

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION



MISSOURI STATE OPERATING PERMIT

UNDERGROUND INJECTION CONTROL

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo. as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No. UI-0000017

Owner: Biokyowa, Inc.
Address: 5469 Nash Rd., Cape Girardeau, MO 63701

Continuing Authority: Same as above
Address: Same as above

Facility Name: Biokyowa, Inc.
Facility Address: 5469 Nash Rd., Cape Girardeau, MO 63701

Legal Description: See pg. 2
UTM Coordinates: See pg. 2

Receiving Stream: Unnamed tributary to Ditch #1 (U)
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204-0102)

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein:

FACILITY DESCRIPTION

Underground Injection – SIC #1629

Aerated water is injected into the aquifer to immobilize Iron and Manganese. Hydrochloric Acid and Sodium Hypochlorite are injected as cleaning agents and disinfectants. This solution is extracted from the aquifer and disposed of via a permitted waste water treatment facility.

This permit authorizes only wastewater discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System; it does not apply to other regulated areas. This permit may be appealed in accordance with Section 644.051.6 of the Law.

August 1, 2012
Effective Date

May 14, 2015
Modification Date

Sara Parker Pauley
Sara Parker Pauley, Director, Department of Natural Resources

July 31, 2017
Expiration Date

John Madras
John Madras, Director, Water Protection Program

FACILITY DESCRIPTION (continued):

Wells 1, 2, 3

These wells are no longer in use do the high amount of iron in their portion of the aquifer. Sequestration activities have ceased at these wells. The wells are operational for emergency use such as for firefighting.

Well 4

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 801682, Y = 4126663
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

Well 5

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 801521, Y = 4126219
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

Well 6

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 802184, Y = 4126761
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

Well 7

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 802034, Y = 4126523
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

Well 8

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 801835, Y = 4126284
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

Well 9

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 801703, Y = 4126421
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

Outfall 009

Outfall 009 was created to incorporate the total amounts of aerated water, sodium hypochlorite, and hydrochloric acid injected into Wells 4 – 9. Outfall #009 is not a physical outfall, but is needed for compliance tracking purposes only. Outfall 009 will use the same locational data as Well 8:

Legal Description: S ½, Sec. 27, T30N, R13E, Cape Girardeau County
UTM Coordinates: X = 801835, Y = 4126284
Receiving Stream: Unnamed tributary to Ditch #1
First Classified Stream and ID: Ditch #1 (C) (3052)
USGS Basin & Sub-watershed No.: (08020204 -0102)

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The permittee is authorized to discharge from outfall(s) with serial number(s) as specified in the application for this permit. The final effluent limitations shall become effective upon issuance and remain in effect until expiration of the permit. Such discharges shall be controlled, limited and monitored by the permittee as specified below:

OUTFALL NUMBER AND EFFLUENT PARAMETER(S)	UNITS	FINAL EFFLUENT LIMITATIONS			MONITORING REQUIREMENTS	
		DAILY MAXIMUM	WEEKLY AVERAGE	MONTHLY AVERAGE	MEASUREMENT FREQUENCY	SAMPLE TYPE
<u>Outfall 009 (combination of wells 4-9)</u>						
Aerated Water	gal/mo	*		*	once/month	calculated
Hydrochloric Acid	lbs/yr	*		*	once/year	recorded
Sodium Hypochlorite	lbs/yr	*		*	once/year	recorded

MONITORING REPORTS SHALL BE SUBMITTED ANNUALLY; THE FIRST REPORT IS DUE September 28, 2013.

B. STANDARD CONDITIONS

IN ADDITION TO SPECIFIED CONDITIONS STATED HEREIN, THIS PERMIT IS SUBJECT TO THE ATTACHED **Part I** STANDARD CONDITIONS DATED October 1, 1980, AND HEREBY INCORPORATED AS THOUGH FULLY SET FORTH HEREIN.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS (continued)

* Monitoring requirement only. The data reported shall consist of the sums of wells 4-9.

C. SPECIAL CONDITIONS

1. There shall be no release of polychlorinated biphenyl compounds (PCBs) to waters of the state at or above the level of quantification currently defined as 1 µg/L or 1 ppb.
2. This permit may be reopened and modified, or alternatively revoked and reissued, to:
 - (a) Comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
 - (1) controls any pollutant not limited in the permit.
 - (b) Incorporate new or modified effluent limitations or other conditions, if the result of a waste load allocation study, toxicity test or other information indicates changes are necessary to assure compliance with Missouri’s Water Quality Standards.
 - (c) Incorporate new or modified effluent limitations or other conditions if, as the result of a watershed analysis, a Total Maximum Daily Load (TMDL) limitation is developed for the receiving waters which are currently included in Missouri’s list of waters of the state not fully achieving the state’s water quality standards, also called the 303(d) list. The permit as modified or reissued under this paragraph shall also contain any other requirements of the Clean Water Act then applicable.
3. Report as no-discharge when a discharge does not occur during the reporting period.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
STATEMENT OF BASIS
UI-000017
BIOKYOWA, INC.

The Federal Water Pollution Control Act ("Clean Water Act" Section 402 Public Law 92-500 as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the "Clean Water Act"). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Director of the Missouri Department of Natural Resources (Department) under an approved program, operating in accordance with federal and state laws (Federal "Clean Water Act" and "Missouri Clean Water Law" Section 644 as amended). MSOPs are issued for a period of five (5) years unless otherwise specified.

As per [40 CFR Part 124.8(a)] and [10 CSR 20-6.020(1)2.] a statement of basis shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the Missouri State Operating Permit (operating permit) listed below.

A statement of basis is not an enforceable part of an operating permit. This statement of basis is for an industrial facility.

Part I – Facility Information

Facility Type: Industrial
Facility SIC Code(s): #1929

Facility Description:

This is an industrial facility conducting underground injection of chemical to treat groundwater prior to production of the groundwater for surface treatment and use in manufacturing amino acids. See the original factsheet below for a more detailed facility description.

Part II – Modification Rationale

This operating permit is hereby modified to add an addition production well and associated series of injection wells to the permit. This well will be included in the cumulative analyses required for the representative outfall #009. The new well will be operated the exact same way as the existing wells and has the exact same environmental concerns already addressed in the permit. There will be no additional conditions established in the permit at this time. A more thorough review of the permit and how it relates to the site and all applicable rules and regulations will be conducted upon renewal of the permit.

No other changes were made at this time.

Part III – Administrative Requirements

On the basis of preliminary staff review and the application of applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the operating permit. The proposed determinations are tentative pending public comment.

PUBLIC NOTICE:

The Department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest in and water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and permittee must be notified of the denial in writing.

The Department must issue public notice of a pending operating permit or of a new or reissued statewide general permit. The public comment period is the length of time not less than 30 days following the date of the public notice which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed operating permit, then please refer to the Public Notice page located at the front of this draft operating permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- The Public Notice period for this operating permit was from March 27, 2015 to April 27, 2015. No responses were received.

DATE OF STATEMENT OF BASIS: MARCH 18, 2015

COMPLETED BY:

**LOGAN COLE, ENVIRONMENTAL SPECIALIST
MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
OPERATING PERMITS SECTION - DOMESTIC WASTEWATER UNIT
(573) 751-5827
logan.cole@dnr.mo.gov**

Missouri Department of Natural Resources
FACT SHEET
FOR THE PURPOSE OF RENEWAL
OF
UI-000017
BIOKYOWA, INC.

The Federal Water Pollution Control Act ("Clean Water Act" Section 402 Public Law 92-500 as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of storm water from certain point sources. All such discharges are unlawful without a permit (Section 301 of the "Clean Water Act"). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Director of the Missouri Department of Natural Resources (Department) under an approved program, operating in accordance with federal and state laws (Federal "Clean Water Act" and "Missouri Clean Water Law" Section 644 as amended). MSOPs are issued for a period of five (5) years unless otherwise specified.

As per [40 CFR Part 124.8(a)] and [10 CSR 20-6.020(1)2.] a Factsheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the Missouri State Operating Permit (operating permit) listed below.

Part I – Facility Information

The untreated water in the aquifer has iron (Fe) and manganese (Mn) in solution. When this untreated water is pumped to the surface, it reacts with oxygen (O₂) and precipitates Fe(OH)₃ and MnO₂ which are dark in color and foul screens and equipment.

By taking water from another source and raising the dissolved oxygen content, and then injecting it into the aquifer, the Fe and Mn are oxidized and immobilized. Some of this oxidation is performed by naturally occurring bacteria in the aquifer which are stimulated by the oxygen addition. This water can then be pumped to the surface and will not foul pipes. This process uses no other chemicals other than the oxygenated water.

Hydrochloric acid and sodium hypochlorite are occasionally injected into the aquifer as cleaning agents and disinfectants. They are then extracted and the waste water sent to the treatment plant.

Application Date: February 18, 2011
Expiration Date: February 2, 2011

Part II – Rationale and Derivation of Effluent Limitations & Permit Conditions

ANTI-BACKSLIDING:

A provision in the Federal Regulations [CWA §303(d)(4); CWA §402(c); 40 CFR Part 122.44(I)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

- All limits in this operating permit are at least as protective as those previously established; therefore, backsliding does not apply.

SCHEDULE OF COMPLIANCE (SOC):

A schedule of remedial measures included in a permit, including an enforceable sequence of interim requirements (actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit.

Not Applicable

WASTELOAD ALLOCATIONS (WLA) FOR LIMITS:

Not Applicable ;

WATER QUALITY STANDARDS:

Per [10 CSR 20-7.031(3)], General Criteria shall be applicable to all waters of the state at all times including mixing zones. Additionally, [40 CFR 122.44(d)(1)] directs the Department to establish in each NPDES permit to include conditions to achieve water quality established under Section 303 of the Clean Water Act, including State narrative criteria for water quality.

Part III – Effluent Limits Determination

WELLS 4 – 8, I.E. “OUTFALL 009” – DERIVATION AND DISCUSSION OF LIMITS:

- **Aerated Water** – Monitoring requirement only. Report in gallons per month.
- **Sodium Hypochlorite**. Monitoring requirement only. Report in pounds per year
- **Hydrochloric Acid**. Monitoring requirement only. Report in pounds per year.

Part IV – Administrative Requirements

On the basis of preliminary staff review and the application of applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the operating permit. The proposed determinations are tentative pending public comment.

PUBLIC NOTICE:

The Department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest in and water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and permittee must be notified of the denial in writing.

The Department must issue public notice of a pending operating permit or of a new or reissued statewide general permit. The public comment period is the length of time not less than 30 days following the date of the public notice which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed operating permit, then please refer to the Public Notice page located at the front of this draft operating permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- The Public Notice period for this operating permit was from June 8, 2012 to July 9, 2012. No responses received or responses to the Public Notice of this operating permit do not warrant the modification of effluent limits and/or the terms and conditions of this permit.

DATE OF FACT SHEET: MAY 30, 2012

COMPLETED BY:

ALAN MOREAU, ENVIRONMENTAL SPECIALIST III
NPDES PERMITS UNIT
PERMITTING AND ENGINEERING SECTION
WATER PROTECTION PROGRAM
(573) 522-2553
alan.moreau@dnr.mo.gov

**STANDARD CONDITIONS FOR NPDES PERMITS
ISSUED BY
THE MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION**

**Revised
October 1, 1980**

**PART I - GENERAL CONDITIONS
SECTION A - MONITORING AND REPORTING**

1. **Representative Sampling**
 - a. Samples and measurements taken as required herein shall be representative of the nature and volume, respectively, of the monitored discharge. All samples shall be taken at the outfall(s), and unless specified, before the effluent joins or is diluted by any other body of water or substance.
 - b. Monitoring results shall be recorded and reported on forms provided by the Department, postmarked no later than the 28th day of the month following the completed reporting period. Signed copies of these, and all other reports required herein, shall be submitted to the respective Department Regional Office, the Regional Office address is indicated in the cover letter transmitting the permit.
2. **Schedule of Compliance**

No later than fourteen (14) calendar days following each date identified in the "Schedule of Compliance", the permittee shall submit to the respective Department Regional Office as required therein, either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements, or if there are no more scheduled requirements, when such noncompliance will be corrected. The Regional Office address is indicated in the cover letter transmitting the permit.
3. **Definitions**

Definitions as set forth in the Missouri Clean Water Law and Missouri Clean Water Commission Definition Regulation 10 CSR 20-2.010 shall apply to terms used herein.
4. **Test Procedures**

Test procedures for the analysis of pollutant shall be in accordance with the Missouri Clean Water Commission Effluent Regulation 10 CSR 20-7015.
5. **Recording of Results**
 - a. For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:
 - (i) the date, exact place, and time of sampling or measurements;
 - (ii) the individual(s) who performed the sampling or measurements;
 - (iii) the date(s) analyses were performed;
 - (iv) the individual(s) who performed the analyses;
 - (v) the analytical techniques or methods used; and
 - (vi) the results of such analyses.
 - b. The Federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six (6) months per violation, or both.
 - c. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.
6. **Additional Monitoring by Permittee**

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Monitoring Report Form. Such increased frequency shall also be indicated.

7. **Records Retention**

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recording for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time.

SECTION B - MANAGEMENT REQUIREMENTS

1. **Change in Discharge**
 - a. All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant not authorized by this permit or any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.
 - b. Any facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants shall be reported by submission of a new NPDES application at least sixty (60) days before each such change, or, if they will not violate the effluent limitations specified in the permit, by notice to the Department at least thirty (30) days before such changes.
2. **Noncompliance Notification**
 - a. If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Department with the following information, in writing within five (5) days of becoming aware of such conditions:
 - (i) a description of the discharge and cause of noncompliance, and
 - (ii) the period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.
 - b. Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally with 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided with five (5) days of the time the permittee becomes aware of the circumstances. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.
3. **Facilities Operation**

Permittees shall operate and maintain facilities to comply with the Missouri Clean Water Law and applicable permit conditions. Operators or supervisors of operations at publicly owned or publicly regulated wastewater treatment facilities shall be certified in accordance with 10 CSR 209.020(2) and any other applicable law or regulation. Operators of other wastewater treatment facilities, water contaminant source or point sources, shall, upon request by the Department, demonstrate that wastewater treatment equipment and facilities are effectively operated and maintained by competent personnel.
4. **Adverse Impact**

The permittee shall take all necessary steps to minimize any adverse impact to waters of the state resulting from noncompliance with any effluent limitations specified in this permit or set forth in the Missouri Clean Water Law and Regulations (hereinafter the Law and Regulations), including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

- a. Any bypass or shut down of a wastewater treatment facility and tributary sewer system or any part of such a facility and sewer system that results in a violation of permit limits or conditions is prohibited except:
 - (i) where unavoidable to prevent loss of life, personal injury, or severe property damages; and
 - (ii) where unavoidable excessive storm drainage or runoff would catastrophically damage any facilities or processes necessary for compliance with the effluent limitations and conditions of this permit;
 - (iii) where maintenance is necessary to ensure efficient operation and alternative measures have been taken to maintain effluent quality during the period of maintenance.
 - b. The permittee shall notify the Department in writing of all bypasses or shut down that result in a violation of permit limits or conditions. This section does not excuse any person from liability, unless such relief is otherwise provided by the statute.
6. **Removed Substances**
Solids, sludges, filter backwash, or any other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutants from entering waters of the state unless permitted by the Law, and a permanent record of the date and time, volume and methods of removal and disposal of such substances shall be maintained by the permittee.
 7. **Power Failures**
In order to maintain compliance with the effluent limitations and other provisions of this permit, the permittee shall either:
 - a. in accordance with the "Schedule of Compliance", provide an alternative power source sufficient to operate the wastewater control facilities; or,
 - b. if such alternative power source is not in existence, and no date for its implementation appears in the Compliance Schedule, halt or otherwise control production and all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.
 8. **Right of Entry**
For the purpose of inspecting, monitoring, or sampling the point source, water contaminant source, or wastewater treatment facility for compliance with the Clean Water Law and these regulations, authorized representatives of the Department, shall be allowed by the permittee, upon presentation of credentials and at reasonable times;
 - a. to enter upon permittee's premises in which a point source, water contaminant source, or wastewater treatment facility is located or in which any records are required to be kept under terms and conditions of the permit;
 - b. to have access to, or copy, any records required to be kept under terms and conditions of the permit;
 - c. to inspect any monitoring equipment or method required in the permit;
 - d. to inspect any collection, treatment, or discharge facility covered under the permit; and
 - e. to sample any wastewater at any point in the collection system or treatment process.
 9. **Permits Transferable**
 - a. Subject to Section (3) of 10 CSR 20-6.010 an operating permit may be transferred upon submission to the Department of an application to transfer signed by a new owner. Until such time as the permit is officially transferred, the original permittee remains responsible for complying with the terms and conditions of the existing permit.
 - b. The Department, within thirty (30) days of receipt of the application shall notify the new permittee of its intent to revoke and reissue or transfer the permit.
 10. **Availability of Reports**
Except for data determined to be confidential under Section 308 of the Act, and the Law and Missouri Clean Water Commission Regulation for Public Participation, Hearings and Notice to Governmental Agencies 10 CSR 20-6.020, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by statute, effluent data shall not be considered confidential. Knowingly making any false statement on any such report shall be subject to the imposition of criminal penalties as provided in Section 204.076 of the Law.
 - a. Subject to compliance with statutory requirements of the Law and Regulations and applicable Court Order, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:
 - (i) violation of any terms or conditions of this permit or the Law;
 - (ii) having obtained this permit by misrepresentation or failure to disclose fully any relevant facts;
 - (iii) a change in any circumstances or conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge, or
 - (iv) any reason set forth in the Law and Regulations.
 - b. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
12. **Permit Modification - Less Stringent Requirements**
If any permit provisions are based on legal requirements which are lessened or removed, and should no other basis exist for such permit provisions, the permit shall be modified after notice and opportunity for a hearing.
 13. **Civil and Criminal Liability**
Except as authorized by statute and provided in permit conditions on "Bypassing" (Standard Condition B-5) and "Power Failures" (Standard Condition B-7) nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.
 14. **Oil and Hazardous Substance Liability**
Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act, and the Law and Regulations. Oil and hazardous materials discharges must be reported in compliance with the requirements of the Federal Clean Water Act.
 15. **State Laws**
Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state statute or regulations.
 16. **Property Rights**
The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of or violation of federal, state or local laws or regulations.
 17. **Duty to Reapply**
If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for a new permit 180 days prior to expiration of this permit.
 18. **Toxic Pollutants**
If a toxic effluent standard, prohibition, or schedule of compliance is established, under Section 307(a) of the Federal Clean Water Act for a toxic pollutant in the discharge of permittee's facility and such standard is more stringent than the limitations in the permit, then the more stringent standard, prohibition, or schedule shall be incorporated into the permit as one of its conditions, upon notice to the permittee.
 19. **Signatory Requirement**
All reports, or information submitted to the Director shall be signed (see 40 CFR-122.6).
 20. **Rights Not Affected**
Nothing in this permit shall affect the permittee's right to appeal or seek a variance from applicable laws or regulations as allowed by law.
 21. **Severability**
The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

BioKyowa, Inc.
P.O. Box 1550
Cape Girardeau
MO 63702-1550
Ph: (573) 335-4849
Fax: (573) 335-1466



Missouri Dept. of Natural Resources
Water Protection Program
PO Box 176
Jefferson City, MO 65102

RECEIVED

FEB 4 2015

WATER PROTECTION PROGRAM

Attn: Amanda Sappington

Re: Injection Permit MO UI-0000017

Amanda,

As we discussed, attached is the documentation for a new well we will be installing. Although you had stated a construction permit would not be necessary, this application is for the permit modification and for review by Missouri Geological Survey. I spoke with Jeff Crews as you suggested and he is aware of the application.

