DEQ
Montana Department
of Environmental Quality

April 16, 2015

Chris Kukulski, City Manager
City of Bozeman
P.O. Box 1230
Bozeman, MT 59771

RE: Bozeman Story Mill Landfill Remediation
C307193
Bozeman, Montana

Dear Mr. Kukulski:

Enclosed is a copy of the Finding of No Significant Impact (FONSI) and Environmental Assessment (EA) for the Bozeman Story Mill Landfill Remediation project. **Please print the FONSI letter in one publication of your local paper under legal advertising and return the Proof of Advertising.** You do not have to print the EA, just have it available for public review should there be interest. We recommend you advertise this as soon as possible to allow for a 30-day comment period. **The FONSI and EA will be placed on our website for public review at http://www.deq.mt.gov/ea.mcpx.**

If you have any questions, please do not hesitate to contact me at (406) 444-6776.

Sincerely,

Mike Abrahamson, P.E.
Environmental Engineer
Technical & Financial Assistance bureau

Enclosures

Cc: Craig Woolard, Public Works Director, City of Bozeman. (via e-mail)
Rick Hixson, P.E., City Engineer, City of Bozeman (via e-mail)
John Collins, DEQ Solid Waste Program (via e-mail)

DEQ
Montana Department
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FINDING OF NO SIGNIFICANT IMPACT

TO ALL INTERESTED GOVERNMENTAL AGENCIES AND PUBLIC GROUPS

As required by state and federal rules for determining whether an Environmental Impact Statement is necessary, an environmental review has been performed on the proposed action below:

Project	Bozeman Story Mill Landfill Remediation Project
Location	Bozeman, Montana
Project Number	C307193
Total Cost	$1,550,300

The City of Bozeman conducts routine sampling of groundwater from monitoring wells located at the Bozeman Story Mill Landfill. In March and May 2014, one off-site groundwater monitoring well (MW-20 located 200 feet south of the unlined cell) had a concentration of tetrachloroethene (also known as PCE) of approximately 10 micrograms per liter (µg/L), which exceeds Montana's human health numeric water quality standard for PCE of 5 µg/L. Two additional groundwater monitoring wells located on landfill property also exceeded groundwater protection standards (GPS) for tetrachloroethene, trichloroethene, and vinyl chloride. The Montana Department of Environmental Quality (DEQ) requires any landfill facility that detects exceedances of GPS values to prepare and implement the findings of a corrective measures assessment (CMA) report.

Based on the results of the CMA report, approved by the DEQ Solid Waste Program on March 31, 2015, the city will address the off-site exceedance using a soil vapor extraction (SVE) system and a vadose zone air injection (VZAI)/air sparging (AS) system. The city will also enhance the existing landfill gas (LFG) extraction system. Extracted VOCs will be thermally destroyed through use of a flare, and/or removed through a granular activated carbon (GAC) filtration system.

Federal and State grant/loan programs will fund the project. Environmentally sensitive characteristics such as wetlands, floodplains, historical sites, and threatened or endangered species are not expected to be adversely impacted as a result of the proposed project. No significant long-term environmental impacts were identified. An environmental assessment (EA), which describes the project and analyzes the impacts in more detail, is available for public scrutiny on the DEQ web site (**http://www.deq.mt.gov/ea.mcpx**) and at the following locations:

Mike Abrahamson, P.E.
Department of Environmental Quality
1520 East Sixth Avenue
P.O. Box 200901
Helena, MT 59620-0901
mabrahamson@mt.gov

Craig Woolard, Public Works Director
City of Bozeman
P.O. Box 1230
Bozeman, MT 59771-1230

Comments on the EA may be submitted to the Department of Environmental Quality at the above address. After evaluating substantive comments received, the department will revise the environmental assessment or determine if an environmental impact statement is necessary. If no substantive comments are received during the comment period, or if substantive comments are received and evaluated and the environmental impacts are still determined to be non-significant, the agency will make a final decision. No administrative action will be taken on the project for at least 30 calendar days after release of the Finding of No Significant Impact.

Sincerely,

Todd Teegarden

Todd Teegarden, Bureau Chief
Technical and Financial Assistance Bureau

BOZEMAN STORY MILL LANDFILL REMEDIATION PROJECT
ENVIRONMENTAL ASSESSMENT

I. COVER SHEET

A. PROJECT IDENTIFICATION

Applicant: City of Bozeman

Address: P.O. Box 1230
Bozeman, MT 59771

Project Number: C307193

B. CONTACT PERSON

Name: Craig Woolard, Public Works Director

Address: P.O. Box 1230
Bozeman, MT 59771

Telephone: (406) 582-2315

C. ABSTRACT

The City of Bozeman conducts routine sampling of groundwater from monitoring wells located at the Bozeman Story Mill Landfill. The landfill site consists of two closed cells (one unlined and one lined) and some on-going active operations. Both closed cells accepted solid, non-hazardous, household, industrial, commercial, municipal, construction and demolition related wastes from 1969 to 2008.

In March and May 2014, one off-site groundwater monitoring well (MW - 20 located 200 feet south of the unlined cell) had a concentration of tetrachloroethene (also known as PCE) of approximately 10 micrograms per liter (µg/L) which exceeds Montana's human health numeric water quality standard for PCE of 5 µg/L. Two additional groundwater monitoring wells located on landfill property also exceeded groundwater protection standards (GPS) for tetrachloroethene, trichloroethene, and vinyl chloride. The Montana Department of Environmental Quality (DEQ) requires any landfill facility that detects exceedances of GPS values to prepare and implement the findings of a corrective measures assessment (CMA) report.

