastewater Treatment
- EPB 432 Use of Chemicals in Drinking Water Treatment
- EPB 293: Managing Wastes Generated by Water Treatment, Distribution, Maintenance, Repair and Extension

The Water Security Agency issues a site specific Permit to Operate (PTO) a Waterworks for each applicable regulated system in Saskatchewan. The Town of Kindersley's PTO is identified as permit #0000-2274-05-00 and will require renewal on December 31, 2017. Notable terms and conditions from the PTO are:

- Appendix B
  - free chlorine of not less than 0.1 mg/L in water entering the distribution

- a total chlorine residual of not less than 0.5 mg/L or a free chlorine residual not less than 0.1 mg/L in the water throughout the distribution system

Table 4.1: Turbidity Standards

Source/Treatment	Routine Standard	Continuous Monitoring Time Duration Max.	Absolute Maximum
Surface water [1,2] source with monthly average source 1.5 NTU or greater employing chemically assisted direct filtration	Less than 0.3 NTU, 95% of discrete measurements of 95% of the time if continuous monitoring employed	Not to exceed 0.3 NTU for more than 12 consecutive hours if continuous monitoring employed	Never to exceed 1.0 NTU

1) Includes surface waters and groundwater under the influence of surface water

2) Turbidity value measured from each filter effluent

5. Waterworks Assessment Findings

5.1 Raw Water Supply

5.1.1 River Wells

Raw water is supplied from induced surface water infiltration wells along the north shore line of the South Saskatchewan River approximately 55 kilometers from the Town of Kindersley. Capacity for the four production wells including three duty and one standby are shown in Table 5.1 below. The four production wells have a theoretical individual design flow of 20.0 L/s each. The reported capacity of three of the production wells operating simultaneously ranges from 45.0 L/s to 69.0 L/s (as reported by Beckie Hydrogeologists). The variant flow rate range and capacity is caused by fluctuations in the river level. The river well field/location was originally developed in 1964 when the original E-K water system was constructed.

Three shield wells are part of the raw water infiltration system and provide protection for the production wells against groundwater intrusion from the nearby Tyner Aquifer. The raw water quality deteriorates if one of the shield wells is offline. Water is pumped from the shield wells via individual 100 mm diameter pipelines then discharged through a 200 mm diameter gravity pipe into the South Saskatchewan River.

Well Type	Well Identifier	Well Capacity / Pumping Rate
Production Well	PW3A-1997	20.0 L/s
Production Well	PW4A-2001	20.0 L/s
Production Well	PW6A-2002	20.0 L/s
Production Well	PW8-2003	20.0 L/s
Shield Well	SW5A-2003	6.0 L/s
Shield Well	SW7-1986	Decommissioned
Shield Well	SW7A-2012	6.0 L/s

5.1.2 River Wells Pumping Station

The River Wells Pumping Station (RWPS) is located immediately adjacent to the river wells and along the South Saskatchewan River. The RWPS can be accessed by vehicle by driving 55 kilometers south of the Town of Kindersley and access the South Saskatchewan River Valley. The RWPS is located 6.2 kilometers west of the Lancer ferry crossing through a private all weather access road through ranchland. The RWPS was constructed in 2003 and replaced the original pumping facilities that were built at the site in 1964.

Raw water is pumped from the production wells to the River Wells Pump Station (RWPS) through individual 150 mm diameter pipes (between the well and the RWPS). Each incoming raw water supply pipeline has an individual flow meter and the raw water is discharged into a reinforced concrete pumpwell located beneath the RWPS. The pumpwell measures 8.8m by 7.0m by 5.25m in depth for a working volume in the pumpwell of 325 m^3. Three incoming pipes were installed in the pump station for future connection to new production wells as demands and capacity in the system warrants it. The pump station has three 300 hp vertical turbine high lift pumps, two as duty and one as standby, each with a variable frequency drive. The three pumps have a maximum discharge pressure of 3620 kPa (525 psi) and a total capacity of 63.4 L/s.

The raw water is pumped from the facility through a 300 mm diameter common header. The common header connects a dual raw water supply line outside the facility that consists of a 200mm diameter pipeline and a 300mm diameter pipeline. The 200mm raw water pipeline extends for 14.8 kilometers between RWPS and Snipe Lake Pumping Station (SLPS) and was constructed in 1964 under the original E-K water system. The 200mm diameter raw waterline is a steel pipeline with a cement mortar lined internal coating. In the Water West (2011 – 2013)

project a 300mm raw water pipeline was installed adjacent to the existing 200mm pipeline (twinning) for a distance of 6.2 kilometers. The twinned pipeline provided additional capacity in the system to transfer raw water from RWPS to SLPS. The 300mm diameter pipeline consists of a steel pipeline with an HDPE internal liner, at the end of its 6.2 kilometer length it connects back to the 200mm pipeline for the remaining 8.6 kilometers to SLPS.

The upgrades that were completed in the Water West project in 2011 to 2013 at the RWPS are summarized in Section 2.2.1.

5.1.3 Snipe Lake Pumping Station

The SLPS is located 12 kilometers west of the Town of Eston and 3.25 kilometers south of Highway No. 44. It was constructed in 2013 as a component of the Water West project. The current SLPS facility replaced the original two pumping facilities that were built to provide raw water pumping service to Eston and Kindersley in 1964 as part of the E-K Water System. Adjacent to SLPS building is an earthen reservoir which was previously used in the E-K Water system as raw water storage to supplement high demand periods at both municipalities that exceeded the pumping capacity between RWPS and SLPS. The earthen reservoir storage originally provided some storage in the event of a pipeline break or facility problem at RWPS.

The earthen reservoir is not part of the raw water supply for the system once the Water West project was completed. The reservoir has been converted to a surge pond to protect SLPS from a building flood in the event of a pumping or instrumentation problem within the facility. Concerns over contamination of the raw water stored in the earthen reservoir was a major factor to its discontinued use within the supply of the system. There is also a secondary overflow from the pumpwell beneath the SLSPS facility to provide protection from the pumpwell exceeding its maximum supply level.

The SLPS consists of structural steel building complete with metal cladding. A reinforced concrete pumpwell is located below the building with dimensions of 9.6m by 4.6m by 4.45m in depth for a maximum working volume of 196 m^3. There are three groups of raw water distribution pumps located within the facility, one duty and one standby in each group. There are two 300 hp vertical turbine high lift pumps which convey the raw water to the Low Lift CNR Pump Station and is the supply to the Town of Kindersley. This group of pumps has a capacity of 48.4 L/s at a maximum discharge pressure of 3240 kPa (470 psi). Another group of 7.5 hp pumps deliver raw water to the Town of Eston at a capacity of 7.5 L/s. The final group of future pumps will provide future raw water supply to the RM's of Chesterfield and Newcombe at a capacity of 7.5 L/s. It should be noted that this future supply was paid for by the Town of Kindersley during the Water West project and could be reallocated to the Town if their needs warrant in the future.

There is a raw water truckfill located on the south exposure of the facility. The truckfill utilizes a single 3 hp pump to provide the necessary service. Users in the area can utilize the truckfill by purchasing water cards from the Town of Eston. The facility is monitored and controlled through the SCADA system with the main computer located in Kindersley WTP.

Raw water is pumped from SLPS to the low lift CN Reservoir and pumping station (CNRPS) through dual raw water pipelines (200mm diameter and 250mm diameter). The 200mm diameter pipeline was originally built in 1964 as part of the E-K Water system and consists of a steel pipeline complete with a cement mortar lining internal coating extending 34 km in length from SLPS to CN Reservoir. A second 250mm diameter raw water pipeline was constructed in 2011 as part of the Water West project and consists of a steel pipeline complete with an HDPE internal liner and this pipeline parallels the original 200mm pipeline (twinning) for 11.6 km. At the end of the twinned 250mm line it connects back into the original 200mm pipeline for the remaining distance to CN Reservoir.

The upgrades that were completed in the Water West project (2011 – 2013) at the SLPS are summarized in Section 2.2.1.

5.1.4 CN Reservoir and Pumping Station

The CN Reservoir and Pumping Station (CNRPS) is located approximately 5.6 km southeast of Kindersley and access is provided through local RM grid roadway network. The CNRPS was constructed in 2013 as a component of the Water West project. The current CNRPS replaced the previous pumping station facility which was constructed in the 1990's. The reservoir site was developed in 1923 when water storage was required for steam engines during development of the railways in Western Canada. An earthen dam was constructed across the coulee to dam off surface runoff water collected in the coulee or drainage run. A second dyke was constructed east of the main dam to provide a compartment for storage and management of the raw water, it is unknown when this secondary east dyke was constructed.

In the Water West project another dyke was constructed in 2012 between the dam and the east dyke to provide a smaller, more defined and manageable raw water storage for the Town. In addition to this new dyke an area on the northern edge of the reservoir was excavated to provide a raw water intake area adjacent to the new pumping station. 300mm diameter piping was installed between the pumpwell (located beneath the pumping station) and the new intake area of the reservoir. A stainless steel intake screen was installed on the intake structure which is located on the floor of the reservoir. There are no fish present in the reservoir however the screen prevent s the entry of debris and other rodents such as muskrats and beavers into the pumpwell. The new raw water storage compartment has a useable storage volume of 71,000 m^3 between the normal water level and low water level.

The raw water storage provided at CNRPS is required to address the high water demands periods in the summer the Town of Kindersley encounters. As described in Section 5.1.3 the maximum pumping capacity between SLPS and CNRPS is 48.4 L/s, however the Town of Kindersley has a raw water MDD of 5,106 m^3/day (Table 3.3) or 59.1 L/s. The storage provides at CNRPS allows for a high flow rate or transfer of water to the WTP during these higher demand periods.

The CNRPS building was constructed of a steel building complete with exterior metal cladding. A reinforced concrete pumpwell is located beneath the building structure with dimensions of 7.0m by 7.0m by 6.6m depth for a maximum pumpwell volume of 323m^3. There are two low lift raw water distribution pumps (RWP 502, 503) in the facility configured in a one duty and one standby configuration. Each pump has a 50 hp motor and a duty point of 70 L/s at a discharge pressure of 414 kPa (60 psi). The facility is also equipped with a $KMnO_4$ dosing system. The dosing system injection points are located on each of the raw water lines just prior to exiting the facility. The $KMnO_4$ dosing system consists of a dry chemical feeder hopper and auger, large automated mixing tank and two dosing pumps which operate as duty and standby. The $KMnO_4$ dosing system is intended to contact and oxidize iron and manganese in the raw water as it is pumped between CNRPS and the Kindersley WTP (KWTP). The $KMnO_4$ dosing system has not been utilized by the waterworks staff from time of facility commissioning (2012) until recently when the system was put into service with different operations staff, the system has been in operation since May 2016.

Raw water is pumped from CNRPS to the Kindersley WTP through dual 200mm and 250mm pipelines. The 200mm pipeline was originally constructed in 1964 and consists of a steel pipeline with a cement mortar lining internal coating extending 4.0 kilometers to the Kindersley WTP. An additional 900m section of the 200mm pipeline was built in 2011 as part of the Water West project which consists of an HDPE DR11 pipeline. The second twinned pipeline between CNRPS and Kindersley WTP is a 250mm HDPE DR11 pipeline that extends 4.8 km and was constructed in 2011 as part of the Water West project. Raw water enters the Kindersley WTP through a common single 400mm header where the dual 200mm and 250mm pipelines come together in the parking lot just south of the facility.

The upgrades that were completed in the Water West project at the CNRPS are summarized in Section 2.2.1.

5.2 Water Treatment Plant

5.2.1 Overview

The WTP is located on the north side of Thomson Drive at the intersection with Ditson Drive. The site is completely fenced as of summer 2015. The WTP was originally constructed in 1958 at its current location and consisted of two rapid sand filters and a clarifier. Further upgrades occurred to the facility in 1972 when a 2,400 m^3 circular reinforced concrete treated water storage reservoir was added to the north of the WTP building. In 1986 three additional rapid sand filters were constructed to replace the two smaller existing filters that had been in service since 1958. The upgrades in 1986 included a major building expansion including: expansion and upgrading of the administration area, new clarifier, addition of chemical storage and feed systems, new electrical room, raw water aerator and distribution pumping area. Additional clearwells and pumpwells were also added in the lower level of the facility.

From 2010 to 2013 the WTP went through another major upgrade whereby the 1986 clarifier was replaced with the ACTIFLO™ clarification system, the three 1986 filters were upgraded and rehabilitated with new undrains and media, a UV disinfection system was added and other chemical and instrumentation feeds were modernized and/or replaced. The facility is a mix of era's dating from 1958 to 1986 and then finally a mix of 2010 to 2013.