The application was completed and signed by a registered geologist as required, the design is the same as our existing well systems and will only differ in the plc control. The purpose of this installation is primarily due to the fact that one of our existing wells suffered a screen tear last year. Although this well is still being used it is of a much lesser capacity than design and this has prompted its replacement.

The package contains an application for the main production well, identified as well 9 and one for the combined 8 recirculation wells, identified as wells 9.1 through 9.8. GPS coordinates for each well are also included for addition into the state database.

We are ready to begin well drilling as soon as we have your approval to proceed. If you have any questions please do not hesitate to call.

Sincerely,

Dave Jennings
BioKyowa Inc.
573-335-4849 x-127
dave.jennings@biokyowa.com

BioKyowa, Inc.
P.O. Box 1550
Cape Girardeau
MO 63702-1550
Ph: (573) 335-4849
Fax: (573) 335-1466



Missouri Dept. of Natural Resources
Water Protection Program
PO Box 176
Jefferson City, MO 65102

RECEIVED

FEB 4 2015

WATER PROTECTION PROGRAM

Attn: Amanda Sappington

Re: Injection Permit MO UI-0000017

Amanda,

As we discussed, attached is the documentation for a new well we will be installing. Although you had stated a construction permit would not be necessary, this application is for the permit modification and for review by Missouri Geological Survey. I spoke with Jeff Crews as you suggested and he is aware of the application.

The application was completed and signed by a registered geologist as required, the design is the same as our existing well systems and will only differ in the plc control. The purpose of this installation is primarily due to the fact that one of our existing wells suffered a screen tear last year. Although this well is still being used it is of a much lesser capacity than design and this has prompted its replacement.

The package contains an application for the main production well, identified as well 9 and one for the combined 8 recirculation wells, identified as wells 9.1 through 9.8. GPS coordinates for each well are also included for addition into the state database.

We are ready to begin well drilling as soon as we have your approval to proceed. If you have any questions please do not hesitate to call.

Sincerely,

Dave Jennings
BioKyowa Inc.

573-335-4849 x-127

dave.jennings@biokyowa.com

RECEIVED

FEB 4 2015



MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM WATER POLLUTION BRANCH
P.O. BOX 176, JEFFERSON CITY, MO 65102
WATER PROTECTION PROGRAM
FORM UIC – APPLICATION FOR CLASS V PERMIT

FOR AGENCY USE ONLY	
CHECK NO.	150053
DATE RECEIVED	2/4/15
FEE SUBMITTED	\$875.00

PART A – DO NOT ATTEMPT TO COMPLETE THIS FORM BEFORE READING THE ACCOMPANYING INSTRUCTIONS.

1.00 ACTION REQUESTED

Construction Permit Application Operating Permit Application

2.00 FACILITY INFORMATION

FACILITY NAME Biokyowa Inc (Production Well 9)	TELEPHONE NUMBER 573-335-4849
ADDRESS 5469 Nash Road Cape Girardeau, MO 63701	FAX NUMBER

2.1 CONSTRUCTION PERMIT NUMBER, IF APPLICABLE

2.2 OPERATING PERMIT NUMBER, IF APPLICABLE

2.3 FACILITY LOCATION (ATTACH A 1" = 2000' SCALE USGS TOPOGRAPHIC MAP SHOWING LOCATION)

1/4, 1/4, Sec. 27, TOWNSHIP 30, RANGE 13, COUNTY Cape Girardeau

3.00 OWNER INFORMATION

OWNER NAME Kyowa Hakko Bio	TELEPHONE NUMBER 573-335-4849
ADDRESS P.O. Box 1550, 5469 Nash Road, Cape Girardeau, MO 63701	FAX NUMBER

4.00 CONTINUING AUTHORITY INFORMATION

NAME Kyowa Hakko Bio	TELEPHONE NUMBER 573-335-4849
ADDRESS P.O. Box 1550, 5469 Nash Road, Cape Girardeau, MO 63701	FAX NUMBER

5.00 FACILITY CONTACT INFORMATION

NAME Dave Jennings	TITLE Superintendent of Environmental Affairs	TELEPHONE NUMBER 573-335-4849 x 127
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6.00 GENERAL INFORMATION

6.1 BRIEF DESCRIPTION OF PURPOSE OF INJECTION. INCLUDE ANALYSES AND CONCENTRATIONS OF ANY POLLUTANTS TO BE REMEDIATED. (ATTACH A SEPARATE SHEET IF NECESSARY)

This application is for the occasional temporary introduction of well cleaning chemicals into a groundwater supply well for the purpose of redeveloping well screens and gravel pack. (See attached).

6.2 BRIEF DESCRIPTION OF FACILITIES TO ACCOMPLISH INJECTION. ATTACH A SIMPLIFIED GEOLOGIC CROSS SECTION SHOWING DEPTH OF BEDROCK, DEPTH OF AQUIFERS, AND DEPTH OF INJECTION. ALSO ATTACH MATERIAL SAFETY DATA SHEETS FOR EACH OF THE INJECTED MATERIALS. IF INJECTION WELL IS TO BE CASED, PROVIDE SCHEMATIC.

See attached.

6.3 IF BIOLOGICAL AGENTS ARE TO BE INTRODUCED IN THIS PROCESS, A BIOLOGICAL PROFILE AND LITERATURE RESEARCH MUST BE SUBMITTED WITH THIS APPLICATION.

6.4 WILL THIS PROCESS INVOLVE A HAZARDOUS WASTE AS DEFINED IN 10 CSR 25-4.010?

YES NO

6.5 WILL THIS PROCESS RESULT IN DISCHARGE TO SURFACE WATER?

YES NO If yes, an NPDES permit must be obtained.

RECEIVED

FEB 4 2015



MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM WATER POLLUTION BRANCH
P.O. BOX 176, JEFFERSON CITY, MO 65177
FORM UIC - APPLICATION FOR CLASS V PERMIT

WATER PROTECTION PROGRAM

FOR AGENCY USE ONLY

CHECK NO.

DATE RECEIVED

FEE SUBMITTED

PART A - DO NOT ATTEMPT TO COMPLETE THIS FORM BEFORE READING THE ACCOMPANYING INSTRUCTIONS.

1.00 ACTION REQUESTED

Construction Permit Application Operating Permit Application

2.00 FACILITY INFORMATION

FACILITY NAME

Biokyowa Inc (Production Well 9)

TELEPHONE NUMBER

573-335-4849

ADDRESS

5469 Nash Road Cape Girardeau, MO 63701

FAX NUMBER

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FAX NUMBER

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NAME

Dave Jennings

TITLE

Superintendent of Environmental Affairs

TELEPHONE NUMBER

573-335-4849 x 127

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See attached.

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6.4 WILL THIS PROCESS INVOLVE A HAZARDOUS WASTE AS DEFINED IN 10 CSR 25-4.010?

YES NO

6.5 WILL THIS PROCESS RESULT IN DISCHARGE TO SURFACE WATER?

YES NO If yes, an NPDES permit must be obtained.

6.00 GENERAL INFORMATION (CONTINUED)

6.6 HOW MANY TOTAL POUNDS OF CHEMICALS OR BIOLOGIC MATERIALS WILL BE INJECTED?
See attached for description of the well cleaning process.

6.7 IF THIS INJECTION IS INTO AN AQUIFER, HOW WILL THE INJECTED CHEMICALS BE WITHDRAWN OR REDUCED TO INJECTION LEVELS?
Chemicals will be introduced, the wells will be mechanically surged, and the wells will be pumped to the facility's wastewater treatment plant prior to discharge under Missouri State Operating Permit No. 0101729.

6.8 IF THE CHEMICALS OR BIOLOGIC AGENTS TO BE INJECTED ARE ALREADY PRESENT IN THE GROUNDWATER, GIVE CONCENTRATIONS:

CHEMICAL/BIOLOGIC AGENT	PRE-INJECTION CONCENTRATION (mg/L)
1. Sodium Hypochlorite	12%
2. Hydrochloric Acid, inhibited.	35%
3. 3.	

7.00 OTHER WELL TYPES ON SITE

YES	NO	TYPE	# AT LOCATION	WELL STATUS		
				ACTIVE	INACTIVE PLUGGED	INACTIVE NOT PLUGGED
<input type="checkbox"/>	<input checked="" type="checkbox"/>	ABANDONED WATER WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AQUIFER RECHARGE WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AQUIFER REMEDIATION WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AUTOMOBILE SERVICE STATION DISPOSAL WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	GROUND SOURCE HEAT PUMP (OPEN LOOP)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	IMPROVED SINKHOLE		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	INDUSTRIAL DRAINAGE WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	MINE BACKFILL WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	SEPTIC TANK WITH LATERAL FIELD THAT HAS THE POTENTIAL TO BE USED BY MORE THAN 20 PEOPLE PER DAY.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	OTHER Water Supply/recirculation wells	8/40	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7.1 WILL INJECTION WELLS BE CASED?
 YES NO
 IF YES, A PERMIT MAY BE REQUIRED FROM THE DIVISION OF GEOLOGY AND LAND SURVEY, P.O. BOX 250, ROLLA, MO 65402-0250 OR CALL (573) 368-2143.

8.00 SIGNATURE INFORMATION

NAME AND OFFICIAL TITLE (TYPE OR PRINT) James Bannantine, Missouri PG# 2012027233	TELEPHONE NUMBER 262-834-0227
SIGNATURE <i>James E Bannantine</i>	DATE SIGNED <i>27 January 2015</i>



9.00 DATA

9.1 THIS SECTION MUST BE COMPLETED IF INJECTION IS INTO AN AQUIFER, IT MUST BE COMPLETED PRIOR TO INJECTION, AT LEAST ONE ANALYSIS MUST BE PERFORMED FOR EACH POLLUTANT LISTED. IF INJECTION IS NOT TO AN AQUIFER, SKIP AND GO TO PART 9.2.

POLLUTANT	MAXIMUM DAILY VAULE	
	CONCENTRATION	MASS
Biochemical Oxygen Demand (BOD)		
Chemical Oxygen Demand (COD)		
Total Organic Carbon (TOC)	1.8 mg/l	
Ammonia as N	0.077 mg/l	
Flow	VALUE no net flow during recirculation (530 gpm in/530 gpm out)	
Temperature (winter)	VALUE 50	
Temperature (summer)	VALUE 70	
pH	MINIMUM <2 during acid addition	MAXIMUM >10 during sodium hypochlorite addition

9.2 MARK "X" IN COLUMN (a) FOR EACH POLLUTANT YOU KNOW OR HAVE REASON TO BELIEVE IS PRESENT. MARK "X" IN COLUMN (b) FOR EACH POLLUTANT YOU BELIEVE TO BE ABSENT. IF YOU MARK COLUMN (a) FOR ANY POLLUTANT, YOU MUST PROVIDE THE RESULTS OF AT LEAST ONE ANALYSIS FOR THAT POLLUTANT. COMPLETE ONE TABLE FOR EACH WELL. SEE THE INSTRUCTIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS.

POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
Bromide (24959-67-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Total Residual Chloine	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Color	<input checked="" type="checkbox"/>	<input type="checkbox"/>	20	
Fecal Coliform	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Absent	
Floride (16984-48-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.293 mg/l	
Nitrate/Nitrite (as N)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.020 mg/l	
Nitrogen, Total Organic (as N)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Oil and Grease	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Total Phosphorus (as P) (7723-14-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Radioactivity	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Alpha, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Beta, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Radium, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
Sulfate (as SO ⁴) (14808-79-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	31.7 mg/l	
Sulfide (as S)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Sulfite (as SO ³)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Surfactants	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Aluminum, Total (7429-90-5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.025 mg/l	
Barium, Total (7440-39-3)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.76 mg/l	
Boron, Total (740-42-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Cobalt, Total (7440-48-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Iron, Total (7439-89-6)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.49 mg/l	
Magnesium, Total (7439-95-4)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	22 mg/l	
Molybdenum, Total (7439-98-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Manganese, Total (7439-96-5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.24 mg/l	
Tin, Total (7440-31-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Titanium, Total (7440-32-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
METALS, CYANIDE, AND TOTAL PHENOLS				
1M. Antimony, Total (7440-36-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2M. Arsenic, Total (7440-38-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.005	
3M. Beryllium, Total (7440-41-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4M. Cadmium, Total (7440-43-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0002 mg/l	
5M. Chromium, Total (7440-47-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0002 mg/l	
6M. Copper, Total (7550-50-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.0036 mg/l	
7M. Lead, Total (7439-97-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.005 mg/l	
8M. Mercury, Total (7439-97-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0002 mg/l	
9M. Nickel, Total (7440-02-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10M. Selenium, Total (7782-49-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.005 mg/l	
11M. Silver, Total (7440-22-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0020 mg/l	
12M. Thallium, Total (7440-28-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13M. Zinc, Total (7440-66-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14M. Cyanide, Total (57-12-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15M. Phenols, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
GC/MS FRACTION - VOLATILE COMPOUNDS				
1V. Acrolein (107-02-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2V. Acrylonitrile (107-13-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3V. Benzene (71-43-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4V. Bis (Chloromethyl) Ether (542-88-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5V. Bromoform (75-25-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6V. Carbon Tetrachloride (56-23-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7V. Chloroform (108-90-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
8V. Cholodibromomethane (124-48-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9V. Chloroethane (75-00-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10V. 2-Chloroethylvinyl Ether (110-75-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11V. Chloroform (67-66-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
12V. Dichlorobromomethane (75-27-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13V. Dichlorodifluoromethane (75-71-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14V. 1,1 – Dichloroethane (75-34-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15V. 1,2 – Dichloroethane (107-06-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
16V. 1,1 – Dichloroethylene (75-35-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
17V. 1,2 – Dichloropropane (78-87-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
18V. 1,2 – Dichloropropylene (542-75-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
19V. Ethylbenzene (100-41-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
20V. Methyl Bromide (74-83-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
21V. Methyl Chloride (74-87-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
22V. Methylene Chloride (75-09-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
23V. 1,1,2,2 – Tetrachloroethane (79-35-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
24V. Tetrachloroethylene (127-18-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
25V. Toluene (106-88-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
26V. 1,2 – Trans Dichloroethylene (156-60-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
27V. 1,1,1 – Trichloroethane (71-55-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
28V. 1,1,2 – Trichloroethane (79-00-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
29V. Trichloroethylene (79-01-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
30V. Trichlorofluoromethane (75-89-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
31V. Vinyl Chloride (75-01-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
GS/MS FRACTION – ACID COMPOUNDS				
1A. 2 – Chloropheno (95-57-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2A. 2,4 – Dichlorophenol (120-83-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3A. 2,4 – Dimethylphenol (105-67-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4A. 4, 6 – Dinitro – O – Cresol (534-52-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5A. 2,4 – Dinitrophenol (51-28-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6A. 2 – Nitrophenol (88-75-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7A. 4 – Nitrophenol (100-82-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
8A. P – Chloro – M – Cresol (59-50-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9A. Pentachlorophenol (87-86-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10A. Phenol (106-95-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11A. 2,4,6 – Trichlorophenol (88-06-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS				
1B. Acenaphthene (83-32-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2B. Acenaphthylene (208-96-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3B. Anthracene (120-12-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4B. Benzidine (92-87-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5B. Benzo (a) Anthracene (56-55-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6B. Benzo (a) Pyrene (50-32-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7B. 3,4 – Benzofluoranthene (205-99-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
8B. Benzo (ghi) Perylene (191-24-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9B. Benzo (k) Fluoranthene (207-08-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10B. Bis (2-Chloroethoxy) Methane (111-91-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11B. Bis (2-Chloroethyl) Ether (111-44-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
12B. Bis (2-Chloroisopropyl) Ether (39638-32-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14B. 4-Bromophenyl Phenyl Ether (101-55-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15B. Butyl Benzyl Phthalate (85-68-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
16B. 2-Chloronaphthalene (91-58-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
17B. 4-Chloronaphenyl (7005-72-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
18B. Chrysene (218-01-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
19B. Dibenzo (a,h) Anthracene (53-70-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
20B. 1,2 – Dichlorobenzene (95-50-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
21B. 1,3 – Dichlorobenzene (541-73-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
22B. 1,4 – Dichlorobenzene (106-46-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
23B. 3,3 – Dichlorobenzidine (91-94-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
24B. Diethyl Phthalate (84-66-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
25B. Dimethyl Phthalate (113-11-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
26B. Di-N-Butyl Phthalate (84-74-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
27B. 2,4 – Dinitrotoluene (121-14-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
28B. 2,6 – Dinitrotoluene (606-20-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
29B. Di – N – Octyl Phthalate (117-84-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
31B. Fluoranthene (206-44-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
32B. Fluorene (86-73-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
33B. Hexachlorobenzene (118-71-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
34B. Hexachlorobutadiene (87-68-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
35B. Hexachlorocyclopentadiene (77-47-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
36B. Hexachloroethane (67-72-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
37B. Indeno (1,2,3-c,d) Pyrene (193-39-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (CONTINUED)				
38B. Isophorone (78-59-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
39B. Napthalene (91-20-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
40B. Nitrobenzene (98-95-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
41B. N-Nitrosodimethylamine (62-75-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
42B. N-Nitrosodi-N-Propylamine (621-64-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
43B. N-Nitrosodiphenylamine (83-30-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
44B. Phenanthrene (85-01-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
45B. Pyrene (129-00-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
46B. 1,2,4 – Trichlorobenzene (120-82-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
GC/MS FRACTION - PESTICIDES				
1P. Aldrin (309-00-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2P. α -BHC (319-84-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3P. β -BHC (319-85-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4P. γ -BHC (58-89-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5P. δ -BHC (319-86-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6P. Chlordane (57-74-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7P. 4,4 – DDT (50-29-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
8P. 4,4 – DDE (72-55-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9P. 4,4 – DDD (72-54-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10P. Dieldrin (60-57-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11P. α -Endosulfan (115-29-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
12P. β -Endosulfan (115-29-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13P. Endosulfan (1031-07-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14P. Endrin (72-20-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15P. Endrin (7421-93-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
16P. Heptachlor (76-44-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
17P. Heptachlor Epoxide (1024-57-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
18P. PCB-1242 (53469-21-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
19P. PCB-1254 (11097-69-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
20P. PCB-1221 (11104-28-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
21P. PCB-1232 (11141-16-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
22P. PCB-1248 (12672-29-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
23P. PCB-1260 (11096-82-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
24P. PCB-1016 (12674-29-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
25P. Toxaphene (8001-35-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
DIOXIN				
2,3,7,8 – Tetrachlorodibenzo-P-Dioxin (1764-01-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	DESCRIBE RESULTS	

INSTRUCTIONS FOR FORM UIC – APPLICATION FOR CLASS V PERMIT

Please read these instructions carefully before completing the application. Send a signed application along with appropriate permit fee to the Water Protection Program, Water Pollution Branch, PO Box 176, Jefferson City, MO 65102. Please make your check payable to State of Missouri.

1.0 ACTION REQUESTED

Construction Permit Application – Check only if the application is for a permit to construct an injection/recovery well system.
Operating Permit Application – Check only if the application is for a permit to operate an injection/recovery well system.
Operating Permit Renewal Application – Check only if the application is for a renewal of an existing permit.

2.0 FACILITY INFORMATION

Name – The site-specific name of the facility where the injection/recovery operation is to be conducted.

Address – Physical address of the site-specific facility.

2.1 Construction Permit Number – provide the UIC construction permit number that the injection/recovery system was constructed under, if this application is for an operating permit for the same facility.

2.2 Operating Permit Number – include only the facility's NPDES or UIC permit number(s) if one or more are in effect. If multiple Class V permits are presently in effect, attach a separate list.

2.3 Facility Location – provide location data.

3.0 OWNER INFORMATION

Name the individual, institution, agency or corporation that owns the facility.

4.0 CONTINUING AUTHORITY INFORMATION

Name the permanent organization that will serve as the continuing authority for the operation, maintenance, and modernization of the facility.

5.0 FACILITY CONTACT

Name the individual within the facility, or operator, most able to supply information about the direct operation of the injection/recovery operation.