Based on the results of the CMA report, approved by the DEQ Solid Waste Program on March 31, 2015, the city will address the off-site exceedance using a soil vapor extraction (SVE) system and a vadose zone air injection (VZAI)/air sparging (AS) system. The city will also enhance the existing landfill gas (LFG) extraction system. Extracted VOCs will be thermally destroyed through use of a

flare, and/or removed through a granular activated carbon (GAC) filtration system.

The Montana Water Pollution Control State Revolving Fund (WPCSRF) program will fund the project with a low interest loan (2.5%). The improvements; including administration, engineering, and construction are estimated to cost approximately $1,550,300.

Environmentally sensitive characteristics such as wetlands, floodplains, threatened/endangered species, and historical sites are not expected to be adversely impacted as a result of the proposed project. Additional environmental impacts related to land use, water quality, air quality, public health, energy, noise, and growth, were also assessed. No significant long-term environmental impacts were identified.

Under the Montana Water Pollution Control State Revolving Fund Act, the DEQ may loan money to municipalities for construction of eligible non-point source pollution control implementation projects.

DEQ's Technical and Financial Assistance Bureau, has prepared this Environmental Assessment to satisfy the requirements of the Montana Environmental Policy Act (MEPA) and the National Environmental Policy Act (NEPA).

D. COMMENT PERIOD

Thirty (30) calendar days

II. PURPOSE OF AND NEED FOR ACTION

The Bozeman Story Mill Landfill site consists of two closed cells (one unlined and one lined) and some on-going active operations. When in operation both cells accepted solid, non-hazardous, household, industrial, commercial, municipal, construction and demolition related wastes; the majority of which is decomposable waste materials such as food, paper, cardboard, cloth, glass, metal, and plastics. As the refuse material decomposes, gases such as methane and a variety of volatile organic compounds (VOCs) are produced through biological and chemical decomposition. The unlined cell is located in the southeastern corner of the landfill property and operated from 1969 to 1995. This cell occupies approximately 32 acres and contains waste that is about 110 feet in thickness. The lined cell is located west of the unlined cell and operated from 1995 to 2008. This cell was constructed with a synthetic (impermeable) liner and a leachate collection system to protect groundwater. The lined cell occupies approximately 12 acres and contains waste that is about 100 feet in thickness.

Through routine sampling of monitoring wells located at the Bozeman Story Mill Landfill, the city has identified the need to address the off-site migration of volatile organic compounds (VOCs) which are believed to be originating from the buried solid waste materials of the unlined cell. One off-site groundwater monitoring well (MW - 20 located

200 feet south of the unlined cell) had a concentration of tetrachloroethene (also known as PCE) of approximately 10 micrograms per liter (µg/L) which exceeds Montana's human health numeric water quality standard for PCE of 5 µg/L. Two additional groundwater monitoring wells located on landfill property also exceeded groundwater protection standards (GPS) for tetrachloroethene, trichloroethene, and vinyl chloride. The Montana DEQ requires any landfill facility that detects exceedances of GPS values to prepare and implement the findings of a corrective measures assessment (CMA) report. The city procured the engineering services of Tetra Tech Inc. to prepare the CMA report and provide recommendations to prevent the further migration of VOCs from the landfill site.

III. ALTERNATIVES INCLUDING THE PROPOSED ACTION

In 1997, as part of an earlier corrective measures assessment, 20 landfill gas (LFG) extraction wells were installed in the waste mass of the unlined cell to collect gases (including VOCs) that are generated from the decomposition of waste materials. A flare, located on the north side of the landfill, thermally destroys the extracted gases. Sampling has indicated that the landfill gas is composed primarily of methane and carbon dioxide, with lesser amounts of tetrachlorethene, trichlorethene, benzene, tolulene, ethylbenzene, xylenes, methylene chloride, vinyl chloride, and other VOCs. After the installation of the LFG system the concentration of VOCs in many groundwater monitoring wells showed a rapid decease and the concentration of VOCs at all off-site monitoring wells were below the GPS. In 2009, LFG - 20 was removed from service due to low methane concentrations and so the city could construct a solid waste drop-off convenience site. Based on recent off-site soil vapor and groundwater sampling, the LFG system no longer provides an adequate level of VOC control, but will remain in place to supplement any new control efforts that are implemented. Based on the VOC concentrations measured in the soil vapor and groundwater, it is believed that the VOCs in the groundwater are largely the result of gas emissions from the waste mass and not from leachate, or a discrete source of pure VOC as a liquid.

A. REMEDIATION ALTERNATIVES

Seven alternatives for addressing the Bozeman Story Mill Landfill remediation needs were evaluated in the CMA. These include:

A. No Action
B. Removal of Unlined Cell
C. Soil Vapor Extraction (SVE) Wells
D. SVE Wells with Air Sparging
E. SVE Wells with Additional Landfill Gas (LFG) Wells
F. SVE Wells, Vadose Zone Air Injection (VZAI)/Air Sparging (AS) Wells and Additional LFG Wells
G. Groundwater Withdrawal and Treatment

A. NO ACTION - The no-action alternative considered making no additional improvements at the landfill site beyond the current activities which include continued operation and optimization of the existing LFG system, continued

groundwater and soil vapor monitoring, and the continued operation of the in-home vapor intrusion mitigation system. Since this alternative would rely on the natural attenuation of VOCs that migrate off the landfill site, it is unknown to what extent and time it will take to achieve full remediation. Landfills tend to generate gas up to 30 years after closure, so it is possible that these activities would need to continue for another 15 years. Due to the exceedance of GPS in an off-site well and the negative impact that soil gas is having on nearby residences, the no-action alternative was not considered to a viable option, and was not given further consideration.