The building envelope consists of three levels in the facility:

- The main level consists of the administration area, the clarification system, filter controllers, electrical and control rooms and mechanical room
- The lower level (beneath the main level) consists of the pumping area and associated distribution piping, UV reactors and filter piping and valving located next to the filter banks.
- The lowest level includes clearwells, east and west pumpwells and associated transfer piping.

5.2.2 Water Treatment Process and Equipment

5.2.2.1 Clarification

The water enters the WTP through the 400mm diameter supply pipeline (from CNRPS), Alum is dosed to the raw water and turbidity, flow rate and pressure are measured prior to the raw water splitting and being routed to the ACTIFLO™ clarification process. There are two ACTIFLO™ trains so flow can be split between the two clarification trains through the 200 mm diameter feed pipelines to each train during high demand periods or to a single train which are operated as duty/standby during low demand periods. The ACTIFLO™, which is supplied by John Meunier Inc., is a proprietary, high clarification process consisting of the following treatment steps:

- **Coagulation/Injection Tank** – Each tank is approximately 1.4m x 1.0m with an operating depth of 3.0 m and each train has two tanks operating in series. The liquid alum has been previously dosed to the raw water and has initiated the coagulation process however to enhance this process a mixer is positioned in each tank. Polymer is injected at the surface and also near the bottom of each tank. This coagulation process continues as the water flows from the coagulation tank to the injection tank beneath a concrete wall positioned between the tanks.
- **Maturation Tank** – Each train has a single maturation tank which is approximately 1.845m x 2.355m with an operating depth of 3.0m. This tank forms high density floc particles by using the polymer and microsand and mechanically mixing the coagulated solids, polymer and microsand into the desired floc particles. The water flows from the maturation tank to the settling tank over a weir positioned at the top of the wall separating the two tanks.
- **Clarifier/Settling Tank** – Each of the two clarifier tanks is approximately 2.355 m x 2.355 m with an operating depth of 2.5 m. The clarifiers are equipped with tube settlers and settling is achieved in the

"lamella clarifier" section. Clarified water is collected at the surface of the tank after passing through the tube settlers. The higher density floc particles settle to the bottom of this tank where they are recycled.

- **Recycle System** – Each train is equipped with one recycle pump, a third pump has been installed to provide duty/standby and redundancy to each train. The recycle pumps draw the floc particles from the bottom of the settling tanks and pump the liquids to the hydrocyclones where the microsand is separated from the recycled water. The separated microsand is reused by discharging into the coagulation/injection tanks and the sludge particles are wasted through a 50 mm diameter drain line to the WTP waste sump. The waste sump empties to the drainage run south of the WTP and west of Motherwell Reservoir through a 375mm diameter gravity sewer. The recycle pumping system is comprised of galvanized steel piping which is severely corroded and is reported to be causing issues.

The clarified water from each train is collected into a channel at the end of the ACTIFLO^{TM} and 300mm diameter piping takes the clarified water to the filters. The clarification system was designed with a capacity of 31.5 L/s (per train).

When the new clarifiers were constructed, only the outside walls from the original clarifier were used and all internal walls for the clarifiers and contact tanks are new. New concrete floors were also poured on the bottom of the original clarifier for the new ACTIFLO^{TM} clarification chambers.

5.2.2.2 Filtration

Effluent water from the clarifiers flows by gravity through a 300 mm diameter pipe to the three open top gravity filters. The filters are concrete structures with anthracite and sand filter media and stainless steel AWI Phoenix underdrains.

Filter Nos. 3, 4, 5 are all the same size and have a filtration area of 12.6 m^2.The filter media for these filters is 450 mm layer of anthracite over a 450 mm layer of sand. As described above the filters were renovated in the upgrades completed between 2010 and 2013 and are relatively new in construction and operation.

Each filter collects the filtered water into individual 200mm diameter piping which each discharge into Clearwell 2A (located beneath the filters). All three filters have effluent piping with separate turbidimeters and particle counters which are connected to the SCADA system to monitor and record values. These values are displayed on the HMI for the Operators to observe. Each filter has a flow meter on their single effluent line. The control valves for each filter are butterfly valves with direct mount electric actuators which were replaced as part of the Water West project.

Backwash water is supplied by a single vertical turbine pump and there is no redundancy in backwash water supply. The pump was not upgraded during the Water West project.

The air scour systems for all filters are supplied by a common blower system. The system includes a single Ingersoll Rand (SFB Series 1) rotary positive blower installed in a vendor supplied enclosure in the adjacent room (near the ACTIFLO^{TM} recycle pumps). Air scour piping is stainless steel and the air to each filter is regulated by electric actuated butterfly valves which are controlled through the SCADA system. The City has a spare blower stored in the WTP as a backup.

The operation of the filters, including the backwashing process, is controlled manually by the Operators through the SCADA system. The filters are currently operated as follows:

- The treatment process is started when the clearwell levels reach a treatment process start level. When a start signal is received the SCADA starts the duty pump at CNRPS to provide raw water to the ACTIFLO^{TM} filtration processes. The treatment process stops once the clearwells are full.

- Backwashing is initiated manually by the operators rather than automatically based on effluent turbidity or head loss through the filters. The frequency for backwashing the filters is determined by filter run time and the filters are backwashed every other day. Once the backwashing sequence is manually activated through the SCADA the backwashing sequence is then automatically controlled by the SCADA system.
- There is no filter-to-waste piping to allow filter effluent water to be discharged to waste after the filter has been backwashed to allow turbidity level to return to normal levels.

5.2.2.3 Ultraviolet Disinfection

The ultraviolet (UV) disinfection system consists of two Trojan UVSwift™ 12 reactors operating in a duty / standby configuration. Filtered water is drawn from the clearwells by the high lift distribution pump (Pump 327) and is pumped through the UV reactors prior to discharge to the Water Tower and distribution system. The UV system has a capacity of 2.7 MLD (31.3 L/s) to 6.0 MLD (69.6 L/s) with one reactor operating with a dosage rate of 5.8 MJ/cm^2 and a minimum UV transmittance (UVT) of 90%. The operation of the UV system as part of the overall disinfection process is evaluated in Section 5.2.6.

Daily maximum, minimum and average UV dosage rates, flow rates and UVT values are recorded by the SCADA system.

5.2.3 Treatment System Chemicals

The chemicals that are used as part of the treatment process include:

- $KMnO_4$ is injected for oxidation of organics in the raw water and can be dosed at the CNRPS; however, at the time of the site inspection, the operators were not utilizing $KMnO_4$ and did not report any issues with taste and odour
- Copper sulfate is manually added to the earthen reservoir at the CNRPS to manage algae growth
- Liquid alum is added to raw water as it enters the WTP and prior to the coagulation/flocculation stage
- Polymer is dosed at the coagulation/flocculation stage
- Microsand is added at the ACTIFLO™ clarifier to create high density floc particles.
- Chlorine is added to the post-filtered water prior to storage in the clearwells
- Fluoride is injected downstream of the UV reactors prior to the water entering the distribution system

Table 5.1 below summarizes the current chemicals used, dosage locations, dosage rates and maximum use levels (MUL). The City tenders out their chemical supply contract and the supplier can change annually, so some chemicals from different manufacturers could be utilized from year to year.

Table 5.1: Summary of Chemicals and Dosage Rates

Chemical	Application Point	Feed Pump Type and Rated Capacity	Dosage Rates (1) (mg/L)	Maximum Usage Level (2) (mg/L)
Potassium Permanganate	200 & 250 mm raw water piping at CNRPS	Two positive displacement diaphragm pumps: – max flow of 42 L/hr (per pump) – min flow of 2 L/hr (per pump)	N/A	50
Liquid Aluminum Sulfate	400mm raw water header - prior to static mixer and prior to ACTIFLO™ clarification.	Two peristaltic dosing pumps: – Max flow of 34 L/hr (per pump) – Min flow of 0 L/hr (per pump)	5.0	200
Polymer (polyacrylamide)	At hydrocyclone injection point in clarifiers	Three progressive cavity pumps: – Max flow of 38 LPH (per pump) – Min flow of 1 LPH (per pump)	0.2	1
Sodium Fluoride	Post UV on treated water distribution header	One pump: – Max Flow of 29.2 LPH – Min Flow of 1.0 LPH	0.7 – 1.2	2.3
Chlorine Gas	Post Filtration – single discharge point into Clearwell 2B	Two primary chlorinators: – Primary chlorinator: Rotameter capacity of 1 kg/ hour	1.2	30

Note:

(1) Dosage rates are taken from WTP records from 2015. The potassium permanganate was not utilized by the WTP operations staff until May 2016 and therefore the dosage rate value has not been included or noted in this table or report.

(2) Values obtained from the http://www.nsf.org/Certified/PwsChemicals/ website.

The secondary containment systems for the chemicals are listed in Table 5.2.

Table 5.2: Summary of Chemical System Secondary Containment

Chemical	Description of Containment
Potassium Permanganate – LLPS	250mm high concrete curb. The volume within the curb is not sufficient for the tank, but there is a level alarm within the curbed area to notify the operators of a spill.
Liquid Aluminum Sulfate	Stored in separate room. 700mm high concrete curb at entrance to room, walls for room form the rest of the containment. The containment area does leak due to cracks in the floor and alum would leak into the basement in the event of a spill from the tank. There is a level alarm within the curbed area to notify the operators of a spill.
Polymer (polyacrylamide)	300 mm high concrete curb. There is a level alarm within the curbed area to notify the operators of a spill.
Sodium Fluoride	300 mm high concrete curb. There is a level alarm within the curbed area to notify the operators of a spill.
Chlorine Gas	Stored in separate room.

The operators indicated there were issues with the polymer feed system when the granular polymer becomes lodged in the hopper. Operators must use a ladder and shake the polymer granules loose. The pressure relief valves also become plugged regularly.

The operators also indicated that the feed pumps for the sodium fluoride shut down regularly.

Dosage rates of chlorine and sodium fluoride are set manually through the HMI. Chlorine is paced based on flowrate. There is adequate redundancy of the feed systems for most chemicals except for sodium fluoride.

The chlorine gas system is contained in a separate room. The gas cylinders are adequately restrained. There is a fan in the room as well as a chlorine gas monitor which is tested monthly. Switches for the lights and fan are located outside of the room; however the switches are not labelled.

5.2.4 Process Wastewater Disposal

The disposal of process wastewater includes wastes from the ACTIFLO™ clarifiers, hydrocyclones and filters which is summarized in Table 5.3.

Table 5.3: Summary of Process Wastes

Waste Source	Discharge Location	Waste Sequence	Comments
Coagulation Tanks and Maturation Tanks Drains	75mm diameter gravity drain piping which drains to the waste sump in the WTP. The waste sump discharges to the natural drainage run south of the WTP and west of the Motherwell Reservoir Spillway	Drained manually by Operators	Drained annually for cleaning of the basins
Clarifier Partial Drains	100mm diameter gravity drain piping which drains to the waste sump in the WTP. The waste sump discharges to the natural drainage run south of the WTP and west of the Motherwell Reservoir Spillway	Drained to below the settling tubes	Drained for cleaning and periodic maintenance.
Hydrocyclone	50mm drain line from hydrocyclone to WTP waste sump. The waste sump discharges to the natural drainage run south of the WTP and west of the Motherwell Reservoir Spillway	Wasted on a continuous basis during ACTIFLO™ operation	Not metered.
Filter Backwash Waste	150mm drain line from each Filter into a 400mm diameter header. The waste sump discharges to the natural drainage run south of the WTP and west of the Motherwell Reservoir Spillway	Wasted during each filter backwash sequence	Backwash waste volume is determined from the volume difference between the metered raw water and metered treated water readings.

Sludge from the hydrocyclones, located downstream of the ACTIFLO™, discharges wastewater into the existing waste sump and then drain through a 375 mm diameter gravity drain line to natural drainage run south of the plant and west of the Motherwell Reservoir spillway.

The process waste generated in the past two years is approximately 17% of the raw water which is within the expected range for the treatment process at the Kindersley WTP. The ACTIFLO™ supplier indicates that the typical waste generation for this process is 8 to 12% of raw water and an 8 - 10% loss for filter backwashing is within the typical range for these types of filters.

5.2.5 Water Quality

The treated water quality data provided in Section 3.4 shows no treated water parameters exceeding the SDWQSO regulated values.

5.2.6 Disinfection Process Effectiveness

The disinfection effectiveness can be characterized by log inactivation's of the disinfection processes. One of the components in determining effectiveness is CT factor which is a product of the residual chlorine concentration and the amount of contact time between the point of disinfectant application and the point of use. These values together with water temperature and pH will result in a given 'log inactivation by chlorine' of both Giardia cysts and viruses.

