89

WARZYN

Design
Report
12153.02

# Conceptual Gas Collection System
# Land & Gas Reclamation, Inc. Landfill
# Town of Williamstown
# Dodge County, Wisconsin

Prepared for:

Land & Gas Reclamation, Inc.
Dodge County, Wisconsin

Prepared by:

Warzyn Engineering Inc.
Madison, Wisconsin

April 1990

WARZYN

April 27, 1990

Mr. Michael Schmoller
Wisconsin Department of Natural Resources
Southern District Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711

RE: Conceptual Gas Collection System Design Report
Land & Gas Reclamation, Inc. Landfill
Project No. 12153.02

Dear Mr. Schmoller:

Enclosed for your information is a copy of the Conceptual Gas Collection System Design Report for the Land & Gas Reclamation, Inc. (LGRI) Landfill. During an April 25, 1990 telephone conversation between Warzyn and Mr. Robert Grefe (WDNR), it was suggested by Mr. Grefe to send you a copy of the above report.

It was Mr. Grefe's intention that we provide you with a copy of this report to keep appropriate Superfund personnel informed of work being performed on the LGRI Landfill. It should be noted that this report has been submitted to Mr. Grefe (Solid Waste), and that this is not considered a formal submittal to your deparmtent.

If you have any questions, please contact us.

Sincerely,

WARZYN ENGINEERING INC.

Brian E. McVean

Brian E. McVean
Project Engineer

Joel V. Schittone

Joel V. Schittone, P.E.
Project Manager

BEM/jkk/JVS
[wpmisc-104-51]
12153.02

Enclosure: April 1990 Conceptual Gas Collection System Design Report

cc: Ms. Suzanne Bangert - WDNR
Mr. D. Hank Hechimovich - LGRI (w/out encl.)
Mr. Robert Grefe - WDNR (w/out encl.)

Warzyn Engineering Inc.
One Science Court
University Research Park
P.O. Box 5385
Madison, Wisconsin 53705
(608) 273-0440

2, 3, 4

WARZYN

April 18, 1990

Mr. Robert Grefe
Wisconsin Department of Natural Resources
Bureau of Solid Waste Management
101 S. Webster Street, GEF II
P.O. Box 7921
Madison, WI 53707

Re: Conceptual Gas Collection System Design Report; and
Land & Gas Reclamation, Inc. Landfill
Project No. 12153.01

Dear Mr. Grefe:

Enclosed for your review is a copy of the Conceptual Gas Collection System Design Report for the Land & Gas Reclamation, Inc. (LGRI) Landfill. This document has been developed on behalf of LGRI by Warzyn Engineering Inc. (Warzyn) pursuant to discussions held at the March 7, 1990 preconstruction meeting hosted by LGRI.

On April 11, 1990 we contacted you to request an extension of the submittal deadline to April 18, 1990. As a result of this telephone conversation, you gave verbal authorization to Warzyn to extend the submittal deadline to April 18, 1990.

If you have any questions, please contact us.

Sincerely,

WARZYN ENGINEERING INC.

Brian E. McVean

Brian E. McVean
Project Engineer

Joel V. Schittone

Joel V. Schittone, P.E.
Project Manager

[triplicate]
BEM/jlv/SGW
[jlv-103-69]
12153.02

Enclosure: April 1990 Conceptual Gas Collection System Design Report

cc: Mr. David Edwards - WDNR Horicon Area Office
Mr. George Hechimovich - LGRI
Mr. D. Hank Hechimovich - LGRI

Warzyn Engineering Inc.
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WARZYN

# Conceptual Gas Collection System
# Land & Gas Reclamation, Inc. Landfill
# Town of Williamstown
# Dodge County, Wisconsin

April 1990

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[dlk-601-31x]

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# CONCEPTUAL GAS COLLECTION SYSTEM DESIGN
# LAND & GAS RECLAMATION, INC. LANDFILL

## INTRODUCTION

This report has been prepared by Warzyn Engineering Inc. (Warzyn) of behalf of Land & Gas Reclamation, Inc. (LGRI), the owner and licensee of the LGRI Landfill. It is comprised of this text and Drawings 12153-50 and 12153-A13.