B. REMOVAL OF UNLINED CELL - This alternative consists of excavating wastes from the existing unlined cell and transferring it to a new lined repository. Since the city already owns property at the existing landfill site it would be most feasible to consider development of additional cell(s) just north of Churn Creek. The proposed new cell(s) would be constructed with a flexible membrane liner, a gas collection and treatment system, a leachate collection system, and surrounding gas and water monitoring wells. Once the new cell is ready to accept waste material the underlying waste in the existing unlined cell would be loaded onto trucks and hauled to the new cell. Once all of the waste has been moved, the new cell would be capped and re-vegetated. The old cell would be re-graded and re-contoured to its original topography. Monitoring would occur around the old unlined cell until it is determined that residual impacts have been attenuated. Monitoring around the new lined cell(s) would be implemented. One major concern with this alternative is that when the waste is exposed, there will likely be significant odors issues and potential health impacts to both nearby residents and workers performing the excavation and hauling.

C. SOIL VAPOR EXTRACTION (SVE) WELLS - This alternative consists of drilling 13 wells, approximately 120 feet apart along the southern boundary of the landfill site adjacent to the unlined cell. Each well would be screened from 20 feet below the surface to just above the groundwater level. The wells would be connected with piping and a vacuum blower would be utilized to pull VOCs and soil gas from the vadose zone. The collected VOCs would be treated through the use of granular carbon media, or by thermal destruction, or both. The SVE wells will not directly remove VOCs from the groundwater, but as VOCs concentrations in the vadose zone decrease, VOCs in the underlying groundwater will migrate into the vadose zone as the VOCs seek equilibrium in the environment. Once the VOCs are released into the vadose zone they will be removed through the vacuum blower and the process will continue to repeat. The vacuum blower would be located on the north side of the unlined cell near the existing vacuum pump and flare that serve the LFG wells. If a flare is used to thermally treat the gases from the SVE wells, propane (or a similar fuel) will likely be required due to the dilute nature of the gases. Any condensate collected from the gases will be stored in a tank and periodically trucked to the city's wastewater treatment facility.

D. SVE WELLS WITH AIR SPARGING (AS) – This alternative is similar to Alternative C but would replace every other SVE well with an AS well. An AS well would be drilled into the groundwater and fresh air in injected into the groundwater through the use of a surface compressor and a piping network. Performance is improved when clean carrier gas (i.e., air) is routed throughout the zone of contamination allowing the contaminants (i.e., VOCs) to partition from the sorbed or aqueous phases to the vapor phase. Therefore, as the fresh air rises through the groundwater, VOCs dissolved in the groundwater will be inducted into the air and carried upward into the vadose zone, where the adjacent SVE wells will remove the VOCs. The injected air will also create a curtain of slightly elevated air pressure that will restrict the movement of VOCs away from the landfill and prevent them from migrating off-site. The air compressor would be located on the north side of the unlined cell near the existing vacuum pump and flare.

E. SVE WELLS WITH ADDITIONAL LANDFILL GAS (LFG) WELLS - This alternative builds on Alternative C by adding 6 additional LFG extraction wells within the footprint of the existing unlined cell. This alternative provides source control by extracting VOCs from the waste mass before they enter the surrounding vadose zone or underlying groundwater. The new LFG wells would be located in the southeast quadrant of the cell and would be connected to the existing LFG collection system where collected gases would be thermally treated in the existing flare. The new LFG wells would be spaced throughout the southeastern quadrant of the unlined cell to increase the collection efficiency of VOCs in that area, which is upgradient from MWs -17, 18, and 20 which have shown exceedances of the groundwater protection standards for tetrachloroethene, trichloroethene, and vinyl chloride. Two of the new LFG wells will be placed near the convenience site (southeast corner of landfill property) to replace LFG - 20 that was removed in 2009.

F. SVE WELLS, VADOSE ZONE AIR INJECTION (VZAI)/AIR SPARGING (AS) WELLS AND ADDITIONAL LFG WELLS - This alternative builds on Alternative E with a paired VZAI/AS well replacing every other SVE well. The VZAI well and the AS well are constructed side by side in the same drill hole. The VZAI well differs from the AS well in that it does not penetrate the groundwater and instead provides a source of fresh air in the vadose zone. The VSAI/AS wells remove VOCs in both the groundwater and in the vadose zone. As the clean carrier gas is routed throughout the zones of contamination the VOCs will partition from the sorbed and aqueous phases to the vapor phase. The adjacent SVE wells would remove the liberated VOCs. The vadose gases (including VOCs) would be treated through use of a new granular activated carbon (GAC) filter system and/or thermally destroyed in a flare. This alternative maximizes the amount of clean carrier gas introduced and will have the most complete coverage of the vadose zone. The VZAI/AS wells would provide a curtain of slightly elevated pressurized air in the vadose zone on the south side of the cell that would tend to prevent the migration of VOC vapor in this direction. A surface air compressor would be located on the north side of the unlined cell and would feed the piping network

connected to the VZAI/AS wells. Propane (or a similar fuel) may be needed to ensure proper operation of the new flare due to the dilute gases that would be extracted.

G. GROUNDWATER WITHDRAWAL AND TREATMENT - This alternative would involve the installation of approximately 7 wells, each equipped with a submersible pump to extract the VOC-containing groundwater from the uppermost portion of the aquifer. The wells would be located along the southern boundary of the landfill with overlapping groundwater capture zones to prevent further migration of VOC impacted groundwater. The wells would extend approximately 20 feet into the groundwater table. The pumped water would be treated with conventional air-stripping equipment whereby the VOC–containing water would flow down through a media filled column while large volumes of air are forced upward through the column. As the VOCs volatilize from the water they would be carried to the top of the column in the air where they would be removed in a carbon filter. The treated water would then be disposed of on city-owned property north of Churn Creek in either buried infiltration galleries or injection wells.

