6/86
K.3

US EPA RECORDS CENTER REGION 5
514074

DRIFT-PLATTEVILLE AQUIFER SOURCE CONTROL WELL PLAN

ERT Document PD-722-291a
June 1986

DRAFT

DRIFT-PLATTEVILLE AQUIFER SOURCE CONTROL WELL PLAN

Prepared for:
Reilly Tar & Chemical Corporation
Indianapolis, Indiana

ERT - A RESOURCE ENGINEERING COMPANY
696 Virginia Road, Concord, Massachusetts 01742

CONTENTS

SECTION A - Site Management Plan

SECTION B - Quality Assurance Project Plan

SECTION C - Health and Safety Plan

SECTION D - Community Realtions Plan

APPENDIX A - ERT SOP No. 7730 - Aquifer Test and Data Evaluation

SECTION A
SITE MANAGEMENT PLAN

Well Location

The Remedial Action Plan specifies approximate criteria for location of the Drift and Platteville source control wells. The wells must be located within 500 feet downgradient of existing monitoring well W13 and must be capable of controlling ground-water flow from beneath the bog (bounded by Walker Street on the north, temporary Louisiana Avenue on the east, Lake Street and the South Frontage Street Extension on the south, and a north-south line through the intersection of Walker Street and 37th Street on the West).

The source control well location indicated in Figure 1 meets the RAP requirements. The proposed location is 500 feet downgradient of W13. Capture zone analysis indicates that pumping from the Drift and Platteville aquifers at the proposed location will control ground-water flow beneath the bog. In addition, the proposed location is practical since it is on property owned by the city of St. Louis Park.

where is data? RI/FS

omit

(depth of wells

Well Design, Drilling Plans and Procedures

The design, drilling plans and procedures for construction of each Drift-Platteville source control well should accommodate a four-inch submersible pump.

The submersible pump necessary for the Drift source control well should be capable of yielding 25 gallons per minute (as specified in the RAP) with a total head lift of approximately 50 feet. Design considerations for the Drift source control well are as follows:

a monthly $\bar{x}$ of

— rating curve

- Well will be drilled using mud rotary drilling techniques to a depth of 80 feet. A nominal 10-inch

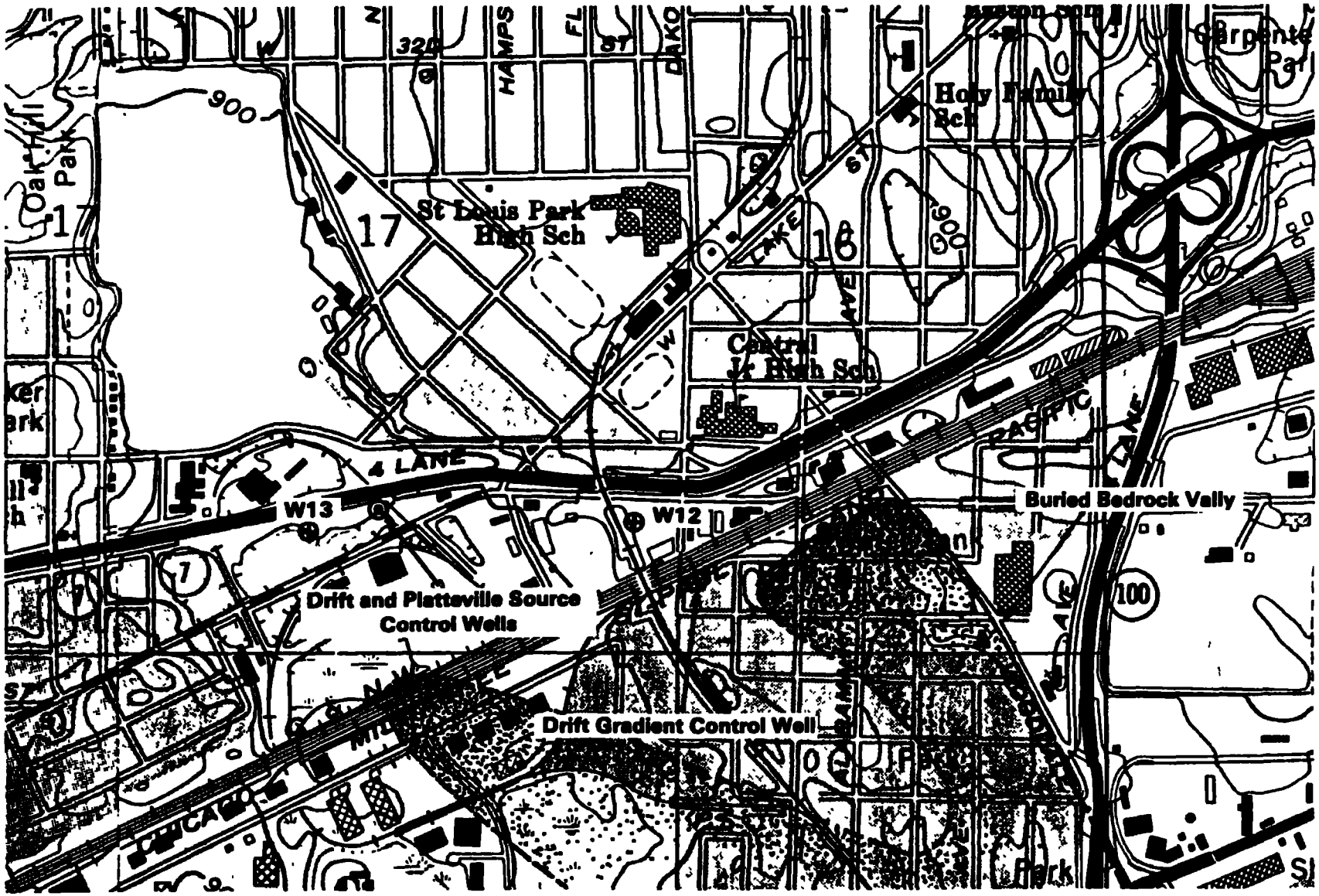


Figure 1 Proposed Locations of Drift and Platteville Control Wells

hole will be drilled to allow for proper grout seal of the 6-inch well casing.

- Continuous split-spoon samples will be collected in order to define the stratigraphy at this location and to provide samples for mechanical grain size analysis.
- Well will be screened in the Drift from the top of the bedrock or basal till layer to the bottom of the surficial peat/organic soil layer. This should be about 50 to 60 feet of screen in an 80-foot well. The well screen should be constructed of a low carbon, 304 stainless steel and of continuous slot, wire-wound construction.
- Well screen slot size should be based on a mechanical sieve analysis of soil samples retrieved from the area in which the screen will be placed. It is anticipated that the drift will be a heterogeneous mixture of clay, silt, sand, and gravel in this area. If so, a custom, multiple-slot screen with blank casing through the clay layers will be required to provide a sufficient quantity of water without producing detrimental quantities of sand. A slot size which will hold out 40 to 60 percent of the material is recommended. Additionally, the diameter of the screen and slot size area should be sufficiently great that the screen intake velocity is less than one foot per second. → vs. 25 gpm ?
- Well casing should extend from the top of the well screen to the ground surface (leaving an appropriate stick up for a well head). The well casing should be pressure grouted using a 3:1 cement/bentonite grout mix. Casing should be constructed of a low carbon steel. → using a tremie pipe filled from the bottom upwards
- Upon completion of the well a gravel pack should be developed around the well screen by a high velocity jetting and pumping technique.

- Upon completion of the well a reference point for measuring water levels should be established at the well head. The horizontal location and vertical elevation of this reference point should be surveyed.

?

The submersible pump necessary for the Platteville source control well should be capable of yielding 25 gallons per minute (as specified in the RAP) with a total head lift of 70 feet. Design consideration for the Platteville limestone source control well are as follows:

- Well should be drilled using mud or air rotary techniques to a depth of approximately 90 feet (the bottom of the Platteville formation).
- Well casing should be seated and grout sealed at the top of the Platteville limestone formation. The top of the limestone is at a depth approximately 70 feet below the ground surface. Casing should be constructed of a low carbon steel.
- The bedrock below the well casing need not be screened. However, the open bedrock well design and construction should allow for installation of a 4-inch submersible pump. It is recommended that a nominal 6-inch bedrock well be constructed.
- Upon completion of the well the open bedrock will, if necessary, be developed to remove the finer grained material and drill cuttings using a high velocity jetting and pumping technique. Removal of drill cuttings during drilling may make well development unnecessary. The field hydrogeologist will determine the need for further development based upon the drilling program.

- Upon completion of the well a reference point for collecting water levels should be established at the well head. The horizontal location and vertical elevation of the reference point should be surveyed.

Pump Specifications and Installation

The pumping rate specified by the RAP for the Drift source control well is 25 gallons per minute. The total head lift that the submersible pump will be required to overcome is estimated at 50 feet. A 4-inch diameter, 3-phase, 1 horsepower submersible pump will be required to achieve the 25 gpm pumping rate and total head lift.

The pumping rate specified by the RAP for the Platteville source control well is 25 gallons per minute. The total head lift that the submersible pump will be required to overcome is estimated at 70 feet. A 4-inch diameter, 3-phase, 1 horsepower submersible pump will be required.

Recommended construction materials for the Drift-Platteville submersible pumps and discharge pipes are as follows:

- The submersible pumps should be constructed of standard 304 stainless steel;
- The submersible pumps' natural butanol rubber (NBR) components should be retrofitted with teflon components;
- A 3-inch national pipe thread (NPT) discharge pipe should extend from the pump outlet to the point of discharge. The discharge pipe should be constructed of low carbon galvanized steel.

The submersible pumps should be installed within the Drift-Platteville source control wells safely below the pumping water level as determined through the aquifer tests.

The use of low carbon galvanized steel and stainless steel components as well as retrofitting the NBR components with Teflon components will increase the operational life expectancy of the system.

At the ground surface the discharge pipe should be secured at the top of the casing with a steel double or single-hole solid well seal with a gate valve installed to regulate the discharge rate. A ground water sampling valve and other necessary monitoring equipment should be connected to the discharge pipe. Construction should also permit measuring of water levels within the well through an access hole at the top of the well casing. Specific design specifications should allow for manufacture-specific requirements.

Aquifer Test Plan

The RAP requires that aquifer tests be conducted at the Drift and Platteville source control wells in order to determine local aquifer parameters. The source control well pump tests will be performed in accordance with ERT Standard Operating Procedure Number 7730, Aquifer Test and Data Evaluation (Appendix A).

Figure 2 shows the proposed location of the Drift source control well and the locations of potential observation wells screened in the Drift aquifer. Measurable drawdowns are expected at Drift monitoring wells within 1000 feet of the proposed Drift source control well. Potential monitoring wells include W121 at 130 feet, P123 at 160 feet, P8 and associated

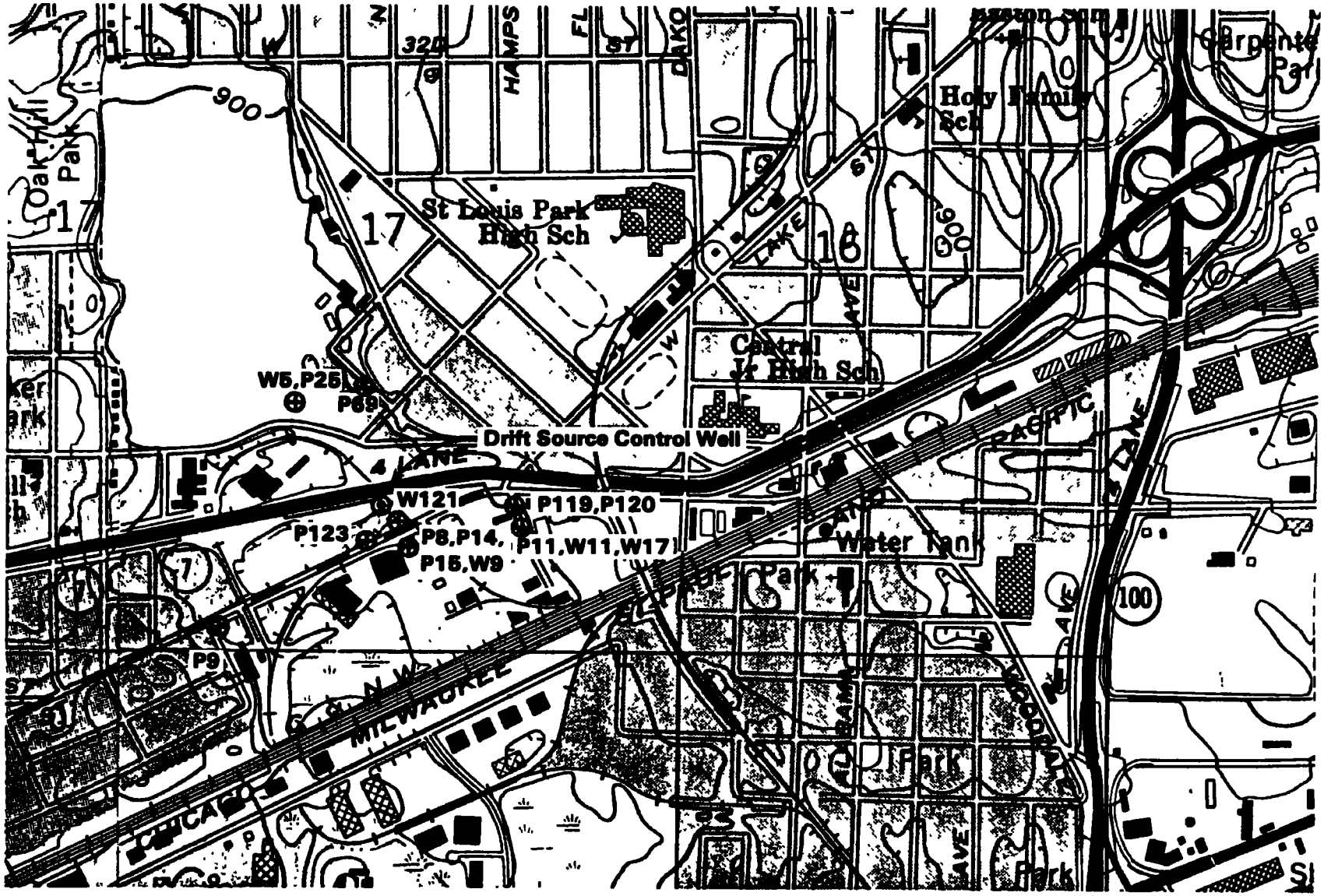


Figure 2 Locations of Potential Monitoring Wells Near Drift Control Well

wells at 280 feet, P69 at 740 feet, W5 and P25 at 900 feet, P119 and P120 at 920 feet, and P11 and associated wells at 940 feet.