A surface water treatment process or a groundwater under the influence of surface water (GUDI) treatment process must achieve 3-log inactivation of Giardia and Cryptosporidium and 4-log removal of viruses. According to *EPB 501,* for conventional sedimentation / filtration, the log removal values credited to the Kindersley WTP is 3.0 for Giardia, 3.0 for Cryptosporidium and 2.0 for viruses. At a minimum, the disinfection process would have to achieve 0.5-log inactivation for Giardia and cryptosporidium and 2-log for viruses.

Actual log inactivation for Giardia and viruses with chlorine is calculated the following equations:

CT_{10} = Free Chlorine Concentration x (Reservoir Volume / Peak Hour Demand) x T_{10}/T Ratio

Actual Log Inactivation for Giardia = ($CT_{10}/CT_{3\text{-log Giardia}}$) x 3

Actual Log Inactivation for viruses = ($CT_{10}/CT_{4\text{-log virus}}$) x 4

The overall contact time available at the WTP is based on the size and geometry of the treated water storage reservoirs. The water tower storage volume is not considered since it is located downstream of the first user of the distribution system. Treated water from the filters is discharged into Clearwell 2A. From there, the water flows to the round reservoir where it has piped connections to each of the other clearwell/pumpwells. The normal flow path is for water to flow from the round reservoir into Clearwell 1B, then 1A and subsequently into Clearwell/Pumpwell 2B where the water is pumped into the distribution system. This combination of interconnecting piping and utilization of more than one reservoir cell would be classified as a "single or multiple baffled inlet and outlet" according to the Water Security Agency. Therefore, a T_{10}/T ratio of 0.3 will be used in the CT calculation.

Table 5.4, below, indicates the parameters used to update the CT calculations from the previous WSA report. A conservative water temperature of 0.5°C will be used in the calculations since no water temperature data is recorded. The pH value is based on the average value from the treated water data presented in Table 3.12. Reservoir capacity is based on a 2.25 m water depth which is approximately 70% the current reservoir high level set points of 3.25 m.

Table 5.4: CT Calculation Parameters

Parameter	Value
2015 Average Day Demand (ADD)	34.6 L/s
Peak Hour Demand	69.2 L/s
T_{10}/T Ratio (Baffling Efficiency)	0.3
Clearwell 1A Capacity	50 m^3 (1)
Clearwell 1B Capacity	80 m^3 (1)
Clearwell 2A Capacity	170 m^3 (1)
Pumpwell 2B Capacity	130 m^3 (1)
Round Reservoir Capacity	1570 m^3 (1)
Combined Reservoir Capacity	2,000 m^3
Reservoir Capacity with Largest Reservoir Out of Service	430 m^3
Temperature	0.5°C
pH	7.5(2)

Note:(1) Reservoir volume based on operating depth of 2.25 m
(2) Average value from Table 3.12

Since disinfection is currently achieved using gas chlorination, Tables 1 and 7 of Appendix A in *Waterworks Design Standard, EPB 501* will be used to obtain the required CT value for 3-log inactivation of Giardia and 4-log inactivation of virus by free chlorine. Various free chlorine residuals, are presented in TrojanUVSwiftTM 12 – 5.8 mJ/cm2 at 90% (cm-1) UVT and 6.0 MLD is 2.0 log for Giardia and Cryptosporidium according to USEPA LT2ESWTR Toolbox Guidance Manual Exhibit 13.1

Table 5.5 which also indicates whether the required inactivation can be achieved. A sample calculation is shown below.

CT_{10} = Free Chlorine Concentration x (Reservoir Volume / Peak Hour Demand) x T_{10}/T Ratio
= 0.4 mg/L x [2,000,000 L / (69.2 L/s x 60 s/min)] x 0.3
= 0.4 mg/L x 482 min x 0.3
= 58 mg·min/L

Actual Log Inactivation for Giardia = (CT_{10}/$CT_{3\text{-log Giardia}}$) x 3
= (58 mg·min/L / 273 mg·min/L) x 3
= 0.6

Actual Log Inactivation for Viruses = (CT_{10}/$CT_{4\text{-log Virus}}$) x 4
= (58 mg·min/L / 12.0 mg·min/L) x 4
= 19

TrojanUVSwift^{TM} 12 – 5.8 mJ/cm^2 at 90% (cm^{-1}) UVT and 6.0 MLD is 2.0 log for Giardia and Cryptosporidium according to USEPA LT2ESWTR Toolbox Guidance Manual Exhibit 13.1

Table 5.5: Log Inactivation

Reservoir Capacity (m^3)	Free Chlorine (mg/L)	Water Temp (°C)	CT_{10} (mg·min/L)	Required $CT_{3\text{-log Giardia}}$	Giardia			Required $CT_{4\text{-log Virus}}$	Virus		
					Log Inactivation (1)	Log Inactivation with Credit(1)(2)	Log Inactivation Achieved		Log Inactivation	Log Inactivation with Credit	Log Inactivation Achieved
430	0.8	0.5	24.9	246	2.30	5.30	Yes	12	6.21	8.21	Yes
	0.8	5	24.9	253	2.29	5.29	Yes	8	9.32	11.32	Yes
	1	0.5	31.1	246	2.38	5.38	Yes	12	7.77	9.77	Yes
	1	5	31.1	179	2.52	5.52	Yes	8	11.65	13.65	Yes
	1.4	0.5	43.5	266	2.49	5.49	Yes	12	10.87	12.87	Yes
	1.4	5	43.5	187	2.70	5.70	Yes	8	16.31	18.31	Yes
	1.6	0.5	49.7	273	2.55	5.55	Yes	12	12.43	14.43	Yes
	1.6	5	49.7	192	2.78	5.78	Yes	8	18.64	20.64	Yes
2,000	0.1	0.5	14.5	237	2.18	5.18	Yes	12	3.61	5.61	Yes
	0.1	5	14.5	166	2.26	5.26	Yes	8	5.42	7.42	Yes
	0.2	0.5	28.9	237	2.37	5.37	Yes	12	7.23	9.23	Yes
	0.2	5	28.9	166	2.52	5.52	Yes	8	10.84	12.84	Yes
	0.4	0.5	57.8	237	2.73	5.73	Yes	12	14.45	16.45	Yes
	0.4	5	57.8	166	2.04	6.04	Yes	8	21.68	23.68	Yes
	0.6	0.5	86.7	239	2.09	6.09	Yes	12	21.68	23.68	Yes
	0.6	5	86.7	171	2.52	6.52	Yes	8	32.51	34.51	Yes

1) Includes UV Disinfection credit of 2.0 log.
2) Includes treatment system credit of 3.0 log.

Based on the information shown in the above table, the required log inactivation for viruses is always achieved, making the 0.5-log inactivation for Giardia the governing factor for determining free chlorine levels. At temperatures as low as 0.5°C, the minimum free chlorine residual concentration required to maintain the required inactivation of Giardia is 0.2 mg/L during normal operation. The average free chlorine concentration in the distribution system is 0.72 mg/L, suggesting that the required log reduction of Giardia and viruses is maintained.

When the largest reservoir is out of service, the storage volume significantly reduces to 430 m^3. When operating under this condition, the minimum free chlorine residual concentration required to maintain the required inactivation of Giardia is 0.8 mg/L at a temperature of 0.5°C.

Trihalomethane (THM) levels in the treated water have averaged 52.9 µg/L which is below the MAC value of 100 µg/L. There has been speculation for a number of years that the federal Guidelines for Canadian Drinking Water Quality will reduce the THM MAC to 80 µg/L based on an annual average to match United States Environmental Protection Agency (USEPA) limits. However, even if the MAC is lowered, THM test results in Kindersley have historically been well below the 80 µg/L limit. Therefore, no issues are anticipated with the required chlorine dosages during normal operation.

5.2.7 Heating and Mechanical Systems

The building heating and ventilation for the building are fed from natural gas and electricity. The mechanical system for the facility has been upgraded in 2012 with the installation of a makeup air unit. New domestic plumbing and drain lines were also installed for the eyewash that was installed in the facility and the new polymer and fluoride chemical skids that were installed.

A majority of the heating system for the WTP facility is the original system that was installed in the 1986 upgrades. There are various natural gas unit heaters positioned in the different levels and rooms throughout the facility and provide the primary heat for the building. There are also a number of louvers and exhaust fans which provide fresh air supply and exhausting throughout the building.

5.2.8 Electrical

The electrical supply to the WTP is a 480 volt, 1000 amp, 3-phase 3-wire underground service from the SaskPower grid. The power is distributed through several motor control centers (MCC's) located within the electrical room in the facility.

If a power failure occurs a standby generator which was installed and commissioned in 2016 will provide power to the entire facility and all three MCC's. The natural gas powered generator is located on the north side of the WTP near the circular below grade treated water reservoir. The unit is rated at 100 kW, 600 volts, 3-phase.

5.2.9 Instrumentation and Controls

Instrumentation and controls within the facility is provided through a SCADA system. The SCADA system was put in place as part of the Water West upgrades. The SCADA provides operation control for the equipment systems within the WTP as well as remotely with CNRPS, SLPS and RWPS raw water supply facilities. PLC's are located throughout the facility to provide this level of monitoring and control of the different equipment and ethernet is used for communications between the PLC's within the WTP. Communications with the remote facilities is by way of SaskTel high speed internet and the PLC's located at each remote facility.

5.3 Treated Water Storage and Distribution

5.3.1 Storage Reservoirs and Water Tower

The Water Security Agency Waterworks Design Standard (EPB 501) recommends that the minimum treated water storage capacity shall be equal to or greater than twice the average daily consumption when fire protection is provided. Other jurisdictions recommend storage requirements based on calculated volumes for fire suppression, equalization storage, emergency storage or required disinfection contact time. The methodology utilized by Water Security Agency has proven to be conservative when the above specific calculations are completed and then compared to using 2 x ADD. Table 5.5 below summarizes the current treated water storage infrastructure the Town operates.

There are numerous treated water storage compartments located at the WTP. When the plant was originally constructed in 1958 there were two small storage chambers constructed (Clearwell 1A and 1B). When the upgrades occurred at the facility in 1986 clearwell 2A and pumpwell 2B were constructed. In 2008, the Town constructed a new elevated concrete reservoir to replace the existing tower.

Table 5.6: Existing Potable Water Storage Capacity

Water Facility	Treated Storage Capacity (m^3)	2015 Average Day Demand (m^3)	2025 Average Day Demand (m^3)
WTP – Clearwell 1A	66(1)	2,221	2,578
WTP - Clearwell 1A	107(1)		
WTP – Clearwell 2A	228(1)		
WTP - Pumpwelll 2B	173 (1)		
WTP – Circular Storage Reservoir	2,093(1)		
Water Tower	3,300		
Total Potable Water Storage	**5,967**	**4,442(2)**	**5,156(2)**

(1) Assuming 3.0m depth of water in the reservoir

(2) Requirement of 2 X ADD

As shown in Table 5.5, the minimum required storage capacity based on two days of average day consumption is 4,442 m^3. The five concrete storage reservoirs at the WTP provides 2,667m^3 of storage and combined with the Water Tower a treated water storage capacity of 5,967 m^3 is available. It should be noted that the table illustrates storage capacity of the reservoirs located at the WTP assuming a water depth of 3.0m. The lower 1.0m of volume is typically locked out due to low low level alarm and would not be considered useable volume under normal conditions. If the 1.0m is removed the useable reservoir capacity at the WTP is reduced to 1,778m^3 and the combined total with the Water Tower included for the system is 5,078m^3, which is still sufficient to meet Kindersley's current storage requirements.

The reservoirs and water tower are in good condition. The water tower was newly constructed in 2008 and there are no reported issues with the storage compartments located at the WTP. The storage compartment access hatches are located on raised concrete curbs and are in good condition. Available record drawings indicate that Clearwells 1A and 1B have vents and overflows. Clearwells 2A and 2B are vented but do not contain overflows. It is not clear if the circular reservoir located on the north side of the facility has a vent or overflow. The water tower has separate fill and discharge lines and the discharge line is metered. The water tower has an overflow pipe to prevent overfilling.

The USEPA recommends a maximum inspection and cleaning interval of between two to five years for water storage facilities. It is not clear if the water tower has been cleaned and inspected since its construction in 2008. Pumpwell 2B and the circular reservoir were cleaned and inspected in 2012 due to the upgrades and work that occurred in those compartments, it is not clear if/when the remaining compartments were cleaned and inspected.

Filter effluent can only be discharged into Clearwell 2A, there are piping connections which allow the flow of water from one reservoir to one or more of the other reservoirs. The location of inlet and interconnection piping as well as the baffle in the circular reservoir promote adequate circulation of water.