B. COST COMPARISON - PRESENT WORTH ANALYSIS

The present worth analysis is a means of comparing alternatives in present day dollars and can be used to determine the most cost-effective alternative. An alternative with low initial capital cost may not be the most cost efficient project if high monthly operation and maintenance (O&M) costs occur over the life of the alternative. Salvage values were determined to be inconsequential, and therefore not presented. An interest rate of 5% over the anticipated 15-year operating period was used in the analysis. A 15-year lifespan was selected because gas generation in the landfill is expected to diminish to minor levels after 30 years of being buried, 15 years of which have already gone by. Table 1 provides a summary of the present worth analysis of the feasible alternatives considered.

TABLE 1 COST ANALYSIS FOR REMEDIATION ALTERNATIVES				
Alternative Number (From Above)	**Alternative**	**Capital Cost**	**Annual O&M**	**Total Present Worth**
A	No Action	$47,000	$175,809	$1,871,717
B	Removal of Unlined Cell	$57,490,096	$218,750	$59,760,503
C	Soil Vapor Extraction (SVE) Wells	$574,020	$273,723	$3,414,996
D	SVE Wells with Air Sparging (AS)	$665,917	$320,457	$3,991,936
E	SVE Wells with Additional Landfill Gas (LFG) Wells	$661,230	$264,040	$3,401,701
F	SVE Wells, Vadose Zone Air Injection (VZAI)/Air Sparging (AS) with Additional LFG Wells	$1,550,300	$310,773	$4,776,123
G	Groundwater Withdrawal and Treatment	$803,925	$306,830	$3,988,511

C. BASIS OF SELECTION OF PREFERRED ALTERNATIVE

Selection of the preferred alternative was based upon several criteria, both monetary and non-monetary. The ranking criteria considered are shown in Table 2. Each alternative was assigned a ranking score 1 to 5 for each category with 1 being the least favorable and 5 being the most favorable. The ranking factors were then summed with the resulting highest score being the most favorable, and recommended alternative. As shown in Table 2, alternatives C through F had very similar overall score with Alternative F (SVE Wells, Vadose Zone Air Injection (VZAI)/Air Sparging (AS) with Additional LFG Wells) having the overall highest ranking. While alternative F is not the lowest cost alternative considered, in comparison to alternatives C, D, and E, it did rank slightly higher due to its ability to achieve compliance with the GPS, its ability and effectiveness to provide source control of VOCs, and the time required to begin and complete the remedy is relatively quick. The biggest concern associated with alternative F is the drilling of additional LFG wells which can, on a temporary basis, include the potential for fires, explosions, and the exposure of well drillers to toxic chemicals, gases, and/or biological risks.

TABLE 2 RANKING CRITERIA FOR REMEDIATION ALTERNATIVES							
Criteria	**Alt A: No Action**	**Alt B: Removal of Unlined Cell**	**Alt C: Soil Vapor Extraction (SVE) Wells**	**Alt D: SVE Wells w/ Air Sparging (AS)**	**Alt E: SVE Wells w/ Additional Landfill Gas (LFG) Wells**	**Alt F: SVE Wells, VZAI/AS Wells w/ Additional LFG Wells**	**Alt G: Groundwater Withdrawal & Treatment**
Ability to Meet Project Objectives:							
Protection to Human Health	3	3	5	5	5	5	5
Protection to Environment	3	5	5	5	5	5	5
Compliance with GPS	1	3	3	3	3	4	4
Source Control Provided	3	5	3	3	4	4	3
Waste Management	5	3	4	4	4	4	1
Effectiveness:							
Performance	2	5	4	3	5	5	5
Reliability	2	5	5	4	5	4	3
Implementability	5	1	4	4	3	3	4
Adverse Impacts	5	1	4	4	3	3	2
Short & Long Term Effectiveness	1	3	4	4	4	4	4
Short & Long Term Protectiveness	1	3	4	4	4	4	4
Source Control Effectiveness	3	5	3	3	4	4	1
Implementation:							
Time Required	5	1	3	4	3	4	3
Institutional Requirements	4	1	3	3	3	3	2
Technical Capability	1	1	1	1	1	1	1
Financial Capability	5	1	4	4	4	4	4
Potential Community Concerns	1	1	4	4	4	4	5
Cost	5	1	4	4	4	4	4
Total Score	55	48	67	66	68	69	60

The estimated administration, engineering, and construction cost for Alternative F is approximately $1,550,300. The city will fund the project through a low-interest loan (2.50%; 20-year term) obtained from the Water Pollution Control State Revolving Fund (WPCSRF) loan program.

The city is using its all-purpose taxing authority to generate money annually to dedicate to the project. A 1.57 mill increase in the city's All Purpose Mill Levy went into effect on September 8, 2014 to pay for the remediation improvements. The cost to each residential property owner within the City of Bozeman will be approximately $4.11 per year per $100,000 of the taxable market value of a residence. This dedicated tax revenue from the General Fund will be transferred to the city's Storm Water Utility each year to pay for the principle and interest due for the loan (estimated at $140,000 annually) until it is paid off. The General Fund and/or the Post-Closure Monitoring Fund will be operating the landfill gas remediation system.

IV. AFFECTED ENVIRONMENT

A. PLANNING AREA / MAPS

The City of Bozeman is located in southwest Montana along Interstate 90 in Gallatin County (See Figure 1). The landfill site is located approximately 2 miles north of the city center (see Figure 2). The landfill is bounded by Story Mill Road to the east; McIlhattan Road and undeveloped land to the west; agricultural and rural residential properties to the north; and a combination of residential subdivision, golf course, and City of Bozeman park land to the south and southwest of the landfill (see Figure 3). The proposed project involves the installation of 13 new wells (7 SVE wells; 6 VZAI/AS wells) along the southern boundary of the unlined cell, and 6 new landfill gas extraction wells within the waste mass of the unlined cell. The overall site plan showing the location of all improvements (including well detail schematics) can be seen in Figure 4. Construction is scheduled to begin in late summer 2015 and will take approximately 6 months to complete.