Figure 3 shows the proposed location of the Platteville source control well and the locations of several potential observation wells screened in the Platteville aquifer. Measurable drawdowns are expected at Platteville monitoring wells within 1800 feet of the proposed Platteville source control well. Potential monitoring wells include P121 at 160 feet, W137 at 180 feet, W18 at 360 feet, W27 at 800 feet, P118 at 920 feet, W26 at 960 feet, W20 at 1100 feet, W53 at 1280 feet, W19 at 1600 feet, and W22 at 1800 feet.

Prior to the aquifer tests observation wells must be located and examined. The integrity of the wells will be checked to ensure that they have not been permanently sealed, damaged, or destroyed. In addition, a brief slug test will be performed at each potential observation well to demonstrate the well's response to hydraulic stress. All satisfactory observation wells in a given aquifer will be monitored when that aquifer is pumped. In addition, the three closest wells in the other aquifer will also be monitored. If fewer than two wells out of W121, P123, and the cluster of wells near P8 prove satisfactory during inspection it will be necessary to install additional Drift monitoring wells to achieve a minimum of two observation wells within 500 feet of the Drift source control well. Similarly if fewer than two wells out of P121, W137, and W18 prove satisfactory it will be necessary to install additional Platteville monitoring wells so as to achieve two observation wells within 500 feet of the Platteville source control well. If, following inspection, there are fewer than four satisfactory observation wells in each aquifer, it will be necessary to install additional wells so that there is a minimum of four observation wells in each aquifer during the pump test.

During the Drift aquifer test, the Drift source control well will be pumped at the rate of 200 gallons per minute (gpm). During the Platteville aquifer test the Platteville

why this rate not ≈ 25 gpm

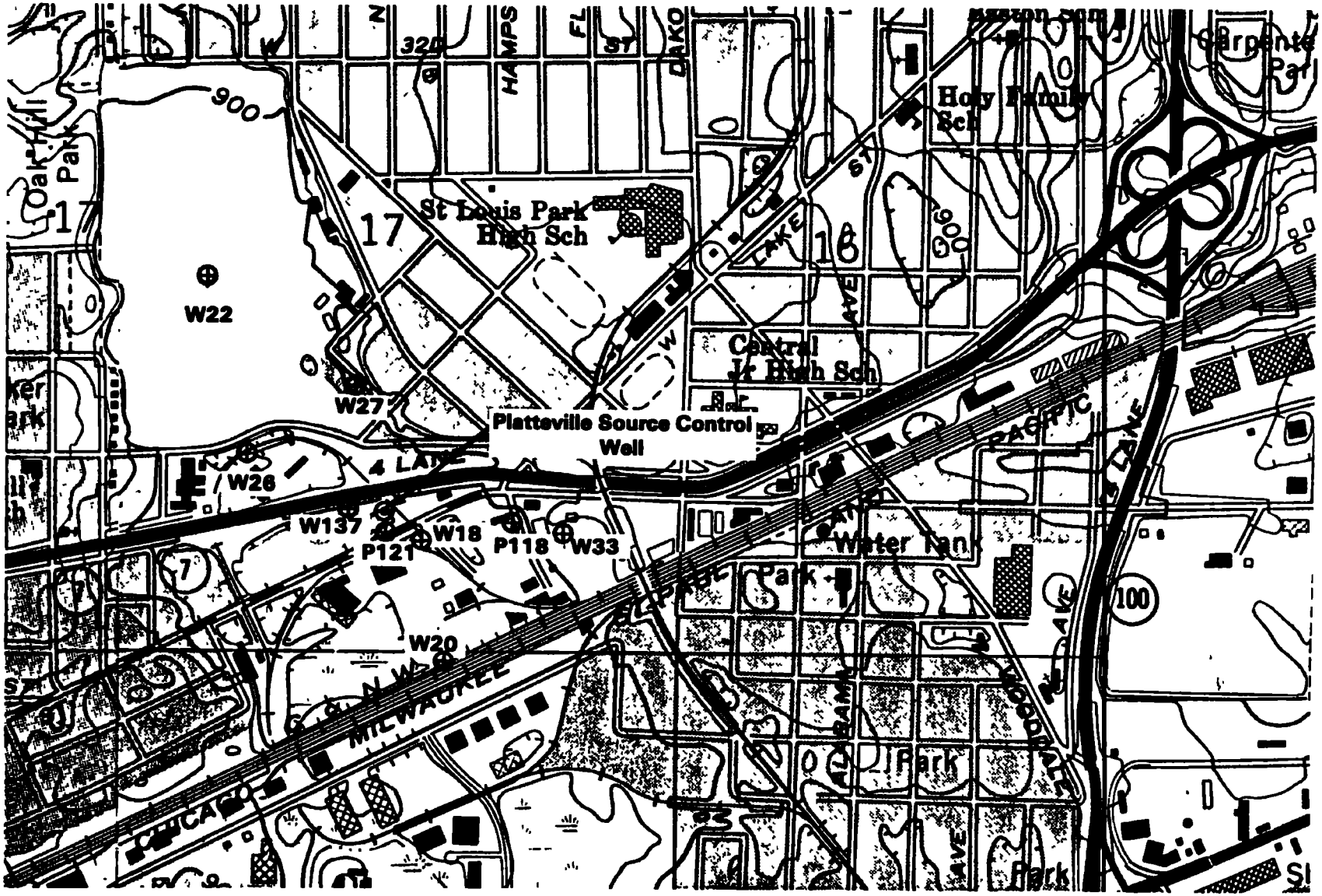


Figure 3 Locations of Potential Monitoring Wells Near Platteville Source Control Well

source control well will be pumped at the rate of 60 gpm. Discharge will be conveyed to the nearest sanitary ~~or storm~~ sewer. The well head and the discharge line will be equipped with monitoring and regulating equipment to control flow.

Each aquifer test will consist of three phases: an initial phase to determine antecedent trends, a pumping phase, and a recovery phase. During the initial phase, dedicated recording pressure transducers and data logging systems will be used to record water levels for a ~~24~~ 48 hour period prior to the start of pumping. The pumping phase will last approximately 48 hours. The exact duration will be determined by the senior hydrogeologist in the field based on data collected during the pump test. Water level measurements will be recorded every 5 minutes through the first hour, every 15 minutes through the third hour, every 30 minutes through the fifth hour, every hour through the first day, and every four hours until the end of the pumping phase. Water levels will then be recorded for 24 hours during the recovery phase at the time intervals listed above. Throughout the aquifer tests atmospheric pressure will be recorded so that water levels can be adjusted for changes due to barometric trends.

The Drift source control well test and Platteville control well test will be performed as separate operations in time. The tests will be separated by a sufficient time period to ensure that there is no interference between the tests due to residual drawdown. Monitoring wells in the Platteville will be observed during the Drift aquifer test and vice versa to identify aquifer interaction.

Pumphouse Design and Construction

The Drift and Platteville source control wells will be located sufficiently close together (7'4") that a single pumphouse can be used to house them both. This will make maintenance and inspection easier. The pumphouse will be located on property owned by the City of St. Louis Park.

The design of the pumphouse for the Drift-Platteville source control wells is based on providing a structure and equipment suitable for what is assumed to be a long-term operation (possibly decades) with minimal maintenance and operating requirements. The pumphouse is designed as a 7'4" by 14'8" walk-in building with plenty of room for maintenance work. The roof is provided with a removable panel to allow for access to the well by a drill rig.

The pumphouse will be a solidly-built masonary structure with a concrete floor. The wall structure will be masonry block with a brick veneer (color to be specified by the City of st. Louis Park) to make a more attractive building. Insulation will be provided in the roof and walls and under the floor for energy efficiency. A concrete driveway off Lake Street is included to provide access and off-street parking for inspection and maintenance personnel. Electric heating and lighting will be provided inside the pumphouse.

Complete construction specifications and blueprints for the Drift-Platteville source control wells pumphouse are presented in Appendix A. These specifications will be used in obtaining bids and contracting for the construction work. Note that the pumphouse floor grade will be established in the field so as to provide drainage away from the building. Some off-site clean fill will be required to achieve this final grading. ? → contaminated soils disposed?

Piping Design and Construction

The piping design for the Drift and Platteville source control wells is also based on providing for long-term, low-maintenance operation. Galvanized pipe will be used from the wellheads to a point just under the pumphouse, where PVC pipe will be used for the underground run to the sanitrary sewer. The discharge lines inside the pumphouse will each be provided with a wellhead pressure gauge, followed by a shut-off valve, a flow controller, a sample tap, a flow indicator, a downstream pressure gauge, and a check valve. The discharge from the Drift and Platteville source control wells will be under pressure to an existing sanitary sewer manhole on Lake Street.

Complete construction specifications and blueprints for the Drift-Platteville source control piping and sanitary sewer connection are also presented in Appendix A.

Operation

Pumping of the Drift and Platteville source control wells will begin within 10 days of completing construction, as required by RAP Section 9.1.3. Each well will be pumped at a monthly average rate of 25 gpm, as specified by RAP Section 9.1.3, until a request to cease pumping is approved pursuant to RAP Section 9.1.4. The EPA and MPCA Project Leaders will be notified by certified mail of the date on which Drift-Platteville source control well construction was completed and the date on which pumping began.

The Drift-Platteville source control wells will be pumped continuously, except for brief shut-down periods required for maintenance and/or repair. The EPA and MPCA Project Leaders will be notified by certified mail of any shutdown lasting more than two (2) weeks, with an explanation of the cause and an estimated date when pumping will be restarted. Shut-down periods for maintenance or repair are expected to be brief and infrequent because of the simple equipment involved.

The Drift-Platteville source control wells will be operated by the City of St. Louis Park (the City) on behalf of Reilly Tar & Chemical Corporation (Reilly) in accordance with Reilly/City Agreement (Exhibit B to the Consent Decree). The City will inspect the pump operation at least twice per week for each well. All inspections will be noted in a log book kept at the Drift-Platteville wellhouse using the form shown in Figure 4. The flow indicator readings, date, time, inspector's name, and any relevant comments will be recorded in the log during each inspection.

The Drift and Platteville source control wells will normally each be pumped at a rate of 25 gpm, but this rate will be increased slightly after shut-down periods in order to maintain a monthly average rate of 25 gpm. The monthly average rate will be calculated on a calendar month basis using the flow indicator readings in the inspection log. The average of successive readings will be taken as the flow rate

for the period between the two readings when calculating the monthly average rate. Monthly average pumping rates for the Drift-Platteville source control wells will be reported for the applicable calendar months in the progress reports required by Park K of the Consent Decree.

The discharge from the Drift-Platteville source control wells will be monitored quarterly for Carcinogenic PAH, and Other Phenolics, as specified by RAP Section 9.1.3. The monitoring will be performed by the City in accordance with the Reilly/City Agreement. In addition, Reilly will monitor the discharge from each well for Carcinogenic PAH, and Other PAH, and Phenolics once during the first week of pumping. This initial monitoring is not required by the RAP, but is suggested by Reilly to aid in time-series analysis of the Drift-Platteville source control wells monitoring data. Sampling and PAH analysis for the first week monitoring will be conducted by ERT using the procedures specified in the "Quality Assurance Project Plan for Sampling and Analysis - GAC Plant Testing June-August 1986", which was prepared by ERT for the City (doc. no. P-D209-129) and approved by the U.S. EPA, MPCA and MDH Project Leaders on June 25, 1986. ERT will perform the Phenolics analysis using EPA Method 420.1 or 420.2.

It should be noted that Section 2(c) of the Reilly/City Agreement requires that the discharge from Drift-Platteville source control wells will be routed to the storm sewer before the fourth anniversary of the Effective Date of the Consent Decree. This change may require pretreatment of the discharge, depending on the NPDES effluent limitations established pursuant to RAP Section 2.5. Discontinuance of the discharge to the sanitary sewer will be implemented in accordance with RAP Section 2.9.

FIGURE 4

INSPECTION LOG FOR THE DRIFT-PLATTEVILLE SOURCE CONTROL WELLS

Date	Time	Drift Source Control Well		Platteville Source Control Well		Inspector's Name
		Flow Indicator Reading (gpm)	Comments	Flow Indicator Reading (gpm)	Comments	

Construction Report

Pursuant to Section 9.1.2 of the RAP, Reilly will prepare a report which presents the installation logs for the Drift and Platteville source control wells, the results of the Drift and Platteville aquifer tests, and descriptions of any field adjustments to the approved design. The report will be submitted to the U.S. EPA and MPCA MDH Project Leaders within the 120-day construction period specified by the RAP.

Schedule

Section 9.1.2 of the RAP specifies that construction of the Drift and Platteville source control wells must be completed within 120 days of receiving DNR and MWCC permits and receiving approval of this plan, whichever comes later. The 120-day period allowed should be adequate for the required construction work, provided that permits and plan approval are received expeditiously, so that consturction can begin well in advance of winter weather. The construction report will also be submitted within this 120-day period.

SECTION B
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE Project PLAN
FOR DRIFT-PLATTEVILLE AQUIFER SOURCE CONTROL WELLS AT THE RTCC - St. LOUIS PARK SITE

ERT Document No. QAD722-291

June 1986

Prepared for

REILLY TAR AND CHEMICAL COMPANY
INDIANAPOLIS, INDIANA

ERT - A RESOURCE ENGINEERING COMPANY
696 Virginia Road, Concord, Massachusetts 01742

6648D 722-291

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Background	1
	1.2 Quality Objectives	1
2.0	PROJECT ORGANIZATION AND RESPONSIBILITIES	2
3.0	QA/QC - FIELD ACTIVITIES	4
	3.1 Training	4
	3.2 Subcontractor Quality Control	4
	3.3 Document Control and Recordkeeping	5
4.0	AQUIFER TEST	7
5.0	NUMERICAL ANALYSIS AND PEER REVIEW	7
6.0	AUDITS AND CORRECTIVE ACTION	7

1.0 INTRODUCTION

1.1 Background

ERT and the Reilly Tar and Chemical Company (RTCC) will complete certain tasks in fulfillment of the Consent Decree and Remedial Action Plan (RAP) for the St. Louis Park Site. This Quality Assurance Project Plan pertains to all work to be performed by ERT, RTCC and subcontractors in completing the requirements of Section 9.1 of the RAP. Section 9.1 concerns source control actions in the Drift-Platteville Aquifer in the vicinity of the St. Louis Park Site. This work will involve the installation of two source control wells at depths of ~~50-70~~ 70-90 feet, installation of pumps; and conducting pumping tests in accordance with ERT SOP 7730, Aquifer Test and Data Evaluation (see Appendix). Further details on the work to be performed, its purpose and the methodology to be employed may be found in the Project Site Management Plan.