6.0 GENERAL INFORMATION

6.1 Purpose of injection/recovery – attach separate pages if needed. Include all or portions of an engineering report containing information needed by the owner, continuing authority, and the Department of Natural Resources to fully describe the purpose of the injection/recovery system.

6.2 Description of the injection/recovery process – attach separate pages if needed. Include all or portions of the engineering report required by #2 above, or submit a separate detailed description of all elements of the product, treatment and injection system required to allow the owner, continuing authority or the Department of Natural Resources to adequately review the system.

The geologic report should contain, at a minimum: a description of the injection/recovery well pattern; a description of the injection zone including details of lithology, hydrology, and unique features of the injection zone and relevant formation; injection and recovery timeframes; systems of transporting, storing, mixing, metering, and introducing injection materials; recovery fluid gathering systems, treatment or recycling, and disposal systems.

6.3 Biological Agents – list and describe all biological agents to be injected, including: scientific names; whether or not the agents are native to the formations involved; list of available literature relevant to the use of the agents for the injection operation; their population and nutrient dynamics under proposed operating conditions; discussion and supporting literature regarding potential health and/or environmental impacts of the agents and their metabolites in and downgradient of the injection zone; and after completion of the operation; results of laboratory tests conducted by or for the facility relevant to the injection/recovery operation.

6.4 Hazardous Waste – will the process involve hazardous wastes as defined by federal and state hazardous waste laws?

6.5 Surface Discharge – if needed, contact the Water Protection Program, Water Pollution Branch for a State Operating Permit application at least 180 days prior to any planned discharge.

6.6 Give total estimated amounts of materials to be injected.

6.7 Describe how injected chemicals will be withdrawn to pre-injection levels.

6.8 Provide analytical data on the pre-injection concentrations of substances to be injected, if these substances are already present in the groundwater. Examples: manganese, if potassium permanganate is injected; or BOD, if a biological agent is to be injected.

INSTRUCTIONS FOR FORM UIC – APPLICATION FOR CLASS V PERMIT (CONTINUED)

7.0 OTHER WELL TYPES ON SITE

If there are existing wells already on site, give the type, number at location and status.

8.0 SIGNATURE

The application **must** be signed by a geologist registered in the State of Missouri or other groundwater professional registered in the State of Missouri.

9.0 DATA

- 9.1 This section must be completed if injection is into an aquifer. It must be completed prior to injection. At least one (1) analysis must be completed for each pollutant listed.
- 9.2 Mark an "X" for each pollutant believed to be present or absent in groundwater. If present, at least one (1) analysis must be completed for that pollutant.

ADDITIONAL FORMS

To apply for termination of this permit, you must submit a completed Form J. Also attach analyses from samples taken after project completion. These analyses must indicate that concentrations of remediated pollutants have not increased from pre-project concentrations.

Memorandum

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FEB 4 2015

WATER PROTECTION PROGRAM

Date: 23 January 2015

To: Missouri Department of Natural Resources
Water Protection Program Water Pollution Branch

Copies to: Dave Jennings, Biokyowa, Inc.

From: Peter King, Geosyntec Consultants, Inc.
James Bannantine, PG, Geosyntec Consultants, Inc.

Subject: Supporting Information for Form UIC – Application for a Class V Permit
Biokyowa, Inc., 5469 Nash Road, Cape Girardeau, MO 63701
Production Well (PW-9)
Construction Permit Application

INTRODUCTION

This memorandum provides supporting information to accompany the application for a Class V Construction Permit Application for a groundwater extraction/production well (PW-9) to be located at the Biokyowa facility, 5469 Nash Road, Cape Girardeau (Figure 1). It is our understanding that the construction of well PW-9 requires a Class V permit because it will require periodic chemical redevelopment to maintain the efficiency of the well. We also understand that eight proposed recirculation wells (RW-9.1 through RW-9.8) that will provide in-situ treatment for PW-9 will also require a Class V permit to construct. A memorandum and application for the recirculation wells will be provided as a separate submittal. Form UIC – Application for a Class V Permit (MO 780-1826 (08-11)) has been completed for PW-9 and is provided as Attachment 2 of the Memorandum. The following sections supplement this application.

SECTION 6.1 Brief Description of Purpose of Injection. Include analyses and concentrations of any pollutants to be remediated.

This application is for the occasional temporary introduction of well cleaning chemicals into a groundwater supply well for the purpose of redeveloping well screens and gravel pack. Historically, water supply wells at this site have been redeveloped on an annual or semi-annual basis to remove mineral and biological deposits from the well screens, gravel pack, and adjacent formation. The redevelopment is accomplished via mechanical means (surging and pumping) combined with chemical means (acid - typically hydrochloric and/or sodium hypochlorite).

Typically, the well pump is removed and surge blocks are used are used to agitate the water in the well to remove loose debris. Chemicals are introduced into the well, surged and then pumped out of the well into a dedicated wastewater line that directs the discharge to the facility's holding tanks and wastewater treatment facility. The well is pumped to the wastewater plant until chlorine residual has been removed and pH has returned to the background pH. The spent redevelopment fluid is treated in the on-site wastewater treatment plant prior to discharge in accordance with Missouri State Operating Permit No. 0101729.

6.2 Brief Description of Facilities to Accomplish Injection

This permit is to allow the injection of chemicals to assist with periodic redevelopment of a proposed groundwater supply production well on the Biokyowa property in the Mississippi River Alluvial Valley (MRAV) in the southeastern lowlands of Missouri. The alluvial deposits in this area cover approximately 3,600 square miles with a maximum thickness of 250 feet in some areas. The site consist of silts and clays ("gumbo") to a depth of approximately 25 feet below ground surface (ft bgs) that is underlain by alluvium comprised of sands and gravels that were deposited in layers to a depth of 115 to 125 ft bgs. The MRAV aquifer is used for municipal, industrial and agricultural purposes and is capable of supporting yields at this site in excess of 3,500 gallons per minute (gpm). The Site location is shown on Figure 1. A conceptual well log for PW-9 is shown as Figure 2 and a conceptual well log for a typical recirculation well is shown as Figure 3. A typical cross section summarizing the Site geology is shown as Figure 4.

The production well will be redeveloped by introducing chemicals and water down a tremie pipe to reach the well screen, which is approximately 70 to 120 feet below ground surface. The chemicals will be delivered via drums or tanker to the well head. The spent chemicals will be pumped from the wells as part of the redevelopment processes into a dedicated wastewater line that will deliver the liquid to the on-site treatment facility.

A typical redevelopment consists of the following:

Main Well: Approximately 200 gallons of 12% Sodium Hypochlorite is added to the well. This is surged inside the well casing for an 8 hour period to remove bacterial contamination. This volume is then pumped to a holding pit until chlorine and pH are within acceptable limits and subsequently through the waste treatment plant.

The pump is removed and approximately 1500 gallons of inhibited 35% hydrochloric acid is added to the well. The well is then surge-blocked and brushed to force the acid through the screen openings and clean them. The pump is reinstalled.

The acid is then pumped to a holding pit and subsequently through the waste treatment plant.

Satellite Wells: The same process is completed for each of the satellite wells with lessor volumes of chemicals being used.

Additional well water is pumped to the holding pit from the main well to meet conductivity limits; this is subsequently pumped through the wastewater plant.

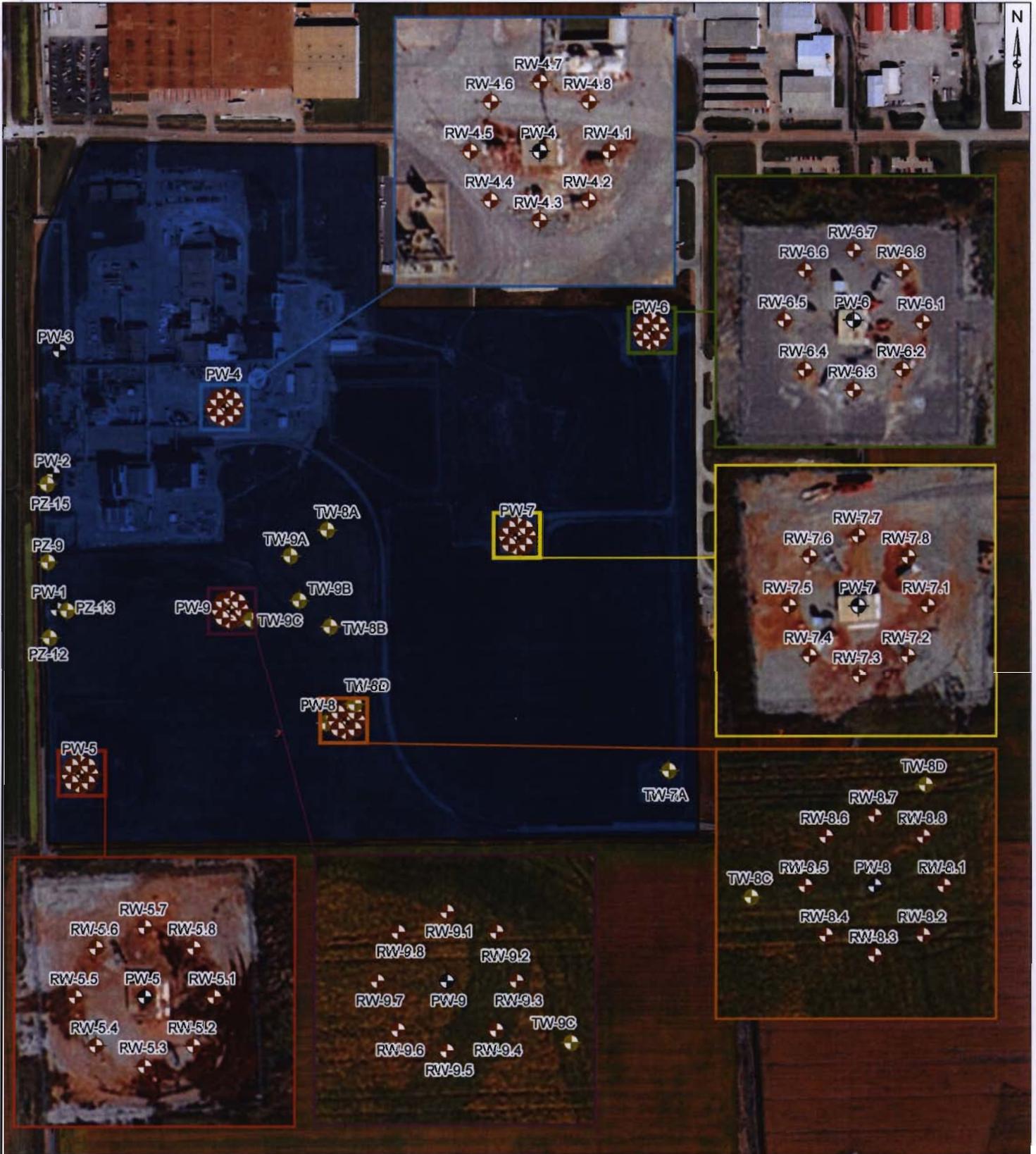
The well is returned to operational status.

7.1 Will the Well Be Cased?

This question is answered in the affirmative. A proposed well log for PW-9 and cross section are provided as Figures 2 and 4. These figures show a silty-clay layer (“gumbo”) above the unconsolidated sand and gravel. The casing is installed to provide structural integrity for the well and to prevent surface infiltration around the borehole. The casing is not required to prevent groundwater flow to or from another water-bearing zone, therefore a permit is not required from the Missouri Geological Survey (formerly known as the Division of Geology and Land Survey).

ATTACHMENTS

Figure 1	Site Map
Figure 2	Production Well 9 Log (Proposed)
Figure 3	Recirculation Well 9.1 through 9.8 Log (Proposed)
Figure 4	Typical Cross Section
Attachment 1	Laboratory Analytical Data
Attachment 2	MSDS for Well Redevelopment Chemicals



Legend

- Test Well/Monitoring Well
- Biokyowa Production Well
- Recirculation Well
- Biokyowa property

500 250 0 500 Feet



Site Map

Biokyowa, Inc.
Cape Girardeau, Missouri

Geosyntec
consultants

Figure

1

Note: All well locations are approximate.

ACTON, MASSACHUSETTS

21 JANUARY 2015

Environmental Analysis South, Inc

4000 East Jackson Blvd. - Jackson MO 63755 - 573-204-8817 - Fax 573-204-8818

Dave Jennings
 BIOKYOWA
 P.O. Box 1550
 Cape Girardeau, MO 63702-1550

Report Number: **128711**

Report of Analysis

Log Number:	Sample Description:	Sample Date:	Sample Received Date:
1802501	Well #8	11/12/2014	11/12/2014

Preparation Methods

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Anions IC Sample Preparation	1	Prep	SM-4110B-00		11/12/14	133
Metals ICP Sample Digestion	1	Prep	EPA-200.7 Rev. 4.4	PDC	12/06/14	

Solids

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Fixed Residue	364	mg/L	SM-2540 E-97		11/10/14	133
Total Dissolved Solids	480	mg/L	SM-2540 C-97		11/10/14	133

Total (Total Recoverable) Trace Metals

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Aluminum by ICP	0.025	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Arsenic by ICP	< 0.005	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Barium by ICP	0.76	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Cadmium by ICP	< 0.0020	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Calcium by ICP	90	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Chromium by ICP	< 0.0020	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Copper by ICP	0.0036	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Iron by ICP	0.49	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Lead by ICP	< 0.005	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Magnesium by ICP	22	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Manganese by ICP	0.24	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Mercury by Cold-Vapor Technique	< 0.0002	mg/L	SM-3112 B-99		11/14/14	133
Potassium by ICP	2.7	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Selenium by ICP	< 0.005	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Silver by ICP	< 0.0020	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Sodium by ICP	28	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	

Environmental Analysis South, Inc

4000 East Jackson Blvd. - Jackson MO 63755 - 573-204-8817 - Fax 573-204-8818

Dave Jennings
BIOKYOWA
P.O. Box 1550
Cape Girardeau, MO 63702-1550

Report Number: 128711

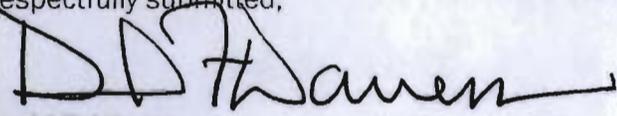
Report of Analysis

Log Number: 1802501 Sample Description: Well #8 Sample Date: 11/12/2014 Sample Received Date: 11/12/2014

Total (Total Recoverable) Trace Metals

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Zinc by ICP	0.011	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	

Respectfully submitted,


David F. Warren

Comments:
G Total coliform absent, escherichia absent.
PDC This parameter or group of analytes was analyzed by the subcontracting lab - PDC Lab Saint Louis, MO

Project Name: BIOKYOWA
Project Number: BR0223

Lab Number: L1202947
Report Date: 02/28/12

SAMPLE RESULTS

Lab ID: L1202947-02
Client ID: PW-06-02162012
Sample Location: CAPE GIRARDEAU, MO
Matrix: Water

Date Collected: 02/16/12 10:30
Date Received: 02/21/12
Field Prep: See Narrative

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	230		mg CaCO3/L	2.0	NA	1	-	02/22/12 10:45	30,2320B	SD
Nitrogen, Ammonia	0.077		mg/l	0.075	--	1	02/22/12 19:00	02/22/12 19:58	30,4500NH3-BH	AT
Phosphorus, Total	0.029		mg/l	0.010	--	1	02/23/12 11:00	02/23/12 15:22	30,4500P-E	SD
Sulfate	25		mg/l	10	--	1	02/22/12 14:25	02/22/12 14:25	1,9038	SD
Total Organic Carbon	1.8		mg/l	0.50	--	1	-	02/24/12 08:43	1,9060	DW
Dissolved Organic Carbon	3.7		mg/l	1.0	--	1	02/22/12 00:30	02/27/12 07:19	1,9060	DW



Location	Latitude DMS	Longitude DMS	UTM15m_X	UTM15m_Y	SPMissouriEastFt_X	SPMissouriEastFt_Y
PW-9	37° 14' 6.8" N	89° 35' 56.9" W	801709.3865	4126388.667	1082465.032	511600.4537
RW-9.1	37° 14' 7.2" N	89° 35' 56.9" W	801709.0238	4126402.388	1082465.032	511645.4537
RW-9.2	37° 14' 7.1" N	89° 35' 56.5" W	801718.8322	4126398.626	1082496.852	511632.2735
RW-9.3	37° 14' 6.8" N	89° 35' 56.3" W	801723.1075	4126389.03	1082510.032	511600.4537
RW-9.4	37° 14' 6.5" N	89° 35' 56.5" W	801719.3452	4126379.221	1082496.852	511568.6339
RW-9.5	37° 14' 6.4" N	89° 35' 56.9" W	801709.7492	4126374.946	1082465.032	511555.4537
RW-9.6	37° 14' 6.5" N	89° 35' 57.3" W	801699.9408	4126378.708	1082433.212	511568.6339
RW-9.7	37° 14' 6.8" N	89° 35' 57.4" W	801695.6656	4126388.304	1082420.032	511600.4537
RW-9.8	37° 14' 7.1" N	89° 35' 57.2" W	801699.4279	4126398.113	1082433.212	511632.2735

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.



REAGENT CHEMICAL & RESEARCH, INC.
115 US Hwy 202 Ringoes, NJ 08551

REVISED DATE: 1/1/2009

VALID UNTIL 1/1/2014

IDENTITY Hydrochloric Acid, 20° or 22° Baume	<i>Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.</i>
--	--

Section I - Product Information

Product Name Hydrochloric Acid	CAS # 7647-01-0
Synonym Muriatic Acid	Chemical Formula HCl
Chemical Name Hydrochloric Acid Solution	Chemical Family Aqueous Inorganic Acid

Section II - Manufacturers Information

Manufacturers Name Reagent Chemical & Research, Inc.	Address 115 US Hwy 202 Ringoes, NJ 08551
Emergency Contact Robert Dritschel	Country United States
Emergency Telephone 1-409-899-3400	Emergency Telephone # CHEMTREC 1-800-424-9300

Section III - Ingredients/Regulatory Information

Substance Description	Percent	CAS #
Hydrogen Chloride	26.00 - 37.00	7647-01-0
Water	63.00 - 74.00	7732-18-5

EXPOSURE LIMITS/REGULATORY INFORMATION

Substance	PEL	TLV	STEL	TWA	CEILING
Hydrogen Chloride	C-7 mg/m3	C-5 ppm	50 ppm	N/D	5 ppm
Water	N/D	N/D	N/D	N/D	N/D

N/D - Not Determined C = Ceiling Level

Section IV - Hazards Identification

Appearance & Odor Clear/Pale Yellow Liquid/Pungent Odor	Statement of Hazards Severe and painful burns upon contact
--	---

Primary Route of Exposure
Skin, eye and inhalation contact are the primary routes of exposure to this product

Inhalation Acute Exposure Effect:
Inhalation of excessive concentrations of Hydrogen Chloride vapors immediately

produces severe irritation of the upper respiratory tract; resulting in coughing, burning of the throat, and a choking sensation. Reactions encountered in man have usually been limited to inflammation occasional ulceration of the nose, throat and larynx. If inhaled deeply, edema of the lungs may occur.

Skin Contact Acute Exposure Effect:
Concentrated solutions are destructive to clothing and on contact with skin, cause: severe burns unless promptly washed off. Repeated skin contact with dilute solution: may lead to the development of dermatitis. Exposure to the concentrated vapors of Hydrogen Chloride may also result in burns and dermatitis.

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Section IV - Hazards Identification (continued)

Eye Contact Acute Exposure Effect:

Contact of the eyes with Hydrogen Chloride, either as a gas or in solution, rapidly causes severe irritation and painful burns of the eyes and eyelids. If the acid is not quickly removed by thorough irrigation with water, there may be prolonged or permanent visual impairment or total loss of sight.