### PURPOSE AND SCOPE

This report has been prepared in response to Condition 2 of the November 21, 1989 Wisconsin Department of Natural Resources (WDNR) Construction Documentation and Plan Modification approval letter (Approval Letter) for the LGRI Landfill (Landfill). Approval is being requested for a proposed phased approach to the installation of a landfill gas collection system as referenced in NR 506.08(6), Wisconsin Administrative Code.

LGRI is proposing to install a landfill gas (and possibly leachate) collection system at the LGRI Landfill as a means of remediating the groundwater contamination identified at the Landfill. Removal and treatment of landfill gas (LFG) and leachate, if encountered, will result in minimizing the migration of volatile organic compounds (VOCs) present in the Landfill.

This report includes a description of the proposed conceptual gas collection system design, the Phase I gas well installation and proposed pump test to be performed on the Phase I gas wells. In addition, the design and construction schedules associated with those activities are included.

### BACKGROUND

The Landfill is located in the eastern 1/2 of the southwest 1/4 of Section 35, T12N, R16E, Town of Williamstown, Dodge County, Wisconsin. It stopped accepting waste on October 21, 1986, in accordance with an agreement reached between the WDNR and LGRI. A majority of the site closure activities were performed and completed during the 1987 construction season.

On July 21, 1987 a Stipulation & Order (S&O) was executed between the State of Wisconsin and George C. Hechimovich, et al. requiring an upgrade of the Landfill final cover and compliance with NR 506.07(3) and NR 506.08(6), Wisconsin Administrative Code. In response to the S&O, an August 1989 Plan Modification was prepared by Warzyn. This Plan Modification requested approval for an alternative landfill cover and an extension to the deadline for design and installation of an active gas collection system.

The WDNR granted conditional approval of the Plan Modification on November 21, 1989. Condition 2 of the Approval Letter addressed the content and schedule of plans to be submitted by LGRI regarding the proposed gas collection system. On December 15, 1989, Warzyn prepared a response to the Approval Letter, which modified and/or clarified the proposed content and schedule of the gas collection system plans. Verbal approval of the proposed modifications and clarifications presented in the December 15, 1989 response letter were received from Mr. Grefe during subsequent telephone conversations and a March 7, 1990 preconstruction meeting held at the Landfill.

The active gas collection system will be designed to minimize the migration of LFG into the air and subsoils beyond the Landfill's property boundary and to remediate the Landfill by removing VOCs from within the Landfill. In addition, alternative uses for the extracted LFG will be evaluated and a selected LFG utilization method will be included with the final gas collection system design.

The installation of an active gas collection system has been delayed at the Landfill for several reasons. These reasons are as follows:

- Allow construction activities on the final cover upgrade to be completed so that the newly placed soil and vegetative cover will have a chance to become established before being disturbed by installation of the gas collection system;
- Allow time for the pending Remedial Investigation/Feasibility Study (RI/FS) process to advance;
- Allow time for review of the conceptual gas collection system by the Potential Responsible Party (PRP) group and approval agencies (e.g., EPA, WDNR);

- Allow time to perform short-term pump test on proposed Phase I gas extraction wells to obtain data for final gas collection system design; and
- Allow time to obtain additional leachate level information from installation and monitoring of proposed Phase I gas extraction wells.

For the above reasons, a phased approach to the installation of an active gas collection system at the Landfill is being proposed. This phased approach consists of a conceptual gas collection system design and submittal, the installation of four (4) Phase I gas extraction wells, a short-term pump test, leachate level monitoring and the design and installation of the final gas (and possibly leachate) collection system.

The proposed active gas collection system will have the capability of extracting both LFG and leachate from the Landfill. Although the proposed Phase I gas extraction wells can be used to extract leachate, they are not being proposed with leachate extraction equipment for this phase of the project. Monitoring of existing leachate head wells (MW2, MW3 and MW4) has shown no appreciable amount of leachate on the landfill base (i.e., less than 2 ft) for the past six months. In the event a substantial leachate head is discovered on the landfill base during installation of the Phase I gas extraction wells, the Phase I gas extraction wells and the final gas collection system design will be modified to incorporate leachate extraction equipment.