1.2 Quality Objectives

The purpose of this Quality Assurance Project Plan is to define the Quality Assurance and Quality Control provisions to be implemented to ensure that:

- The resulting source control wells conform to design specifications given in the Project Site Management Plan.

- The work is performed in an efficient manner.
- Field records generated during the course of the field work are sufficiently complete and accurate to satisfy data analysis and report requirements.
- All assumptions, formulae, interpretations and numerical analyses used in the process of deriving reported results and conclusions are documented in permanent records.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization is illustrated in Figure 2-1. The RTCC Project Manager, Mr. John Craun will oversee and coordinate all project activities. The ERT Project Manager/Field Coordinator, Mr. William Gregg, will schedule and direct all field activities, including the design and implementation of the aquifer tests, and will conduct correspondence with RTCC. The ERT Project Manager/Field Coordinator is also responsible for maintaining records of the work performed on the project and for archiving those records in the Central File upon completion of the work. The RTCC Engineering Manager, Mr. Lewis Locke will direct the engineering aspects of the work, including the installation of the sewer line connections and pump houses. The Project Quality Assurance Officers are responsible for ensuring that this plan is implemented by their respective organizations, and that project data undergo technical and peer review, as necessary. The pump installation contractor will perform all work necessary to install the pumps and make them operational. The sewer

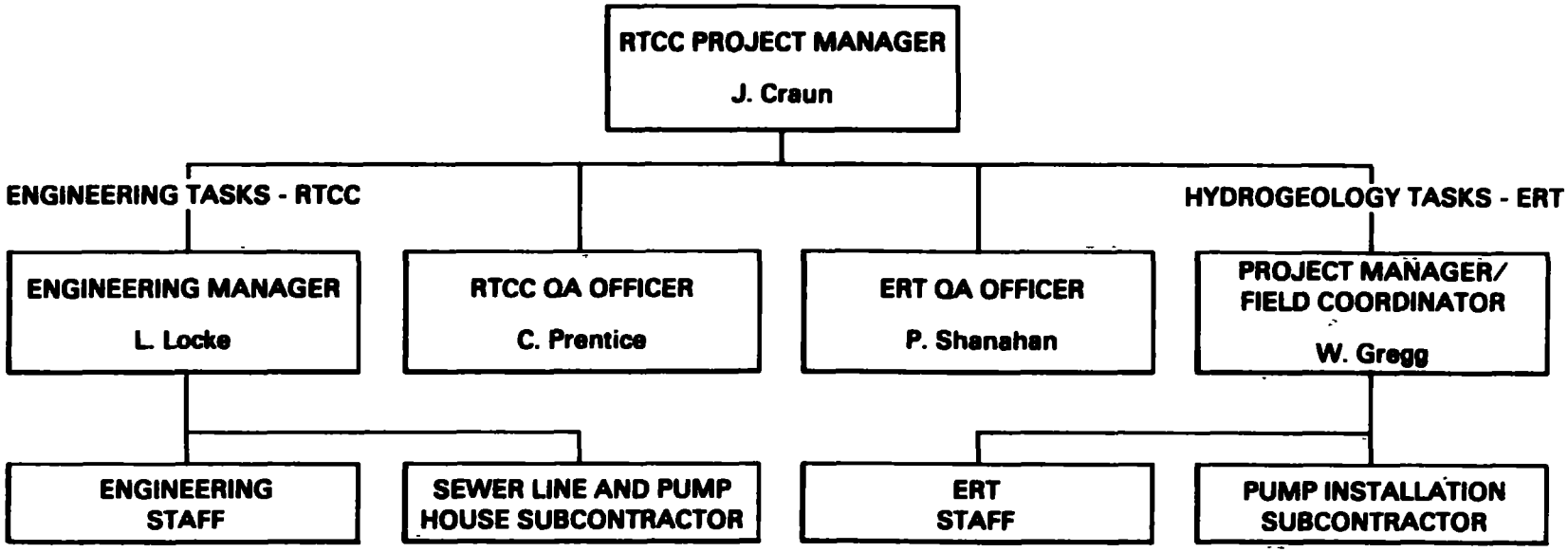


Figure 2-1 Project Organization

line connection subcontractor will install piping and connections to the sewer lines and will install well houses to enclose the wells and pumps.

3.0 QA/QC - FIELD ACTIVITIES

3.1 Training

In order to ensure that the two subcontractors doing the field work can do so in a cooperative and efficient manner, instruction and guidance will be provided by the RTCC Project Manager and the ERT Project Manager/Field Coordinator to instill an understanding of the project objectives and plans and of the respective roles of the subcontractors.

3.2 Subcontractor Quality Control

Subcontractor quality control is that system of activities which ensures that products or services obtained from subcontractors fulfill the needs of the project. Subcontractor quality control begins with subcontractor procurement. The project policy for control of procurement is described in the ERT Quality Assurance Manual for Hazardous Waste Site Investigations, Chapter 5. The subcontractor procurement process considers:

- Bidder's qualifications in terms of personnel and physical resources, Quality Assurance program and Health and Safety program,

- Results of pre-qualification audits, if appropriate,
- Price and technical qualifications

Periodic quality control inspections of each contractor will be performed by the RTCC Engineering Manager and the ERT Project Manager/Field Coordinator to evaluate adherence to the project QA Plan and the project Health and Safety Plan. Inspection will include (as appropriate):

- Type and condition of equipment,
- Calibration procedures,
- Personnel qualifications,
- Decontamination procedures,
- Documentation.

Results of the inspection will be entered in the field notebook.

3.3 Document Control and Recordkeeping

Document Control for the Drift-Platteville Aquifer Source Control Well work serves a two-fold purpose. It is a formal system of activities that ensures that:

1) All participants in the project are promptly informed of revisions of the Quality Assurance Plan; and
2) All critical documents generated during the course of the work are accounted for during, and at the end of the project.

This QAP Plan and all Standard Operating Procedure documents have the following information on each page:

- Document Number
- Page Number
- Total number of pages in document
- Revision number
- Revision date

When any of these documents are revised, the affected pages are reissued to all personnel listed as document holders with updated revision numbers and dates. Issuance of revisions is accompanied by explicit instructions as to which documents or portions of documents have become obsolete.

Control of, and accounting for documents generated during the course of the project is achieved by assigning the responsibility for document issuance and archiving. For the Drift-Platteville Aquifer Source Control Well work, the RTCC Project Manager and the ERT Project Manager/Field Coordinator have this responsibility.

Documentation for the project will either be recorded in non-erasable ink, or will be photocopied promptly upon completion, and the photocopies dated. All documents will be signed by the person completing them.

4.0 AQUIFER TEST

The aquifer tests will be performed in accordance with ERT SOP No. 7730, Aquifer Test and Data Evaluation, and the "Drift-Platteville Aquifer Source Control Well Plan" (ERT, June, 1986). 2 detail

5.0 NUMERICAL ANALYSIS AND PEER REVIEW

2- agency review

All numerical analyses, including manual calculations, mapping, and computer modeling will be documented and subjected to quality control review in accordance with ERT SOP 2005, Numerical Analysis and Peer Review. All records of numerical analyses will be legible, reproduction-quality and complete enough to permit logical reconstruction by a qualified individual other than the originator.

6.0 AUDITS AND CORRECTIVE ACTION

ERT conducts periodic audits to assess the level of adherence to QA policies, procedures and plans.

by the Agencies & ERT

Whenever quality deficiencies are observed that warrant immediate attention, formal corrective action request forms are issued to the project manager by the Quality Assurance Department. The QA Department retains one copy of the form when it is issued. The project manager completes the form and signs it when corrective action has been implemented, and returns the original to the QA Officer to close the loop.

The Quality Assurance Department maintains a record of all corrective action requests and reports their status to ERT management in a quarterly report.

Should an audit be conducted on the Drift-Platteville Source Control Well work activities, RTCC will be apprised of the audit findings and of any corrective action that is requested and performed.

SECTION C
HEALTH AND SAFETY PLAN

SAFETY PLAN

for the

Reilly Tar & Chemical Corp.
St. Louis Park Site, Drift Plateville Aquifer
Source Control Well Installations
(Name of Site/Facility)

Located in

St. Louis Park, Minnesota
(City) (State)

Project Number: D722-291

Division Number: 120

Date: June 5, 1986

Prepared By: Kevin Powers

Date: 6/5/86

Approved By: Peter Shanahan
Project Manager

Date: 6/19/86

Kevin Powers
Health & Safety Manager

Date: 6/19/86

SITE DESCRIPTION

FACILITY DESCRIPTION: ACTIVE? YES _____ NO X

An 80 acre site located in St. Louis Park, Minnesota, bordering the eastern edge of Minneapolis. The site was formerly occupied by a Reilly Tar and Chemical Corporation, Coal Tar Distillation and Wood Treating plant. The plant began operations in 1917 and ceased operations in 1971. The entire facility was razed and the land leveled in 1972. The site has since come to be used for various private and public projects, including a condominium development, a public park and minor commercial developments

HISTORICAL INFORMATION: From 1917 to 1972 Reilly Tar and Chemical Corporation operated a Wood Treating and Coal Tar Distillation Plant at the site. During this time both wood treating waste products and coal tar distilling waste products entered the ground. The site apparently received contaminants from process and handling operations, direct discharge of wastewater, and inadvertent discharges such as from spills, leaks and storm water runoff.

COMPOUNDS OF CONCERN: Coal tar and creosote; particularly phenols and a wide array of Polynuclear Aromatic Hydrocarbons including, but not limited to, Benzo (a) Pyrene, Benz (a) Anthracene and Quinoline.

PHYSICAL STATE OF COMPOUNDS: Not contained; contaminants in ground water and shallow soils.

SCOPE OF WORK

PROPOSED DATE(S) OF FIELD ACTIVITY: To be determined

PERSONNEL REQUIREMENTS:

NAME	RESPONSIBILITY
Bill Gregg	Coordinate drilling/pump installation
Subcontractor	Perform drilling/pump installation
Subcontractorr	Perform trench excavation and sewer line connection
RTC&C Engineer	Coordinate trench excavation and sewer line connection

TRAINING REQUIREMENTS: Respirator training and respirator fit test.

PROPOSED ON-SITE ACTIVITIES: The installation of two new source control wells.

SCOPE OF WORK: Two new source control wells will be installed including connection of the pump effluent stream to the sewer system. A trench will be dug from the pump to the sewer system to make this connection.

HAZARD EVALUATION

WASTE CHARACTERISTICS:

X	A.	TOXIC*	____	E.	SOLUBLE	____	I.	HIGHLY VOLATILE
____	B.	CORROSIVE	____	F.	INFECTIOUS	____	J.	EXPLOSIVE
____	C.	RADIOACTIVE	____	G.	FLAMMABLE	____	K.	REACTIVE
____	D.	PERSISTENT	____	H.	IGNITABLE	____	L.	INCOMPATIBLE
						____	M.	NOT APPLICABLE

*May be toxic depending upon route and nature of exposure.

TOPOGRAPHICAL HAZARDS: None known at this time

OPERATIONAL HAZARDS: Drilling rig, trench excavation by backhoe

NOTES OF INTEREST: The walls of trenches greater than 4 feet in depth must be adequately shored or sloped to the angle of repose. For average soil, an angle of repose of 45 is recommended. For loose or sandy soil an angle of 30 is recommended. Access to trenches greater than 4 feet in depth should be by ladders which extend to the bottom of the trench and at least 3 feet above the surface of the ground.

OVERALL HAZARD: ____ LOW X MEDIUM ____ HIGH

Soil contamination at these well sites may be high

PERSONAL PROTECTION REQUIREMENTS

- upgrade to C when?
- decon see HSP for WTLF

RESPIRATORY PROTECTION REQUIREMENT: LEVEL D (modified)

SPECIFICATIONS: MSA Comfo II with Type GMC-H cartridges

MODIFICATIONS: Respiratory protection required if working in an (a) trench in which ~~liquids are~~ creosote materials are present, in the vicinity of the drilling or excavating operation ~~if VOC's~~ are detected in the breathing zone. ~~by an HNU reading of 10 units or greater or whenever odors or dust become objectionable.~~

PROTECTIVE CLOTHING REQUIREMENT:

X WORK CLOTHES/COVERALLS (long sleeved)

___ CHEMICAL PROTECTIVE CLOTHING. TYPE? - Tyvek - for personnel entering the trench ~~or whenever~~ contact with contaminated soil is likely.

___ WORK SHOES (STEEL TOE/SHANK)

X BOOTS. TYPE? Slush type coverings

X GLOVES. TYPE? Nitrile - for handling contaminated soil

X HARD HAT

___ FACE SHIELD

X SAFETY GLASSES/GOGGLES

MODIFICATIONS: ~~Hard hat/safety glasses required within 25' foot radius of the drilling rig or operating backhoe.~~ Faceshield for personnel working in trench if ~~liquids~~ creosote materials are present.

MONITORING REQUIREMENTS:

1) INSTRUMENT: HNU PI-101

MONITORING PROCEDURE: Monitor breathing zone when in the vicinity of the drilling operation or trench excavation.

2) INSTRUMENT:

MONITORING PROCEDURE

DECONTAMINATION PROCEDURES

EQUIPMENT/SOLVENTS/SOLUTIONS: Alconox, clean water

DECONTAMINATION PROCEDURE(S):

1) ITEM(S): Gloves, boots and other equipment ~~as necessary~~ before making off site

PROCEDURE: Wash with alconox detergent and rinse with clean water

2) ITEM(S):

PROCEDURE:

DISPOSAL PROCEDURE: General refuse for all consumables. ? tyvek suits

SPECIAL INSTRUCTIONS:

NOTE: The above specified decontamination procedures pertain to the decontamination of personal protective equipment only. Procedures for the decontamination of sampling tools and other related equipment should be specified in the subject work plan and/or QA plan. ??? where

EMERGENCY REFERENCE

AMBULANCE: 920-2345

POLICE: 920-2345

FIRE: 920-2345

HOSPITAL: Methodist Hospital

Location: 6500 Excelsior Blvd.
St. Louis Park, Minnesota
932-5000

DIRECTIONS TO HOSPITAL: MAP INCLUDED? Yes

Directions to Methodist Hospital: From the site on Louisiana Ave., take Louisiana Ave., south to Highway 7 (approx. 0.2 mile). Go east on Highway 7 to Brunswick Avenue (approx. 0.6 mile). Turn right on Brunswick and proceed south to Excelsior Blvd. (approx. 0.8 mile). Turn right on Excelsior and proceed west past Dakota Ave. (approx. 0.2 mile). Methodist Hospital is on the north side (right) of Excelsior Blvd. immediately after Dakota Ave.