B. NATURAL FEATURES

The landfill site is located just north of the Bozeman city limits and lies on the southwest flank of the Bridger Mountains. The topography varies from hilly on the landfill property to flat along the East Gallatin River. The ground surface slopes to the west-southwest at an average grade of 5%, with much of it sloping 15 to 50%. The elevation of the site ranges from approximately 4,700 to 4,900 feet above sea level. The landfill is situated on unconsolidated, fine and coarse grained sediments consisting of sandy to clayey silt, thin beds of fine grained sand with silt, and gravel in a silty matrix.

Surface water resources in the area include seeps, ponds, and streams. Spring Creek and Churn Creek, both located north of the closed cells, traverse the landfill property. Spring Creek flows in a west-southwest direction across the northern part of the property and Churn Creek is a perennial drainage located north of the closed lined cell. Bridger Creek is located 2,000 feet south of the

landfill site and flows in a westerly direction where it joins the East Gallatin River. The East Gallatin River, located 1,000 feet west of the landfill site, is the predominate surface water feature in the area, with flows ranging from 17 to 100 cubic feet per second. The depth to groundwater in the area ranges from 1 foot below the ground surface near the western margin of the site to 113 feet below the ground surface near the eastern margin of the site. Groundwater under the landfill flows to the southwest, shifting to a more westerly flow as it reaches the unconsolidated alluvial sediments of the Bridger Creek and East Gallatin River valleys.

The climate in Bozeman is characterized by long cold winters and short relatively cool summers. Bozeman's average high temperature is 83°F, but can occasionally top 100°F during the summer months. The average low temperature is approximately 14°F, with periods of sub-zero temperatures at times during the winter months. The average annual precipitation rate is 19.74 inches per year with nearly a third of that falling during the months of May and June.

V. ENVIRONMENTAL IMPACTS OF PROPOSED PROJECT

A. DIRECT AND INDIRECT ENVIRONMENTAL IMPACTS

1. Land Use/Prime Farmland – The landfill sits upon a 200-acre site that is owned by the City of Bozeman. The site consists of approximately 100 acres of undisturbed ground with two creeks, a 12-acre lined closed cell, a 32-acre unlined closed cell, a shop complex, an area for soil borrow, and a waste disposal and recycling convenience site. This site also contains a 40-acre city recreational area located in the northwest corner of the property. Most of the area adjacent to the landfill was historically used for either farming or grazing. Land to the east, west, and north is currently unoccupied with the land to the west being used for grazing. There is a golf course and two residential subdivisions (both on city services) located south and southwest of the landfill that began development in 2000. The Natural Resource Conservation Service (NRCS) has not classified any of the land in the area of the landfill as prime farmland. The proposed project will not alter current land use in the area as all improvements will occur within the existing boundary of the landfill on city-owned property.

2. Floodplains – The landfill is not located within any designated floodplains and there will be no disturbances beyond the existing landfill boundaries.

3. Wetlands – Impacts to wetlands are not anticipated. No wetlands exist within the proposed project boundaries.

4. Cultural Resources – No impacts to cultural resources are anticipated. All construction activity will occur within the fence line of the landfill property which has been previously disturbed during previous and current landfill operations. No historic structures will be impacted.

5. Fish and Wildlife —Expansion of the landfill gas collection system will collect and treat additional VOCs and is expected to lower VOC concentrations within the groundwater. Improved groundwater quality in the area will also improve the water quality within ponds and seeps fed by the groundwater and will better protect aquatic life or wildlife that may contact these surface waters.

   Minor trench excavations and well construction may temporarily disrupt wildlife that feed within the boundaries of the landfill, but disturbances to vegetation that do occur will be small in relation to the remaining undisturbed portions of the landfill.

6. Water Quality – The recommended alternative is expected to improve groundwater quality in the area of the landfill. The proposed alternative will increase the collection efficiency of the existing LFG system removing the VOCs from the vadose zone before they can contaminate the groundwater that flows beneath the landfill. In addition, as air is injected into the groundwater it will result in VOCs separating from the aqueous phase to the vapor phase, where they will be removed from the environment via the SVE wells and thermally treated in flare, and/or passed through a GAC filter, effectively remediating the contaminated groundwater. It is expected that VOC contaminated groundwater that is beyond the boundaries of the landfill will naturally attenuate. By enhancing source control of the VOCs and remediating the groundwater, down gradient surface water features (e.g., ponds, streams, and wetlands) will also be protected.

7. Air Quality – The Bozeman Landfill currently operates under Montana Air Quality Permit (MAQP) #2951-04 issued by the DEQ Air Quality Bureau. The proposed project will expand the landfill gas collection system resulting in the collection and subsequent destruction of more landfill gases (including VOCs). The emissions levels in the facility's existing MAQP were based on an input capacity to the flare of 700 cfm. The facility currently operates with a flare input of approximately 150 cfm. Provided the improvements will not result in an input capacity that exceeds 700 cfm the facility should remain in compliance with its existing permitted emission levels. Consideration is also being given to the installation of either a new granular activated carbon (GAC) filter system and/or a new flare to treat the landfill gases (including VOCs). If a GAC filtration system is utilized there should be no increase in emissions from the site. If a new flare is installed, a modification of the facility's MAQP will be required a process that will require the submittal of a new permit application with application fee, issuance of a public notice, a 30-day public comment period on the draft permit, and completion of a human health risk assessment. In addition, should the new flare result in potential emission levels in excess of 100 tons per year of any regulated pollutant from the facility, it would be designated as a major source of

emissions and the landfill would need to apply for a Title V Operating Permit.