5.3.2 Distribution System

All water supplied within the Town comes for the WTP distribution high lift pumps. There is a single primary supply line that leaves the WTP. This primary main provides pressure to the Town and also fills the water tower. The Town's water distribution system consists of one single pressure zone. The existing water distribution system consists of approximately 52 km of pressure pipe ranging in diameter from 50 mm to 400 mm. Table 5.6 summarizes the pipe material, diameter, and age range within the distribution system. The information for Table 5.6 was taken from the current base map; these attributes should be confirmed and updated by the Town. Figures 0-4 and 0-5 in Appendix B also illustrate the water distribution system pipe material, size, and installation date

The water distribution system pressure is primarily controlled with the water tower. Two high lift distribution pumps are located at the WTP and are used to maintain normal water level in the water tower. Pump 327 operates primarily as the duty pump and the other pump, 104 acts as the standby. The pumps are not designed or programmed to run simultaneously. Pump 327 has a rated capacity of 70 L/s at 490 kPa, with a current operating average day demand of 49.6 L/s.

The Town will continue to maintain the engine driven standby pump which can operate during power outages and for fire protection. The engine driven pumps appears to provide sufficient fire protection to the Town as analyzed in the November 2014 AE / AECOM report.

The town implements an annual cast iron replacement program, the location of the replacements are determined by the Town staff based on available budget and number of issues (breaks) with a segment of pipe.

Table 5.7: Water Distribution System Infrastructure Summary

Pipe Material	Diameter (mm)	Length (m)	Newest Installation Year	Oldest Install Year
Asbestos Concrete	150	13,747	1979	1956
	200	2,294	1979	1965
	400	220	1985	1985
Cast Iron	100	100	1958	1958
	150	4,729	1984	1950
	200	1,947	1960	1953
HDPE	50	6	1990	1990
	150	1,558	2013	2009
	175	96	1991	1991
	200	231	2015	1998
	250	338	2015	2015
PVC	100	86	2006	1988
	150	21,912	2013	1965
	200	6,003	2012	1979
	250	1,650	2006	1985
	300	874	2005	1985
	400	2,012	2004	1984
Steel	200	102	1959	1959
Unlined Cast Iron	100	592	1958	1950
	150	1,615	1994	1950
	200	3	1995	1953
Total Length (m)		60,115		

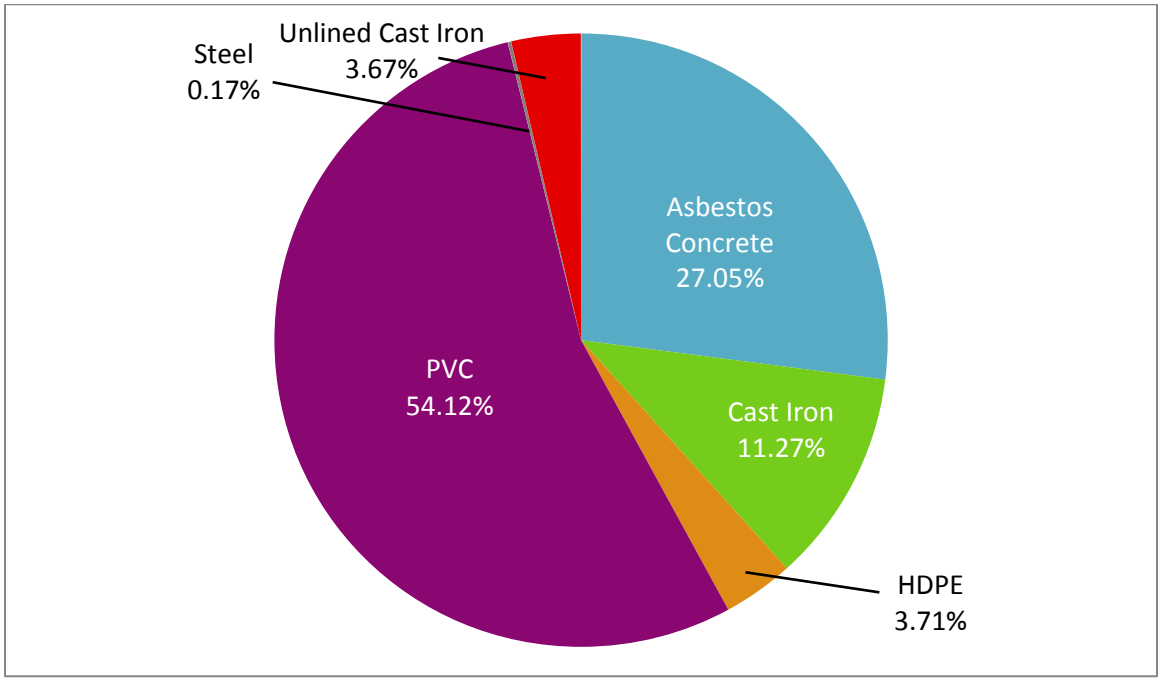


Figure 5.1: Water Distribution System Infrastructure

5.3.3 Fire Protection

The water tower is capable of meeting the Town's fire demands, however a diesel engine driven fire pump is also present at the WTP if ever required in the event of an emergency or during a power outage. The following rationale was used to determine waterworks performance in the November 2014 AECOM / AE Infrastructure Capacity Assessment report:

- Maximum Day Demand with Fire Flows (MDD + Fire Flow) is the performance of the system under the estimated maximum demand to be sustained for an entire calendar day with the addition of an isolated fire flow added to each hydrant within the system. WaterCAD calculates the flow available at each hydrant individually so that only one hydrant is having a fire flow drawn from it at one time. This simulation is critical in determining areas of the system with insufficient water supply and pressure to adequately provide firefighting flow if one were to occur.

The system was evaluated based on a minimum fire flow requirement of 60 L/s regardless of zoning and/or land use and a minimum residual pressure in the system of 150 kPa (22 psi). The analysis identified that 5 hydrant locations within the system were not able to meet the minimum criteria for the performance evaluation. For further detail as to the performance of the current system in this simulation please refer to Section 4 and Figure 0-6 in the November 2014 AECOM / AE Infrastructure Capacity Assessment report.

5.3.4 Backflow Protection

Three key areas of backflow prevention within the Town's water supply system were reviewed:

- Service connections – the Town currently does not have any policies requiring potable water service connections to have back flow preventers
- Reservoirs – The water tower is elevated and as such the reservoir is protected from backflow due to its height and position in the system. The reservoirs located at the WTP are protected from backflow

with the check valves that are installed on the distribution headers prior to the connection with the reservoirs.

- Sewage Pumping Stations – all have backflow preventers on the water service lines.

5.3.5 Truck Fill

A water crane provides potable water service to the truckfill located in the industrial area west of Highway 21. This water crane location is equipped with an air gap assembly to prevent reverse flow.

5.4 Operation and Maintenance Procedures

The Town's preventative maintenance program for the WTP and storage reservoirs is summarized below:

- Daily inspection of all water treatment equipment
- Daily inspection of water tower
- Weekly bacteriological and chlorine residual tests taken from one of ten sites on a rotating basis
- Weekly running emergency standby pump
- Annual inspection of reservoirs
- Annual inspection and cleaning of sumps
- Annual oil change for all equipment
- Annual amp test of pump drives
- Calibrate all equipment as per operators manuals
- Rebuild distribution pumps as required
- Rotate used drives and redundant equipment as required
- Change packing on pumps every two years or when needed

The maintenance program for the distribution system is summarized below:

- Annual flushing of all hydrants at dead ends for a minimum of 30 minutes (except for those within private developments)
- A specific disinfection procedure is followed after watermain repairs are conducted. An SOP needs to be developed and implemented by the Town, this includes issuance of a precautionary drinking water advisory (PDWA).

5.5 Capacity Assessment

A capacity review of the existing waterworks infrastructure is presented in Table 5.8 below:

Table 5.8: Waterworks System Capacity Assessment

Equipment	Capacity		Demand Condition	2015 Demand	2025 Demand	2035 Demand	Year When Demand Exceeds Capacity
Raw Water Supply System							
River Wells	PW3A-1997	69 L/s(1)	MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
	PW4A-2001						
	PW6A-2002						
	PW8-2003						
River Wells Pumping Station (RWPS)	RWP 1311	63.4 L/s	MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
	RWP 1321						
	RWP 1331						
RWPS to SLPS Raw Water Pipeline	63.4 L/s		MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
Snipe Lake Pumping Station (SLPS)	RWP 101	48.0 L/s	MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
	RWP 102	48.0 L/s					
SLPS to CNRPS Raw Water Pipeline	48.0 L/s		MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
CN Reservoir Pumping Station (CNRPS)	RWP 502	70 L/s	MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
	RWP 503	70 L/s					
CNRPS to KWTP Raw Water Pipeline	105.0 L/s		MDD	59.1 L/s(2)	68.6 L/s	79.6 L/s	2027(2)
Treatment and Disinfection System							
Ballasted Flocculation Clarifiers	Train A & B	57.7 L/s(3)	MDD	49.3 L/s	59.7 L/s	69.2 L/s	2023(3)
Dual Media Filters	Filter 3	58.3 L/s	MDD	49.3 L/s	59.7 L/s	69.2 L/s	2024
	Filter 4						
	Filter 5						
Ultraviolet Disinfection (4)	UV-1 & 2	69.6 L/s	PHD	74 L/s	89.5 L/s	103.9 L/s	2015
Potable Water Storage and Distribution System							
Clearwells	1A	66 m3	2 x ADD	4,442 m^3	5,156 m^3	5,982 m^3	2024(5)
	1B	107 m^3					
	2A	228 m^3					
	Circular	2,093 m^3					
Pumpwells	2B	173 m^3					
Water Tower	WT	3,300 m^3					
Potable Water Pumps	TWP 327	70 L/s	PHD	74 L/s	89.5 L/s	103.9 L/s	2015
	TWP 104	70 L/s	PHD	74 L/s	89.5 L/s	103.9 L/s	2015
	Diesel Fire Pump - 103	Unknown	N/A	N/A	N/A	N/A	N/A

Note:

(1) Capacity is reported with 3 wells running simultaneously. Individual well capacity is 20 L/s, Combined capacity has also been reported as low as 45 L/s (South Saskatchewan River level dependant)

(2) Demand is report for Town of Kindersley only. This portion of the system is currently jointly operated with Town of Eston (E-K water System) – Eston could draw 7.5 L/s for supply to their system. 48 L/s is the maximum rate that water can be transferred to CNRPS presently and is the governing factor in determining capacity of this portion of the system.

(3) Capacity is based on 22 hour maximum daily operational time. 24 hour run time is 63 L/s but has been de-rated as it is not realistic to run Actiflo consistently 24 hours per day.

(4) Capacity is 69.6 L/s with one reactor in service. UVT > 90% and 2.0-log inactivation of cryptosporidium.

(5) As per Section 5.3.2 the useable treated water reservoir capacity has been determined to be 5,078 m^3.

The table above indicates that the UV reactors and distribution pumps cannot meet the current demands.

5.6 Capital Replacement Costs and Remaining Service Life

The following table identifies the estimated replacement values and remaining service life for several key components within the existing water supply system.