POISON CONTROL CENTER: 347-3141

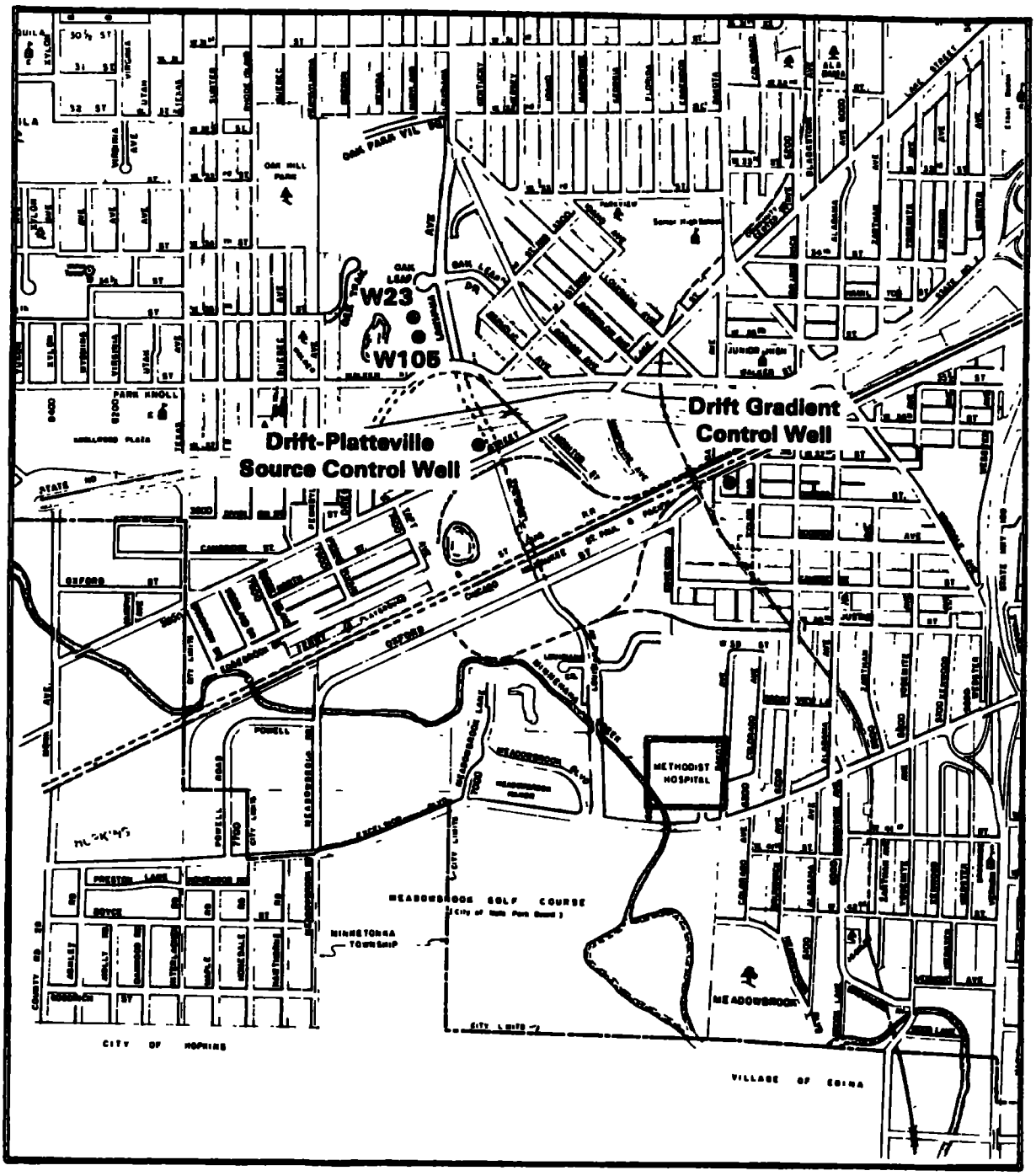
NATIONAL RESPONSE CENTER: 1-800-424-8802

- CORPORATE:

ERT/CONCORD, MA	617-369-8910
-KEVIN POWERS (HSM)	X 314
	617-773-0484 (Home)
-SCOTT WHITTEMORE (QA)	X 291
	603-888-1174 (Home)
ERT/MINNEAPOLIS, MN	
-WILLIAM GREGG (PM)	612-541-1642

- AGENCY REPRESENTATIVE: MPCA Douglas J. Robohm 612-296-7395
  EPA Daniel J. Bicknell 312-886-7341
  John C. Craun
- CLIENT REPRESENTATIVE: Reilly Tar & Chemical 317-248-6426

NEAREST PHONE: Park Tavern (Bowling Alley) 3401 Louisiana Ave.



Map of St. Louis Park and Control Well Locations

SECTION D

COMMUNITY RELATIONS PLAN

Construction of the Drift-Platteville aquifer source control wells will be undertaken pursuant to the provisions of the Consent Decree and Remedial Action Plan for the Reilly Tar & Chemical Corporation, St. Louis Park, Minnesota NPL site. All community relations programs related to the Drift-Platteville source control wells work will be coordinated through the following agencies:

United States	Ms. Judy Beck U.S. Environmental Protection Agency (312) 353-1325
State of Minnesota	Ms. Susan Brustman Minnesota Pollution Control Agency (612) 296-7769
City of St. Louis Park	Ms. Sharon Klumpp City of St. Louis Park (612) 924-2523

APPENDIX A

STANDARD OPERATING PROCEDURE

Number: 7730 Date of Issue: 2nd Qtr. 1986

Title: AQUIFER TEST AND DATA EVALUATION

Organizational Acceptance	Authorization	Date
Originator	[illegible]	[illegible]
Department Manager	[illegible]	5-29-86
Divisional Manager	D E Andrews	5/28/86
~~Group~~ Quality Assurance ~~Officer~~ Manager	Scott M. [illegible]	5-29-86
Other		

Revisions	Changes	Authorization	Date

Title: AQUIFER TEST AND DATA EVALUATION

1.0 PURPOSE/APPLICABILITY

This SOP is concerned with the procedures necessary for aquifer-test design, aquifer-test performance and general techniques of data evaluation. The scope of this SOP is limited to general procedures necessary to properly understand and organize an aquifer test. A detailed test plan should be prepared before beginning an aquifer test, following the general guidelines given in this SOP. More detailed studies concerning aquifer tests and analyses can be found in any of the various references listed at the end of this SOP.

Aquifer tests are generally conducted to evaluate the hydraulic properties of an aquifer system as they relate to remedial action design criteria and/or water supply studies.

2.0 RESPONSIBILITIES

for agency approval.

The project manager or his delegate (a qualified hydrologist, hydrogeologist, geologist, etc.) will have the responsibility of designing an appropriate aquifer-test program specific to the project needs. Additionally, he or she will be responsible for coordinating any second or third parties and ensuring that all procedures are performed in accordance with SOP and the aquifer-test plan. Any deviation from the SOPs or the aquifer-test plan will be fully documented in a daily log book. & approved by the agencies

2.1 ERT Personnel

The ERT project manager or his delegate will be responsible for:

- Aquifer-test design - This will include review of pertinent hydrogeologic literature (reports, boring and well logs, etc.) and, based on that information, the preparation of a site-specific aquifer-test plan that specifies: (1) the placement of monitoring and recovery wells; (2) site-specific discharge rates and point of discharge; and (3) time intervals at which water level data will be collected.
- Aquifer-test performance - This includes: (1) implementation of the aquifer test in accordance with job-specific protocols given in the aquifer-test plan; and (2) recording aquifer-test data.
- Reduction and evaluation of aquifer-test data - This will include: (1) evaluation of antecedent water-level trends; (2) evaluation of the pumping phase water-level data; and (3) evaluation of the recovery phase water-level data.

2.2 Drillers

It is the responsibility of the driller to provide the necessary equipment for monitoring and recovery well installation as specified in SOP 7220 and as modified by the project manager or his delegate. If the driller is to supply submersible pumps, generators, flow meters, discharge lines or any other equipment necessary to the job the project manager shall explain in detail to the subcontracted driller the job-specific equipment needs. During setup and/or installation of the equipment the project manager shall oversee the performance and adherence to the test plan. Additionally, during the entire aquifer test, if the driller is involved in activities such as monitoring the performance of the pumps, fuel supplies, etc., the project coordinator shall ensure that the driller adheres to the test plan.

2.3 Second or Third Parties

During the aquifer test other involved parties shall be monitored for performance and adherence to the test plan. Any deviation shall be corrected and fully recorded by the project coordinator in a daily log book.

3.0 SUPPORTING MATERIALS

The following list identifies the types of equipment which may be used during an aquifer-test program. Exact equipment needs will be project-specific and will be detailed in the aquifer-test plan.

3.1 ERT

- Electric water-level indicator
- Steel surveyors tape and plopper
- Pressure transducer and data logging system
- 100-foot surveyors tape
- Field portable printer or computer (compatible with data logging system)
- Aquifer-test record sheets/clip board
- Daily log book

- Log-log and semi-log graph paper
- Watch
- Calculator
- Decontamination equipment (required for personal protection during aquifer tests in potentially contaminated environments or if sampling for chemical analysis will be included):

  Alconox detergent
  Chemical-free paper towels
  Deionized water w/squeeze bottle
  Methanol w/squeeze bottle
  Trash bags
  Tap water (5 gallons)
  Buckets

- Ground-water sampling kit from lab (if applicable)
- Personnel health and safety equipment (as specified by the HSO)
- Submersible pump
- Aeration column (for stripping volatiles out of discharged ground water)

3.2 Driller

- Tankers for collecting discharged ground water
- Submersible pump
- Generator and fuel
- Flow meters and control valves
- Discharge line

3.3 Supporting SOPs

- 2005 - Numerical Analysis and Peer Review
- 7220 - Monitoring Well Construction and Installation

4.0 GENERAL AQUIFER TEST DESIGN AND OPERATIONAL PROTOCOLS

Aquifer tests are broken down into four separate phases, all of which must be performed for proper evaluation of the hydraulic properties of the aquifer. Any deviation from these four phases must be fully documented and justified. These four phases are:

- Aquifer-test design approved by the agencies
- Antecedent water-level monitoring
- Pumping
- Recovery
- Aquifer-Test Design

Prior to an aquifer test an initial review of site hydrological and geological conditions must be performed and a detailed aquifer-test plan must be prepared. Information concerning aquifer thickness, aquifer type, transmissivity, hydraulic conductivity, storativity, etc., can be obtained or estimated from the following types of sources:

- Boring logs
- Well records
- USGS water resource reports
- State water resource reports
- Textbook tables and charts
- historical data

The hydrogeologic information gathered from these sources is necessary to:

- estimate the cone of influence at a specific discharge rate;
- properly and strategically locate monitoring wells and the recovery well; and
- determine the proper time intervals at which time-drawdown data should be collected.

The following subsections provide guidelines for preparation of aquifer-test plans.

4.1.1 Cone of Influence

installation

The cone of influence which will result from pumping of the aquifer must be estimated for proper placement of monitoring wells. Analysis of the cone of influence is performed using: (1) analytical techniques described in Section 5.0; (2) known and/or estimated hydraulic characteristics of the aquifer system; and (3) the project-specific discharge rate.

4.1.2 Recovery Wells ? - what type wells - SC/SC wells

Recovery well design is mainly dependent upon the heterogeneity of the aquifer system to be tested. Standard design considerations which should be evaluated under all situations are as follows:

- The inside diameter of the recovery well and well screen should be sufficient to allow for installation of the submersible pump.

- The well screen should be of sufficient slot-size opening to prevent entrainment of finer grained sediment while keeping the screen intake velocity and head loss at a minimum.

- The recovery well should be properly developed prior to the aquifer test.

The screened interval of the recovery well is dependent upon the heterogeneity of the aquifer system. Under fairly homogeneous, isotropic conditions the recovery well should be screened over 70 to 80 percent of the aquifer's entire thickness. More heterogeneous, anisotropic conditions may require a specific screened interval dependent upon the formational unit to be tested. Under complex heterogeneous anisotropic conditions the placement of the recovery well screen must be evaluated by a qualified hydrogeologist. ?

4.1.3 Monitoring Wells

Monitoring well design is largely dependent upon the heterogeneity of the aquifer system to be tested. Standard design considerations which should be evaluated under all situations are as follows:

- The inside diameter of the monitoring well should be sufficient to allow for installation of water-level monitoring equipment and ground-water sampling equipment.

- A minimum of five monitoring wells should be used for the collection of water level and drawdown data.

- Monitoring wells should be properly developed prior to the aquifer test to ensure proper hydraulic continuity with the aquifer system.

o location

Under fairly homogeneous, isotropic conditions the following rules for proper monitoring well placement should be observed:

- Monitoring well screens should extend to at least a depth equal to the midpoint of the recovery well.

gradient ?

- The closest monitoring well should be located at a radial distance, from the recovery well, equal to the saturated thickness of the aquifer.

- At least one/5 monitoring well should be located outside of the predetermined cone of influence.

- For a confined aquifer, shallow monitoring wells should be placed in the overlying source bed (if any).

Figure 1 shows a typical setup of monitoring wells and the recovery well along with major assumptions for homogeneous, isotropic conditions. More heterogeneous, anisotropic aquifer systems may require discreet screen placement within specific geologic units. This placement shall be determined by a qualified hydrogeologist. Agency approval

4.2 Antecedent Water-Level Monitoring

Antecedent water-level trends must be established prior to startup of the recovery well pump. Antecedent water-level trends include:

- Diurnal fluctuations due to daily ground-water withdrawals in the area

- Seasonal water-level fluctuations

o ppt.

- Changes in water levels due to changes in the atmospheric barometric pressures

- Changes in water levels due to tidál cycles

- Changes in water levels due to daily traffic patterns

Dedicated, continuously recording, pressure transducers and data logging systems should be employed to establish antecedent water-level trends. Water levels should be monitored at no greater than hourly intervals in at least three monitoring wells to establish any spatial trends within the aquifer system. Data should be collected until a water level trend can be established but for no less than a 24-hour period. The observed antecedent trend also can be used to locate possible ground-water supply wells which may cause interference during the aquifer test. All efforts should be made to reduce the use of any well which may cause interference during the aquifer test.