If during installation of the proposed Phase I wells a substantial leachate head is not encountered, monitoring of the existing leachate head wells and the proposed Phase I wells will be performed over the winter to obtain additional leachate level information. This information will be used to design the final gas collection system (i.e., with or without leachate extraction equipment).

The conceptual gas collection system layout was used to determine the location of the Phase I gas extraction wells. The location selected for the Phase I wells will allow them to be easily incorporated into the final system. Details of the conceptual gas collection system, Phase I gas extraction wells and the short-term pump test are addressed in subsequent sections of this report.

## CONCEPTUAL GAS RECOVERY SYSTEM DESIGN AND SCHEDULE

### GENERAL

The conceptual gas collection system design includes fourteen extraction wells, three dripleg assemblies, a condensate sump, a condensate holding tank, a blower station and gas utilization system. Because leachate levels at the landfill have been shown to be negligible, the conceptual system design is being presented without leachate extraction capabilities. However, if during the installation of the proposed Phase I gas extraction wells, substantial leachate levels are encountered on the landfill base (i.e., greater than 8 ft), the final system will be modified to include leachate extraction equipment. The leachate head level criteria of 8 ft has been required by the WDNR at several other landfills in the State with similar circumstances. The modifications to the system would include adding pumps/controls to the extraction wells, providing electrical power to wells with pumps, additional leachate conveyance piping and modifying the condensate holding tank to incorporate leachate storage. Removal of leachate, if encountered, will be performed as a means of remediating the groundwater contamination which has apparently occurred at the Landfill.

Because the conceptual system may be installed in the near future, the Phase I wells were located for incorporation into the final system design. The Phase I gas extraction wells will be discussed in greater detail later in this text.

The conceptual system design is based on Warzyn's past experience in gas and leachate extraction system designs. The final system will be designed after the installation of the Phase I wells, thereby allowing time for agency review, actual field data to be used for design, and newly placed vegetation to mature prior to the installation of the final system.

### Basis for Design

The proposed conceptual gas collection system is designed to extract methane gas produced by anaerobic decomposition of refuse. The conceptual system consists of fourteen (14) gas extraction wells placed within the landfill refuse limits. A 150 ft radius-of-influence (ROI) was used to determine the location and number of wells to be installed. Based on Warzyn's past

experience in gas and leachate extraction system designs, this 150 ft ROI should be obtainable for gas extraction wells placed in municipal refuse at the expected average well depth of approximately 45 ft. Refer to Drawing 12153-50 for the proposed conceptual gas collection system layout.

Gas Extraction Wells

Each gas extraction well will be constructed of a non-perforated section of 6-in. diameter Schedule 80 polyvinyl chloride (PVC) pipe coupled with a perforated section of 6-in. diameter Schedule 80 PVC pipe. The well pipes will be placed in 36-in. diameter boreholes, with an annular space around the perforated portion of the pipe consisting of a clear stone pack. The wells will be drilled to within approximately 1 ft of the landfill base. In the event a substantial leachate level is encountered, the wells will be drilled to the base of the landfill and a bentonite seal will be placed at the bottom of the borehole. The wells will be temporarily capped with a threaded plug that will allow leachate level monitoring to be performed in each well.

Wells will be constructed with the clear stone pack extending from the well bottom to approximately 17 ft below the Landfill surface. It is estimated that wells will range from 40 ft to 75 ft in depth. The radius of influence is estimated to be a minimum of 150 ft, based on field experience at previous sites. For details and dimensions of the proposed Phase I gas extraction wells refer to Drawing 12153-A13 and Table 1.

Gas Header Piping

The gas header piping will consist of a branching system of high density polyethylene (HDPE) pipes. The final size and location of the header pipes will be included in the final system design.

The gas header system will transport the landfill gas from the extraction wells to the blower station and will be constructed in accordance with the final collection system design. The pipe inverts will be installed a minimum of 4 ft below final grade for frost protection and to minimize condensate formation. A continuous warning ribbon and tracing wire will be

installed above the pipe to alert excavators of the pipe location and aid in locating the pipe in the future. To allow for potential differential settlement and removal of condensate formed in the pipes, a minimum slope of 2.0% will be maintained in the headers.