Table 5.9: Estimated Remaining Service Life and Estimated Replacement Costs

Equipment/Component		Remaining Service Life	Replacement Value
			Raw Water System Sub-Total = $37,350,000
Production & Shield Wells	PW3A-1997	31 years	$ 250,000
	PW4A-2001	35 years	$ 250,000
	PW6A-2002	36 years	$ 250,000
	PW8-2003	37 Years	$ 250,000
	SW5A-2003	37 Years	$ 250,000
	SW7-1986	20 Years	$ 250,000
	SW7A-2012	46 Years	$ 250,000
River Wells Pumping Station	Building & Structure	75 years	$ 1,500,000
	Electrical	30 years	$ 1,000,000
	Pumps	20 years	$ 800,000
	Piping	50 years	$ 200,000
Snipe Lake Pumping Station	Building & Structure	75 years	$ 1,500,000
	Electrical	30 years	$ 1,000,000
	Pumps	20 years	$ 800,000
	Piping	50 years	$ 200,000
CN Reservoir & Pumping Station	Building & Structure	75 years	$ 1,500,000
	Electrical	30 years	$ 1,000,000
	Pumps	20 years	$ 800,000
	Piping	50 years	$ 200,000
	Earthen Reservoir	100 Years	$ 2,000,000
Raw Water Supply Lines	200 mm CML Steel – 54,500 m 250 mm HDPE Steel – 11,600 m 250mm HDPE – 4,700 m 300mm CML Steel ~ 6,200 m	50 years	$ 23,100,000
			Water Treatment Plant Sub-Total = $16,350,000
Original WTP Building (1958, 1972 and 1986 Construction)	Distribution Pumps	20 years	$ 250,000
	Reservoir No. 1A	2 years	$ 500,000
	Reservoir No. 1B	2 years	$ 500,000
	Reservoir No. 2A	50 years	$ 500,000
	Reservoir No. 2B	50 years	$ 500,000
	Circular Reservoir	16 years	$ 3,000,000
	Structural Steel and Masonry	30 years	$ 5,000,000
WTP Upgrades (2012 Construction)	Process Piping	25 years	$ 500,000
	Process Valves	25 years	$ 500,000
	ACTIFLO™ Clarification System	15 years	$ 2,000,000
	Chemical Dosing Equipment	15 years	$ 200,000
	HVAC Equipment	20 years	$ 300,000
	Electrical and Lighting	20 years	$ 1,000,000
	Controls	25 years	$ 300,000
	Instrumentation	10 years	$ 100,000
	Filters	15 years	$ 800,000
	UV Disinfection	15 Years	$ 400,000
			Distribution System Sub-Total = $23,360,000
Water Tower	3.3 ML Capacity	50 years	$ 4,000,000
Distribution System Components	Hydrants ~ 225	Varies	$ 1,500,000
	Shut-off Valves ~ 200	Varies	$ 500,000
	Watermains		
	150mm dia. ~ 37,000 m	varies	$ 7,500,000
	200mm dia. ~ 10,700 m	varies	$ 2,700,000
	300mm dia. ~ 180 m	varies	$ 60,000
	400mm dia. ~ 2,300 m	varies	$ 1,100,000
Service Connections	Approximately 2,000	varies	$ 6,000,000
			Total Estimated Replacement Cost = $77,060,000

5.7 Waterworks Cost Analysis

The Town has provided financial information related to the operation of the waterworks system. Table 5.10 below summarizes the major revenue and expenditure components of the waterworks utility.

Table 5.10: Financial Summary

	Year		
	2013	2014	2015
OPENING BALANCE (Utility Reserve)	**$ 1,399,074.20**	**$ 910,641.9**	**$ 388,582.22**
REVENUES			
Fees and Charges	$ 2,383,890	$ 2,482,721	$ 3,253,703
Grant, Capital	$ 53,025	$ 0	$ 0
TOTAL REVENUE	**$ 2,436,915**	**$ 2,482,721**	**$ 3,253,703**
EXPENSES			
Wages & Benefits	$ 283,385	$ 351,175	$ 407,588
Professional / Contractual Services	$ 392,486	$ 398,293	$ 528,587
Utilities	$ 195,931	$ 175,602	$ 91,214
Maintenance Materials and Supplies	$ 263,795	$ 235,966	$ 297,537
Interest	$ 360,045	$ 364,305	$ 336,427
Capital Expenditure	$ 783,292	$ 433,437	$ 775,290
Loan Principal Payment	$ 712,259	$ 781,298	$ 781,298
TOTAL EXPENSES	**$ 2,279,384**	**$ 1,958,778**	**$ 2,436,642**
Annual Surplus (Deficit)	$ 157,530	$ 523,943	$ 817,061
CLOSING BALANCE (Utility Reserve)	**$ 910,641.9**	**$ 388,582.22**	**$ 570,099.83**

The data indicates that the Town has consistently maintained a surplus over the last three years from the waterworks utility. This surplus suggests that the water rate structure is adequate to support the annual operation and maintenance costs of the waterworks system including some capital expenditures to accommodate upgrades within the system. As the table above indicated the utility reserve is decreasing in light of the waterworks producing an annual surplus. It is important to note that the utility reserve is combined between the wastewater and waterworks systems. In 2013 and 2014 the Town did not have a rate structure for the wastewater system and as such there was expenses but no revenue. In 2015 wastewater rates were implemented to capture some of the expenses for wastewater. Currently the wasterworks utility subsidizes the wastewater however these utility increased in 2015 which illustrates the rates are not capturing the costs between these combined utilities and should produce modest reserves in the years to come unless major unexpected expenditures are required.

5.8 Waterworks Economic and Environmental Sustainability

Overall, the WTP is in good condition and well maintained. The only immediate capacity shortfall is for the distribution pumping and UV disinfection system as the PHD demands exceeds the pumping capacity of TWP 327.

The anticipated capital cost over the next 5 years is based on the total cost of the recommendations provided in Section 6.2 of $1,770,000. It is unlikely that there will be any significant changes in operating expenses which will address any typical maintenance issues and repairs.

With an average annual surplus of approximately $499,511 (over past 3 years), the Town has maintained financial support to complete various minor upgrades as well as occasional major waterworks projects. At the end of five years, the total water system utility surplus is expected to reach $2.5M. Inflation and interest on these funds has not been considered as these percentages would likely cancel each other out. From this analysis, the anticipated capital costs can be adequately funded by the utility fund reserve over the next 5 years.

The comments provided here regarding economic sustainability are based on a very high level condition assessment and a review of limited financial data. These comments are general opinions based on this limited information and have not been reviewed by a qualified accounting professional. Prior to considering the implementation of any of these financial recommendations, a review by an accounting professional as well as Town Council to determine the preferred method(s) of funding capital projects is required.

6. Recommendations

6.1 Recommendations from 2010 WSA

The Round 2 Waterworks Assessment Report identified several risks and recommended improvements to the waterworks system. A number of facility operation issues were identified during preparation of the 2010 WSA report. These risks and the steps taken to address them are summarized in Table 6.1.

Table 6.1: 2010 WSA Recommendation Summary

Issues Identified in the 2010 WSA	Improvements Made
CI pipelines are failing and require replacement	See replaced mains identified in Section 2.2.2. Progress is being made and the town has implemented a replacement program.
AC distribution pipeline replacement recommended	The basis for this recommendation is unclear. A condition assessment would need to be completed to identify the condition of AC mains before a widespread program is implemented at a high capital cost. Recommend this be removed from future WSA report and replaced with cast iron distribution pipe replacement.
Loop all dead ends in distribution system	Progress is being made, a valid recommendation to carry forward.
Re-chlorination station at water tower	Not necessary, since the WTP upgrades in 2012 there is no issue with free or total chlorine residuals in the system. It would be difficult and costly to implement rechlorination at the Water Tower and would see little benefit. Recommend removing this from future WSA reports.
Water tower pipeline identification	Complete.
Backflow prevention devices on all new service connections and upgrades	This is common practice and has been implemented on recent waterworks upgrades and new installations.
Prepare maintenance procedures	Some progress. Maintenance procedures generally seem acceptable.

6.2 Current Recommended Improvements

Significant upgrades have occurred in the WTP since 2010 and these upgrades provided a significant improvement and modernization to the raw water supply and water treatments systems. We have identified the following recommended upgrades (in order of priority) to the various components in the water system.

Upgrade Identifier (in order by priority)	Upgrade Description & Details
No. 1	**Water Plant - Distribution Pumping** – High Lift Pump (TWP-327) was installed in 2011 in the WTP upgrades project and has a capacity of 70 L/s. The current project PHD for the water system is 74 L/s as indicated in Table 5.8. The deficiency is pumping capacity results in the water tower slowly losing volume/level when demands exceed 70 L/s. With the addition of a natural gas genset the engine driven pump could be removed (if the new genset has suitable capacity for that load) and the pumping arrangement could be revised and Pump 104 and 103 could be replaced with new VFD equipped vertical turbine pumps and supplement TWP 327 more efficiently.
	Estimated Cost: $200,000
	Reason for Upgrade: To meet peak hour demands in the water network and avoid reduced service or system depressurization.
No. 2	**Water Plant - Ultraviolet Disinfection Upgrade–** To match the increase in distribution pumping capacity (see upgrade No. 1) the UV will need to be upgraded to match the increased pumping capacity.
	Estimated Cost: $400,000.
	Reason for Upgrade: To provide disinfection during peak hour demand pumping in the water network.
No. 3	**Water Plant - Backwash Pump Redundancy** – Currently the WTP only has a single backwash pump with no interconnection or backup if this pump were to fail or be out of service. Piping upgrades are recommended so the old backwash pump which is located in the 1958 portion of the plant could be used if the circumstances warranted.
	Estimated Cost: $30,000
	Reason for Upgrade: Provide system/equipment redundancy vital to the water treatment process.
No. 4	**Water Plant – Misc. Repairs** - General WTP process upgrades and repairs including; Replacement of corroded piping on ACTIFLO™ recycle system and Alum containment room sealing.
	Estimated Cost: $40,000
	Reason for Upgrade: System maintenance and operation to avoid future component failure.
No. 5	**Water Plant / Water Tower - Treated Water Reservoir Cleaning -** The treated water storage reservoirs and the water tower should be emptied for cleaning and inspection approximately every five years. The USEPA recommends a maximum inspection and cleaning interval of between two to five years for water storage facilities. In regards to ongoing maintenance activities, it is advised that the Town consider cleaning and inspecting the reservoir and water tower more frequently as the facilities age. It is not clear when all reservoirs were last cleaned, some of the clearwells at the WTP would have been emptied and cleaned in 2012 when upgrades occurring, there is no record of those reservoirs or the water tower being drained and cleaned since.
	Estimated Cost: $20,000
	Reason for Upgrade: System maintenance to maintain water quality.
No. 6	**Water Distribution - Replace 100 mm Cast Iron Pipes** - The pipes on either side of 4th Avenue between Main Street and 2nd Street East are too small to be a main part of the distribution system. It is recommended that water mains be replaced with larger pipes that can accommodate required flows. For all future water mains no water main should be less than 150 mm diameter and a trunk main less than 200 mm diameter.
	Estimate Cost: $500,000
	Reason for Upgrade: Improve Fireflow in the network to meet necessary minimum requirements.

No. 7	**Water Distribution - Highway 21 Pipe Crossings** - Flow to the north west industrial part of the Town is constricted by the pipe crossings of Highway 21 at 7th Avenue and 11th Avenue. Increasing the pipe crossings to 250 mm diameter will allow more flow into the area. Daily flow rates may typically be low due to the smaller number of occupants in the area; however, fire flow requirements may be higher than normal if there are industries with larger fire flow requirements.
	Estimated Cost: $580,000
	Reason for Upgrade: Improve fire flow in the network. Improve water quality with more connectivity and recirculation.

6.3 Immediate Issues and Risks

There are no immediate issues or risks that could adversely affect water quality in the Town of Kindersley water treatment, storage, or distribution systems.

7. Declaration

"I, the undersigned, declare that the information contained within this submission is, to the best of my knowledge, complete and accurate, and has been prepared in accordance with the standard for this submission as published by the Saskatchewan Water Security Agency."

AECOM Canada Ltd.