During analyses of the aquifer-test data, antecedent water-level trends are extrapolated out through the pumping and recovery phases of the aquifer test. Water level and drawdown data are then corrected for any established antecedent trend.

4.3 Pumping Phase

During the pumping phase of the aquifer test the recovery well pump is switched on and run at the specified discharge rate. All technicians who will be collecting data shall synchronize their watches and begin collecting water level data when the recovery well pump is switched on. Water level data shall be collected at the time intervals shown in Table 1 or as specified by the project manager. All appropriate aquifer-test data shall be recorded on the aquifer-test data record sheet (Figure 2). Each person recording data shall sign and date, in ink, his or her record sheet.

The duration of the aquifer test shall be determined by the project manager. For a valid aquifer test the recovery well should be pumped until changes in drawdown become negligible, the hydraulic gradient becomes constant and/or changes in the discharge rate from aquifer to the recovery well approach zero. These criteria determine the type of solution, steady state or non-steady state, that will be used in analyzing the aquifer-test data. The forementioned conditions indicate steady-state conditions. Steady-state conditions will allow for the most accurate evaluation of the aquifer's hydraulic characteristics.

The duration of the aquifer test can be estimated during the design phase while judgments in the field as to the state of ground-water flow can be made once data has been collected for a sufficient period of time. Aquifer tests should however be run for no less than 12 hours. A practical maximum duration of 72 hours will provide sufficient data to characterize hydraulic properties of the aquifer. Large aquifer systems which may be used for major municipal supplies should be tested for 7 to 14 days to evaluate long-term pumping affects.

detail for this study

The discharge rate should be measured and ~~adjusted (if~~ steady necessary) at least hourly throughout the entire aquifer test. Ground water withdrawn from the recovery well must be discharged at a suitable distance outside of the radial cone of influence. This will prevent artificial recharge back into the aquifer system. If artificial recharge into the aquifer system being tested occurs, erroneous results will be calculated during analyses of the aquifer-test data.

4.4 Recovery Phase

During the recovery phase of the aquifer test the recovery well pump is switched off and water level rebounds are measured in all monitoring wells and the recovery well at the time intervals listed in Table 1. Monitoring of the water level rebound should continue until the aquifer has recovered to within 90 percent of its initial water level. It is usually sufficient to monitor for a 24-hour period. Long-term pumping, however, should be followed by long-term monitoring of water level recovery and post-aquifer-test water level trends.

5.0 AQUIFER-TEST ANALYSES

Once the aquifer test has been completed, field data must be reduced, assimilated and evaluated. Data analyses include three main procedures:

1) Water level data must be corrected for antecedent trends observed during phase two of the aquifer test.

2) Time-drawdown data collected during the pumping phase of the aquifer test must be plotted on log-log paper. These log-log plots are then matched to known aquifer type responses shown in Figure 3.

3) Aquifer-test data must be analyzed using appropriate type solutions as listed in Tables 2 and 3.

Aquifer-test data which has been corrected for any antecedent trends is plotted on log-log paper. These plots are then matched to typical responses of known aquifer types as shown in Figure 3. Once the type of aquifer response has been evaluated, the project manager must select the proper solutional technique to evaluate the aquifer-test data. agency Table 2 lists the various methods of data analyses and calculated hydraulic properties which can be used if the following assumptions are met:

- The aquifer has infinite areal extent.
- The aquifer is homogeneous, isotropic and of uniform thickness.
- Prior to pumping, the piezometric surface and the phreatic surface are nearly horizontal.
- The discharge rate is constant.
- The aquifer is fully penetrated by the recovery well.
- Storage within the recovery well can be neglected.
- Water removed from the aquifer is discharged instantaneously with a decline in hydraulic head.

More detailed analyses may be necessary under complex hydrogeologic conditions. Table 3 lists techniques of aquifer-test analyses with replaced assumptions indicative of more complex hydrogeologic conditions. In any case, the assumptions on which analyses are based should be stated in the final report.

All aquifer-test analyses must be performed by a qualified hydrogeologist. The list of references at the end of this SOP provide detailed methods of analyses for all hydrogeologic conditions.

6.0 REVIEW

All data reduction, calculations and assumptions shall be verified, by a qualified person other than the originator, in accordance with SOP 2005 (Numerical Analysis and Peer Review). In addition to protocols listed in SOP 2005, the verification process shall include a review of:

- Assumptions made for antecedent water-level trends

- Major assumptions as listed in Section 5.0 for aquifer type and solutional technique

- Overall method of analyses and reporting of results

All reviews shall be signed by the reviewer prior to reporting of analyses to the client.

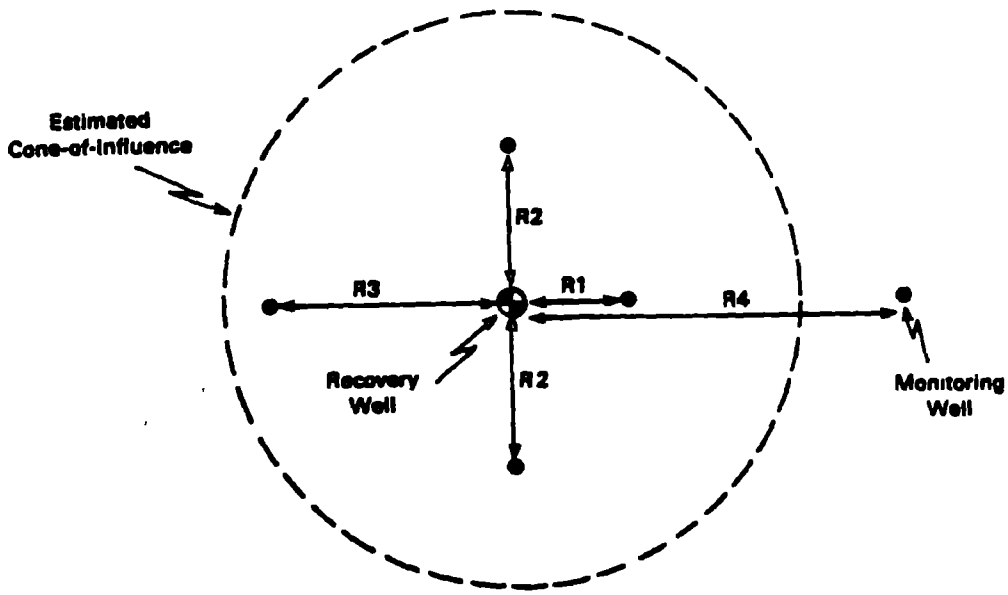
REFERENCES

Ground Water Manual, A Water Resources Technical Publication, U.S. Department of the Interior, 1977.

Ground Water; R. Allan Freeze and John A. Cherry, 1979.

Practical Aspects of Ground Water Modeling, Flow, Mass and Heat Transport, and Subsidence; Analytical and Computer Models. William C. Walton, 1984.

Analysis and Evaluation of Pumping Test Data; Bulletin 11. Kruseman G.P. and DeRidder N.A.



Where:

R = Radial Distance from the Recovery Well and R1 < R2 < R3 < R4

Aquifer Assumptions:

- The aquifer has infinite areal extent.
- The aquifer is homogeneous, isotropic and of uniform thickness.
- Prior to pumping the piezometric surface and phreatic surface are nearly horizontal.
- The discharge rate is constant.
- The aquifer is fully penetrated by the recovery well.
- The storage in the recovery well can be neglected.
- Water removed from the aquifer is discharged instantaneously with a decline in hydraulic head.

Figure 1 Generalized Aquifer Test Set Up

TABLE 1

PREDETERMINED MEASUREMENT INTERVALS

Time Since Test-Started	Measurement Interval
0 - 1 hr	1 - 5 mins
1 - 3 hrs	15 mins
3 - 5 hrs	30 mins
5 - 24 hrs	60 mins
24 - 48 hrs	2 - 4 hrs
48 - 72 hrs	4 - 8 hrs

Well # _____
Pg 1 of ____

AQUIFER TEST DATA RECORD SHEET

Date _____ Technician _____
Project _____
Depth of Well _____ Length of Screen _____
Time Test Started _____ hrs. Length of Casing (AGS) _____
Radial Distance from Pump Well _____
Static Water Level (TOC) _____

Watch Time	Time Since Test Started	Water Level from T.O.C.	Adjusted Water Level	Drawdown (ft)	Pump Rate

ERT
A RESOURCE ENGINEERING COMPANY
696 VIRGINIA ROAD, CONCORD, MASSACHUSETTS 01742, USA

2010/1-86

Figure 2 Aquifer Test Data Record Sheet

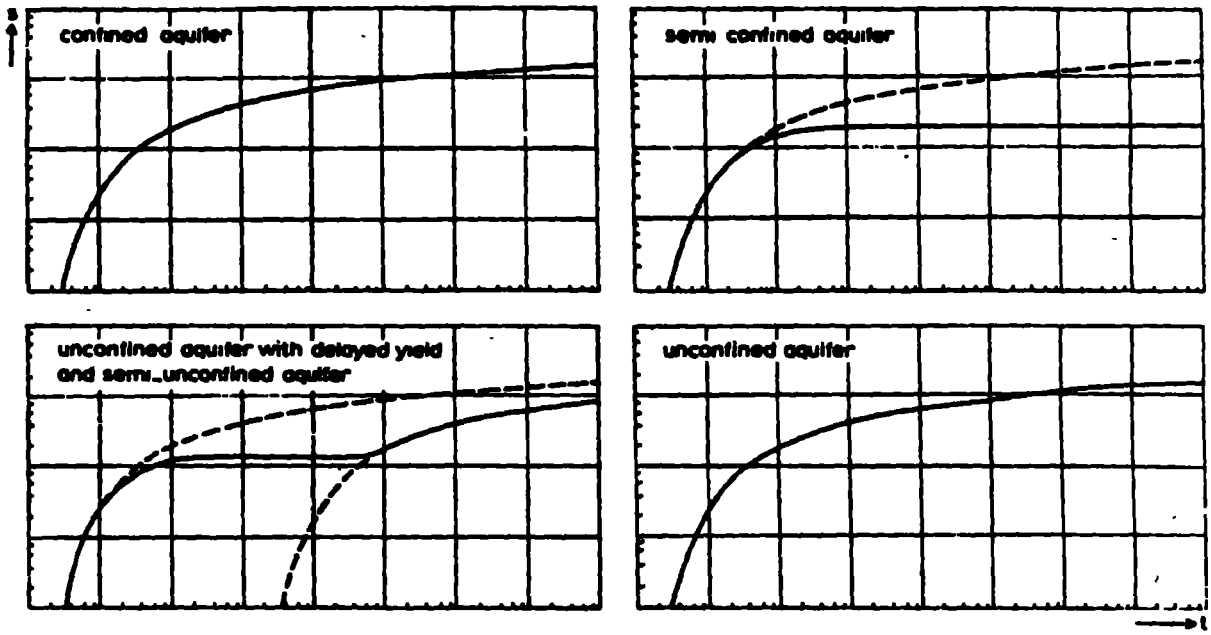


Figure 3 Typical Time-Drawdown Curves for Different Aquifer Types

TABLE 2

ANALYTICAL PROCEDURES FOR EVALUATING AQUIFER-TEST DATA

Aquifer Type	Type of Solution	Method of Analysis: Name	Method of Analysis: Type	Calculated Parameters*
confined	steady state	Thiem	calculation	T,K
	unsteady state	Theis	curve fitting	T,S,K
		Chow	nomogram	
		Jacob	straight line	T,S,K
		Theis recovery	straight line	T,K
semi confined	steady state	De Glee	curve fitting	T,C,K,L
		Hantush Jacob	straight line	T,C,K,L
		Ernst mod. Thiem meth.	calculation	T,K
	unsteady state	Walton	curve fitting	T,S,K,C,L
		Hantush I	inflection point	T,S,K,C,L
		Hantush II	inflection point	
		Hantush III	curve fitting	T,S,K,C,L
unconfined with delayed yield and semi-unconfined	unsteady state	Boulton	curve fitting	$T, S_A, S_Y, B, 1/\alpha, K$
unconfined	steady state	Thiem-Dupuit	calculation	T,K
unsteady state	as for confined aquifers			T,S,K

Note: T = Transmissivity; K = Horizontal Hydraulic Conductivity; S = Storativity; C = Hydraulic Resistance; L = Leakage Factor; S_A = Storativity; S_Y = Specific Yield; $1/\alpha$ = Delay Index; B = Drainage Factor

TABLE 3

ANALYTICAL PROCEDURES FOR EVALUATING AQUIFER-TEST DATA

Replaced Assumption(s)	Aquifer Type	Type of Solution	Method of Analysis: Name	Method of Analysis: Type	Conditions	Calculated Parameters*
Aquifer crossed by one or more fully penetrating recharge or barrier boundaries	confined or unconfined	steady state	Dietz	calculation	recharge boundaries only	T,K
		unsteady state	Stallman	curve fitting	recharge and/or barrier boundaries	T,K,S
			Hantush image	straight-line	one recharge boundary	
Aquifer homogeneous, anisotropic and of uniform thickness	confined or unconfined	unsteady state	Hantush	calculation		T_X,T_Y,S,K
			Hantush-Thomas	calculation	for recovery data also	T_X,T_Y,S,K
	semi confined	unsteady state	Hantush	calculation		T_X,T_Y,S,C,L,K
Aquifer homogeneous and isotropic; but thickness varies exponentially	confined	unsteady state	Hantush	curve fitting	$dD/dx < 0.20$	T,S,K
Prior to pumping the phreatic surface slopes in the direction of flow	unconfined	steady state	Culmination point	calculation		T,K
		unsteady state	Hantush	curve fitting	$i < 0.20$	T,S,K
Discharge rate variable	confined or unconfined	unsteady state	Cooper-Jacob	straight line	step-type pumping	T,K,S
			Aron-Scott	straight line	continuously decreasing discharge	T,K,S
			Sternberg	straight line	continuously decreasing discharge	T,K,S
			Sternberg recovery	straight line	continuously decreasing discharge	T,K

Key: T = Transmissivity; K = Horizontal Hydraulic Conductivity; S = Storativity; C = Hydraulic Resistance; L = Leakage Factor; T_X,T_Y = Transmissivity in the X and Y direction.