Ingestion Acute Exposure Effect:

When concentrated Hydrochloric Acid is swallowed, it causes severe burns of the mucous membranes of the mouth, esophagus and stomach. The lips and mouth usually turn white, and later brown. There is pain in the throat and stomach, difficulty in swallowing, intense thirst, nausea and in severe cases, collapse and unconsciousness.

Fire and Explosion Hazard:

Non-flammable, but Hydrochloric Acid reacts with all metals, except gold and platinum, with rapid evolution of Hydrogen which is flammable and explosive in air. Firefighters exposed to Hydrochloric Acid vapors should wear Scott Air-Pak, or equivalent. Hydrogen Chloride vapors are extremely irritating to the respiratory tract and may cause breathing difficulty.

Carcinogenicity

IARC ...No OSHA ...No ACGIH ...No

Section V - First Aid Measures

General

If a known exposure occurs or is suspected, immediately initiate the recommended procedures below. Simultaneously contact a physician, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow the advice given. For additional information, call day or night, Reagent Chemical (409) 962-5769 or Chemtrec (800) 424-9300.

Inhalation

Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually-triggered, oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous-flow inhalator, preferably with a physician's advice. Contact a physician immediately.

Eye Contact

Immediately flush the eyes with large quantities of running water for 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eyes and lids with water. DO NOT attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not available.

Section V - First Aid Measures (continued)

Skin Contact

Immediately remove contaminated clothing under a safety shower. Flush all affected areas with large amounts of water for 15 minutes. DO NOT attempt to neutralize with chemical agents. Obtain medical advice.

Ingestion

DO NOT induce vomiting. Immediately give large quantities of water or milk, if available. If vomiting does occur, give fluids again. Never give anything by mouth to an unconscious person. Call a physician of the nearest Poison Control Center

Medical Conditions Generally Aggravated by Exposure

Hydrogen Chloride will aggravate breathing disorders

Note to Physician

Attending Physician should treat exposed patients symptomatically

Section VI - Fire Fighting Measures

Flash Point

N.A.

Flash Method

N.A.

Extinguishing Method

Not Applicable

Unusual Fire and Explosion Hazard:

Non-flammable, but Hydrochloric Acid reacts with metals.

Special Firefighting Procedure:

Non-flammable, but Hydrochloric Acid reacts with all metals, except gold and platinum, with rapid evolution of Hydrogen which is flammable and explosive in air. Firefighters exposed to Hydrochloric Acid vapors should wear Scott Air-Pak, or equivalent. Hydrogen Chloride vapors are extremely irritating to the respiratory tract and may cause breathing difficulty.

Section VII - Accidental Release Measures

Steps to be Taken in Case Material is Released or Spilled

Spills or discharges into the environment involving large quantities of Hydrochloric Acid should be controlled and cleaned-up according to a pre-determined, affirmative written Spill Prevention and Control Program. For assistance in developing a SPCP contact your nearest Reagent Sales Office.

Spills should be handled immediately by neutralization and dilution of the spilled product by the use of Soda Ash (Sodium Carbonate), Lime (Calcium Hydroxide), or Limestone (Calcium Carbonate) with large amounts of water. For an interior (inside a closed space) spill be aware that the use of Soda Ash, Lime and Limestone will evolve heat and carbon dioxide and that ample ventilation must be provided.

Waste Disposal

Under Federal RCRA, it is the responsibility of the user of products to determine, at the time of disposal, whether the product falls under RCRA as a hazardous waste. This is because product uses, transformations, mixtures, etc. may render the resulting end-product hazardous.

Container Disposal

Containers should be cleaned of residual product before disposal. Empty containers should be disposed of in accordance with all applicable laws and regulations.

Section VII - Accidental Release Measures (continued)

Precautions to be Taken in Handling and Storage

Make sure all personnel involved in housekeeping and spill clean-up follow good

Industrial Hygiene practices and wear proper protective equipment.

Section VIII - Handling/Storage/Transportation

Handling

Chemical goggles and full face shield must be worn at all times by personnel

exposed to or handling Hydrochloric Acid. The use of a NIOSH approved cartridge

respirator or a Scott Air-Pak should be used by all personnel exposed.

Storage

Store containers in a cool, dry location away from direct sunlight, sources of

intense heat, or where freezing may occur. Store material in acid-proof container

Keep container tightly closed when not in use. Keep container away from incompatible

materials. All loading, unloading, and storage equipment must be inspected prior to

any transfer operations are initiated.

General Comments

Impervious clothing, gloves, footwear and head gear must be worn at all times

by personnel exposed to or handling Hydrochloric Acid.

Section IX - Exposure Controls/Personal Protection

Respiratory Protection (Specify Type)

Maintain airborne contaminate levels below listed guidelines. Use with adequate

ventilation. Use a mechanical fan or vent area to scrubber.

Ventilator	Local Exhaust	Special
	If PEL exceeded	Vent fumes to appropriate scrubber
	Mechanical (General)	Other
	If PEL exceeded	Not Applicable

Skin Protector

Wear neoprene rubber gloves to minimize skin contact.

Eye Protector

Splash goggles or safety glasses. Face shields are recommended.

Other Protector

Use body protection appropriate for task. An apron or other impermeable body

protection is suggested. Full body chemical protection is recommended for

emergency response procedures.

Applicable Exposure Limits

Other than any exposure limits which may be displayed in Section 3, there are no other

known exposure limits applicable to this product or its components.

Section X - Physical and Chemical Properties

Boiling Point	230 F	Specific Gravity (H2O = 1)	1.13 - 1.19
Vapor Pressure (mm Hg)	50 - 60 mm	Freezing Point	-.12 F to -63 F
Vapor Density (AIR = 1)	N.A.	Density	9.48 - 9.61

Solubility in Water

miscible

Appearance and Odor

Clear/Slightly yellow with a sharp pungent odor

Section XI - Stability and Reactivity

Stability	Unstable	X	Conditions to Avoid Hydrochloric Acid is extremely reactive. Avoid contact with metal surfaces and oxidizing agents.
	Stable		

Section XI - Stability and Reactivity (continued)

Incompatibility (Materials to Avoid)

Hydrochloric Acid is chemically stable when properly contained and handled. It is a strong mineral acid and reacts with many metals and metal oxides and hydroxide: to form the equivalent metal chloride. It reacts with zeolites and other silicious: compounds to form Hydrosilicic Acid; it reacts with carbonates to form Carbon Dioxide and Water. It is oxidized by Oxygen or electrolysis to form Chlorine, a lethal, poisonous gas. It reacts with alkaline compounds to form a neutral salt. It is a hydrolyzing agent for carbohydrates, esters and other compounds. Its reaction with most metals will produce Hydrogen, an explosive gas. Violent reactions will result when Hydrochloric Acid Reacts with acetic anhydride, 2-aminoethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, ethylene diamine, ethylene imine, oleum (fuming sulfuric acid), perchloric acid, beta propiolactone, propylene oxide, sodium hydroxide, sulfuric acid, uranium phosphide and vinyl acetate. This listing is not all-inclusive.

Hazardous Decomposition or By-products

Extreme heat may cause the product to decompose, producing toxic fumes which may include chlorine compounds.

Hazardous Polymerization	May Occur	Conditions to Avoid
	Will Not Occur	Extreme heat and contact with incompatible materials
	X	

Section XII - Toxicological Information

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	Yes	Yes	Yes

Health Hazards (Acute and Chronic)

Hydrogen Chloride, both as a gas and in a solution as Hydrochloric Acid, is a corrosive substance and can cause severe and painful burns on contact with any part of the body or if taken internally. The mucous membranes of the eyes and the upper respiratory tract are especially susceptible to the irritating effects of high atmospheric concentrations of Hydrogen Chloride. The gas or vapor is so penetrating and pungent that when high concentrations do occur, those exposed should immediately leave the contaminated area.

Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Exposure

Exposure to Hydrochloric acid may cause severe burns at the contact point:

Medical Conditions Generally Aggravated by Exposure

Exposure to fumes may aggravate dermatitis and breathing disorders.

Toxicology	Inhalation Data
	Human LCLo - 1300 ppm/30 min
Hydrogen Chloride	Rat LC ₅₀ - 4701 ppm/30 min
	Oral (rabbit) LD ₅₀ - 900 mg/kg
	Mutagenic Effects
	Inhalation: 100 ppm/24 hrs (Chromosome damage)
	Oral: 100 ppm (Chromosome damage)
	Parental: 20 mg (Cytogenic effects)

Section XIII - Ecological Information**Ecological Toxicity**

Animals exposed to hydrochloric acid solution will experience tissue damage, burns and may be killed. Plants contaminated with hydrochloric acid solutions of low pH may be adversely effected or destroyed. High concentrations have been shown to be detrimental to aquatic life. A release into a body of water will kill fish and other aquatic life

Other Ecological Information

Hydrochloric acid is stable and found naturally in the environment. All work practice should be aimed at eliminating environmental contamination.

Chemical Fate Information

Hydrochloric acid is naturally occurring in the environment.

Other Regulatory Information

No other regulatory information is available on this product.

Section XIV - Transportation Information**Regulated Material**

Hydrochloric Acid is defined as hazardous by the US Dot and Transport Canada:

DOMESTIC SHIPPING INFORMATION

Proper Shipping Name	Hydrochloric Acid	Hazard Classification	Corrosive
UN/NA Identification	UN 1789	Hazard Class	Class 8
DOT Labels Required	Corrosive	Packaging Group	II

INTERNATIONAL SHIPPING INFORMATION

Proper Shipping Name	Hydrochloric Acid	Hazard Classification	Corrosive
UN/NA Identification	UN 1789	Hazard Class	Class 8
Labels Required	Corrosive	Packaging Group	II

Section XV - Other Information

Created By Product Safety - 6/1/98	MSDS Revision Number Revision # 006	Dated 1/1/2009
Toxic Substances Control Act TSCA listed 7647-01-0	Superfund Amendment & Reauthorization Act, Title I Hazard Categories	Acute & HEALTH: Chronic
Emergency Planning & Community Right to Know EHS - Threshold Quantity: None		PHYSICAL: None
Is product Regulated Under 1990 Clean Air Act? No	Does Product Contain, or is Manufactured with, CFC's? No	
Reportable Quantity RQ - 5000 lbs	NSF Listing Scale & Corrosion control at maximum 40 mg/l	
National Fire Protection Association (NFPA) Ratings: Health - 3 Flammability - 0 Instability - 0 Other Hazard Information - ACID		
Hazardous Material Identification System (HMIS): Health - 3 Flammability - 0 Physical Hazard - 0 Protective Equipment - X		
Is This Product Regulated Under the EPA's Risk Management Plan No, Hydrochloric Acid Solution under 37% is not regulated.		
North American Emergency Response Guide Book ID # 1789 Guide #157		

Disclaimer of Liability

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Material Safety Data Sheet

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PRODUCT: Sodium Hypochlorite Solution



1. Product and Company Identification

Product Identity: **Sodium Hypochlorite Solution**

Chemical Formula: NaOCl
Molecular Weight: 74.45

Synonyms: Sodium Hypochlorite Solution (10-15.6%); Hypochlorite Solution; Bleach Solution, Hypochlorous acid, sodium salt, &/or AB Bleach; sodium hypochlorite/de-ionized water, Sodium Hypochlorite Solution 10%; Sno-glo Bleach; Hypochlorous acid, sodium salt

Brenntag Mid-South Inc.
1405 Hwy 136 W
Henderson, KY 42420

Technical Information: 270-830-1200
Emergency Number: 800-424-9300 (CHEMTREC)
Emergency Number: 703-5273887 (International)

2. Hazards Identification

PRECAUTIONARY STATEMENTS (Hazards to humans and domestic animals): Danger! Corrosive! May cause severe skin and eye irritation or chemical burns to broken skin. Causes eye damage. Exposure to skin may cause sensitization or other allergic responses.

INHALATION: Corrosive! Product may cause severe irritation of the nose, throat and respiratory tract. Repeated and/or prolonged exposures may cause productive cough, runny nose, bronchopneumonia, pulmonary edema (fluid build-up in lungs), and reduction of pulmonary function. Repeated inhalation exposure may cause impairment of lung function and permanent lung damage.

EYE CONTACT: Extremely corrosive! This product causes corneal scarring and clouding. Glaucoma, cataracts and permanent blindness may occur.

SKIN CONTACT: Corrosive! Concentrated solutions may cause pain and deep and severe burns to the skin. Prolonged and repeated exposure to diluted solutions often causes irritation, redness, pain and drying and cracking of the skin. Human evidence has indicated that an ingredient in this product can cause skin sensitization.

INGESTION: Corrosive! Will immediately cause severe corrosion of and damage to the gastrointestinal tract. Exposure characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration.

PRIMARY ROUTES OF ENTRY: Inhalation and contact.

3. Composition/Information on Ingredients

CAS NUMBER	CHEMICAL NAME(S)	*WT %
7681-52-9	Sodium hypochlorite**	10 – 15.6
1310-73-2	Sodium hydroxide	0.3 – 1.8
7647-14-5	Sodium Chloride	9 – 14.9
497-19-8	Sodium carbonate	≤ 0.5
7732-18-5	Water	Balance

Material Safety Data Sheet

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PRODUCT: Sodium Hypochlorite Solution

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4. First Aid Measures

INHALATION: Remove victim to fresh air. Give artificial respiration if not breathing. Get medical attention.

EYE CONTACT: Wash eyes with plenty of water for at least 15 minutes while holding eyelids open. Consult an eye specialist immediately.

SKIN CONTACT: Flush skin with plenty of water while removing contaminated clothing. Get medical attention for persistent irritation. Clean clothing before reuse.

INGESTION: If swallowed drink large quantities of water. Do NOT induce vomiting. Call a poison control center or doctor immediately for treatment advice. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

5. Fire Fighting Measures

FLASH POINT (METHOD USED): Non - flammable

FLAMMABLE LIMITS (% BY VOLUME): n.a.

EXTINGUISHING MEDIA: Use water spray, fog, foam, dry chemicals, or carbon dioxide.

SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear protective equipment including self contained breathing apparatus. Avoid fumes. Dilute spill with copious amounts of water, ventilate. Be prepared to use respirator.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Possible vigorous reaction upon contamination with organics or oxidizing agents. Bleach decomposes when heated, decomposition products may cause containers to rupture or explode. Many reactions can cause fire and explosion. This material will react with some metals which may cause liberation of oxygen. Toxic fumes can be liberated by contact with acid or heat. Vigorous reactions can occur with oxidizable materials and organics. Keep material cool using a water spray from a safe distance. Keep all unnecessary people away. Stay up wind and stay out of low-lying areas.

6. Accidental Release Measures

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Personnel with proper protective equipment should contain spill. Flush area with large amounts of water. Use reducing agents such as bisulfites or ferrous salt solutions to neutralize.



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 Page 3 of 6
PRODUCT: Sodium Hypochlorite Solution

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store this product in a cool dry area; away from direct sunlight and heat to avoid deterioration. In case of spill, flood areas with large quantities of water. Product or rinsates that cannot be used should be diluted with water before disposal in a sanitary sewer. Do not reuse container. Do not contaminate food or feed by storage, disposal or cleaning of equipment. Most metals and metal alloys are NOT suitable for use in contact with sodium hypochlorite solutions including aluminum, brass, bronze, copper, cast iron, galvanized steel, mild steel, nickel, or stainless steel, since these metals act as a catalyst which will cause rapid decomposition of the sodium hypochlorite solution through the release of oxygen.

Sodium hypochlorite solutions are basically unstable, and on exposure to heat and/or light, will slowly decompose, becoming less concentrated with time. Sodium hypochlorite solutions should never be allowed to contact or mix with acids or other low pH compounds, due to the release of chlorine gas. Do not allow sodium hypochlorite to mix with ammonia, since chloramines may be formed.

Decomposition of sodium hypochlorite takes place within a few seconds with following salts: ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate.

Hypochlorites react with urea to form nitrogen trichloride, which explodes spontaneously in air.

Solutions of sodium hypochlorite are corrosive to the skin, eyes, and mucous membranes. Proper safety equipment should be used when working with or in close proximity of sodium hypochlorite.

OTHER PRECAUTIONS: Use with adequate ventilation. Wash thoroughly after handling. Do not get in eyes, on skin or clothing. Do NOT breathe fumes or mist. Mixing this product with chemicals (e.g. common household cleaners, ammonia, acids, detergents, etc.) or organic matter will release chlorine gas, which is irritating to eyes, lungs, and mucous membranes.

STRONG OXIDIZING AGENT: Mix only with water according to label directions. Mixing this product with chemicals (e.g. common household cleaners, ammonia, acids, detergents, etc.) or organic matter (e.g. urine, feces, etc.) will release chlorine gas, which is irritating to eyes, lungs and mucous membranes.

8. Exposure Controls/Personal Protection

CAS NUMBER	CHEMICAL NAME(S)	*WT %	THRESHOLD LIMIT VALUES (UNITS)			
			OSHA:		ACGIH:	
			PEL	STEL	TLV	STEL
7681-52-9	Sodium hypochlorite**	10 - 15.6	— NONE ESTABLISHED —			
1310-73-2	Sodium hydroxide	0.3 - 1.8	2 mg/m ³ Ceiling	----	2 mg/m ³ Ceiling	----
7647-14-5	Sodium Chloride	9 - 14.9	— NONE ESTABLISHED —			
497-19-8	Sodium carbonate	≤ 0.5	— NONE ESTABLISHED —			
7732-18-5	Water	Balance	— NONE ESTABLISHED —			

** %(w/w) as Cl₂ 9.5 to 14.9% TLV/TWA (ACGIH) 0.5ppm Cl₂; TLV/STEL (ACGIH) 1ppm Cl₂ & PEL (OSHA) 1ppm Cl₂

RESPIRATORY PROTECTION: When fumes present, use NIOSH approved respirator with acid type canister.

VENTILATION: Local exhaust preferable as required to control fumes.

PROTECTIVE GLOVES: Rubber or plastic.

EYE PROTECTION: Chemical goggles.

OTHER PROTECTIVE EQUIPMENT: Clothing to protect skin. Safety shower and eye wash fountain.

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PRODUCT: Sodium Hypochlorite Solution

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9. Physical and Chemical Properties

BOILING POINT °F (°C): 110 °C for 15% NaOCl

VAPOR DENSITY (AIR =1): n.a.

VAPOR PRESSURE (mmHg): Vapor pressure of water plus decomposition products.

SOLUBILITY IN WATER: Complete

SPECIFIC GRAVITY (H₂O=1): 1.08 - 1.27

EVAPORATION RATE: n.a.

PERCENT VOLATILE BY VOLUME (%): Water vapor plus decomposition products.

APPEARANCE AND ODOR: Light, yellow-green liquid

10. Stability and Reactivity

STABILITY: Unstable (Contingent upon temperature, contamination (metals), and pH.)

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Heat, light exposure, decrease in pH, and contamination with heavy metals, such as nickel, cobalt, copper and iron.

INCOMPATIBILITY (MATERIALS TO AVOID): Heavy metals, reducing agents, organics, ether, ammonia, ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, ammonium phosphate, urea and acids.

HAZARDOUS DECOMPOSITION PRODUCTS: Hypochlorous acid, chlorine, hydrochloric acid, sodium chloride, sodium chlorate, and oxygen. Decomposition of sodium hypochlorite takes place within a few seconds with following salts: ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate. Hypochlorites react with urea to form nitrogen trichloride, which explodes spontaneously in air.