Short-term negative impacts on air quality are expected to occur during construction as gases are released from the drilling activities and from heavy equipment in the form of dust and exhaust fumes. Proper construction practices will minimize this potential problem. The prevailing wind direction, from the southwest in the area, will also help to minimize the influence of odors upon residents in the area during well installation.

8. Public Health - Public health will not be negatively affected by the proposed project. The proposed remediation improvements will provide long-term protection to human health and the environment as long as the system is in operation. The groundwater flowing under the landfill and the surrounding vadose zone should see reductions in the concentration of contaminants as the VOCs are liberated and sent to a flare for thermal treatment and/or a GAC filtration system.

   Workers installing the LFG wells, AZAI/AS wells, and SVE wells could be exposed to physical safety hazards including fire, explosions, and potential chemical exposures to methane, carbon dioxide, and trace VOCs. Proper construction and safety practices should eliminate these hazards.

   Human exposure to residual groundwater contamination is expected to be negligible due to the low concentrations measured and will only decrease as source control measures are implemented and natural attenuation occurs. Furthermore, all impacted homes are on city water services. The exposure to humans via the respiratory system will also be minimal as the VOCs extracted from the groundwater and vadose zone will be thermally destroyed in a flare, and/or removed in a GAC filter.

   In-home mitigation systems were installed by the City of Bozeman in 27 homes located in the Bridger Creek Subdivision as a means to prevent migrating landfill gases from infiltrating into homes. After the installation of these systems, indoor air quality sampling detected low concentrations of some compounds. However, the level of these compounds were at the low end of the range of concentrations typically found in indoor air in Montana and did not appear to be coming from beneath the home, but rather from products typically found within a home. It is also worth noting that the mitigation systems reduced radon levels in these homes as well.

9. Energy – An increase in energy consumption will occur after the new remediation system is constructed. Energy consumption will be minimized as much as possible through the use of energy efficient equipment (i.e., air compressors, vacuum blowers, etc.).

The consumption of energy resources directly associated with construction of the recommended improvements is unavoidable, but will be a short-term commitment.

10. Noise - Short-term impacts from excessive noise levels may occur during the construction activities. The construction period will be limited to normal daytime hours to avoid early morning or late evening construction disturbances. The new compressor and vacuum blower will be located north of the closed cell (near the center of the city property) to minimize noise, so no significant long-term impacts from noise will occur.

11. Environmental Justice – Environmental Justice Executive Order 12898: The proposed project will not result in disproportionately high or adverse human health or environmental effects on minority or low income populations. No disproportionate effects among any portion of the community would be expected.

12. Wild and Scenic River Act – The proposed project will not impact any rivers designated as wild and scenic by Congress or the Secretary of the Interior.

13. Growth – The proposed remediation improvements will occur at a landfill that has been closed since 2008. Therefore, there will be no impact on the growth of the community. The citizens of Bozeman are currently served by a landfill located near Logan, Montana.

14. Cumulative Effects – The proposed remediation improvements will occur at a landfill that has been closed since 2008. There may be secondary impacts to the air shed if additional VOCs and methane gas are treated with a flare. Provided the improvements will not result in an input capacity to the flare that exceeds 700 cfm (current operation is approximately 150 cfm) the facility should remain in compliance with its permitted emission levels. If a new flare is installed, a modification of the facility's existing MAQP will be required. Through this process, the DEQ will determine the air quality impacts to the area and will complete a health risk assessment based on the anticipated emissions from the flare. Emission limits will be set that are protective of public health. If a GAC filtration system is utilized there should be no increase in emissions from the site.

B. UNAVOIDABLE ADVERSE IMPACTS

Short-term construction related impacts (i.e., noise, dust, etc.) will occur, but should be minimized through proper construction management. Energy consumption during construction and energy for operation of the new air compressor and vacuum blower cannot be avoided.

VI. PUBLIC PARTICIPATION

The public has been made aware of the Bozeman Story Mill Landfill VOC issue and the remediation alternatives considered addressing that issue through numerous articles published in the Bozeman Daily Chronicle, news broadcasts, the city's website, letters mailed directly to impacted homeowners, and public meetings. The information covered included facility history, an overview of the site and soil gas movement, updates on sampling and remediation efforts, and potential health risks. Meetings were also held with realtors and lenders to apprise them of the situation impacting the Bridger Creek Subdivision residents and their property. The findings of the CMA, prepared by Tetra Tech, were presented at the City Commission Meeting held on October 15, 2014. This meeting presented the remedial alternatives considered and details of the recommended alternative proposed for implementation. Additional action taken based on public comments to the CMA included the installation of additional monitoring wells to better assess the nature and extent of the contaminants, an analysis of the effectiveness of the proposed technology to achieve contaminant reduction rates at similar sites, and the development of a back-up plan should the selected alternative not produce the desired results.

VII. AGENCY ACTION, APPLICABLE REGULATIONS AND PERMITTING AUTHORITIES

All proposed improvements will be designed to meet state standards in accordance with the DEQ Solid Waste program, and will be constructed using standard construction methods. Best management practices will be implemented to minimize or eliminate pollutants during construction. No additional permits will be required from the State Revolving Fund (SRF) section of DEQ for this project after the review and approval of the submitted plans and specifications by the Solid Waste Program. However, coverage under the storm water general discharge permit will be required from DEQ Water Protection Bureau prior to the beginning of construction. A modified MAQP issued by the DEQ Air Quality Bureau will be required prior to construction of the proposed improvements if necessary.