APPENDIX B

CONTRACT SPECIFICATIONS

FOR

DRIFT AND PLATTEVILLE AQUIFERS
SOURCE CONTROL WELLS

REILLY TAR & CHEMICAL CORP.
1510 MARKET SQUARE CENTER
151 NORTH DELAWARE STREET
INDIANAPOLIS, IN 46204

PUMPING FACILITY ENGINEERING SPECIFICATIONS

CONTENTS

Summary of Work . . . . . Sec. 100

Mechanical Work . . . . . Sec. 200

Electrical Work . . . . . Sec. 300

Painting . . . . . Sec. 400

Driveway . . . . . Sec. 500

Building. . . . . Sec. 600

SECTION 100

SUMMARY OF WORK

101 SCOPE OF WORK

The work consists of the complete finish of the Drift and Platteville aquifers source control wells Pump House at _____Lake St., St. Louis Park, MN. The work is to be completed as per this specification and Reilly Tar & Chemical Corp. drawings 861737-001 and 600.

102 OWNER RESPONSIBILITIES

who The Owner will have a Representative available for field Consultation.

The Owner will furnish site elevations prior to letting the work for bids.

The Owner will furnish all required construction and permanent permits.

103 CONTRACTOR RESPONSIBILITIES

The Contractor will arrange for a temporary water supply and temporary electrical service connection during the construction period.

The Contractor shall provide project management to ensure completion of the work on schedule.

The Contractor will be responsible for base lines and bench marks for subcontractor use.

The Contractor must notify the Owner 3 days in advance of any utility tie-in or any work that will interrupt normal activity around the job site.

Coordination between the Contractor and the Subcontractors must be maintained in order to meet the schedule.

All applicable Codes and Safety Regulations will be followed by every Contractor and his workers.

The Contractor shall provide five copies of all equipment warranties, operating instructions, installation instructions, maintenance instructions and parts list for each piece of equipment installed shall be provided to the owner on completion of the work.

The Contractor shall provide temporary baricades and fencing.

The Contractor shall ensure that at the end of each working day, positive drainage shall be provided.

The Contractor shall ensure that the topsoil is removed to its entire depth, in the areas of new construction and stockpile topsoil which will be required for finish grading.

The Contractor shall see that areas that are to have topsoil removed shall first be cleared of excessive vegetation, rubbish and debris.

The Contractor shall see that stockpiled topsoil is replaced in lawn areas prior to sodding and or seeding to a minimum depth of 6 inches. Remove all stones larger than 2 inches.

?, contaminated soil

The Contractor will be responsible for site restoration to near original condition.

The Contractor shall be responsible for layout of his Work, including lines and elevations. Each Subcontractor shall field verify all dimension relating to his work, as shown on the Drawings, and report any errors or discrepancies to the General Contractor before commencing work.

The Contractor is responsible for the protection of his Work from adverse weather. He shall provide, at all times, all means and methods for weather protection as necessary for the satisfactory execution and performance of his work.

104 GUARANTEES

A written one year guarantee is required to cover all installed material, equipment and labor not otherwise covered by manufacturers warranties. Exceptions to this are the roof (2 yrs) and caulking (5 yrs).

All guarantees will begin at the Owners recognized date of substantial completion.

105 TEMPORARY FACILITIES

The Contractor will furnish a project office at the site with a telephone for business use to all personnel. Toilet facilities will be provided by the Contractor.

Storage facilities are to be provided by the Contractor. Set-up location must be approved by the Owner. If the set-up location interferes with work later in the job, relocation may be required.

The Electrical Subcontractor will furnish all temporary electrical for lights and outlets at the beginning of the job. This temporary work is to be included in the Contract Bid. This work must meet the appropriate codes and regulations.

The Electrical Subcontractor is also responsible for removal of this equipment when no longer needed.

Fire extinguishers will be provided by the Contractor at required locations on the job site. Each Subcontractor is responsible for providing his own extinguishers during any cutting or welding. Certain Owner designated locations will require Owner approval before welding or cutting can be done.

Project Sign: If required, the Contractor will provide and maintain a Project Sign as approved by the City and the Owner. No other signs are allowed except as required for safety, security, or traffic control; or without the permission of the Contractor.

106 MEETINGS

Prior to Contract award, the leading Bidder will be required to attend a pre-award meeting. At this time the bid and all applicable Contract Document information will be reviewed. A preliminary schedule will be provided for Contractor input. The Contractor should also be ready to provide information on Subcontractors, Suppliers, material and equipment delivery times, personnel etc.

At any time during the job, the Owner may call a progress meeting in the St. Louis Park area. These meetings may require attendence by the Contractor, Subcontractors and Material Suppliers.

107 SHOP DRAWINGS

Shop drawings and product data must be received by the Owner with sufficient time for approval. Contractor or Supplier delay in forwarding drawings and data for approval will not be viewed as an acceptable reason for schedule extension.

Seven (7) copies of all approved drawings and data will be supplied to the Owner for further distribution.

108 CLEAN-UP - Sails / water - TSD

The Contractor and each Subcontractor will be responsible for site clean-up during the job. A trash container will be supplied by the Contractor.

109 PROJECT CLOSEOUT

The Mechanical and Electrical Subcontractors must submit five (5) sets of operating and maintenance manuals to the Owner before final payment will be made. These manuals will contain the following:

- Contractor and Supplier List
- Guarantees
- Wiring and control diagrams
- Operating instructions
- Maintenance instructions
- Parts lists
- Any other information relating to supplied equipment and materials

The Contractor and all Subcontractors must submit a Contractor and Supplier List and a written guaranty.

The Contractor will be responsible for keeping a set of as-built drawings on site for updating changes. It is the responsibility of each Subcontractor to note all changes related to his work on this set.

SECTION 200

MECHANICAL WORK

201 GENERAL

This Section describes work, equipment and materials to be furnished by the Mechanical Subcontractor.

All mechanical systems are to be finished to a ready-to-operate condition. The Mechanical Contractor is responsible for completing all mechanical systems except for power wiring tie-ins.

The accompanying drawings have been drawn to scale and have some listed dimensions. Care has been taken to maintain accuracy, but it remains the Contractors responsibility to verify the scaled and listed dimensions.

The Mechanical Subcontractors Bid shall include a list describing the major types of equipment and materials to be used. After acceptance of the bid, changes to this list will not be allowed.

The Mechanical Contractor will assume all responsibility for conforming to rules and regulations of the applicable government agencies and utilties.

The plumbing installation will comply with all requirements of the Minnesota Department of Health and the Uniform Plumbing code.

The mechanical installation will comply with the Uniform Mechanical Code.

All installed work will comply with rules and recommendations of the National Fire Protection Association.

Shop drawings and operation and maintenance manuals must be supplied as described in the SUMMARY OF WORK.

202 SYSTEM TESTING

Every piping system will be flushed clean prior to pressure testing.

Testing procedures for various piping systems are as follows:

- Discharge water	- All lines pressured to 125 psi for 4 hours with no loss of pressure.
- Waste piping	- All lines pressurized with ~~5~~ 15 psig air ~~or 10' static water head with no leakage for 1 hour.~~

203 MECHANICAL EQUIPMENT SPECIFICATIONS
(Equipment is listed as per well)

Discharge Gate Valve 1 1/2" NPT (Powell Fig. 500)

Pressure Gauges (2) 0-100 psi (Ashcroft 1279 (*) 54 1/2" TA Lower 1/2 NPT 0-100 psi)

Flow Controller 1 1/2" NPT (Kates Flow Control 4FA1-1)

Sample Line Valve and Pressure Gauge Shutoff Valve (3)
1/2" NPT, ball type (Powell Fig. 4210B 1/2")

Flow Indicator 1 1/2"NPT (Universal Fluid Flow Monitor
MN-CSB50G-12-32V1.0-OWR)

Backflow Check Valve 2", spring closing (TRW
Mission Duo Check II K15 HMF 2")

204 GENERAL PIPING MATERIALS

The Mechanical Contractor is to furnish all piping, valves and accessories to complete the work as described by the Contract Documents. Substitutions may be made for specified items with approval from the owner.

The list of acceptable manufacturers is as follows:

- Gate and check valves: Nibco/Scott, Crane, Powell, Lunken, TRW Mission Heimer, Walworth, Jenkins or Stockman

- Ball valves: Wolverine Brass Works, Nibco/Scott, Hammond, Powell, Jamesbury, Metraflex or Dyna-Quip

All flange connections are to have 1/16" full face "Cranite" gaskets coated with a thread lubricant when installed.

205 GENERAL PIPING INSTALLATION

All piping must be installed and routed in a neat and orderly manner with sufficient clearances for maintenance unless otherwise indicated on the drawings.

206 GAUGES

Acceptable guage manufacturers are Ashcroft, Marsh, Trerice, Duro, Danton, Cambridge, American Air Filter or Dryer.

Typical guages shall be similar to the following:

- Ashcroft 1279

207 DISCHARGE WATER PIPING

Piping will be part low carbon steel galvanized Sch 40 with screwed and flanged fittings and part PVC Sch 40 as indicated on the drawings.

208 WASTE PIPING

Piping will be PVC SCH 40.

209 GENERAL EQUIPMENT INFORMATION

The Mechanical Subcontractor is responsible for complete purchasing and installation of all equipment other than as noted in the Drawings and Specifications. This work includes supports and all connections except power wiring to the unit.

All equipment is to be completely installed to a ready to operate state, including any lubrication, alignment and adjustments.

SECTION 300

ELECTRICAL WORK

301 GENERAL

This section describes work, equipment and materials to be furnished by the Electrical Subcontractor.

The Electrical Subcontractor will assume all responsibility for conforming to all rules and regulations of the applicable government agencies and utilities.

The Electrical Subcontractor is responsible for verification of dimensions that affect his work. Any minor deviations caused by interferences shall be considered a part of the job and the owner will not be held responsible for any reimbursement.

All electrical equipment must be U. L. approved and meet all other applicable code requirements.

All permits and inspections required for completion of electrical work are to be arranged and paid for by the Owner.

All electrical materials and equipment shown on the Contract Drawing and listed in the Specifications must be provided by the Electrical Subcontractor unless otherwise noted.

Shop Drawings and Operations and Maintenance Manuals must be supplied as described in the SUMMARY OF WORK.

302 TEMPORARY WORK

The Electrical Subcontractor must supply temporary power supply pole and outlets to allow for convenient construction use.

303 ELECTRICAL EQUIPMENT SPECIFICATIONS:

Pumps 2 units each being 1 Hp, 3ph, 240V 60He, 4 amps (furnished by Well Contractor)

Nema Size 0 starters 2 units each being (Square D class 8536, type SBW, Nema type 4 with Dual Push Button and pilot light control unit KXRG117)
Two 10 amp circuit breaker disconnects in load center (Square D Q0310) 3 pole, common trip with indicator

Heaters 2 units each being 3KW, 10,239 Btuh, 240/208 V, 60Hz, 12.5 amps (Dayton 3E039)
Two 15 amp ground fault circuit interupter circuit breaker disconnects in load center (Square D Q0215GFI)2 pole, common trip with indicator

Lights 4 units each unit having 2 lamps, 120V, 6Hz, 70 watts per fixture, .65 amps per fixture (Graybar Meter Miser Wrap-Arounds GMM-8-2224)
One 15 amp ground fault circuit interupter circuit breaker disconnect in load center for both lights (Square D Q0115GFI) 1 pole with trip indicator

Switch toggle type, 120V, 15 amp (Hubbell 1201 GRY)

Duplex Outlet corrosion resistant, 3 wire grounding, 125V 20 amp (Hubbell 53CM62)

One 20 amp ground fault circuit interupter circuit breaker disconnect in load center (Square D QO120GFI) 1 pole with trip indicator

Loadcenter circuit breaker type, 3ph, 4 wire, 120/240V, 100 amp main (Square D QO424M100) flush cover (Square D QOC430LF) Equipment Ground bar kit (Square D PK15GTA)

Safety Socket Box test-bypass type, 3ph, 4 wire, 240/120V, delta, 100 amp (Square D EM71NRB)

304 GENERAL MATERIALS

The following types of material and equipment should be used

- Service equipment, panelboards, safety switches, motor starters and other general purpose control devices	- Square D
- Wiring devices	- Hubbell, A.H. & H., P. & S. G. E., Sierra, Grouse-Hinds
- Finishing plates	- Sierra
- Lighting Fixtures	- Noted on Drawings or approved equal
- Lamps	- G.E., Sylvania or Westinghouse

Conduit can be U.L. approved heavy wall rigid or EMT where not otherwise specified. All fittings must be U.L. approved and electrically conductive. Minimum conduit size is 3/4" except where noted. Flexible conduit is 1/2" minimum.

Conduit runs shall be in the block walls and under the concrete floors unless otherwise indicated.

Wire and cable for general wiring shall be rated 600 volt. Conductors size #12 through #8 AWG shall have type TW, THW or THW/THHN insulating wall unless otherwise noted. Conductors sized #6 AWG and larger shall have type THWN, THW, THHN or XHHW insulating wall unless otherwise noted. Minimum conductor size must be #12 AWG. All wire terminating in light fixtures or at equipment should be heat resisting type. Wire must be sized so that voltage drop does not exceed 3% from branch panel to last outlet. Color coding should be Phase A - Black, Phase B - Red, Phase C - Blue, Neutral - White or Grey and Ground - Green. All wire must be 98% conductability soft drawn commercially pure copper.

Toggle switches and receptacles should have a grey finish. Finishing plates must be brushed stainless steel.

305 GENERAL INSTALLATION

The Electrical Subcontractor is responsible for all power tie-ins required for installed equipment.

All equipment, switches, panels, main circuits and feeder circuits that are installed by the Electrical Subcontractor should be identified by permanent labels.

The Electrical Subcontractor is responsible for all testing required to insure a complete and secure electrical system.

All conduit shall be hidden from view unless noted on drawings or approved by Owner. No runs will be installed diagonally. Conduit ran through outside walls must be sealed with appropriate material.

Wire must not be pulled using grease or oil. Only cable pulling compounds similar to Y - ER - EASE are to be used. Any required splicing will be done using approved splicing procedures and must be approved by Owner.

All wall mounted switch and outlet boxes must be flush mounted unless otherwise noted.

Mounting height of switch and outlet boxes and devices are to be as follow:

- Receptacle outlets - 40" above floor
- Toggle switches - 48" above floor

306 HEATERS

The Electrical Subcontractor is responsible to furnish, install and wire the electric heaters. The heating fixtures are to be hung from the wall after the wall and ceiling painting are complete. The units specified may be replaced with equal units. Such units shall have a built in hydraulic thermostat (35° to 85°F range), totally enclosed corrosion resistant elements finned and sheathed, quiet built in fan, totally enclosed shaded pole motor with sealed bearings (54° to 67°F heat rise), automatic-reset thermal cut-out disconnects for element and motor.