11. Toxicological Information

TOXICITY DATA:

Oral LD50: 8,910 mg/kg. (Rats)	Acute dermal toxicity: III; LD50, > 3,000 mg/kg
Dermal LD 50: > 10,000mg/kg. (Rabbits)	Primary eye irritation: I; Corrosive
Inhalation 0.25-hour LC 50: >10.5 mg/l (Rats)	Primary skin irritation: I; Corrosive
Acute oral toxicity: IV; LD50, 192 mg/kg	

SUMMARY: The concentrated solution is corrosive to skin, and a 5% solution is a severe eye irritant. Solutions containing more than 5% available chlorine are classified by DOT corrosive. Toxicity described in animals from single exposures by ingestion includes muscular weakness, and hyperactivity. Repeated ingestion exposure in animals caused an increase in the relative weight of adrenal glands in one study, but no pathological change were observed in two other studies. Long-term administration of compound in drinking water of rats caused depression of the immune system. No adverse changes were observed in an eight-week dermal study of a 1% solution in guinea pigs. Tests in animals demonstrate no carcinogenic activity by either the oral or dermal routes. Tests in bacterial and mammalian cell cultures demonstrate mutagenic activity.

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PRODUCT: Sodium Hypochlorite Solution

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12. Ecological Information

ENVIRONMENTAL HAZARDS: This pesticide is toxic to fish and aquatic organisms. Do not discharge effluents containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact you State Water Board or Regional Office of the EPA.

Acute oral-bobwhite quail: LD50, > 2510 mg/kg
Acute dietary-mallard duck: LC50, > 5220 ppm
Acute dietary-bobwhite quail: LC50, > 5620 ppm
Acute fish-rainbow trout: LC50, 0.18-0.22 mg/l
Acute fish-bluegill sunfish: LC50, 0.44-0.79 mg/l

Acute invertebrate-daphnia: LC50, 0.033-0.048 mg/l
Fathead minnows: 96-hour LC50, 5.9 mg/LO
Rainbow Trout: 96-hour LC50, 0.2mg/liter
Bluegill sunfish: 96-hour LC50, 0.58mg/liter

13. Disposal Considerations

WASTE DISPOSAL METHOD: Disposal is to be in accordance with all Federal, State, and Local regulations.

14. Transport Information

PROPER SHIPPING NAME: Hypochlorite Solutions

HAZARD CLASS: 8 (Corrosive)

UN/NA: UN 1791

PACKING GROUP: III

D.O.T. LABEL REQUIRED: Corrosive

REPORTABLE QUANTITY OF PRODUCT: 800 to 2,000 lbs.

15. Regulatory Information

TSCA (Toxic Substance Control Act): All components of this product are listed on the TSCA inventory.

CERCLA AND SARA REGULATIONS, 40 CFR §300-373:

Super fund Reportable Discharge = 100 pounds (100% NaOCl) CERCLA Hazardous Material: yes

SARA Extremely Hazardous substance: No

SARA Toxic Chemical: No

Title III Hazard Classifications: Acute: yes Chronic: yes Fire: no Reactivity: yes Pressure: No

EPA "CLEAN AIR ACT": This product does not contain nor is it manufactured with ozone depleting substances.

OTHER REGULATIONS/LEGISLATION THAT APPLY TO THIS PRODUCT: Massachusetts, Pennsylvania, and New Jersey Right-to Know Laws.

Product #: 497765 Name: SOD HYPOCHLORITE 10% Desc:
From: BRENNTAG MID-SOUTH INC. To: BIOKYOWA Monday, February 28, 2011

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PRODUCT: Sodium Hypochlorite Solution

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16. Other Information

HMIS HAZARD RATING: Health 3

Flammability 0

Reactivity 2

VOC CONTENT (lbs/gal): n.a.

This MSDS is provided as an information resource only. It should not be taken as a warranty or representation for which Brenntag assumes legal liability. While Brenntag believes the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its identity. The buyer assumes all responsibility for using and handling the product in accordance with applicable international, federal, state, and local regulations.

Brenntag Mid-South Inc.
1405 Hwy 136 W
Henderson, KY 42420

PREPARED BY: *[Signature]*

APPROVED BY: *[Signature]*

C:\RD1\WORD\MSDS\SOD HYPOCHLORITE

RECEIVED

FEB 4 2015



MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM WATER POLLUTION BRANCH
P.O. BOX 176, JEFFERSON CITY, MO 65102
FORM UIC – APPLICATION FOR WATER PROTECTION PROGRAM

FOR AGENCY USE ONLY	
CHECK NO.	
DATE RECEIVED	FEE SUBMITTED

PART A – DO NOT ATTEMPT TO COMPLETE THIS FORM BEFORE READING THE ACCOMPANYING INSTRUCTIONS.

1.00 ACTION REQUESTED

Construction Permit Application Operating Permit Application

2.00 FACILITY INFORMATION

FACILITY NAME Biokyowa Inc (Well 9 Recirculation Wells)	TELEPHONE NUMBER 573-335-4849
--	----------------------------------

ADDRESS 5469 Nash Road Cape Girardeau, MO 63701	FAX NUMBER
--	------------

2.1 CONSTRUCTION PERMIT NUMBER, IF APPLICABLE

2.2 OPERATING PERMIT NUMBER, IF APPLICABLE

2.3 FACILITY LOCATION (ATTACH A 1" = 2000' SCALE USGS TOPOGRAPHIC MAP SHOWING LOCATION)

¼, ¼, Sec. 27, TOWNSHIP 30, RANGE 13, COUNTY Cape Girardeau

3.00 OWNER INFORMATION

OWNER NAME Kyowa Hakko Bio	TELEPHONE NUMBER 573-335-4849
-------------------------------	----------------------------------

ADDRESS P.O. Box 1550, 5469 Nash Road, Cape Girardeau, MO 63701	FAX NUMBER
--	------------

4.00 CONTINUING AUTHORITY INFORMATION

NAME Kyowa Hakko Bio	TELEPHONE NUMBER 573-335-4849
-------------------------	----------------------------------

ADDRESS P.O. Box 1550, 5469 Nash Road, Cape Girardeau, MO 63701	FAX NUMBER
--	------------

5.00 FACILITY CONTACT INFORMATION

NAME Dave Jennings	TITLE Superintendent of Environmental Affairs	TELEPHONE NUMBER 573-335-4849 x 127
-----------------------	--	--

6.00 GENERAL INFORMATION

6.1 BRIEF DESCRIPTION OF PURPOSE OF INJECTION. INCLUDE ANALYSES AND CONCENTRATIONS OF ANY POLLUTANTS TO BE REMEDIATED. (ATTACH A SEPARATE SHEET IF NECESSARY)

This application is for the pumping and reinjection of groundwater in eight recirculation wells (RW-9.1 through RW-9.8) associated with insitu iron and manganese treatment for Production Well 9 (PW-9) and occasional temporary introduction of well cleaning chemicals into the recirculation wells for the purpose of redeveloping well screens and gravel pack. (See attached).

6.2 BRIEF DESCRIPTION OF FACILITIES TO ACCOMPLISH INJECTION. ATTACH A SIMPLIFIED GEOLOGIC CROSS SECTION SHOWING DEPTH OF BEDROCK, DEPTH OF AQUIFERS, AND DEPTH OF INJECTION. ALSO ATTACH MATERIAL SAFETY DATA SHEETS FOR EACH OF THE INJECTED MATERIALS. IF INJECTION WELL IS TO BE CASED, PROVIDE SCHEMATIC.

See attached.

6.3 IF BIOLOGICAL AGENTS ARE TO BE INTRODUCED IN THIS PROCESS, A BIOLOGICAL PROFILE AND LITERATURE RESEARCH MUST BE SUBMITTED WITH THIS APPLICATION.

6.4 WILL THIS PROCESS INVOLVE A HAZARDOUS WASTE AS DEFINED IN 10 CSR 25-4.010?

YES NO

6.5 WILL THIS PROCESS RESULT IN DISCHARGE TO SURFACE WATER?

YES NO If yes, an NPDES permit must be obtained.

6.00 GENERAL INFORMATION (CONTINUED)

6.6 HOW MANY TOTAL POUNDS OF CHEMICALS OR BIOLOGIC MATERIALS WILL BE INJECTED?
 Recirculation - only atmospheric oxygen added. See attached for description of well cleaning process.

6.7 IF THIS INJECTION IS INTO AN AQUIFER, HOW WILL THE INJECTED CHEMICALS BE WITHDRAWN OR REDUCED TO INJECTION LEVELS?
 Chemicals will be introduced, the wells will be mechanically surged, and the wells will be pumped to the facility's wastewater treatment plant prior to discharge under Missouri State Operating Permit No. 0101729.

6.8 IF THE CHEMICALS OR BIOLOGIC AGENTS TO BE INJECTED ARE ALREADY PRESENT IN THE GROUNDWATER, GIVE CONCENTRATIONS:

CHEMICAL/BIOLOGIC AGENT	PRE-INJECTION CONCENTRATION (mg/L)
1. Sodium Hypochlorite	12%
2. Hydrochloric Acid, inhibited.	35%
3. 3.	

7.00 OTHER WELL TYPES ON SITE

YES	NO	TYPE	# AT LOCATION	WELL STATUS		
				ACTIVE	INACTIVE PLUGGED	INACTIVE NOT PLUGGED
<input type="checkbox"/>	<input checked="" type="checkbox"/>	ABANDONED WATER WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AQUIFER RECHARGE WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AQUIFER REMEDIATION WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AUTOMOBILE SERVICE STATION DISPOSAL WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	GROUND SOURCE HEAT PUMP (OPEN LOOP)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	IMPROVED SINKHOLE		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	INDUSTRIAL DRAINAGE WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	MINE BACKFILL WELL		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	SEPTIC TANK WITH LATERAL FIELD THAT HAS THE POTENTIAL TO BE USED BY MORE THAN 20 PEOPLE PER DAY.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	OTHER Water Supply/recirculation wells	8/40	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7.1 WILL INJECTION WELLS BE CASED?
 YES NO
 IF YES, A PERMIT MAY BE REQUIRED FROM THE DIVISION OF GEOLOGY AND LAND SURVEY, P.O. BOX 250, ROLLA, MO 65402-0250 OR CALL (573) 368-2143.

8.00 SIGNATURE INFORMATION

NAME AND OFFICIAL TITLE (TYPE OR PRINT) James Bannantine, Missouri PG# 2012027233	TELEPHONE NUMBER 262-834-0227
SIGNATURE <i>James E Bannantine</i>	DATE SIGNED 27 January 2015



9.00 DATA

9.1 THIS SECTION MUST BE COMPLETED IF INJECTION IS INTO AN AQUIFER, IT MUST BE COMPLETED PRIOR TO INJECTION, AT LEAST ONE ANALYSIS MUST BE PERFORMED FOR EACH POLLUTANT LISTED. IF INJECTION IS NOT TO AN AQUIFER, SKIP AND GO TO PART 9.2.

POLLUTANT	MAXIMUM DAILY VAULE	
	CONCENTRATION	MASS
Biochemical Oxygen Demand (BOD)		
Chemical Oxygen Demand (COD)		
Total Organic Carbon (TOC)	1.8 mg/l	
Ammonia as N	0.077 mg/l	
Flow	VALUE no net flow during recirculation (530 gpm in/530 gpm out)	
Temperature (winter)	VALUE 50	
Temperature (summer)	VALUE 70	
pH	MINIMUM <2 during acid addition	MAXIMUM >10 during sodium hypochlorite addition

9.2 MARK "X" IN COLUMN (a) FOR EACH POLLUTANT YOU KNOW OR HAVE REASON TO BELIEVE IS PRESENT. MARK "X" IN COLUMN (b) FOR EACH POLLUTANT YOU BELIEVE TO BE ABSENT. IF YOU MARK COLUMN (a) FOR ANY POLLUTANT, YOU MUST PROVIDE THE RESULTS OF AT LEAST ONE ANALYSIS FOR THAT POLLUTANT. COMPLETE ONE TABLE FOR EACH WELL. SEE THE INSTRUCTIONS FOR ADDITIONAL DETAILS AND REQUIREMENTS.

POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
Bromide (24959-67-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Total Residual Chloine	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Color	<input checked="" type="checkbox"/>	<input type="checkbox"/>	20	
Fecal Coliform	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Absent	
Floride (16984-48-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.293 mg/l	
Nitrate/Nitrite (as N)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.020 mg/l	
Nitrogen, Total Organic (as N)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Oil and Grease	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Total Phosphorus (as P) (7723-14-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Radioactivity	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Alpha, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Beta, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Radium, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
Sulfate (as SO ⁴) (14808-79-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	31.7 mg/l	
Sulfide (as S)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Sulfite (as SO ³)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Surfactants	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Aluminum, Total (7429-90-5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.025 mg/l	
Barium, Total (7440-39-3)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.76 mg/l	
Boron, Total (740-42-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Cobalt, Total (7440-48-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Iron, Total (7439-89-6)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.49 mg/l	
Magnesium, Total (7439-95-4)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	22 mg/l	
Molybdenum, Total (7439-98-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Manganese, Total (7439-96-5)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.24 mg/l	
Tin, Total (7440-31-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Titanium, Total (7440-32-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
METALS, CYANIDE, AND TOTAL PHENOLS				
1M. Antimony, Total (7440-36-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2M. Arsenic, Total (7440-38-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.005	
3M. Beryllium, Total (7440-41-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4M. Cadmium, Total (7440-43-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0002 mg/l	
5M. Chromium, Total (7440-47-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0002 mg/l	
6M. Copper, Total (7550-50-8)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0.0036 mg/l	
7M. Lead, Total (7439-97-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.005 mg/l	
8M. Mercury, Total (7439-97-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0002 mg/l	
9M. Nickel, Total (7440-02-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10M. Selenium, Total (7782-49-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.005 mg/l	
11M. Silver, Total (7440-22-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<0.0020 mg/l	
12M. Thallium, Total (7440-28-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13M. Zinc, Total (7440-66-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14M. Cyanide, Total (57-12-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15M. Phenols, Total	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
GC/MS FRACTION - VOLATILE COMPOUNDS				
1V. Acrolein (107-02-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2V. Acrylonitrile (107-13-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3V. Benzene (71-43-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4V. Bis (Chloromethyl) Ether (542-88-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5V. Bromoform (75-25-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6V. Carbon Tetrachloride (56-23-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7V. Cholorezene (108-90-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
8V. Cholodibromomethane (124-48-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9V. Chloroethane (75-00-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10V. 2-Chloroethylvinyl Ether (110-75-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11V. Chloroform (67-66-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
12V. Dichlorobromomethane (75-27-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13V. Dichlorodifluoromethane (75-71-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14V. 1,1 – Dichloroethane (75-34-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15V. 1,2 – Dichloroethane (107-06-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
16V. 1,1 – Dichloroethylene (75-35-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
17V. 1,2 – Dichloropropane (78-87-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
18V. 1,2 – Dichloropropylene (542-75-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
19V. Ethylbenzene (100-41-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
20V. Methyl Bromide (74-83-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
21V. Methyl Chloride (74-87-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
22V. Methylene Chloride (75-09-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
23V. 1,1,2,2 – Tetrachloroethane (79-35-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
24V. Tetrachloroethylene (127-18-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
25V. Toluene (106-88-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
26V. 1,2 – Trans Dichloroethylene (156-60-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
27V. 1,1,1 – Trichloroethane (71-55-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
28V. 1,1,2 – Trichloroethane (79-00-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
29V. Trichloroethylene (79-01-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
30V. Trichlorofluoromethane (75-89-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
31V. Vinyl Chloride (75-01-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
GS/MS FRACTION – ACID COMPOUNDS				
1A. 2 – Chloropheno (95-57-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2A. 2,4 – Dichlorophenol (120-83-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3A. 2,4 – Dimethylphenol (105-67-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4A. 4, 6 – Dinitro – O – Cresol (534-52-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5A. 2,4 – Dinitrophenol (51-28-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6A. 2 – Nitrophenol (88-75-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7A. 4 – Nitrophenol (100-82-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
8A. P – Chloro – M – Cresol (59-50-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9A. Pentachlorophenol (87-86-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10A. Phenol (106-95-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11A. 2,4,6 – Trichlorophenol (88-06-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS				
1B. Acenaphthene (83-32-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2B. Acenaphthylene (208-96-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3B. Anthracene (120-12-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4B. Benzidine (92-87-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5B. Benzo (a) Anthracene (56-55-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6B. Benzo (a) Pyrene (50-32-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7B. 3,4 - Benzofluoranthene (205-99-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
8B. Benzo (ghi) Perylene (191-24-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9B. Benzo (k) Fluoranthene (207-08-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10B. Bis (2-Chloroethoxy) Methane (111-91-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11B. Bis (2-Chloroethyl) Ether (111-44-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
12B. Bis (2-Chloroisopropyl) Ether (39638-32-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14B. 4-Bromophenyl Phenyl Ether (101-55-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15B. Butyl Benzyl Phthalate (85-68-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
16B. 2-Chloronaphthalene (91-58-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
17B. 4-Chloronaphenyl (7005-72-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
18B. Chrysene (218-01-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
19B. Dibenzo (a,h) Anthracene (53-70-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
20B. 1,2 - Dichlorobenzene (95-50-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
21B. 1,3 - Dichlorobenzene (541-73-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
22B. 1,4 - Dichlorobenzene (106-46-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
23B. 3,3 - Dichlorobenzidine (91-94-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
24B. Diethyl Phthalate (84-66-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
25B. Dimethyl Phthalate (113-11-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
26B. Di-N-Butyl Phthalate (84-74-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
27B. 2,4 - Dinitrotoluene (121-14-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
28B. 2,6 - Dinitrotoluene (606-20-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
29B. Di - N - Octyl Phthalate (117-84-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
31B. Fluoranthene (206-44-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
32B. Fluorene (86-73-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
33B. Hexachlorobenzene (118-71-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
34B. Hexachlorobutadiene (87-68-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
35B. Hexachlorocyclopentadiene (77-47-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
36B. Hexachloroethane (67-72-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
37B. Indeno (1,2,3-c,d) Pyrene (193-39-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

9.00 DATA (CONTINUED)				
POLLUTANT AND CAS. NO. (IF AVAILABLE)	MARK "X"		MAXIMUM DAILY VALUE	
	(a) PRESENT	(b) ABSENT	CONCENTRATION	MASS
GC/MS FRACTION – BASE/NEUTRAL COMPOUNDS (CONTINUED)				
38B. Isophorone (78-59-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
39B. Napthalene (91-20-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
40B. Nitrobenzene (98-95-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
41B. N-Nitrosodimethylamine (62-75-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
42B. N-Nitrosodi-N-Propylamine (621-64-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
43B. N-Nitrosodiphenylamine (83-30-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
44B. Phenanthrene (85-01-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
45B. Pyrene (129-00-0)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
46B. 1,2,4 – Trichlorobenzene (120-82-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
GC/MS FRACTION - PESTICIDES				
1P. Aldrin (309-00-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2P. α -BHC (319-84-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
3P. β -BHC (319-85-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
4P. γ -BHC (58-89-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
5P. δ -BHC (319-86-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
6P. Chlordane (57-74-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
7P. 4,4 – DDT (50-29-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
8P. 4,4 – DDE (72-55-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
9P. 4,4 – DDD (72-54-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
10P. Dieldrin (60-57-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
11P. α -Endosulfan (115-29-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
12P. β -Endosulfan (115-29-7)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
13P. Endosulfan (1031-07-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
14P. Endrin (72-20-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
15P. Endrin (7421-93-4)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
16P. Heptachlor (76-44-8)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
17P. Heptachlor Epoxide (1024-57-3)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
18P. PCB-1242 (53469-21-9)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
19P. PCB-1254 (11097-69-1)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
20P. PCB-1221 (11104-28-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
21P. PCB-1232 (11141-16-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
22P. PCB-1248 (12672-29-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
23P. PCB-1260 (11096-82-5)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
24P. PCB-1016 (12674-29-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
25P. Toxaphene (8001-35-2)	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
DIOXIN				
2,3,7,8 – Tetrachlorodibenzo-P-Dioxin (1764-01-6)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	DESCRIBE RESULTS	

INSTRUCTIONS FOR FORM UIC – APPLICATION FOR CLASS V PERMIT

Please read these instructions carefully before completing the application. Send a signed application along with appropriate permit fee to the Water Protection Program, Water Pollution Branch, PO Box 176, Jefferson City, MO 65102. Please make your check payable to State of Missouri.