Ryan King, Engineering Licensee

Appendix A

Site Photos

Inside of Water Tower

Water Tower Piping

WTP - Engine Driven Pump

WTP – High lift distribution pump

WTP – Backwash Pump

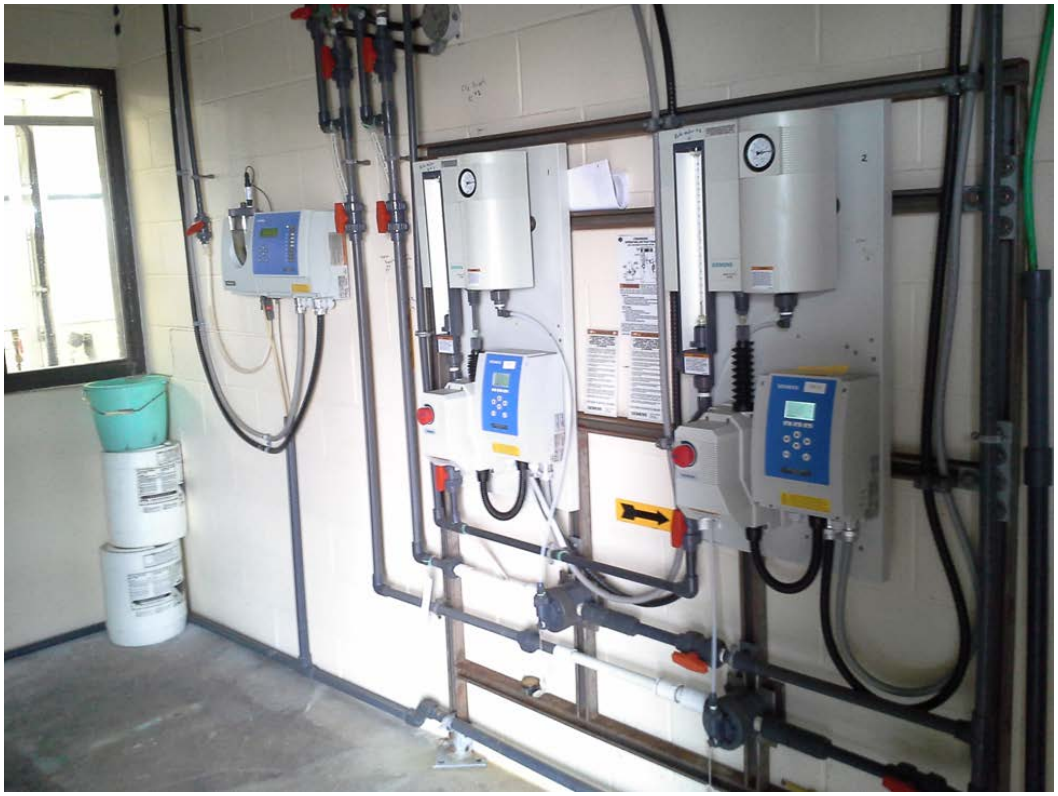
WTP – Filter Piping

WTP – ACTIFLO ™ Recycle Pumps

WTP – ACTIFLO™ Hydrocyclone

WTP – ACTIFLO™ Clarification System

WTP – Electrical Room



WTP – Gas Chlorination System

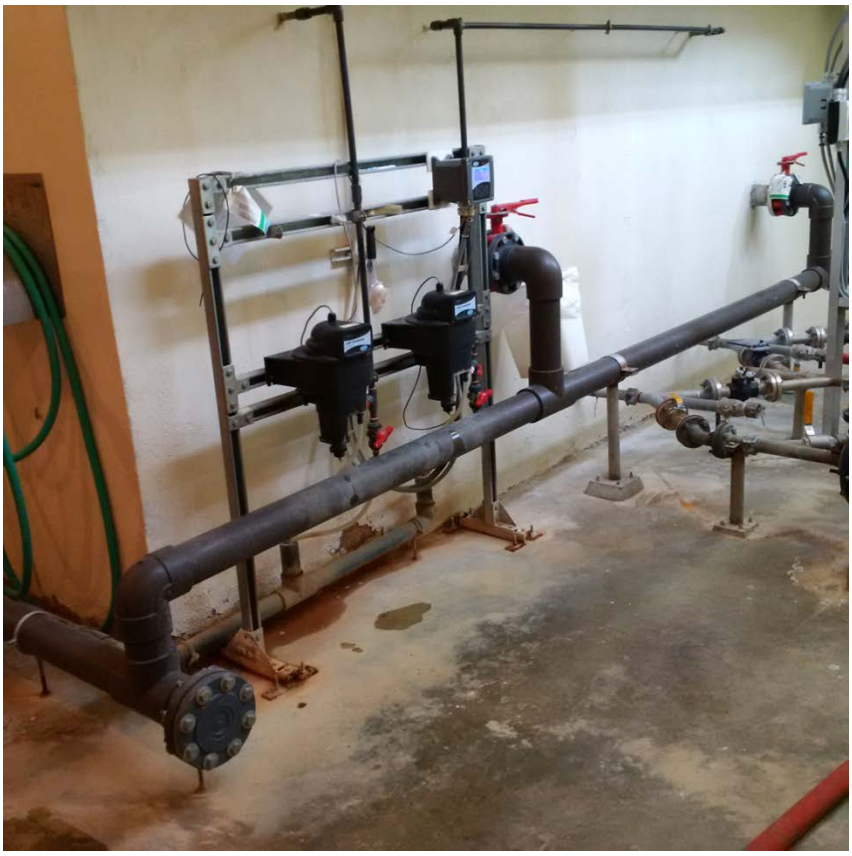
WTP – Polymer Skid

WTP – Fluoride Skid

WTP – Filter No. 3, 4 & 5

WTP – Filter No. 3, 4 & 5

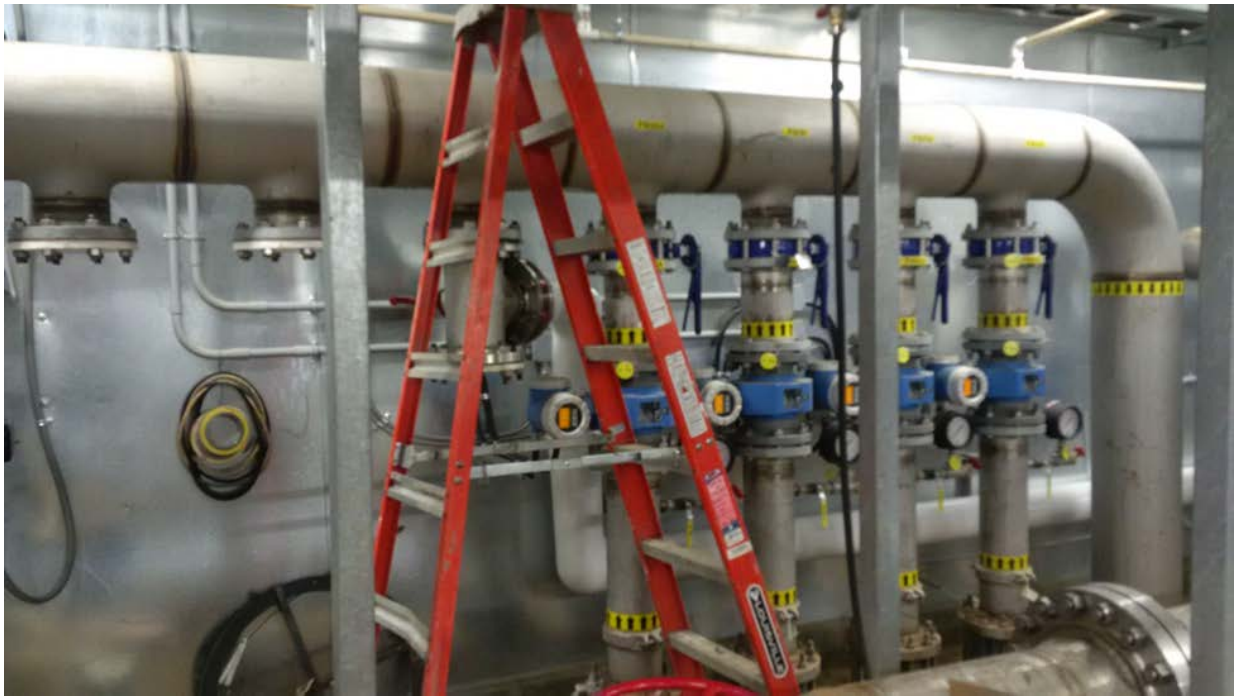
WTP – UV Reactor



WTP – Turbidimeters

WTP – Filter Blower

River Wells Pumping Station



River Well Pump Station

River Wells Pumping Station

River Wells Pumping Station

CN Pumping Station

CN Pumping Station

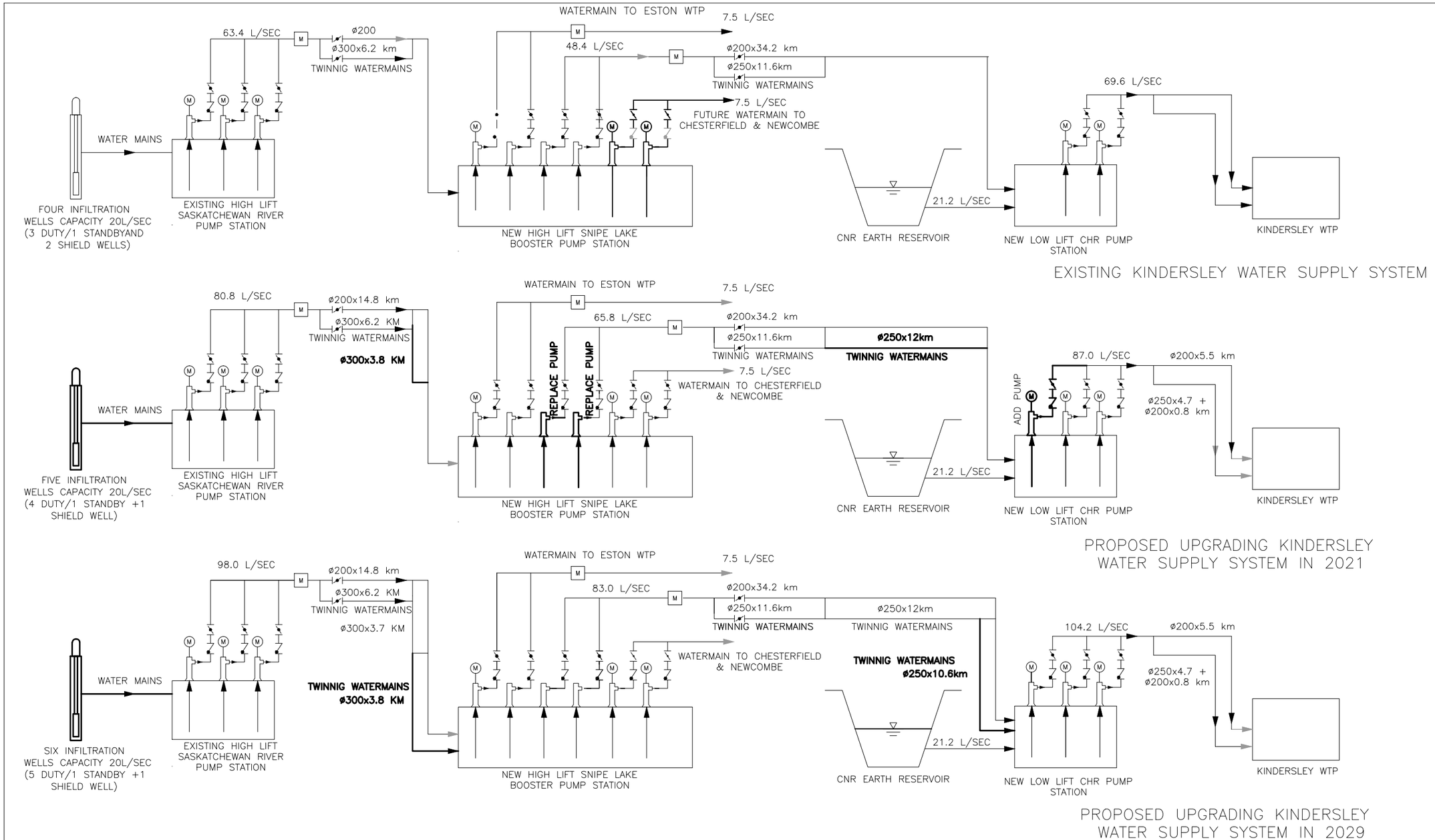
CN Pumping Station – Potassium Permagnate System

Snipe Lake Pumping Station

Snipe Lake Pumping Station

Appendix B

Drawings



WATER USAGE AND SOURCE OF SUPPLY	EXISTING MAXIMUM DAY FLOW UP TO YEAR 2021 L/SEC	PROPOSED MAXIMUM DAY FLOW YEAR 2021 TO 2029 L/SEC	PROPOSED MAXIMUM DAY FLOW YEAR 2029 TO 2036 L/SEC
TOWN OF KINDERSLEY (2.56% POP. GROWTH) FROM SNIPE LAKE PS / CN RESERVOIR PS	69.6 48.4/21.2	87.0 65.8/21.2	104.2 83.0/21.2
TOWN OF ESTON, NEWCOMBE & CHESTERFIELD	15.0	15.0	15.0
TOTAL (FROM SOUTH SASCATOON RIVER PS)	63.4	80.8	98.0

NOTE: HEAVY LINES REPRESENT NEW CONSTRUCTION

Issue Status: CONCEPTUAL

AECOM

Figure: 0-1

Proposed Upgrades to Raw Water Supply Flow Diagram

INFRASTRUCTURE ASSESSMENT
WATER AND WASTEWATER
TOWN OF KINDERSLEY
Project No: 60313803

Project Management Initials: Designer: Checked: Approved: ANSI D 558.8mm x 863.6mm