Trenching/Cover Restoration

The gas header pipes within the landfill refuse limits will be placed in a trench that will be constructed through the landfill cover and which may extend into the uppermost layer of refuse. The landfill cover areas disturbed will be restored to a condition equivalent to the final cover specified in the Approval Letter.

Blower Station

An extraction blower will be used to create a vacuum to withdraw gas from the landfill. The extracted gas will be used for the selected gas utilization alternative. The blower will be sized during design of the final system.

Gas Utilization

Several alternatives will be considered for utilizing the methane gas extracted from the landfill. Possible alternatives to be considered for gas utilization are:

- Generation of electricity and heat recovery using reciprocating engine(s)/generator(s);
- Generation of electricity and heat recovery using a gas turbine;
- Using medium BTU gas for heating/cooling or other industrial uses; and
- Upgrading the gas to high BTU gas (cleaned and refined) for use or sale.

These alternatives will be evaluated and the method selected will be incorporated into the final system design.

CONDENSATE COLLECTION AND CONVEYANCE

Condensate Driplegs

Condensate produced by the cooling of the saturated gas mixture in the gas header system will be removed using a dripleg assembly. A dripleg consists of a liquid-filled trap and a connection to the condensate conveyance system, where it will then drain to the condensate holding tank.

Two proposed driplegs are located outside the refuse limits, on the gas header piping. Additionally, a dripleg will be required between the blower and the selected gas utilization equipment. Refer to Drawing 12153-50 for proposed dripleg locations. Condensate flow is estimated to be negligible.

Condensate Sump

Condensate formed in the northern-most branch of the gas header piping will be conveyed to a sump located outside the refuse limits, west of the Landfill. The proposed condensate sump was required due to the topographic characteristics of the Landfill. Gravity will be used to drain condensate to the sump, where it will be pumped to the condensate holding tank.

The condensate sump will consist of a reinforced precast concrete manhole. Duplex submersible pumps will be provided to pump the accumulated condensate to the condensate holding tank. Duplex pumps will be utilized to provide additional capacity and redundancy in the event of pump failure. The sump will be coated on the interior with a coal tar epoxy for protection against potential deterioration by the condensate. Refer to Drawing 12153-50 for the proposed sump location. The sump has been proposed to be located outside the refuse fill limits to minimize settlement. The sump, pumps and associated controls and alarms will be designed during final system design.

Condensate Conveyance Piping

The condensate conveyance pipes located outside the landfill refuse limits will be encased in 2 ft of compacted clay. Clay materials and placement methods will be the same as for cover restoration activities performed during trenching activities. In-situ soils excavated will be used to supplement the clay backfill in trenches located outside the landfill refuse limits.

Condensate Holding Tank

An underground condensate holding tank is proposed for storing collected condensate generated by the cooling gas. The tank will be used solely for condensate collected from the LGRI Landfill and will be isolated from the existing leachate holding tanks used for the

Hechimovich Sanitary Landfill. Details of the condensate holding tank will be determined during final system design. Refer to Drawing 12153-50 for the proposed location of the condensate holding tank.

Condensate Removal and Disposal

It is expected that condensate will be extracted from the holding tank via tanker truck suction. Upon being loaded, the condensate will then be transported to the City of Horicon Wastewater Treatment Plant for treatment and disposal.

DESIGN SCHEDULE

As mentioned before, one of the reasons for constructing the gas collection system in phases was to allow time for the PRP group, EPA and WDNR to examine the proposed conceptual gas collection system and to provide data for finalizing the final system design. Therefore, final design will begin after installation of the Phase I gas extraction wells and the landfill final cover. This schedule will allow time for review by the PRP group, EPA, WDNR and allow for design modifications before the 1991 construction season.