307 PANEL BOARD, STARTERS AND METER BOX

100 amp, 3ph, 4 wire, 240/120 volt meter box is to be supplied and installed by the Electrical Subcontractor, the unit is to be equal to Square D.

Nema Size 0 starters are to be supplied and installed by the Electrical Subcontractor. The units are to be equal to Square D. They are to be installed after the wall and ceiling painting are complete.

100 amp 240/120 volt circuit breaker panelboard complete with main breaker and listed number of individual breakers is to be supplied and installed by the Electrical Subcontractor. The panel should be equal to Square D.

308 GROUNDING

The conduit system ground must be continuous through all new construction. All equipment must be provided with a suitable ground. Green pigtails and jumpers are to be used with outlets, switches and all flexible conduits. All conduit ground must be tested to insure correct and complete ground and approved by Owner.

309 LIGHTING

The Electrical Subcontractor is responsible to furnish, install and wire all light fixtures. Ceiling fixtures will be hung after ceiling is painted. All ceiling fixtures must be self supporting and also secured to bar joists. All fixtures must be equipped with U. L. heat resistant wiring. Fixtures should have white finish on all metal.

310 SERVICE ENTRANCE WIRING

The service entrance wire size will be #2 AWG. The service entrance conduit will be routed underground to the nearest Power Company pole or ground mounted transformer. The bury depth shall be 18 inches to the center of the conduit. A 2 inch thick by 6 inch wide concrete cover shall be poured in the trench after 6 inches of fill has been compacted over the conduit. A yellow plastic warning tape shall be laid in the trench after 6 inches of soil has been compacted over the concrete cover. The remaining fill shall then be added and compacted. If a ground mounted transformer is to be utilized for the power supply the service entrance conduit shall terminate in the terminal cabinet of the transformer. If a pole mounted transformer is to be utilized for the power supply the service entrance conduit shall extend 12 feet up the pole and have a weather head. The General Contractor will be responsible for coordinating the electrical service connection.

SECTION 400

PAINTING

401 GENERAL

The Painting Subcontractor is responsible to furnish all supplies and labor to paint all interior walls, ceiling, door (interior and exterior), gutters, downspouts, exposed roof flashing, meter box and exposed conduit.

The painting schedule will consist of two segments. All sealing, priming and finish coats will be in the first segment. After other construction is complete touch up will be done.

Care must be taken to protect all adjacent surfaces during preparation and painting. All surfaces should be prepared to paint manufacturers recommendations before painting.

402 MATERIALS AND APPLICATION

Top Coat Paint colors to be used are as follows:

- All exterior metal doors, frames and meter socket box	- Glidden Professional Colors Aluminum
- All galvanized gutters, flushing, downspouts and conduit	- Glidden Professional Colors Aluminum
- All interior walls, ceilings, doors frames and conduit	- Glidden Professional Colors White

Paint types to be used are as follows:

- Exterior Primed Surfaces	- (2) coats Glidden #592
- Exterior Galvanized Surfaces	- (2) coats Glidden Epoxy Chromate Primer #5251/5252 - (2) coats Glidden #592
- Interior Block	- (1) coat Glidden Ultra Hide Block Filler #5317 - (2) coats Glidden Glid Guard Epoxy #5250/5242
- Interior Ceiling, bar joists and conduit (all galvanized)	- (2) coats Glidden Epoxy Chromate Primer #5251/5252 - (2) coats Glidden Glid Guard Epoxy #5250/5242
- Interior Primed metal door and frame	- (1) coat Glidden Universal Fast Dry Metal Primer #5210 - (2) Coats Glidden Glid Guard Epoxy #5250/5242

SECTION 500

DRIVEWAY

501 GENERAL

The Paving Subcontractor is responsible for labor, material and installation of the drive shown on Reilly Tar & Chemical Corp. drawing number 861737-001. The driveway is to be installed to meet the specifications of the City of St. Louis Park. The Paving Subcontractor is also responsible for the pump house entry walk as shown on Reilly Tar and Chemicals Corp. drawing number 861737-600.

All concrete shall be cured for a period of not less than 7 days. During this curing period, no part of the concrete shall be permitted to become dry. Curing shall be applied and maintained to prevent loss of water from concrete for the duration of the curing period.

Fresh concrete shall be protected from heavy rains, flowing water and mechanical injury. All concrete shall be protected from the sun and drying winds.

Sidewalks and other exterior slabs except vehicular traffic areas shall receive a hair broom finish in accordance with ACI 301, Section 1104(d) with a Class B. tolerance.

Vehicular traffic areas shall receive a medium broom finish.

Exterior concrete slabs shall be cured with Sealtight WP-40 White-Pigmented Concrete Curing Compound as manufactured by W. R. Meadows Elgin, Illinois. or an equal product approved by the Owner. Application for this product shall be 300 square feet per gallon. Product shall meet specifications: ASTM C309, Type 2, Class A; AASHTO M148, Type 2, Class A; ANSI A 37.87, Type 2, Class A.

Concrete testing shall be done on a per truckload basis. Samples shall be taken per ASTM methods and tested by an independent testing laboratory. The laboratory shall be selected by the General contractor and approved by the Owner. The cost of sampling and testing shall be included in the bid price. The owner will evaluate the test results for acceptance or rejection.

SECTION 600

BUILDING

601 GENERAL

This portion of the contract includes the following:

- Foundation construction
- Masonry wall construction
- Wall, roof and floor insullation
- Concrete floor construction
- Brick veneer construction
- Bar joists and decking construction
- Roof scuttle
- Roofing, flashing, nailers, gutters and downspouts
- Door, frame, threshold, hinges, plates and handle
- Lockwork and door closer
- Caulking

All materials and labor required for complete finish are to be included.

All of the Work shall meet the requirement of all governing codes, ordinances, laws, regulations, safety orders and directives.

602 EXCAVATION AND BACKFILL

Provide all equipment, material and labor to excavate for foundations, footings, stoops, sidewalks, curbs, retaining walls and similar items, all to the lines and grades indicated herein and on the drawings.

Excavate to full depth and full width of foundations; allow ample room for forms where required. Excavation shall be held to a true line and grade. Bottom shall be level and free from loose material. Where bottom of footing is undercut, return to grade with concrete of same quality as specified for the footing of foundation.

Promptly backfill excavations as work permits, but not before walls have attained design strength. Shore walls and footings as required to prevent toppling, cracking, and misalignment.

All spaces excavated for and not occupied by structures shall be backfilled to subgrade with excavated materials from the site or bank-run gravel from off-site and thoroughly compacted in layers not to exceed 12" in depth. Backfill shall be compacted to a minimum of 95% of maximum density at optimum moisture content, as determined by Modified Proctor Test (ASTM D-1557). Backfill simultaneously on both sides of the structures.

Excess excavated material not used as backfill, but suitable for site fill, shall be used for site grading as directed by the Contractor.

Excavated material deemed unsuitable for backfilling or fill will be disposed of by the Owner.

who, what, how, when

Fill material required to complete the finish grading will be bank-run gravel for subgrade and top soil as required to meet the minimum coverage requirement of 6 inches. All additional materials for the building excavation and general site grading shall be provided by the Contractor.

Place granular drainage fill under the slab and compact. Depth of drainage fill shall be minimum 4 inches or as shown on drawings.

Earthwork density tests shall be required for each lift during construction. They shall be made by an independent testing laboratory selected by the Earwork Subcontractor and approved by the Owner. Field density tests shall be taken at locations selected with a minimum of one per 150 sq. ft. per 2' lift. All tests required to bring compaction to the required density shall be paid for by the Building Earthwork Subcontractor.

603 CONCRETE

This section includes general requirements for the concrete Subcontractor and is intended to supplement the specifications listed on the drawings.

Reinforcing bars shall conform to the requirements of ASTM A-615 "Specifications for Deformed Billet-Steel Bars for Concrete Reinforcement. The grade of steel to be as shown on drawings.

Welded wire fabric shall conform to the requirements of ASTM A-185, "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement".

Expansion Material shall be ASTM D1752, Type III, preformed, self-expanding strips formed of cork particles with a nonbitumen, isolable resin binder, similar to "W.R. Grace Code No. 4324."

All materials and labor required for complete finish are to be included.

All of the Work shall meet the requirement of all governing codes, ordinances, laws, regulations, safety orders and directives.

Provide Expansion Joint Material where indicated on Drawings. Install preformed, self-extending granulated cork strips full depth of joints.

Interior concrete slabs shall be cured with Clear Bond as manufactured by Guardian Chemical Company, Atlanta, Georgia or approved equal by the Owner that can be applied in one coat at the rate of 400 square feet to the gallon and shall meet ASTM C309 (Type 1), TTC-00800 (GSA-Fss), CRD-C-300 and U.S. Corps of Engineers Abrasion Test Method.

Preparation: All work shall be in accordance with ACI-614-59, "Recommended Practice for Measuring, Mixing and Placing Concrete". ACI-614-59 will be republished as ACI-304. All construction debris and extraneous matter shall be removed from within the forms. Struts, stays, bracing and blocks, servicing temporarily to hold the forms in correct shape and alignment, shall be removed. All concrete shall be place on clean damp surfaces, free from water, or upon properly consolidated fills.

Vibration: Concrete shall be consolidated by means of mechanical vibrating. Vibrators shall be inserted and removed vertically at regular intervals to insure uniform consolidation. In no case shall vibrators be used to transport concrete inside the forms. Internal vibrators shall maintain a speed of not less than 7,000 impulses per minute when in operation. At least one standby vibrator shall be on hand at all times.

Cold Weather Batching: No frozen materials or materials containing ice shall be used in cold weather. Temperatures of materials including mixing water, shall not exceed 140°. When placed in forms, the concrete shall have a temperature between 50°F. and 90°F. Work shall be in accordance with ACI-306, "Recommended Practice for Winter Concreting".

Top surface of footings shall receive a floated finish with a Class B tolerance (1/4 inch in 10 feet).

All interior floor slabs shall receive a troweled finish in accordance with ACI 301, Section 1104(c) with a Class A tolerance (1/8 inch in 10 feet).

All concrete shall be cured for a period of not less than 7 days. During this curing period, no part of the concrete shall be permitted to become dry. Curing shall be applied and maintained to prevent loss of water from concrete for the duration of the curing period.

Fresh concrete shall be protected from heavy rains, flowing water and mechanical injury. All concrete shall be protected from the sun and drying winds.

604 HARDWARE SPECIFICATIONS

Pull Handle and Plate, 3 1/2" x 14" Plate (Brookline 52A, 700 Series)

Push Plate, 3 1/2" x 14" (Brookline 52, 700 series)

Dead Bolt Lock (Best (1) 67T-6L2-DB-STK-626)

Roof Scuttle Pad Locks (Best (1) 6B-6T-72-M3-R)

Door Closer (Yale Series 50, standard door closer #54)

Door Hinges (3) Full Mortise, standard weight, wrought steel, Anti-friction ball bearing, non rising pin, flush tip, Non-Removable Pins, Satin Chrome finish (Stanley FBB179-26D-NRP)

Roof Scuttle (Bilco Type S-50)

605 MASONRY WALL CONSTRUCTION

The door opening shown on the drawing is to have a reinforced lintel. Construction materials should be 6" & 12" ASTM C90, Grade N, Type 1 hollow core block and Type S mortar.

Face brick shall be standard size (2-1/4" x 3-3/4" x 8"), grade SW, conforming to ASTM designation C216. Color and style to be specified by the Owner.

Wall reinforcing shall be truss type, 9 gauge steel wire conforming to ASTM A82, with side rods deformed. Placed as shown on drawings. Standards: Truss-Mesh (Hohmann & Barnard) - Dur-O-Wall (Dur-O-Wall Mfg. Co.) - Keywall Truss (Keystone).

Mortar joints which are to be exposed or painted shall be struck off flush with the wall surface and when the mortar is partially set, shall be firmly compacted with a round jointing tool. Mortar joints in the face of walls to be covered shall be struck off flush with the face of the wall.

The Masonry Subcontractor shall cooperate with all trades and be responsible for cutting, patching and building-in all work as required.

The door frame is to be grouted

Set and build-in flashings and counter flashings, expansion joints, frames, sleeves, lintels, and anchor inserts, furnished under other Sections, which are incidental to, or support masonry.

Anchors embedded in masonry shall be furnished and installed by the Masonry Contractor. Size and spacing will be shown on drawings.

Flashing, expansion and control joints shall be built-in to masonry and placed as the work progresses. Provide weep holes 24" o.c. at bottom of walls (floor line) and bottom of flashings.

Exterior brick and stone walls above grade shall receive silicone or stearate water-repellent, applied in accordance with manufacturer's instructions. Standards: Toch Brothers - Supertox; Sonneborn S-X Hycon; Toch Brothers Limestone Supertox; Sonneborn Hydrocide Unipel.

All permanently exposed masonry walls, including partitions shall be thoroughly cleaned down on completion, damaged surfaces repaired or replaced and mortar joints pointed to leave the work in a condition acceptable to the Owner. Cleaning and pointing shall be started at the top and worked down. Cleaning of MASONRY, except concrete block and stone, shall be done with fiber brushes using soap powder boiled in water, adding clean, sharp, fine sand to the soap and water mixture where necessary. Excess MORTAR STAINS shall be removed and the entire surfaces rinsed with clean water. Cut out defective mortar joints where necessary and fill the crevices solidly with motar and tool as specified. EXPOSED CONCRETE BLOCK to be rubbed with stone to eliminate excess mortar. Point up all surfaces and leave walls in a condition acceptable to the Owner.

No masonry work shall be permitted when the temperature is less than 32 degrees F. or below 40 degrees F. and falling, unless the following precautions are taken:

1. Below 40 degrees F. but above 32 degrees F.: Heat mortar mixing water, but not above 160 degrees F. Plastic sheets or tarpaulins shall be placed over the newly laid walls.

2. Below freezing, but above 0 degrees F.: In addition to the preceding requirements, sand shall be heated, but not scorched. The working area shall be enclosed with protective coverings and artificial heat shall be provided. When the temperature falls below 20 degrees F., all concrete masonry units shall be heated to at least 50 degrees F. at the job site by the Contractor.

3. Below 0 degrees F.: Construction shall be stopped unless the enclosure is complete and tight. Observe all preceding requirements.

   Masonry shall be protected against freezing for at least 48 hours.

   No masonry shall be laid with or on frozen materials.