1.0 ACTION REQUESTED

Construction Permit Application – Check only if the application is for a permit to construct an injection/recovery well system.
Operating Permit Application – Check only if the application is for a permit to operate an injection/recovery well system.
Operating Permit Renewal Application – Check only if the application is for a renewal of an existing permit.

2.0 FACILITY INFORMATION

Name – The site-specific name of the facility where the injection/recovery operation is to be conducted.

Address – Physical address of the site-specific facility.

2.1 Construction Permit Number – provide the UIC construction permit number that the injection/recovery system was constructed under, if this application is for an operating permit for the same facility.

2.2 Operating Permit Number – include only the facility's NPDES or UIC permit number(s) if one or more are in effect. If multiple Class V permits are presently in effect, attach a separate list.

2.3 Facility Location – provide location data.

3.0 OWNER INFORMATION

Name the individual, institution, agency or corporation that owns the facility.

4.0 CONTINUING AUTHORITY INFORMATION

Name the permanent organization that will serve as the continuing authority for the operation, maintenance, and modernization of the facility.

5.0 FACILITY CONTACT

Name the individual within the facility, or operator, most able to supply information about the direct operation of the injection/recovery operation.

6.0 GENERAL INFORMATION

6.1 Purpose of injection/recovery – attach separate pages if needed. Include all or portions of an engineering report containing information needed by the owner, continuing authority, and the Department of Natural Resources to fully describe the purpose of the injection/recovery system.

6.2 Description of the injection/recovery process – attach separate pages if needed. Include all or portions of the engineering report required by #2 above, or submit a separate detailed description of all elements or the product, treatment and injection system required to allow the owner, continuing authority or the Department of Natural Resources to adequately review the system.

The geologic report should contain, at a minimum: a description of the injection/recovery well pattern; a description of the injection zone including details of lithology, hydrology, and unique features of the injection zone and relevant formation; injection and recovery timeframes; systems of transporting, storing, mixing, metering, and introducing injection materials; recovery fluid gathering systems, treatment or recycling, and disposal systems.

6.3 Biological Agents – list and describe all biological agents to be injected, including: scientific names; whether or not the agents are native to the formations involved; list of available literature relevant to the use of the agents for the injection operation; their population and nutrient dynamics under proposed operating conditions; discussion and supporting literature regarding potential health and/or environmental impacts of the agents and their metabolites in and downgradient of the injection zone; and after completion of the operation; results of laboratory tests conducted by or for the facility relevant to the injection/recovery operation.

6.4 Hazardous Waste – will the process involve hazardous wastes as defined by federal and state hazardous waste laws?

6.5 Surface Discharge – if needed, contact the Water Protection Program, Water Pollution Branch for a State Operating Permit application at least 180 days prior to any planned discharge.

6.6 Give total estimated amounts of materials to be injected.

6.7 Describe how injected chemicals will be withdrawn to pre-injection levels.

6.8 Provide analytical data on the pre-injection concentrations of substances to be injected, if these substances are already present in the groundwater. Examples: manganese, if potassium permanganate is injected; or BOD, if a biological agent is to be injected.

INSTRUCTIONS FOR FORM UIC – APPLICATION FOR CLASS V PERMIT (CONTINUED)

7.0 OTHER WELL TYPES ON SITE

If there are existing wells already on site, give the type, number at location and status.

8.0 SIGNATURE

The application **must** be signed by a geologist registered in the State of Missouri or other groundwater professional registered in the State of Missouri.

9.0 DATA

- 9.1 This section must be completed if injection is into an aquifer. It must be completed prior to injection. At least one (1) analysis must be completed for each pollutant listed.
- 9.2 Mark an "X" for each pollutant believed to be present or absent in groundwater. If present, at least one (1) analysis must be completed for that pollutant.

ADDITIONAL FORMS

To apply for termination of this permit, you must submit a completed Form J. Also attach analyses from samples taken after project completion. These analyses must indicate that concentrations of remediated pollutants have not increased from pre-project concentrations.

Memorandum

RECEIVED

FEB 4 2015

Date: 23 January 2015

To: Missouri Department of Natural Resources
Water Protection Program Water Pollution Branch

Copies to: Dave Jennings, Biokyowa, Inc.

From: Peter King, Geosyntec Consultants, Inc.
James Bannantine, PG, Geosyntec Consultants, Inc.

Subject: Supporting Information for Form UIC – Application for a Class V Permit
Biokyowa, Inc., 5469 Nash Road, Cape Girardeau, MO 63701
Recirculation Wells (RW-9.1 through RW-9.8)
Construction Permit Application

WATER PROTECTION PROGRAM

INTRODUCTION

This memorandum provides supporting information to accompany the application for a Class V Construction Permit Application for eight proposed recirculation wells (RW-9.1 through RW-9.8) that will provide in-situ treatment for a proposed production well (PW-9) at the Biokyowa facility, 5469 Nash Road, Cape Girardeau (Figure 1). It is our understanding that the construction of the recirculation wells requires a Class V permit because the recirculation wells will be used to recirculated aerated groundwater and the recirculation wells will require periodic chemical redevelopment to maintain their efficiency. We also understand that the proposed production well (PW-9) will also require a Class V permit to construct. A memorandum and application for the production well will be provided as a separate submittal. Form UIC – Application for a Class V Permit (MO 780-1826 (08-11)) has been completed for RW-9.1 through RW-9.8 and is provided as Attachment 2 of the Memorandum. The following sections supplement this application.

SECTION 6.1 Brief Description of Purpose of Injection. Include analyses and concentrations of any pollutants to be remediated.

This application is for:

1. The injection of aerated water for the purpose of providing in-situ iron treatment for PW-9 and,

2. The occasional temporary introduction of well cleaning chemicals into the recirculation wells for the purpose of redeveloping well screens and gravel pack.

Aerated water is recirculated in the aquifer around the production well to stimulate naturally occurring bacteria to facilitate the precipitation of iron and manganese in the formation. This treatment reduces the dissolved iron and manganese in the water withdrawn by the main production well. The recirculation is accomplished as follows:

The treatment at this production well consists of eight recirculation wells divided into four pairs. Each pair of wells is connected to a treatment unit that aerates the incoming water from one of the paired wells, then redistributes the aerated water to the other well in the pair. Groundwater is pumped from one recirculation well at a rate of between 450 and 530 gallons per minute (gpm) into a treatment unit. The aerated water then flows via gravity into the non-pumping recirculation well for a period of approximately 10 hours. After a short rest period with neither well pumping, the well that had just been recharged becomes the active pumping well and the former pumping well becomes the recharge well. This alternating pumping and recharging provides an even distribution of aerated water in the formation around the production well, creating a treatment zone around the central production well.

The recirculation wells at this site have been redeveloped on an annual or semi-annual basis to remove mineral and biological deposits from the well screens, gravel pack, and adjacent formation. The redevelopment is accomplished via mechanical means (surging and pumping) combined with chemical means (acid - typically hydrochloric and/or sodium hypochlorite). Typically, the well pump is removed and surge blocks are used to agitate the water in the well to remove loose debris. Chemicals are introduced into the well, surged and then pumped out of the well into a dedicated wastewater line that directs the discharge to the facility's holding tanks and wastewater treatment facility. The well is pumped to the wastewater plant until chlorine residual has been removed and pH has returned to the background pH. The spent redevelopment fluid is treated in the on-site wastewater treatment plant prior to discharge in accordance with Missouri State Operating Permit No. 0101729.

6.2 Brief Description of Facilities to Accomplish Injection

This permit is to allow the injection of aerated groundwater associated with the in-situ treatment and injection of chemicals to assist with periodic redevelopment of a proposed groundwater recirculation wells on the Biokyowa property in the Mississippi River Alluvial Valley (MRAV) in the southeastern lowlands of Missouri. The alluvial deposits in this area cover approximately 3,600 square miles with a maximum thickness of 250 feet in some areas. The site consist of silts and clays ("gumbo") to a depth of approximately 25 feet below ground surface (ft bgs) that is underlain by alluvium comprised of sands and gravels that were deposited in layers to a depth of 115 to 125 ft bgs. The MRAV aquifer is used for municipal, industrial and agricultural purposes and is capable of supporting yields at this site in excess of 3,500 gallons per minute (gpm). The Site location is shown on Figure 1. A conceptual well log for PW-9 is shown as Figure 2 and a

conceptual well log for a typical recirculation well is shown as Figure 3. A typical cross section summarizing the Site geology is shown as Figure 4.

The recirculation wells will be redeveloped by introducing chemicals and water down a tremie pipe to reach the well screen, which is approximately 70 to 120 feet below ground surface. The chemicals will be delivered via drums or tanker to the well head. The spent chemicals will be pumped from the wells as part of the redevelopment processes into a dedicated wastewater line that will deliver the liquid to the on-site treatment facility.

A typical redevelopment consists of the following:

Recirculation Well: Approximately 25 gallons of 12% Sodium Hypochlorite is added to the well. This is surged inside the well casing for an 8 hour period to remove bacterial contamination. This volume is then pumped to a holding pit until chlorine and pH are within acceptable limits and the water is subsequently passed to the waste treatment plant.

The pump is removed and approximately 150 gallons of inhibited 35% hydrochloric acid is added to the well. The well is then surge-blocked and brushed to force the acid through the screen openings and clean them. The pump is reinstalled.

The acid is then pumped to a holding pit and subsequently through the waste treatment plant.

Additional well water is pumped to the holding pit from the recirculation well to meet conductivity limits; this is subsequently pumped through the wastewater plant.

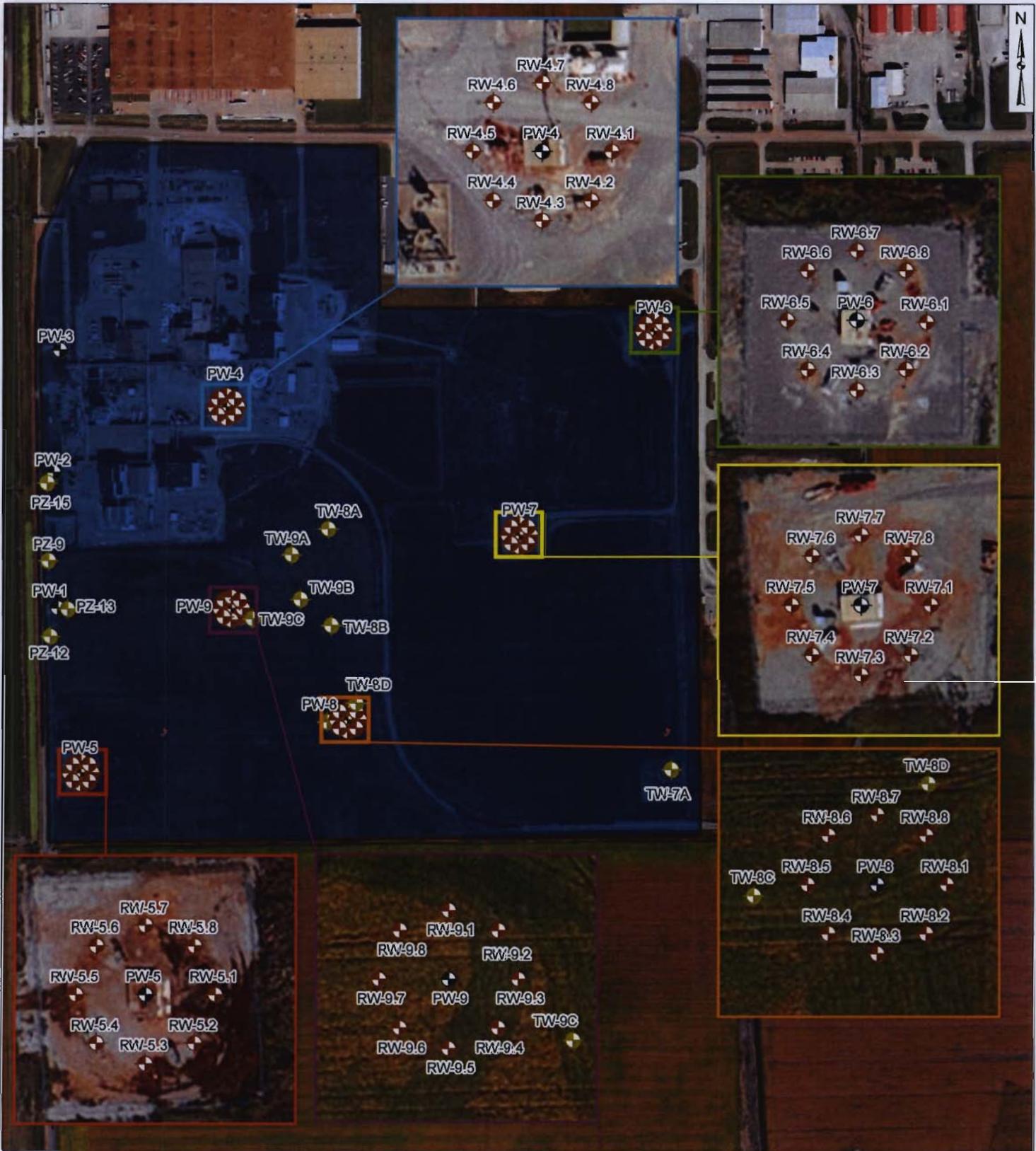
The well is returned to operational status.

7.1 Will the Well Be Cased?

This question is answered in the affirmative. A proposed well log for RW-9x and cross section are provided as Figures 3 and 4. These figures show a silty-clay layer ("gumbo") above the unconsolidated sand and gravel. The casing is installed to provide structural integrity for the well and to prevent surface infiltration around the borehole. The casing is not required to prevent groundwater flow to or from another water-bearing zone, therefore a permit is not required from the Missouri Geological Survey (formerly known as the Division of Geology and Land Survey).

ATTACHMENTS

Figure 1	Site Map
Figure 2	Production Well 9 Log (Proposed)
Figure 3	Recirculation Well 9.1 through 9.8 Log (Proposed)
Figure 4	Typical Cross Section
Attachment 1	Laboratory Analytical Data
Attachment 2	MSDS for Well Redevelopment Chemicals



Legend

- Test Well/Monitoring Well
- Recirculation Well
- Biokyowa Production Well
- Biokyowa property



Site Map

Biokyowa, Inc.
Cape Girardeau, Missouri

Geosyntec[®]
consultants

Figure

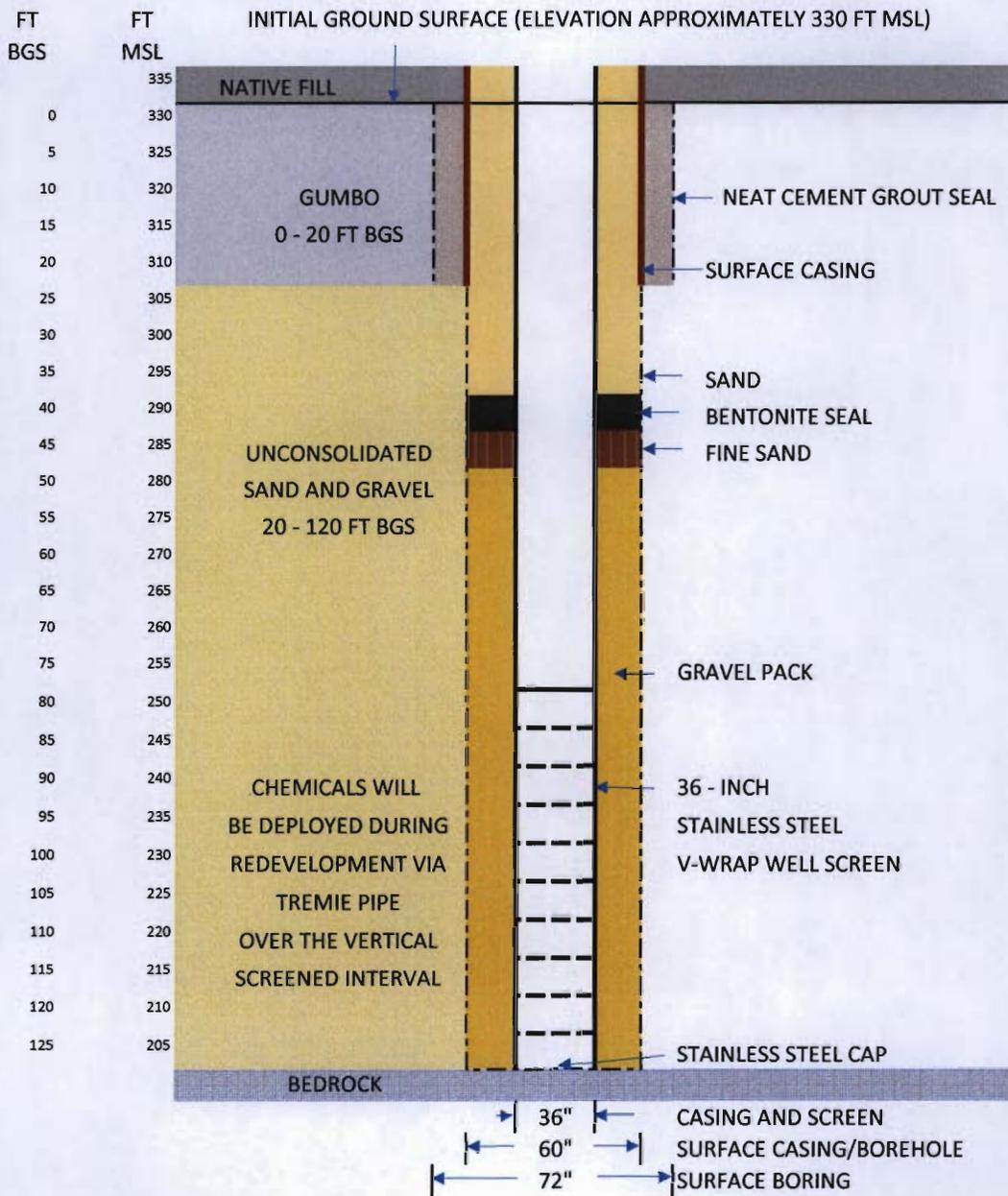
1

Note: All well locations are approximate.