## PHASE I GAS EXTRACTION WELLS

Four (4) gas extraction wells are proposed in the Landfill to initiate the installation of the final gas collection system and to allow a short-term pump test to be performed. Data obtained will be used in the final system design. These wells are not proposed to be used for active gas extraction at the Landfill until the entire system is installed the following year. Temporary active gas extraction would require temporary above-ground piping and running electrical power to the top of the landfill. Construction activities related to the final cover improvements could potentially be hindered by above-ground piping and electrical cables. In addition, purchasing a temporary flare and above-ground piping that could not be used in the final system would result in unpractical expenditures by LGRI.

Locations proposed for Phase I extraction wells GWL1, GWL2, GWL3 and GWL4 (refer to Drawing 12153-50) were based on several factors. Primarily, the wells were located to be incorporated into the final gas collection system. In addition, the wells are generally located

within the portion of the existing landfill cover that does not need upgrading (shown as an amoeba shaped outline on Drawing 12153-50). By locating the wells within this area they would not interfere with the final cover restoration activities and may allow installation of the wells to be performed at the same time as the final cover work.

The wells will consist of temporarily capped Schedule 80 PVC pipes as described previously in this report and as shown on Drawing 12153-A13. LGRI is currently planning to install the Phase I wells and is in the process of selecting a drill rig to be purchased for this type of work. Construction Observation and technical guidance for installing the wells will be provided by Warzyn.

## SHORT-TERM PUMP TEST

A short-term pump test is being proposed to be performed to obtain information for use in design of the final gas collection system. The pump test will be performed on gas extraction well GWL2 (for location of gas extraction well GWL2, refer to Drawing 12153-50).

A portable blower/generator system will be connected to the gas extraction well and a vacuum will be created within the well extracting gas. The gas extracted during the short-term pump test will be vented into the air. As the vacuum is placed on the well, monitoring for pressure will be performed at the other Phase I extraction wells and existing leachate monitoring wells MW3 and MW4. In addition to using the Phase I wells and existing leachate wells for monitoring, LGRI could install several shallow probes closer to the well for additional monitoring if needed. The monitoring points will then be used to determine a representative ROI for the extraction wells at the Landfill. Results of the pump test will be used in the final gas collection system design.

## CONSTRUCTION SCHEDULES

### PHASE I GAS EXTRACTION WELL INSTALLATION

The four (4) Phase I gas extraction wells are proposed to be installed during the 1990 construction season (between May and October). These wells will be installed during or after

the final cover restoration work being performed on the Landfill during the 1990 restoration season.

## FINAL GAS COLLECTION SYSTEM INSTALLATION

Installation of the final gas collection system cannot commence until final design of the gas collection system is submitted and approved by the WDNR. At this time, the final design is tentatively planned to be submitted in time for review and approval by mid-1991. This may allow installation to begin, and possibly be finished during the 1991 construction season. However, it is not known what, if any, effect the pending RI/FS will have on the final system design and respective schedule.