606 SUPPLY AND INSTALL DOOR

Hollow metal door and frame are to be supplied and installed. Doors are to be Steelcraft Corp. or approved equal. Door and frame are to be factory primed. Frame is to be grouted. The door is to be fitted with a top cap.

The frame is to be checked for level during construction to assure it remains plumo.

Finish hardware shall be equal to the following:

- Hinges	- Hager, Stanley, McKinney
- Door closer	- Sargent & Co., Yale
- Threshold	- National Guards Products Co.
- Butts	- The Stanley Works
- Push plates & handle	- Brookline Industries Inc.

607 SUPPLY AND INSTALL LOCKWORK

The lockwork to be used is as follows:

- Door	- Best Lock Co., key lock only
- Roof Scuttles	- Best Lock Co., pad lock

All lockwork is to be satin chrome and be keyed to meet City of St. Louis Park specifications.

608 CAULKING

Provide all labor, materials, and equipment necessary for complete caulking work as shown on drawings and specified herein.

All caulking work shall be performed by an experienced, competent Caulking Contractor as per requirements herein.

Interior Caulking: same as exterior.

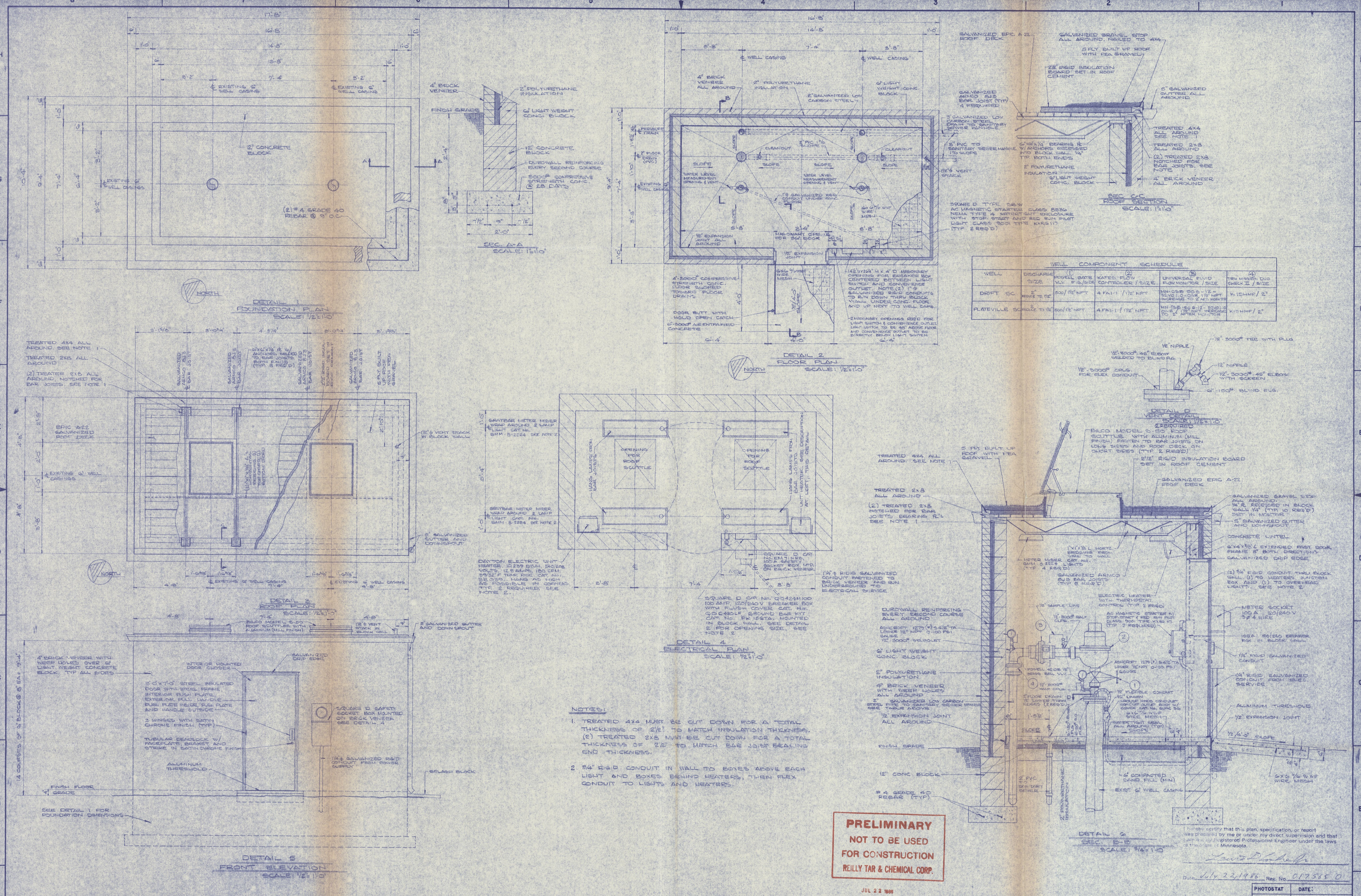
Exterior Caulking: shall be of a color to closely match the mortar color, 2 part polysulfide base (Thiokol) sealant material meeting requirement of American Standard Specifications for Sealing Compounds for the Building Trade, A116.1 1960 of Shore A or approved equal.

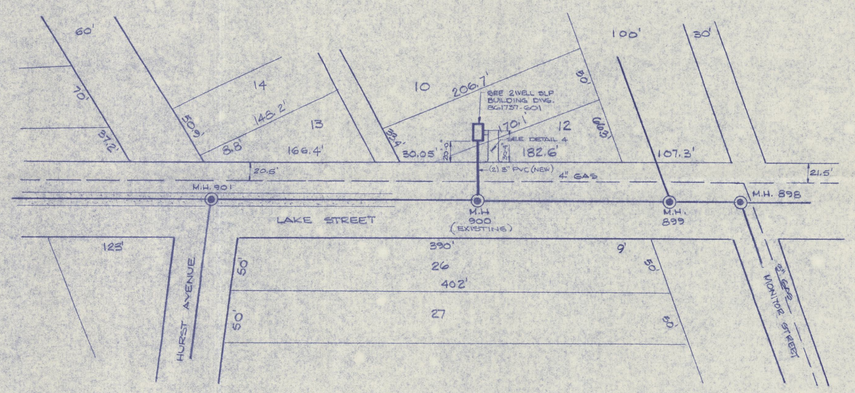
Primer: colorless by caulking manufacturer.

All materials shall be used in accordance with their manufacturer's latest printed instructions.

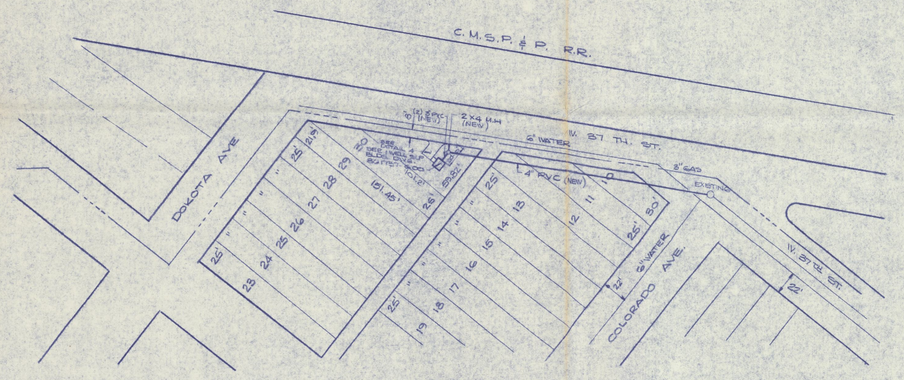
Caulk expansion joints, control joints, and around entire perimenter of doors and other openings and joints where caulking is otherwise indicated or obviously required on exterior of building(s).

Mix compounds which require field mixing as per manufacturer's instructions. Apply with gun especially for compound, to attain a smooth finish surface, free of wrinkles, air pockets and holes. Compress into joint with tooling rods or paddles to insure conformance of compound to even the smallest surface irregularity. Depth of joint shall be as recommended by Manufacturer of the sealant material. Pack joints required with sealant backer to bring voids to required depth before caulking.

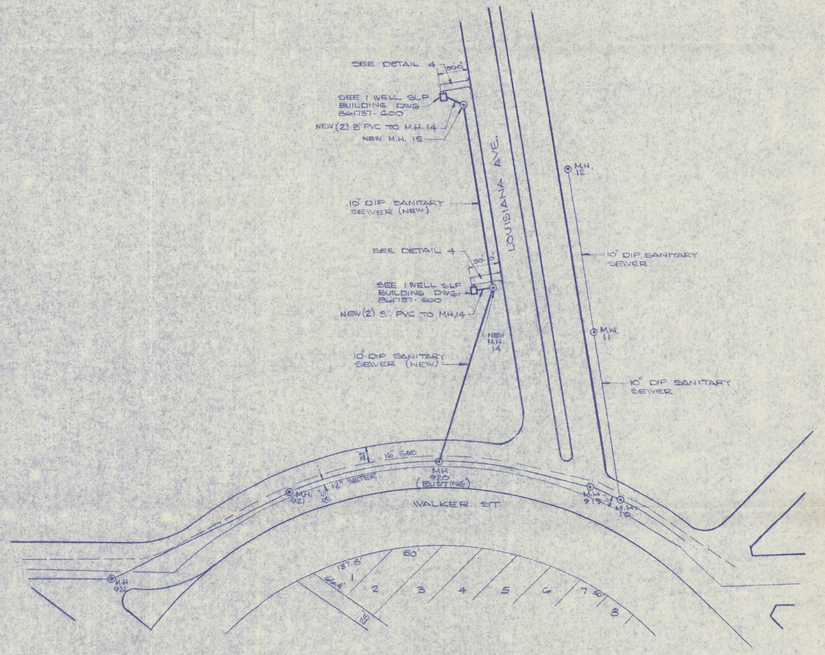

DETAIL 1
FOUNDATION PLAN
SCALE: 1/2"=1'-0"
DETAIL 2
FLOOR PLAN
SCALE: 1/2"=1'-0"
SEC. A-A
SCALE: 1/2"=1'-0"
SEC. C-C
ROOF SECTION
SCALE: 1"=1'-0"
WELL COMPONENT SCHEDULE
DETAIL 3
ROOF PLAN
SCALE: 1/2"=1'-0"
DETAIL 4
ELECTRICAL PLAN
SCALE: 1/2"=1'-0"
DETAIL 5
FRONT ELEVATION
SCALE: 1/2"=1'-0"
DETAIL 6
SEC. B-B
SCALE: 3/4"=1'-0"
DETAIL D
VENT DETAIL
SCALE: 1/2"=1'-0"
NOTES:
1. TREATED 4X4 MUST BE CUT DOWN FOR A TOTAL THICKNESS OF 2 1/2" TO MATCH INSULATION THICKNESS. (2) TREATED 2X8 MUST BE CUT DOWN FOR A TOTAL THICKNESS OF 2 1/2" TO MATCH BAR JOIST BEARING END THICKNESS.
2. 3/4" RIGID CONDUIT IN WALL TO BOXES ABOVE EACH LIGHT AND BOXES BEHIND HEATERS, THEN FLEX CONDUIT TO LIGHTS AND HEATERS.
PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION
REILLY TAR & CHEMICAL CORP.
JUL 22 1986
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.
Date July 22, 1986 Reg. No. 017565
REILLY TAR & CHEMICAL CORPORATION
INDIANAPOLIS INDIANA
2 WELL SLP BUILDING
DRAWN BY AK
SCALE INDICATED
CHECKED BY
APPROVED BY
PLANT ST. LOUIS PARK, MINN.
DRAWING NUMBER 861737-001
PHOTOSTAT
MICRO FILM
REVISIONS
REFERENCE DRAWINGS



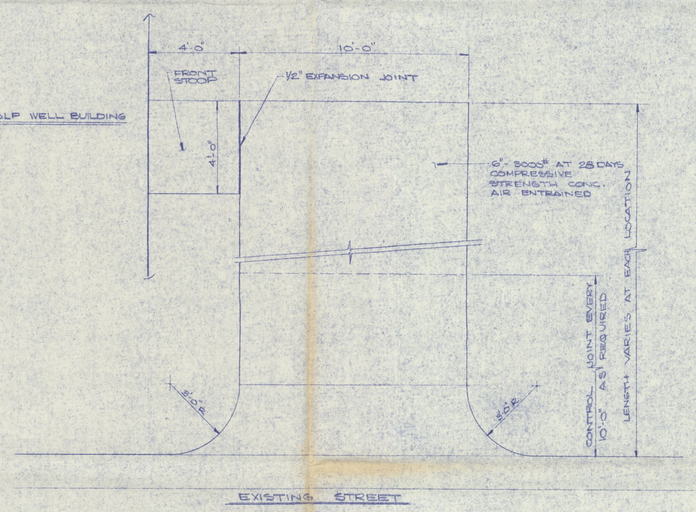
DETAIL 1
LAKE STREET 2 WELL SLP BLDG
SCALE: 1" = 60'



DETAIL 2
W. 37TH. ST. 1 WELL SLP BLDG.
SCALE: 1" = 60'



DETAIL 3
LOUISIANA AVE. 1 WELL SLP BLDG'S.
(2 REQ'D)
SCALE: 1" = 100'



NOTES:
1. LOCATIONS FOR WELL HOUSES ARE APPROXIMATE

DETAIL 4
DRIVEWAYS (4 REQ'D)
SCALE: 1/8" = 1'-0"

PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION
REILLY TAR & CHEMICAL CORP.

JUL 22 1986

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Date July 22, 1986 Reg. No. 017565 0

PHOTOSTAT	DATE:
MICRO FILM	DATE:

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK'D	APP'D

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK'D	APP'D

REVISIONS

NO.	DATE	BY	DESCRIPTION	CHK'D	APP'D
I	7/7/86	AK	ADDED DETAIL 4 & CALLED OUT NEW LINES & M.H.'S		

REFERENCE DRAWINGS

DRAWING NUMBER	DESCRIPTION

REILLY TAR & CHEMICAL CORPORATION
INDIANAPOLIS INDIANA

ST. LOUIS PARK WELL LOCATIONS

DRAWN BY	DATE	CHECKED BY	DATE	PLANT	REVISION
AK	6/27/86	[illegible]	6/27/86	ST. LOUIS PARK, MINN.	I
SCALE		APPROVED BY	DATE	DRAWING NUMBER	
INDICATED		[illegible]	6/27/86	861737-001	