ACTON, MASSACHUSETTS

21 JANUARY 2015

BIOKYOWA, INC.
5469 NASH ROAD
CAPE GIRARDEAU, MISSOURI
PRODUCTION WELL 9 LOG (PROPOSED)



NOTES:

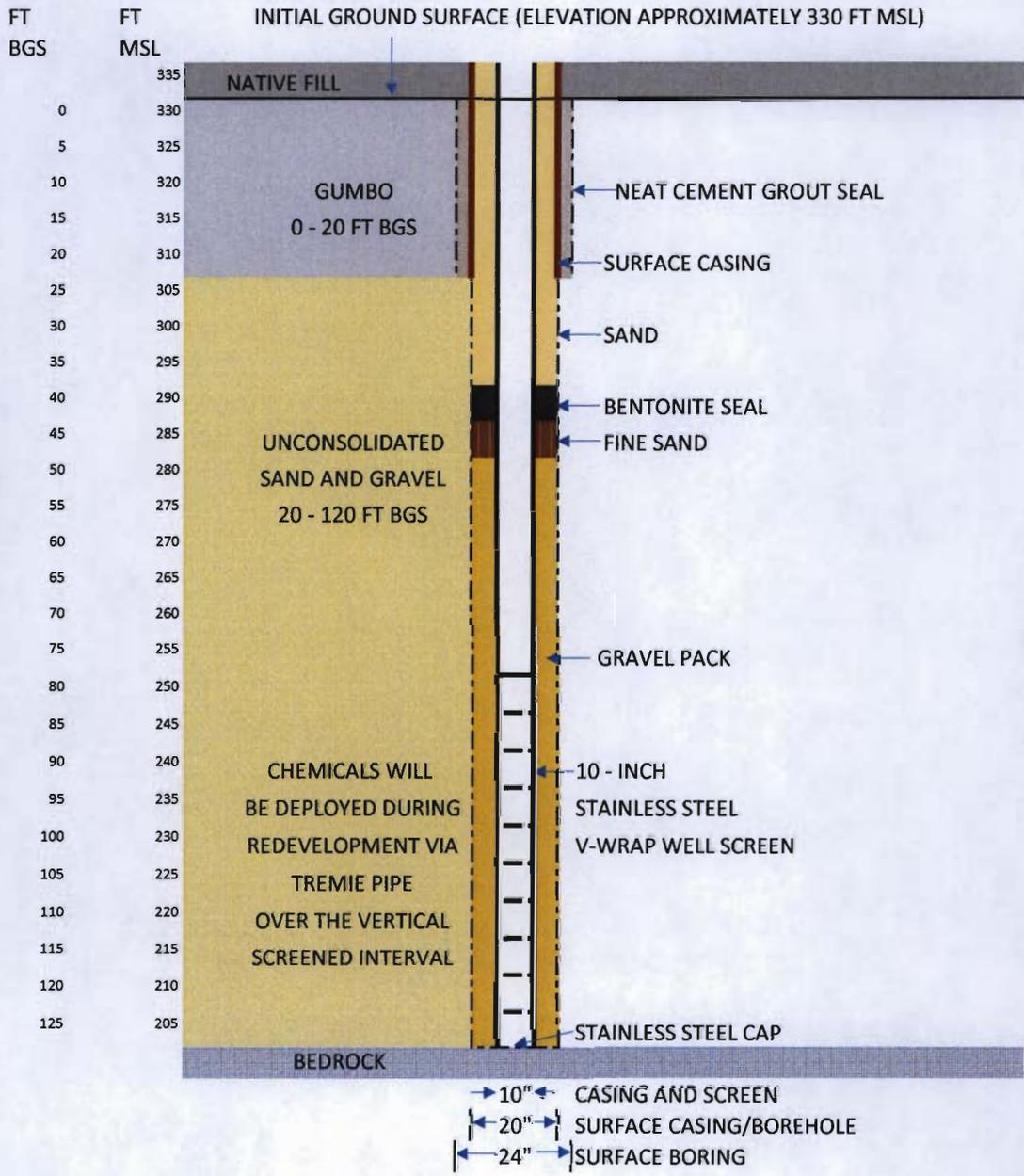
FT BGS FEET BELOW GROUND SURFACE
 FT MSL FEET ABOVE MEAN SEA LEVEL
 SCALE NOT TO SCALE

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FIGURE
2

BIOKYOWA, INC.
5469 NASH ROAD
CAPE GIRARDEAU, MISSOURI
RECIRCULATION WELL 9.1 THROUGH 9.8 LOG (PROPOSED)

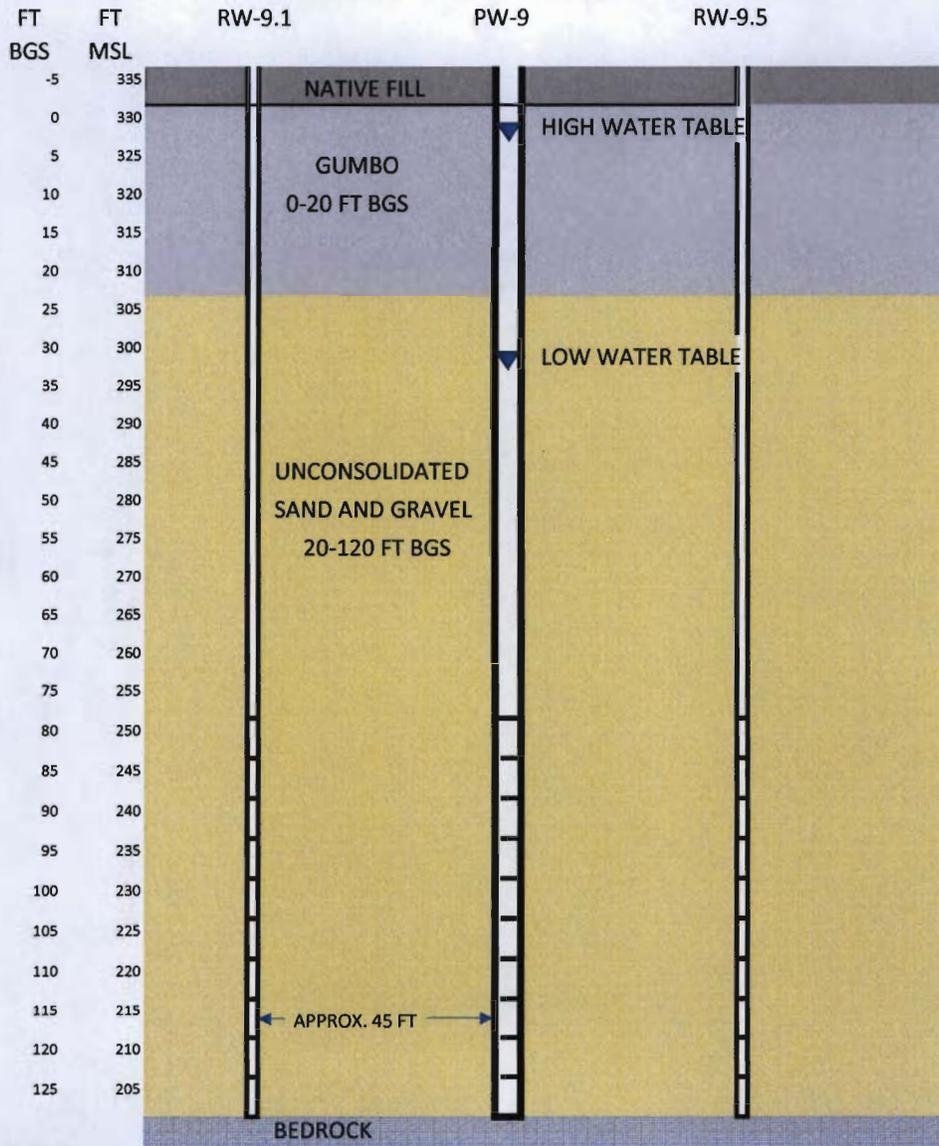


NOTES:
 FT BGS FEET BELOW GROUND SURFACE
 FT MSL FEET ABOVE MEAN SEA LEVEL
 SCALE NOT TO SCALE

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FIGURE
3

BIOKYOWA, INC.
5469 NASH ROAD
CAPE GIRARDEAU, MISSOURI
TYPICAL CROSS SECTION



PROCESS DESCRIPTION:

EIGHT RECIRCULATION WELLS (RW-9.X) ARE LOCATED ON AN APPROXIMATELY 45 FOOT RADIUS FROM THE PRODUCTION WELL (PW-9). THE RECIRCULATION WELLS ALTERNATELY PUMP WATER TO AN AERATOR OR ACCEPT AERATED WATER FROM AN ADJACENT WELL. THIS PROCESS INCREASES DISSOLVED OXYGEN IN THE GROUNDWATER TO CREATE A TREATMENT ZONE THAT REDUCES IRON CONCENTRATIONS IN THE PRODUCTION WELL. WITH THE EXCEPTION OF PERIODIC WELL REDEVELOPMENT NO CHEMICALS ARE INTRODUCED INTO THE AQUIFER.

NOTES:

FT BGS FEET BELOW GROUND SURFACE
 FT MSL FEET ABOVE MEAN SEA LEVEL
 SCALE NOT TO SCALE

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FIGURE
 4

Environmental Analysis South, Inc

4000 East Jackson Blvd. - Jackson MO 63755 - 573-204-8817 - Fax 573-204-8818

Dave Jennings
 BIOKYOWA
 P.O. Box 1550
 Cape Girardeau, MO 63702-1550

Report Number: 128711

Report of Analysis

Reference:

The analysis of wastewater is conducted in accordance US EPA approved methods listed in 40 CFR Part 136. All results expressed on an as received basis unless indicated by a footnote.

Log Number:	Sample Description:	Sample Date:	Sample Received Date:
1802501	Well #8	11/12/2014	11/12/2014

Microbiology

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Total Coliform	Absent	Results	Idexx - Colisure	G	11/12/14	102

Minerals

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Alkalinity as CaCO3	321	mg/L	SM-2320 B-97		11/19/14	133
Chloride	29.3	mg/L	SM-4110B-00		11/17/14	133
Fluoride	0.293	mg/L	SM-4110B-00		11/17/14	133
Hardness (calculated)	315	mg/L	SM-2340B-97		12/08/14	133
Hardness-Carbonate (calculated)	315	mg/L	SM-2340B-97		12/08/14	133
Hardness-Noncarbonate (calculate <	0.5	mg/L	SM-2340 B-97		12/08/14	133
pH Measurement	7.29	S.U.	SM-4500-H B-00		11/12/14	133
Sulfate	31.7	mg/L	SM-4110B-00		11/17/14	133

Miscellaneous

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Color	20		SM-2120 B-01		11/12/14	133

Nutrients

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Nitrate as Nitrogen	< 0.020	mg/L	SM-4110B-00		11/17/14	133

Environmental Analysis South, Inc

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Dave Jennings
 BIOKYOWA
 P.O. Box 1550
 Cape Girardeau, MO 63702-1550

Report Number: 128711

Report of Analysis

Log Number: 1802501 Sample Description: Well #8 Sample Date: 11/12/2014 Sample Received Date: 11/12/2014

Preparation Methods

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Anions IC Sample Preparation	1	Prep	SM-4110B-00		11/12/14	133
Metals ICP Sample Digestion	1	Prep	EPA-200.7 Rev. 4.4	PDC	12/06/14	

Solids

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Fixed Residue	364	mg/L	SM-2540 E-97		11/10/14	133
Total Dissolved Solids	480	mg/L	SM-2540 C-97		11/10/14	133

Total (Total Recoverable) Trace Metals

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Aluminum by ICP	0.025	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Arsenic by ICP	< 0.005	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Barium by ICP	0.76	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Cadmium by ICP	< 0.0020	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Calcium by ICP	90	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Chromium by ICP	< 0.0020	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Copper by ICP	0.0036	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Iron by ICP	0.49	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Lead by ICP	< 0.005	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Magnesium by ICP	22	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Manganese by ICP	0.24	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Mercury by Cold-Vapor Technique	< 0.0002	mg/L	SM-3112 B-99		11/14/14	133
Potassium by ICP	2.7	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Selenium by ICP	< 0.005	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Silver by ICP	< 0.0020	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	
Sodium by ICP	28	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	

Environmental Analysis South, Inc

4000 East Jackson Blvd. - Jackson MO 63755 - 573-204-8817 - Fax 573-204-8818

Dave Jennings
BIOKYOWA
P.O. Box 1550
Cape Girardeau, MO 63702-1550

Report Number: 128711

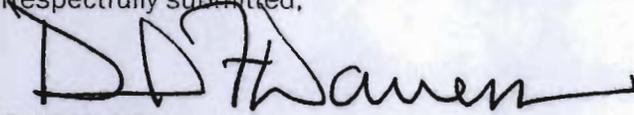
Report of Analysis

Log Number: 1802501 Sample Description: Well #8 Sample Date: 11/12/2014 Sample Received Date: 11/12/2014

Total (Total Recoverable) Trace Metals

Test Description	Result	Units	Method	Comment Code	Analysis Date	Analyst
Zinc by ICP	0.011	mg/L	EPA-200.7 Rev. 4.4	PDC	12/06/14	

Respectfully submitted,


David F. Warren

Comments:
G Total coliform absent, escherichia absent.
PDC This parameter or group of analytes was analyzed by the subcontracting lab - PDC Lab Saint Louis, MO

Project Name: BIOKYOWA
Project Number: BR0223

Lab Number: L1202947
Report Date: 02/28/12

SAMPLE RESULTS

Lab ID: L1202947-02
Client ID: PW-06-02162012
Sample Location: CAPE GIRARDEAU, MO
Matrix: Water

Date Collected: 02/16/12 10:30
Date Received: 02/21/12
Field Prep: See Narrative

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Alkalinity, Total	230		mg CaCO3/L	2.0	NA	1	-	02/22/12 10:45	30,2320B	SD
Nitrogen, Ammonia	0.077		mg/l	0.075	--	1	02/22/12 19:00	02/22/12 19:58	30,4500NH3-BH	AT
Phosphorus, Total	0.029		mg/l	0.010	--	1	02/23/12 11:00	02/23/12 15:22	30,4500P-E	SD
Sulfate	25		mg/l	10	--	1	02/22/12 14:25	02/22/12 14:25	1,9038	SD
Total Organic Carbon	1.8		mg/l	0.50	--	1	-	02/24/12 08:43	1,9060	DW
Dissolved Organic Carbon	3.7		mg/l	1.0	--	1	02/22/12 00:30	02/27/12 07:19	1,9060	DW



Location	Latitude DMS	Longitude DMS	UTM15m_X	UTM15m_Y	SPMissouriEastFt_X	SPMissouriEastFt_Y
PW-9	37° 14' 6.8" N	89° 35' 56.9" W	801709.3865	4126388.667	1082465.032	511600.4537
RW-9.1	37° 14' 7.2" N	89° 35' 56.9" W	801709.0238	4126402.388	1082465.032	511645.4537
RW-9.2	37° 14' 7.1" N	89° 35' 56.5" W	801718.8322	4126398.626	1082496.852	511632.2735
RW-9.3	37° 14' 6.8" N	89° 35' 56.3" W	801723.1075	4126389.03	1082510.032	511600.4537
RW-9.4	37° 14' 6.5" N	89° 35' 56.5" W	801719.3452	4126379.221	1082496.852	511568.6339
RW-9.5	37° 14' 6.4" N	89° 35' 56.9" W	801709.7492	4126374.946	1082465.032	511555.4537
RW-9.6	37° 14' 6.5" N	89° 35' 57.3" W	801699.9408	4126378.708	1082433.212	511568.6339
RW-9.7	37° 14' 6.8" N	89° 35' 57.4" W	801695.6656	4126388.304	1082420.032	511600.4537
RW-9.8	37° 14' 7.1" N	89° 35' 57.2" W	801699.4279	4126398.113	1082433.212	511632.2735

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.



REAGENT CHEMICAL & RESEARCH, INC.
115 US Hwy 202 Ringoes, NJ 08551

REVISED DATE: 1/1/2009

VALID UNTIL 1/1/2014

IDENTITY

Hydrochloric Acid, 20° or 22° Baume

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I - Product Information

Product Name	CAS #
Hydrochloric Acid	7647-01-0
Synonym	Chemical Formula
Muriatic Acid	HCl
Chemical Name	Chemical Family
Hydrochloric Acid Solution	Aqueous Inorganic Acid

Section II - Manufacturers Information

Manufacturers Name	Address
Reagent Chemical & Research, Inc.	115 US Hwy 202 Ringoes, NJ 08551
Emergency Contact	Country
Robert Dritschel	United States
Emergency Telephone	Emergency Telephone #
1-409-899-3400	CHEMTREC 1-800-424-9300

Section III - Ingredients/Regulatory Information

Substance Description	Percent	CAS #
Hydrogen Chloride	26.00 - 37.00	7647-01-0
Water	63.00 - 74.00	7732-18-5

EXPOSURE LIMITS/REGULATORY INFORMATION

Substance	PEL	TLV	STEL	TWA	CEILING
Hydrogen Chloride	C-7 mg/m3	C-5 ppm	50 ppm	N/D	5 ppm
Water	N/D	N/D	N/D	N/D	N/D

N/D - Not Determined C = Ceiling Level

Section IV - Hazards Identification

Appearance & Odor	Statement of Hazards
Clear/Pale Yellow Liquid/Pungent Odor	Severe and painful burns upon contact

Primary Route of Exposure

Skin, eye and inhalation contact are the primary routes of exposure to this product

Inhalation Acute Exposure Effect:

Inhalation of excessive concentrations of Hydrogen Chloride vapors immediately

produces severe irritation of the upper respiratory tract; resulting in coughing,

burning of the throat, and a choking sensation. Reactions encountered in man have

usually been limited to inflammation occasional ulceration of the nose, throat and

larynx. If inhaled deeply, edema of the lungs may occur.

Skin Contact Acute Exposure Effects:

Concentrated solutions are destructive to clothing and on contact with skin, cause:

severe burns unless promptly washed off. Repeated skin contact with dilute solution:

may lead to the development of dermatitis. Exposure to the concentrated vapors of

Hydrogen Chloride may also result in burns and dermatitis.

Section IV - Hazards Identification (continued)

Eye Contact Acute Exposure Effects

Contact of the eyes with Hydrogen Chloride, either as a gas or in solution, rapidly causes severe irritation and painful burns of the eyes and eyelids. If the acid is not quickly removed by thorough irrigation with water, there may be prolonged or permanent visual impairment or total loss of sight.

Ingestion Acute Exposure Effects

When concentrated Hydrochloric Acid is swallowed, it causes severe burns of the mucous membranes of the mouth, esophagus and stomach. The lips and mouth usually turn white, and later brown. There is pain in the throat and stomach, difficulty in swallowing, intense thirst, nausea and in severe cases, collapse and unconsciousness

Fire and Explosion Hazard:

Non-flammable, but Hydrochloric Acid reacts with all metals, except gold and platinum, with rapid evolution of Hydrogen which is flammable and explosive in air. Firefighters exposed to Hydrochloric Acid vapors should wear Scott Air-Pak, or equivalent. Hydrogen Chloride vapors are extremely irritating to the respiratory tract and may cause breathing difficulty.

Carcinogenicity

IARC ...No OSHA ...No ACGIH ...No

Section V - First Aid Measures

General

If a known exposure occurs or is suspected, immediately initiate the recommended procedures below. Simultaneously contact a physician, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow the advice given. For additional information, call day or night, Reagent Chemical (409) 962-5769 or Chemtrec (800) 424-9300.

Inhalation

Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually-triggered, oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous-flow inhalator, preferably with a physician's advice. Contact a physician immediately.

Eye Contact

Immediately flush the eyes with large quantities of running water for 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eyes and lids with water. DO NOT attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not available.

Section V - First Aid Measures (continued)

Skin Contact

Immediately remove contaminated clothing under a safety shower. Flush all

affected areas with large amounts of water for 15 minutes. DO NOT attempt to

neutralize with chemical agents. Obtain medical advice.

Ingestion

DO NOT induce vomiting. Immediately give large quantities of water or milk, if

available. If vomiting does occur, give fluids again. Never give anything by mouth

to an unconscious person. Call a physician of the nearest Poison Control Center

Medical Conditions Generally Aggravated by Exposure

Hydrogen Chloride will aggravate breathing disorders

Note to Physician

Attending Physician should treat exposed patients symptomatically

Section VI - Fire Fighting Measures

Flash Point

N.A.

Flash Method

N.A.

Extinguishing Method

Not Applicable

Unusual Fire and Explosion Hazard:

Non-flammable, but Hydrochloric Acid reacts with metals.

Special Firefighting Procedures:

Non-flammable, but Hydrochloric Acid reacts with all metals, except gold and

platinum, with rapid evolution of Hydrogen which is flammable and explosive in air

Firefighters exposed to Hydrochloric Acid vapors should wear Scott Air-Pak, or

equivalent. Hydrogen Chloride vapors are extremely irritating to the respiratory

tract and may cause breathing difficulty.

Section VII - Accidental Release Measures

Steps to be Taken in Case Material is Released or Spilled

Spills or discharges into the environment involving large quantities of Hydrochloric

Acid should be controlled and cleaned-up according to a pre-determined, affirmative

written Spill Prevention and Control Program. For assistance in developing a SPC

contact your nearest Reagent Sales Office.