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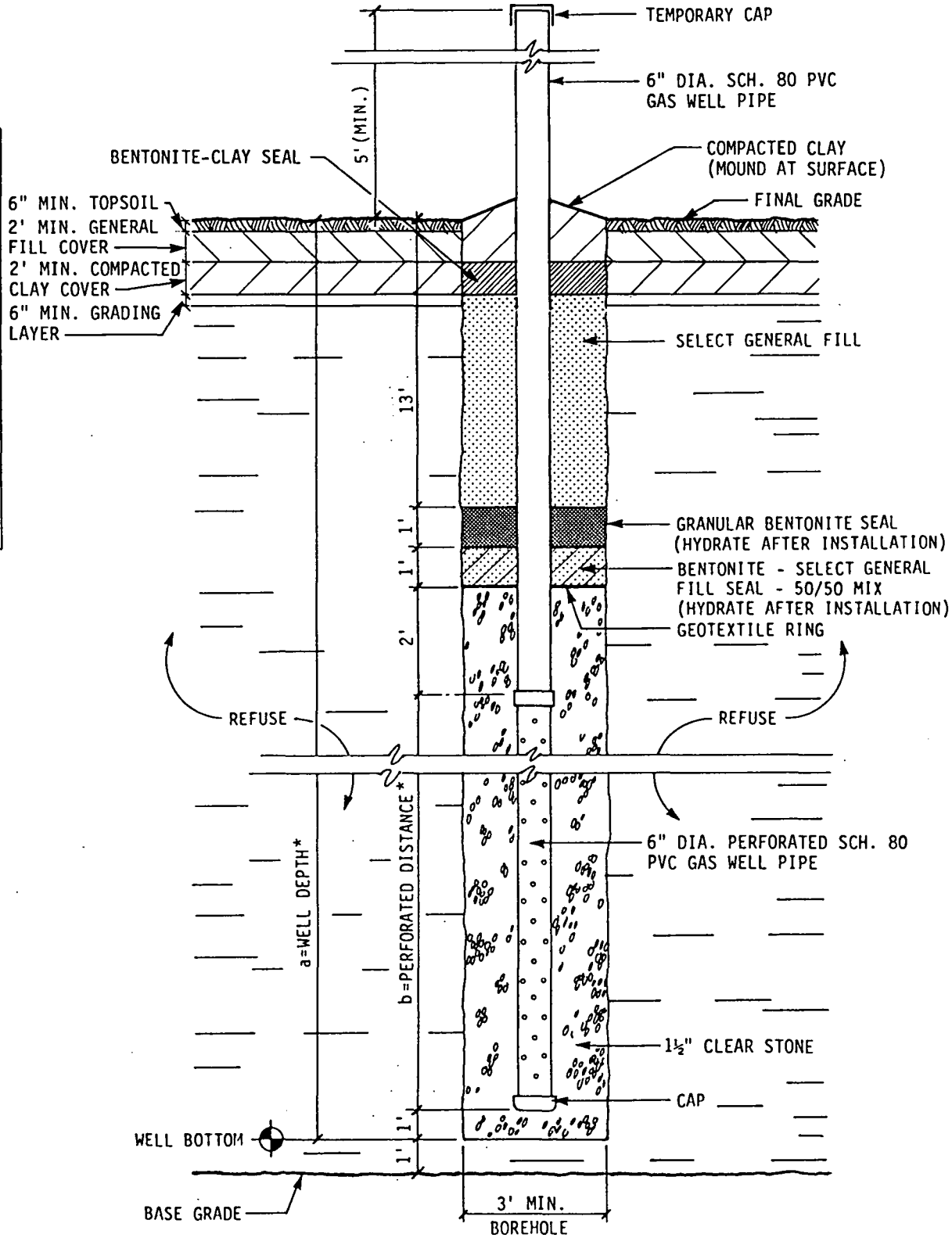
TABLE 1
WELL DIMENSIONS

| WELL | GRID COORDINATES | EST. FINAL GRADE | EST. BASE GRADE | WELL DEPTH[a] | PERFORATED DISTANCE[b] |
|---|---|---|---|---|---|
| GWL1 | 7+60N, 50+22E | 1002.0 | 957.0 | 44.0 | 26.0 |
| GWL2 | 10+15N, 50+34E | 1008.5 | 945.5 | 62.0 | 44.0 |
| GWL3 | 12+88N, 50+24E | 1008.5 | 944.0 | 63.5 | 45.5 |
| GWL4 | 15+57N, 50+27E | 1011.5 | 935.0 | 75.5 | 57.5 |

NOTES:

1. Estimated final grades obtained from Warzyn Drawing 12153-25, topography dated 8/13/87 and 12/10/87.
2. Estimated base grades obtained from Warzyn Drawings 12153-30 and 12153-31.
3. Grid coordinates obtained from Warzyn Drawing 12153-50.
4. All dimensions are in feet; elevations are based on U.S.G.S. datum.
5. Refer to Warzyn Drawing 12153-A13 for well dimension locations.