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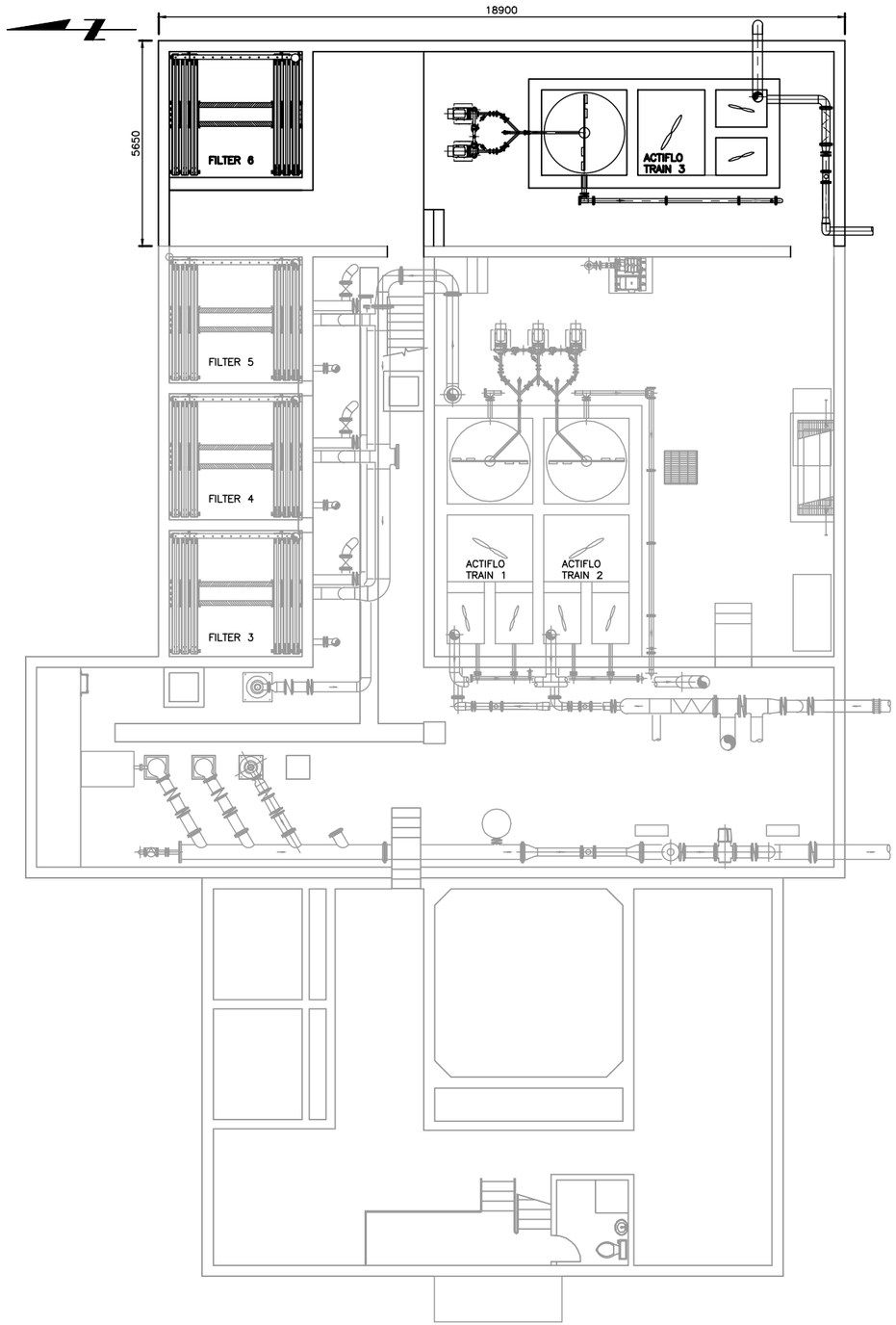
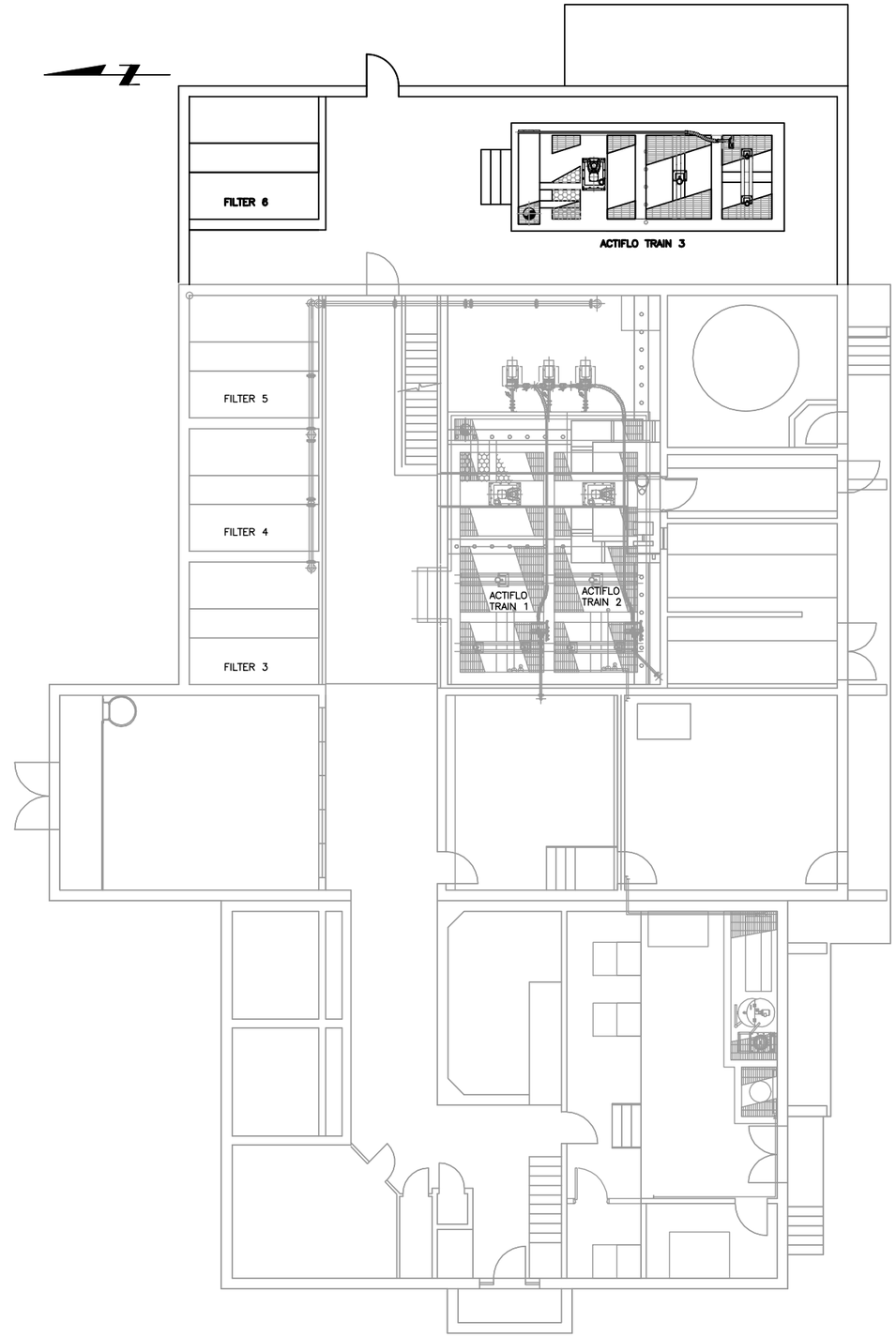


LOWER LEVEL PLAN
1:75



UPPER LEVEL PLAN
1:75

NOTE: HEAVY LINES REPRESENT NEW CONSTRUCTIONS

Issue Status: CONCEPTUAL

AECOM

Figure: 0-2

Proposed Water Treatment Plant General Arrangement

INFRASTRUCTURE ASSESSMENT
WATER AND WASTEWATER
TOWN OF KINDERSLEY
Project No.: 60313003

Project Management Initials: Designer: Checked: Approved: ANSI D 558.8mm x 863.6mm

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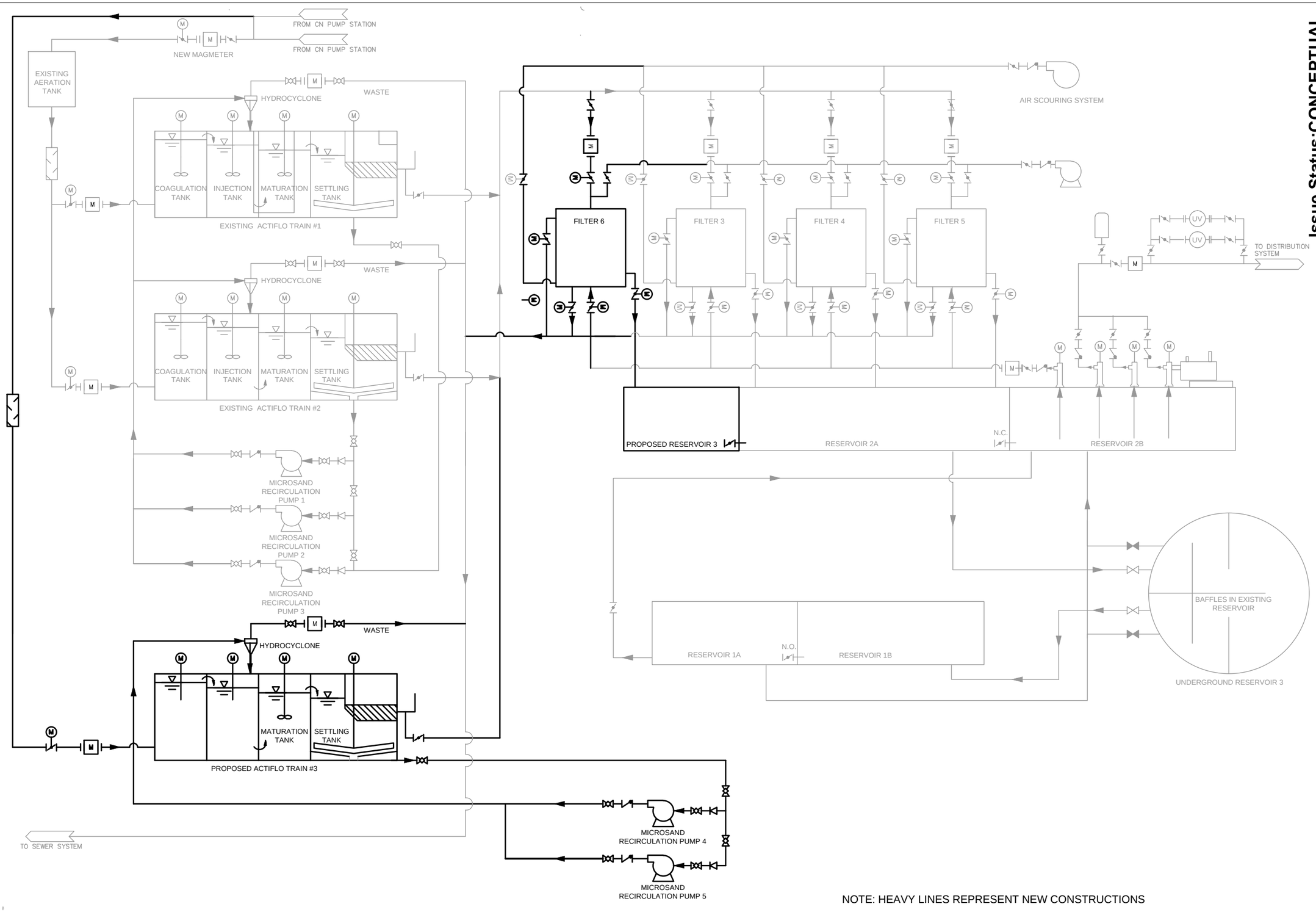

NOTE: HEAVY LINES REPRESENT NEW CONSTRUCTIONS

Issue Status:CONCEPTUAL

AECOM

Figure: 0-3

Proposed Upgrades to Water Treatment Plant Flow Diagram

INFRASTRUCTURE ASSESSMENT
WATER AND WASTEWATER
TOWN OF KINDERSLEY
Project No.: 60313803

Project Management Initials: Designer: Checked: Approved: ANSI D 558.8mm x 863.6mm

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Appendix C

EPO Inspection Reports

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-04-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 21-JUN-2011 11:22
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 26470

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			

Approval Clause	DISTRIBUTION SYSTEM	Compliant	Non-Compliant	N/A	Comments
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			BACTERIOLOGICAL SAMPLES HAVE TO BE SUBMITTED BY THE TOWN FROM THE VICINITY OF THE WATER MAIN BREAK AFTER EACH REPAIR AND THE SAMPLE HAS TO BE MARKED AS OTHER.

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Pipe Entries installed to Prevent Contamination 27(5)				
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.3 NTU discrete measurements (95%) 33(2)a(i)A(I)	X			
	Less than or Equal to 0.3 NTU Continuous Measurements (95%) 33(2)a(i)A(II) & 33(2)a(i)B	X			
	Not to Exceed 1.0 NTU	X			

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Chemical Standards 29(4,5) & 34				
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35		X		WSA ON THE DISTRIBUTION SYSTEM HAS TO BE COMPLETED.