Spills should be handled immediately by neutralization and dilution of the spilled

product by the use of Soda Ash (Sodium Carbonate), Lime (Calcium Hydroxide), or

Limestone (Calcium Carbonate) with large amounts of water. For an interior (inside

a closed space) spill be aware that the use of Soda Ash, Lime and Limestone will

evolve heat and carbon dioxide and that ample ventilation must be provided.

Waste Disposal

Under Federal RCRA, it is the responsibility of the user of products to determine,

at the time of disposal, whether the product falls under RCRA as a hazardous waste

This is because product uses, transformations, mixtures, etc. may render the

resulting end-product hazardous.

Container Disposal

Containers should be cleaned of residual product before disposal. Empty containers

should be disposed of in accordance with all applicable laws and regulations.

Section VII - Accidental Release Measures (continued)

Precautions to be Taken in Handling and Storage

Make sure all personnel involved in housekeeping and spill clean-up follow good Industrial Hygiene practices and wear proper protective equipment.

Section VIII - Handling/Storage/Transportation

Handling

Chemical goggles and full face shield must be worn at all times by personnel

exposed to or handling Hydrochloric Acid. The use of a NIOSH approved cartridge respirator or a Scott Air-Pak should be used by all personnel exposed.

Storage

Store containers in a cool, dry location away from direct sunlight, sources of intense heat, or where freezing may occur. Store material in acid-proof container

Keep container tightly closed when not in use. Keep container away from incompatible materials. All loading, unloading, and storage equipment must be inspected prior to any transfer operations are initiated.

General Comments

Impervious clothing, gloves, footwear and head gear must be worn at all times by personnel exposed to or handling Hydrochloric Acid.

Section IX - Exposure Controls/Personal Protection

Respiratory Protection (Specify Type)

Maintain airborne contaminate levels below listed guidelines. Use with adequate ventilation. Use a mechanical fan or vent area to scrubber.

Ventilator	Local Exhaust If PEL exceeded	Special Vent fumes to appropriate scrubber
	Mechanical (General) If PEL exceeded	Other Not Applicable

Skin Protector

Wear neoprene rubber gloves to minimize skin contact.

Eye Protector

Splash goggles or safety glasses. Face shields are recommended.

Other Protector

Use body protection appropriate for task. An apron or other impermeable body protection is suggested. Full body chemical protection is recommended for emergency response procedures.

Applicable Exposure Limits

Other than any exposure limits which may be displayed in Section 3, there are no other known exposure limits applicable to this product or its components.

Section X - Physical and Chemical Properties

Boiling Point	230 F	Specific Gravity (H2O = 1)	1.13 - 1.19
Vapor Pressure (mm Hg)	50 - 60 mm	Freezing Point	-.12 F to -63 F
Vapor Density (AIR = 1)	N.A.	Density	9.48 - 9.61

Solubility in Water

miscible

Appearance and Odor

Clear/Slightly yellow with a sharp pungent odor

Section XI - Stability and Reactivity

Stability	Unstable	X	Conditions to Avoid Hydrochloric Acid is extremely reactive. Avoid contact with metal surfaces and oxidizing agents.
	Stable		

Section XI - Stability and Reactivity (continued)

Incompatibility (Materials to Avoid)

Hydrochloric Acid is chemically stable when properly contained and handled. It is a

strong mineral acid and reacts with many metals and metal oxides and hydroxides:

to form the equivalent metal chloride. It reacts with zeolites and other silicious:

compounds to form Hydrosilicic Acid; it reacts with carbonates to form Carbon

Dioxide and Water. It is oxidized by Oxygen or electrolysis to form Chlorine, a

lethal, poisonous gas. It reacts with alkaline compounds to form a neutral salt

It is a hydrolyzing agent for carbohydrates, esters and other compounds.

Its reaction with most metals will produce Hydrogen, an explosive gas. Violent

reactions will result when Hydrochloric Acid Reacts with acetic anhydride,

2-aminoethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid,

ethylene diamine, ethylene imine, oleum (fuming sulfuric acid), perchloric acid,

beta propiolactone, propylene oxide, sodium hydroxide, sulfuric acid, uranium

phosphide and vinyl acetate. This listing is not all-inclusive.

Hazardous Decomposition or By-products

Extreme heat may cause the product to decompose, producing toxic fumes which may

include chlorine compounds.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	Extreme heat and contact with incompatible materials

Section XII - Toxicological Information

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	Yes	Yes	Yes

Health Hazards (Acute and Chronic)

Hydrogen Chloride, both as a gas and in a solution as Hydrochloric Acid, is a

corrosive substance and can cause severe and painful burns on contact with any

part of the body or if taken internally. The mucous membranes of the eyes and the

upper respiratory tract are especially susceptible to the irritating effects of high

atmospheric concentrations of Hydrogen Chloride. The gas or vapor is so

penetrating and pungent that when high concentrations do occur, those exposed

should immediately leave the contaminated area.

Carcinogenicity	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Exposure

Exposure to Hydrochloric acid may cause severe burns at the contact point:

Medical Conditions Generally Aggravated by Exposure

Exposure to fumes may aggravate dermatitis and breathing disorders.

Toxicology	Inhalation Data:
Hydrogen Chloride	Human LC ₅₀ - 1300 ppm/30 min
	Rat LC ₅₀ - 4701 ppm/30 min
	Oral (rabbit)
	LD ₅₀ - 900 mg/kg
	Mutagenic Effects
	Inhalation: 100 ppm/24 hrs (Chromosome damage)
	Oral: 100 ppm (Chromosome damage)
	Parental: 20 mg/kg (Cytogenic effects)

Section XIII - Ecological Information**Ecological Toxicity**

Animals exposed to hydrochloric acid solution will experience tissue damage, burns and may be killed. Plants contaminated with hydrochloric acid solutions of low pH may be adversely effected or destroyed. High concentrations have been shown to be detrimental to aquatic life. A release into a body of water will kill fish and other aquatic life

Other Ecological Information

Hydrochloric acid is stable and found naturally in the environment. All work practice should be aimed at eliminating environmental contamination.

Chemical Fate Information

Hydrochloric acid is naturally occurring in the environment.

Other Regulatory Information

No other regulatory information is available on this product.

Section XIV - Transportation Information**Regulated Material**

Hydrochloric Acid is defined as hazardous by the US Dot and Transport Canada:

DOMESTIC SHIPPING INFORMATION

Proper Shipping Name	Hydrochloric Acid	Hazard Classification	Corrosive
UN/NA Identification	UN 1789	Hazard Class	Class 8
DOT Labels Required	Corrosive	Packaging Group	II

INTERNATIONAL SHIPPING INFORMATION

Proper Shipping Name	Hydrochloric Acid	Hazard Classification	Corrosive
UN/NA Identification	UN 1789	Hazard Class	Class 8
Labels Required	Corrosive	Packaging Group	II

Section XV - Other Information

Created By Product Safety - 6/1/98	MSDS Revision Number Revision # 006	Dated 1/1/2009
Toxic Substances Control Act TSCA listed 7647-01-0	Superfund Amendment & Reauthorization Act, Title I Hazard Categories	Acute & HEALTH: Chronic
Emergency Planning & Community Right to Know EHS - Threshold Quantity: None		PHYSICAL: None
Is product Regulated Under 1990 Clean Air Act? No	Does Product Contain, or is Manufactured with, CFC's? No	
Reportable Quantity RQ - 5000 lbs	NSF Listing Scale & Corrosion control at maximum 40 mg/l	
National Fire Protection Association (NFPA) Ratings: Health - 3 Flammability - 0 Instability - 0 Other Hazard Information - ACID		
Hazardous Material Identification System (HMIS): Health - 3 Flammability - 0 Physical Hazard - 0 Protective Equipment - X		
Is This Product Regulated Under the EPA's Risk Management Plan No, Hydrochloric Acid Solution under 37% is not regulated.		
North American Emergency Response Guide Book ID # 1789 Guide #157		

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Material Safety Data Sheet

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PRODUCT: Sodium Hypochlorite Solution

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1. Product and Company Identification

Product Identity: **Sodium Hypochlorite Solution**

Chemical Formula: NaOCl
Molecular Weight: 74.45

Synonyms: Sodium Hypochlorite Solution (10-15.6%); Hypochlorite Solution; Bleach Solution; Hypochlorous acid, sodium salt, &/or AB Bleach; sodium hypochlorite/de-ionized water, Sodium Hypochlorite Solution 10%; Sno-glo Bleach; Hypochlorous acid, sodium salt

Brenntag Mid-South Inc.
1405 Hwy 136 W
Henderson, KY 42420

Technical Information: 270-830-1200
Emergency Number: 800-424-9300 (CHEMTREC)
Emergency Number: 703-5273887 (International)

2. Hazards Identification

PRECAUTIONARY STATEMENTS (Hazards to humans and domestic animals): Danger! Corrosive! May cause severe skin and eye irritation or chemical burns to broken skin. Causes eye damage. Exposure to skin may cause sensitization or other allergic responses.

INHALATION: Corrosive! Product may cause severe irritation of the nose, throat and respiratory tract. Repeated and/or prolonged exposures may cause productive cough, runny nose, bronchopneumonia, pulmonary edema (fluid build-up in lungs), and reduction of pulmonary function. Repeated inhalation exposure may cause impairment of lung function and permanent lung damage.

EYE CONTACT: Extremely corrosive! This product causes corneal scarring and clouding. Glaucoma, cataracts and permanent blindness may occur.

SKIN CONTACT: Corrosive! Concentrated solutions may cause pain and deep and severe burns to the skin. Prolonged and repeated exposure to diluted solutions often causes irritation, redness, pain and drying and cracking of the skin. Human evidence has indicated that an ingredient in this product can cause skin sensitization.

INGESTION: Corrosive! Will immediately cause severe corrosion of and damage to the gastrointestinal tract. Exposure characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration.

PRIMARY ROUTES OF ENTRY: Inhalation and contact.

3. Composition/Information on Ingredients

CAS NUMBER	CHEMICAL NAME(S)	*WT %
7681-52-9	Sodium hypochlorite**	10 - 15.6
1310-73-2	Sodium hydroxide	0.3 - 1.8
7647-14-5	Sodium Chloride	9 - 14.9
497-19-8	Sodium carbonate	≤ 0.5
7732-18-5	Water	Balance

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4. First Aid Measures

INHALATION: Remove victim to fresh air. Give artificial respiration if not breathing. Get medical attention.

EYE CONTACT: Wash eyes with plenty of water for at least 15 minutes while holding eyelids open. Consult an eye specialist immediately.

SKIN CONTACT: Flush skin with plenty of water while removing contaminated clothing. Get medical attention for persistent irritation. Clean clothing before reuse.

INGESTION: If swallowed drink large quantities of water. Do NOT induce vomiting. Call a poison control center or doctor immediately for treatment advice. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

5. Fire Fighting Measures

FLASH POINT (METHOD USED): Non - flammable

FLAMMABLE LIMITS (% BY VOLUME): n.a.

EXTINGUISHING MEDIA: Use water spray, fog, foam, dry chemicals, or carbon dioxide.

SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should wear protective equipment including self contained breathing apparatus. Avoid fumes. Dilute spill with copious amounts of water, ventilate. Be prepared to use respirator.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Possible vigorous reaction upon contamination with organics or oxidizing agents. Bleach decomposes when heated, decomposition products may cause containers to rupture or explode. Many reactions can cause fire and explosion. This material will react with some metals which may cause liberation of oxygen. Toxic fumes can be liberated by contact with acid or heat. Vigorous reactions can occur with oxidizable materials and organics. Keep material cool using a water spray from a safe distance. Keep all unnecessary people away. Stay up wind and stay out of low-lying areas.

6. Accidental Release Measures

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Personnel with proper protective equipment should contain spill. Flush area with large amounts of water. Use reducing agents such as bisulfites or ferrous salt solutions to neutralize.



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7. Handling and Storage:

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store this product in a cool dry area; away from direct sunlight and heat to avoid deterioration. In case of spill, flood areas with large quantities of water. Product or rinsates that cannot be used should be diluted with water before disposal in a sanitary sewer. Do not reuse container. Do not contaminate food or feed by storage, disposal or cleaning of equipment. Most metals and metal alloys are NOT suitable for use in contact with sodium hypochlorite solutions including aluminum, brass, bronze, copper, cast iron, galvanized steel, mild steel, nickel, or stainless steel, since these metals act as a catalyst which will cause rapid decomposition of the sodium hypochlorite solution through the release of oxygen.

Sodium hypochlorite solutions are basically unstable, and on exposure to heat and/or light, will slowly decompose, becoming less concentrated with time. Sodium hypochlorite solutions should never be allowed to contact or mix with acids or other low pH compounds, due to the release of chlorine gas. Do not allow sodium hypochlorite to mix with ammonia, since chloroamines may be formed.

Decomposition of sodium hypochlorite takes place within a few seconds with following salts: ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate.

Hypochlorites react with urea to form nitrogen trichloride, which explodes spontaneously in air.

Solutions of sodium hypochlorite are corrosive to the skin, eyes, and mucous membranes. Proper safety equipment should be used when working with or in close proximity of sodium hypochlorite.

OTHER PRECAUTIONS: Use with adequate ventilation. Wash thoroughly after handling. Do not get in eyes, on skin or clothing. Do NOT breathe fumes or mist. Mixing this product with chemicals (e.g. common household cleaners, ammonia, acids, detergents, etc.) or organic matter will release chlorine gas, which is irritating to eyes, lungs, and mucous membranes.

STRONG OXIDIZING AGENT: Mix only with water according to label directions. Mixing this product with chemicals (e.g. common household cleaners, ammonia, acids, detergents, etc.) or organic matter (e.g. urine, feces, etc.) will release chlorine gas, which is irritating to eyes, lungs and mucous membranes.

8. Exposure Controls/Personal Protection

CAS NUMBER	CHEMICAL NAME(S)	*WT %	THRESHOLD LIMIT VALUES (UNITS)			
			OSHA:		ACGIH:	
			PEL	STEL	TLV	STEL
7681-52-9	Sodium hypochlorite**	10 - 15.6	— NONE ESTABLISHED —			
1310-73-2	Sodium hydroxide	0.3 - 1.8	2 mg/m ³ Ceiling	---	2 mg/m ³ Ceiling	---
7647-14-5	Sodium Chloride	9 - 14.9	— NONE ESTABLISHED —			
497-19-8	Sodium carbonate	≤ 0.5	— NONE ESTABLISHED —			
7732-18-5	Water	Balance	— NONE ESTABLISHED —			

** %(w/w) as Cl₂ 9.5 to 14.9% TLV/TWA (ACGIH) 0.5ppm Cl₂; TLV/STEL (ACGIH) 1ppm Cl₂ & PEL (OSHA) 1ppm Cl₂

RESPIRATORY PROTECTION: When fumes present, use NIOSH approved respirator with acid type canister.

VENTILATION: Local exhaust preferable as required to control fumes.

PROTECTIVE GLOVES: Rubber or plastic.

EYE PROTECTION: Chemical goggles.

OTHER PROTECTIVE EQUIPMENT: Clothing to protect skin. Safety shower and eye wash fountain.

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9. Physical and Chemical Properties

BOILING POINT °F (°C): 110 °C for 15% NaOCl

VAPOR DENSITY (AIR =1): n.a.

VAPOR PRESSURE (mmHg): Vapor pressure of water plus decomposition products.

SOLUBILITY IN WATER: Complete

SPECIFIC GRAVITY (H₂O=1): 1.08 - 1.27

EVAPORATION RATE: n.a.

PERCENT VOLATILE BY VOLUME (%): Water vapor plus decomposition products.

APPEARANCE AND ODOR: Light, yellow-green liquid

10. Stability and Reactivity

STABILITY: Unstable (Contingent upon temperature, contamination (metals), and pH.)

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Heat, light exposure, decrease in pH, and contamination with heavy metals, such as nickel, cobalt, copper and iron.

INCOMPATIBILITY (MATERIALS TO AVOID): Heavy metals, reducing agents, organics, ether, ammonia, ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, ammonium phosphate, urea and acids.

HAZARDOUS DECOMPOSITION PRODUCTS: Hypochlorous acid, chlorine, hydrochloric acid, sodium chloride, sodium chlorate, and oxygen. Decomposition of sodium hypochlorite takes place within a few seconds with following salts: ammonium acetate, ammonium carbonate, ammonium nitrate, ammonium oxalate, and ammonium phosphate. Hypochlorites react with urea to form nitrogen trichloride, which explodes spontaneously in air.

11. Toxicological Information

TOXICITY DATA: Oral LD50: 8,910 mg/kg. (Rats) Acute dermal toxicity: III; LD50, > 3,000 mg/kg
Dermal LD 50: > 10,000mg/kg. (Rabbits) Primary eye irritation: I; Corrosive
Inhalation 0.25-hour LC 50: >10.5 mg/l (Rats) Primary skin irritation: I; Corrosive
Acute oral toxicity: IV; LD50, 192 mg/kg

SUMMARY: The concentrated solution is corrosive to skin, and a 5% solution is a severe eye irritant. Solutions containing more than 5% available chlorine are classified by DOT corrosive. Toxicity described in animals from single exposures by ingestion includes muscular weakness, and hyperactivity. Repeated ingestion exposure in animals caused an increase in the relative weight of adrenal glands in one study, but no pathological change were observed in two other studies. Long-term administration of compound in drinking water of rats caused depression of the immune system. No adverse changes were observed in an eight-week dermal study of a 1% solution in guinea pigs. Tests in animals demonstrate no carcinogenic activity by either the oral or dermal routes. Tests in bacterial and mammalian cell cultures demonstrate mutagenic activity.

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12. Ecological Information

ENVIRONMENTAL HAZARDS: This pesticide is toxic to fish and aquatic organisms. Do not discharge effluents containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact you State Water Board or Regional Office of the EPA.

Acute oral-bobwhite quail: LD50, > 2510 mg/kg
Acute dietary-mallard duck: LC50, > 5220 ppm
Acute dietary-bobwhite quail: LC50, > 5620 ppm
Acute fish-rainbow trout: LC50, 0.18-0.22 mg/l
Acute fish-bluegill sunfish: LC50, 0.44-0.79 mg/l

Acute invertebrate-daphnia: LC50, 0.033-0.048 mg/l
Fathead minnows: 96-hour LC50, 5.9 mg/LO
Rainbow Trout: 96-hour LC50, 0.2mg/liter
Bluegill sunfish: 96-hour LC50, 0.58mg/liter

13. Disposal Considerations

WASTE DISPOSAL METHOD: Disposal is to be in accordance with all Federal, State, and Local regulations.

14. Transport Information

PROPER SHIPPING NAME: Hypochlorite Solutions

HAZARD CLASS: 8 (Corrosive)

UN/NA: UN 1791

PACKING GROUP: III

D.O.T. LABEL REQUIRED: Corrosive

REPORTABLE QUANTITY OF PRODUCT: 800 to 2,000 lbs.

15. Regulatory Information

TSCA (Toxic Substance Control Act): All components of this product are listed on the TSCA inventory.

CERCLA AND SARA REGULATIONS, 40 CFR §300-373:

Super fund Reportable Discharge = 100 pounds (100% NaOCl) CERCLA Hazardous Material: yes

SARA Extremely Hazardous substance: No

SARA Toxic Chemical: No

Title III Hazard Classifications: Acute: yes Chronic: yes Fire: no Reactivity: yes Pressure: No

EPA "CLEAN AIR ACT": This product does not contain nor is it manufactured with ozone depleting substances.

OTHER REGULATIONS/LEGISLATION THAT APPLY TO THIS PRODUCT: Massachusetts, Pennsylvania, and New Jersey Right-to Know Laws.

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16. Other Information

HMIS HAZARD RATING: Health 3

Flammability 0

Reactivity 2

VOC CONTENT (lbs/gal): n.a.

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