BM/vbl/JVS
[wpmisc-401-98]
12153.02



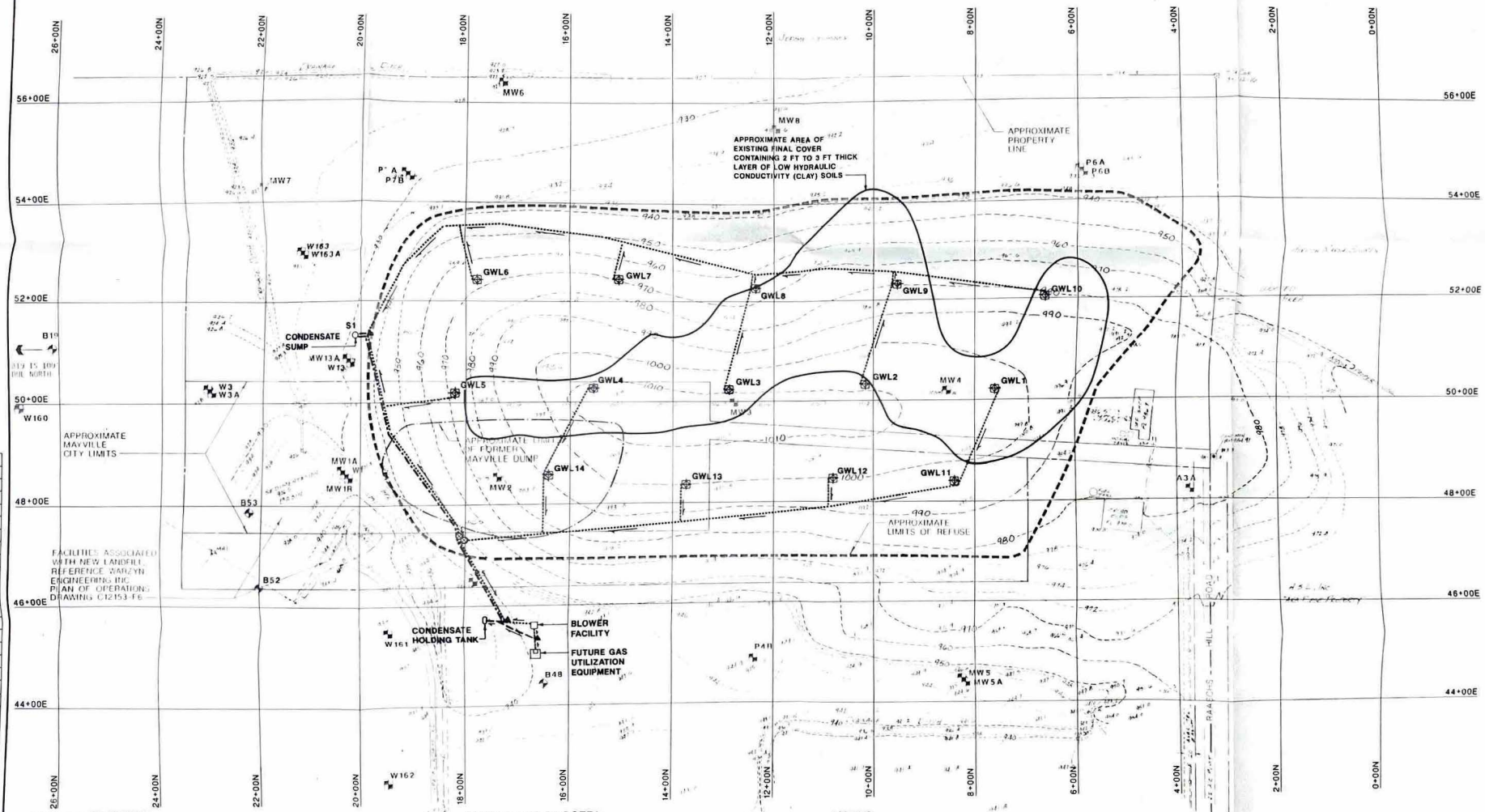

*REFER TO TABLE 1 FOR WELL DIMENSIONS.