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Chlorine Monitoring 39(1)	X			
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Upset Conditions 42(1)f	X			
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			QA/QC POLICY HAS TO BE UPDATED.
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments				
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed	X			SOURCE INSPECTION COMPLETED JUNE 16, 2011.

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-04-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 16-FEB-2012 11:24
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 28355

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			

Approval Clause	DISTRIBUTION SYSTEM	Compliant	Non-Compliant	N/A	Comments
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.2 NTU Discrete Measurements (95%) 33(2)a(ii)A(I)	X			
	Not to Exceed 1.0 NTU 33(2)a(ii)C	X			

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Chemical Standards 29(4,5) & 34				
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			OPERATOR SHOULD INVESTIGATE GETTING SCADA SYSTEM SO IT CAN PRODUCED REPORTS OF FILTER TURBIDITY.
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-04-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 26-JUN-2012 11:12
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 30128

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			

Approval Clause	DISTRIBUTION SYSTEM	Compliant	Non-Compliant	N/A	Comments
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b		X		CHLORINE LEVELS THROUGHOUT THE DISTRIBUTION SYSTEM WERE BELOW THE MINIMUM CHLORINE RESIDUALS.

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.3 NTU discrete measurements (95%) 33(2)a(i)A(I)	X			
	Not to Exceed 1.0 NTU	X			

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e				
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g				

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			CHLORINE DOSAGE SHOULD BE INCREASED A MINIMUM OF 0.5 MG/L.
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-04-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 20-NOV-2012 09:44
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 31106

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual as required in the Permit to Operate a Waterworks - EMPA2002 Section 23(1)(b) and 34(1)&(2)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.3 NTU discrete measurements (95%) 33(2)a(i)A(I)	X			
	Not to Exceed 1.0 NTU	X			

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34	X			
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			QA/QC POLICY UPDATED.

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			THE TOWN HAS TO ENSURE THE BACTERIOLOGICAL SAMPLING IS CONDUCTED PRIOR TO COMMISSIONING NEW WATER MAINS AS PER THE PERMIT TO CONSTRUCT.
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection					
Approval Clause	**GENERAL**	Compliant	Non-Compliant	N/A	Comments
	Source Inspection was Completed				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-05-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 09-MAY-2013 11:29
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 32085

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			

Approval Clause	DISTRIBUTION SYSTEM	Compliant	Non-Compliant	N/A	Comments
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual as required in the Permit to Operate a Waterworks - EMPA2002 Section 23(1)(b) and 34(1)&(2)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.3 NTU discrete measurements (95%) 33(2)a(i)A(I)	X			
	Not to Exceed 1.0 NTU	X			

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34	X			
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			THE TOWN HAS TO ENSURE THE BACTERIOLOGICAL SAMPLING IS CONDUCTED PRIOR TO COMMISSIONING NEW WATER MAINS AS PER THE PERMIT TO CONSTRUCT.
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained		X		NO
	Representative of the waterworks agreed with the inspection statements				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection					
Approval Clause	**GENERAL**	Compliant	Non-Compliant	N/A	Comments
	Source Inspection was Completed				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-05-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 09-DEC-2013 15:49
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 33766

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual as required in the Permit to Operate a Waterworks - EMPA2002 Section 23(1)(b) and 34(1)&(2)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.3 NTU discrete measurements (95%) 33(2)a(i)A(I)	X			
	Not to Exceed 1.0 NTU	X			

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34	X			
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed				

Municipal/Industrial Inspection

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-05-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 01-APR-2014 11:26
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 34642

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual as required in the Permit to Operate a Waterworks - EMPA2002 Section 23(1)(b) and 34(1)&(2)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.3 NTU discrete measurements (95%) 33(2)a(i)A(I)	X			
	Not to Exceed 1.0 NTU	X			

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34	X			
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed				

Municipal/Industrial Inspection

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-05-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 20-NOV-2014 12:59
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 37548

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.2 NTU Discrete Measurements (95%) 33(2)a(ii)A(I)	X			
	Not to Exceed 1.0 NTU 33(2)a(ii)C	X			

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			VCONSULTANT HAS BEEN HIRED TO DO WSA ROUND 3

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
	General Chemical sampling conducted	X			
	Health and Toxicity sampling conducted	X			
	Trihalomethane sampling conducted	X			
	On-site Turbidity tests conducted	X			
	Accredited Laboratory 39(2)	X			

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Daily Water Meter Reading 42(1)a	X			
	Types, Dosages and Total amounts of Chemical 42(1)b	X			
	Samples - Locations, Sampler, and Results 42(1)c	X			
	Abnormal Operating Procedures 42(1)d & 42(1)e	X			
	Upset Conditions 42(1)f	X			

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Municipal/Industrial Inspection

Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
	Chlorine Upsets 42(1)g	X			
	Calibration of Equipment 42(1)h	X			
	Maintenance 42(1)i	X			
	Chronological Order 42(2)a	X			
	Permittee Recorder 42(2)b	X			
	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

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Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
	Quality 44(1)a	X			
	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

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Municipal/Industrial Inspection

Operation: KINDERSLEY WATERWORKS	Plant Phone Number:	Plant Classification:
Approval Number: 00002274-05-00	Person(s) Interviewed:	After Hours Phone Number:
Approval Holder: Kindersley	Phone Number:	
Approval Contact:	Phone Number:	Inspection Date/Time: 19-MAY-2015 11:15
Inspector: Lemon, Rod	Phone Number: (306)778-8642	Inspection Id: 38880

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	Approved System EMPA 21(1)	X			
	Certified Operator 63	X			
	Common Trenching 26(1,2,3)	X			
	Disinfection of New and Repaired Pipelines 26(4) & 30(4)	X			

Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	Water Tight Cover 27(2)a	X			

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Approval Clause	WATER STORAGE RESERVOIRS	Compliant	Non-Compliant	N/A	Comments
	In Good Repair 27(2)b	X			
	Manholes 27(3,4)	X			
	Vents 27(6)	X			

Approval Clause	WATER TREATMENT PLANTS AND PUMPHOUSES	Compliant	Non-Compliant	N/A	Comments
	Floor Drainage 28(a)	X			
	Drain Lines to Sanitary Sewers have trap 28(b)	X			
	Backflow Prevention Device 28(c)	X			
	Water Meter(s) Installed 28(d)	X			
	Adjustable Chemical Feeder 28(e)	X			
	Facility is Clean and in Orderly Condition 28(f)	X			
	Approved Chemicals being used 30(3)	X			
	Proper Fluoride Chemical Dosage 30(7)	X			

Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments

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Approval Clause	DISINFECTION	Compliant	Non-Compliant	N/A	Comments
	Continuous Disinfection 30(5)	X			
	A Free Chlorine Residual of not less than 0.1 mg/L in Water Entering the Distribution System 30(6)a	X			
	A Total Chlorine Residual of not less than 0.5 mg/L OR a Free Chlorine Residual of not less than 0.1 mg/L in Water throughout the Distribution Systetm 30(6)b	X			

Approval Clause	STANDARDS	Compliant	Non-Compliant	N/A	Comments
	Bacteriological 32	X			

Approval Clause	TURBIDITY	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SURFACE	Compliant	Non-Compliant	N/A	Comments

Approval Clause	CHEMICALLY ASSISTED FILTRATION	Compliant	Non-Compliant	N/A	Comments

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Approval Clause	SOURCE WATER GREATER THAN OR EQUAL TO 1.5	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SOURCE WATER LESS THAN 1.5	Compliant	Non-Compliant	N/A	Comments
	Less than or Equal to 0.2 NTU Discrete Measurements (95%) 33(2)a(ii)A(I)	X			
	Not to Exceed 1.0 NTU 33(2)a(ii)C	X			

Approval Clause	MEMBRANE FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	SLOW SAND/DIATOMACEOUS EARTH FILTRATION	Compliant	Non-Compliant	N/A	Comments

Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks Turbidity levels meet the requirements of future standards, which have yet to take effect	X			
	Chemical Standards 29(4,5) & 34	X			

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Approval Clause	OTHER FILTRATION TECHNOLOGY	Compliant	Non-Compliant	N/A	Comments
	Waterworks meets the requirements of future chemical health and pesticide related standards, which have yet to take effect	X			

Approval Clause	ASSESSMENT	Compliant	Non-Compliant	N/A	Comments
	Proper Waterworks Assessment 35	X			CONSULTANT HAS BEEN HIRED TO DO WSA ROUND 3

Approval Clause	OPERATIONAL ANOMALIES	Compliant	Non-Compliant	N/A	Comments
	Reported Upset Condition 37(1)	X			
	Reported Chlorine Upset 37(2)	X			

Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Bacteriological Testing 39(1)	X			
	Bacteriological Follow-up 39(4) & 39(9)	X			
	Bacteriological Sample after Completion, Alteration, Extension or Repair 40	X			
	Chlorine Monitoring 39(1)	X			

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Approval Clause	TESTING	Compliant	Non-Compliant	N/A	Comments
	Fluoride Monitoring 41	X			

Approval Clause	OTHER CONSTITUENTS 39(1)A	Compliant	Non-Compliant	N/A	Comments
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	Upset Conditions 42(1)f	X			

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Approval Clause	OPERATIONAL RECORDS	Compliant	Non-Compliant	N/A	Comments
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	Maintenance 42(1)i	X			
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	Identification of Recorder 42(2)c	X			
	Five Year History of Log 42(2)d	X			
	Explanatory Notes 42(2)e	X			
	Factual Data Entry 42(2)f	X			
	No Default Values Used 42(2)g	X			

Approval Clause	QA/QC AND RECORDKEEPING	Compliant	Non-Compliant	N/A	Comments
	QA/QC in Place 43(1)	X			
	Monthly Review 43(2)	X			
	Report Abnormal Records 43(3)	X			

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Approval Clause	ANNUAL NOTICE TO CUSTOMERS	Compliant	Non-Compliant	N/A	Comments
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	Compliance 44(1)b	X			
	Notification of Consumer Report to Minister 44(2)	X			

Approval Clause	GENERAL	Compliant	Non-Compliant	N/A	Comments
	General Comments	X			
	Split sampling with the operator was completed	X			
	Operator's test equipment is performing adequately	X			
	Representative of the waterworks signature was obtained	X			YES
	Representative of the waterworks agreed with the inspection statements	X			YES
	Source Inspection was Completed				

Saskatchewan Ministry of Environment

Municipal/Industrial Inspection		
Inspector's Signature:	Printed Name: Lemon, Rod	Date:
Authorized Representative:	Printed Name:	Date:

Site Sketch Attached: No

Appendix D

EPB 233C WSA Summary Sheet

Round 3 Waterworks System Assessment Summary

Waterworks: Kindersley

Owner(s): Town of Kindersley

Env. Project Officer: Rod Lemon

Summary Completion Date: 10/13/2016

Population: Full Time: 5,544 Seasonal:

Source: Groundwater: [ ] Surface Water: [X] GUDI (groundwater under direct influence): [ ]
Treated Groundwater: [ ] Treated Surface Water: [ ] Treated GUDI: [ ]

Sourcewater Protection Concerns: None

Source/Raw Water Quality Issues that May Affect Treatment/Treated Water Quality:

Parameter:	Level:	Parameter:	Level:
Turbidity	3.7 - 49 NTU		

Raw water capacity/allocation: 16,245 dam3, maximum diversion rate of 520 L/s

Treated/Distributed Water Quality Issues (any that exceed Standards and Objectives after treatment):

Parameter:	Level:	Parameter:	Level:
none			

List of Chemicals Used: Potassium Permanganate, Liquid Alum, Polymer (polyacrylamide), Sodium Fluoride, Chlorine Gas

Description of Treatment Processes in Place:

Clarification
Filtration
Disinfection

Treatment Processes with existing issues (including capacity issues):

none

Other issues identified within the waterworks:

WTP - High Lift Distribution Pumping Capacity
WTP - UV reactors (Capacity to match required pumping upgrade)
WTP - Backwash Pump Redundancy
WTP - Misc. repairs
Distribution System - Miscellaneous upgrades to the network

Major Recommendations:

WTP - High Lift Distribution Pumping Capacity
WTP - UV reactors (Capacity to match required pumping upgrade)
WTP - Backwash Pump Redundancy
WTP - Misc. repairs
Distribution System - Miscellaneous upgrades to the network

Any Recommendations that may pose an Immediate Health Concern:

None

Total Cost of Recommended Upgrades: $1,770,000

Other Comments:

*Please submit electronic copy to WSA. If more space is required, a longer summary sheet may be requested.