**NOT TO SCALE**

| | | | |
|---|---|---|---|
| WARZYN | **TYPICAL GAS EXTRACTION WELL DETAIL** | Drawn DLF | Checked BEM, DVA | App'd. DVA |
| | CONCEPTUAL GAS COLLECTION SYSTEM DESIGN<br>LAND AND GAS RECLAMATION, INC. LANDFILL<br>PART OF SECTION 35, T12N, R16E<br>TOWN OF WILLIAMSTOWN, DODGE CO., WISCONSIN | Revisions | Date 4/18/90 |
| | | | 12153 **A13** |

QUALITY CONTROL

| | INITIALS | DATE |
|---|---|---|
| Drafting Standards | DLF | 3/4 |
| Lead Professional | BEM | 4/18 |
| Section | JVS | |
| PM | JVS | 4/18 |
| Division | SGW | |
| Other | | |




## LEGEND (EXISTING)

- APPROXIMATE PROPERTY LINE
- APPROXIMATE MAYVILLE CITY LIMITS
- APPROXIMATE LIMITS OF FORMER MAYVILLE DUMP
- APPROXIMATE LIMITS OF REFUSE
- BUILDING
- SPOT ELEVATION
- 978 GROUND CONTOUR
- ROAD
- B53 SOIL BORING LOCATION AND NUMBER
- MW7 MONITORING WELL LOCATION AND NUMBER

## LEGEND (PROPOSED)

- S1 CONDENSATE SUMP LOCATION AND NUMBER
- DRIPLEG LOCATION
- GWL1 GAS EXTRACTION WELL LOCATION AND NUMBER
- GAS HEADER PIPING
- PRESSURE CONDENSATE PIPING
- GRAVITY CONDENSATE PIPING
- DIRECTION OF CONDENSATE FLOW AND PIPE SLOPE
- BURIED SERVICE VALVE LOCATION

## NOTES

1. BASE MAP SUPPLIED BY LAND AND GAS RECLAMATION, INC. LANDFILL WITH MODIFICATIONS BY WARZYN ENGINEERING INC. TOPOGRAPHIC INFORMATION BASED ON 8/13/87 AND 12/10/87 SURVEYS PERFORMED BY LAND AND GAS RECLAMATION, INC.
2. ELEVATIONS ARE REFERENCED TO U.S.G.S. DATUM.
3. THE GRID SYSTEM IS BASED ON W1/4 CORNER: 30+00.00N, 30+00.00E; AND THE SW CORNER: 03+46.59N, 30+23.97E, BOTH IN SECTION 35, T12N, R16E, TOWN OF WILLIAMSTOWN, DODGE CO., WISCONSIN (COORDINATES PROVIDED BY WELCH, HANSON & ASSOCIATES, INC., OCONOMOWOC, WISCONSIN, AND ARE BASED ON LOCAL GRID).
4. MONITORING WELLS MW-1R, MW-1A, MW-2, MW-3, MW-4, MW-5 MW-5A, MW-6, MW-7, MW-8 AND MW-31A WERE INSTALLED BY WARZYN ENGINEERING INC. BETWEEN JUNE 8 AND JUNE 30, 1987. LOCATIONS SURVEYED BY LAND AND GAS RECLAMATION, INC. IN JUNE 1987.
5. GAS EXTRACTION WELLS GWL1, GWL2, GWL3 AND GWL4 ARE TO BE INSTALLED BY LAND AND GAS RECLAMATION, INC. DURING 1990 CONSTRUCTION SEASON
6. FINAL SELECTION OF GAS UTILIZATION METHOD AND EQUIPMENT WILL BE DETERMINED IN FINAL GAS COLLECTION SYSTEM DESIGN.

north

0 100 200
SCALE IN FEET

**CONCEPTUAL GAS COLLECTION SYSTEM LAYOUT**

CONCEPTUAL GAS COLLECTION SYSTEM DESIGN
LAND AND GAS RECLAMATION, INC. LANDFILL
PART OF SECTION 35, T12N, R16E
TOWN OF WILLIAMSTOWN,
DODGE CO., WISCONSIN

Drawn By PLF, LCL
Checked By
Date 4/18/90
Reference 12153-25, B5
Designed By
Approved By
Date • By • App'd
Revisions

WARZYN
WARZYN ENGINEERING INC.
Milwaukee • Madison
Minneapolis • Chicago
Detroit

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Sheet Number 1 OF 1
Project Number 12153
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WARZYN