VIII. RECOMMENDATION FOR FURTHER ENVIRONMENTAL ANALYSIS

[ ] EIS [ ] More Detailed EA [X] No Further Analysis

Rationale for Recommendation: Through this EA, DEQ has verified that none of the adverse impacts of the proposed Bozeman Story Mill Landfill project are significant. Therefore, an environmental impact statement is not required. The environmental review was conducted in accordance with the Administrative Rules of Montana (ARM) 17.4.607, 17.4.608, 17.4.609, and 17.4.610. The EA is the appropriate level of analysis because none of the adverse effects of the impacts are significant.

IX. REFERENCE DOCUMENTS

The following documents have been utilized in the environmental review of this project and are considered to be part of the project file:

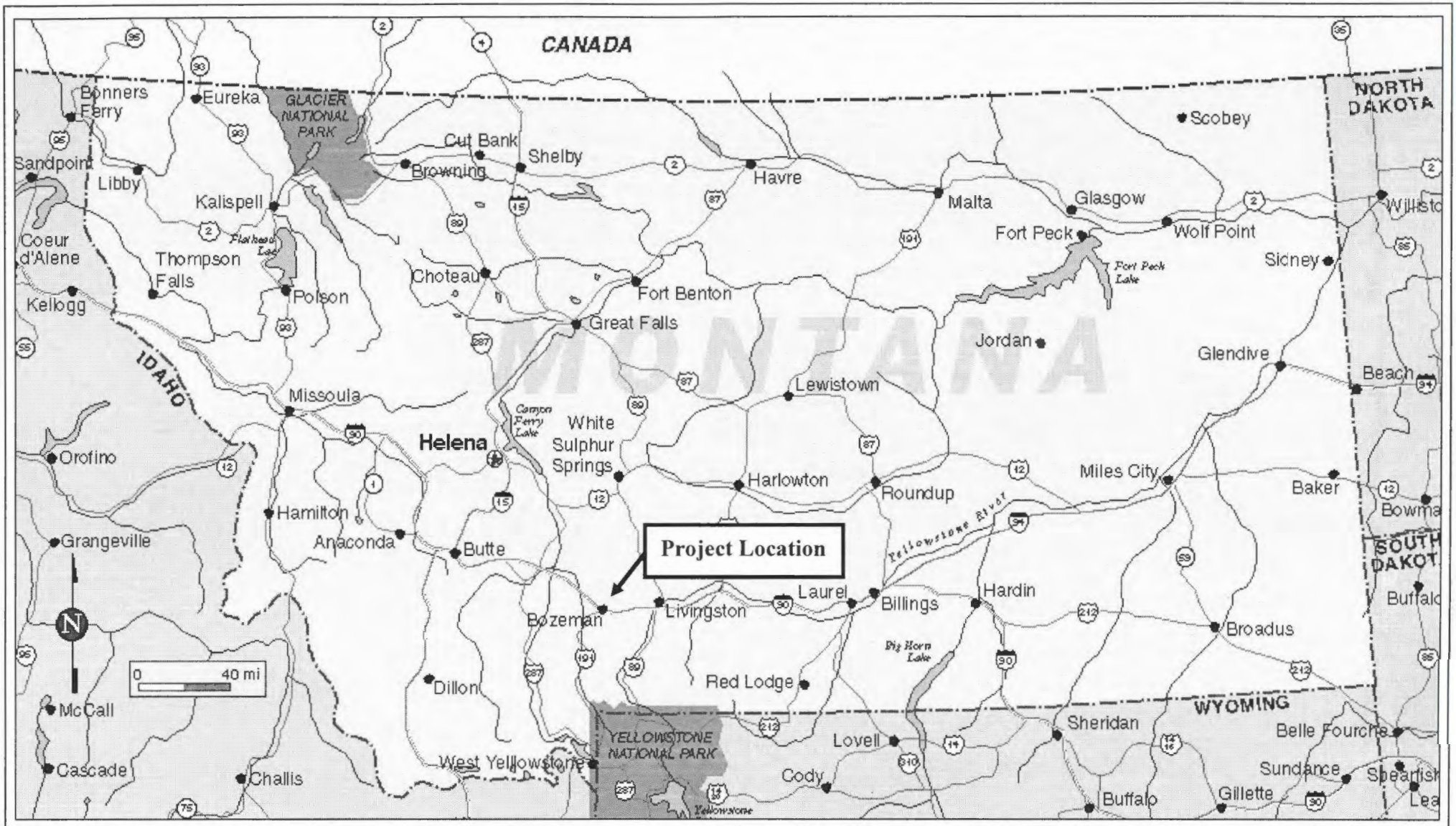
1. Draft Revised Corrective Measures Assessment Bozeman Landfill. September 2014, prepared by Tetra Tech Inc.
2. Responses to Comments of Draft Revised Corrective Measures Assessment City of Bozeman. March 2015, prepared by Tetra Tech Inc.
3. Uniform Environmental Checklist. April 2015, prepared by Tetra Tech Inc.
4. Public outreach documentation. June 2013 to April 2015, prepared by City of Bozeman
5. Uniform Application Forms for Montana Public Facility Projects. March 2014, prepared by City of Bozeman.
6. Soil Data Mart website from the Department of Natural Resources Conservation Service, http://soildatamart.nrcs.usda.gov/ Gallatin County. 2014

EA Prepared by:

Mike Abrahamson, P.E. — Date: 4/16/15

EA Reviewed by:

Jerry Paddock, P.E. — Date: 4/16/15



Montana Department of
ENVIRONMENTAL QUALITY

Figure 1. Site Location Map – Bozeman, MT

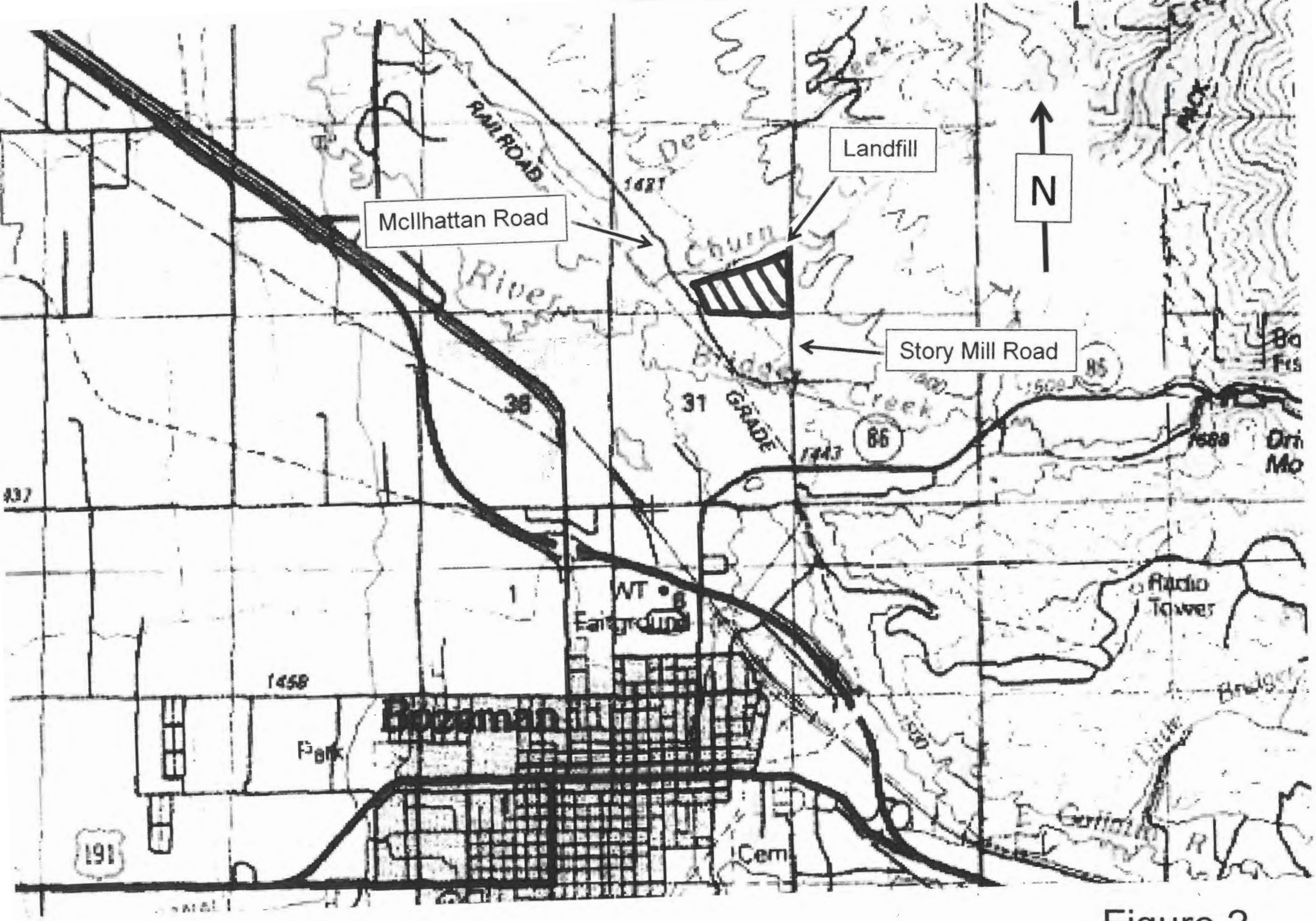

Landfill
N
McIlhattan Road
Story Mill Road
RAILROAD
Chum
River
Bridger
Creek
GRADE
31
36
1
Fairgrounds
Radio
Tower
Bozeman
Park
Cem
191
66
85

Figure 2

O:\A-G\Bozeman City of\114-560446 - Bozeman LF Remediation\120-GIS\Arcmap\F-1-1-Site Plan.mxd

N
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0 400 800
Feet

Datum: NAD83 StatePlane Montana

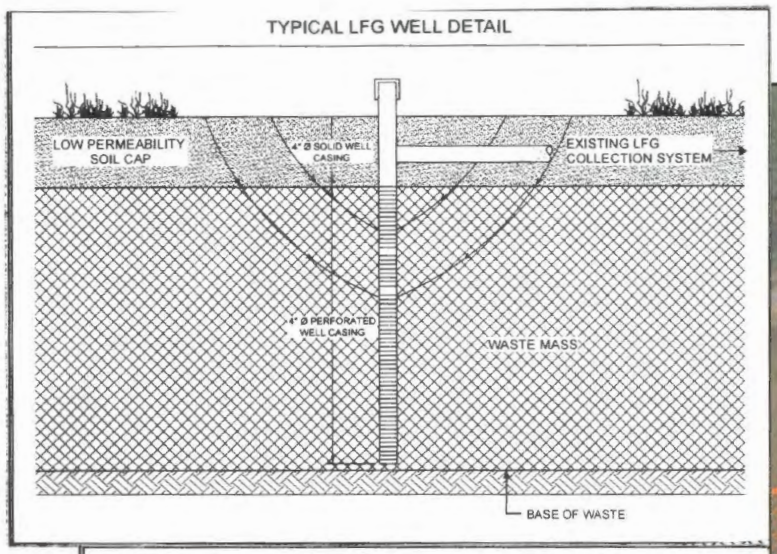
NOTE:
All station locations and landfill boundary are approximate

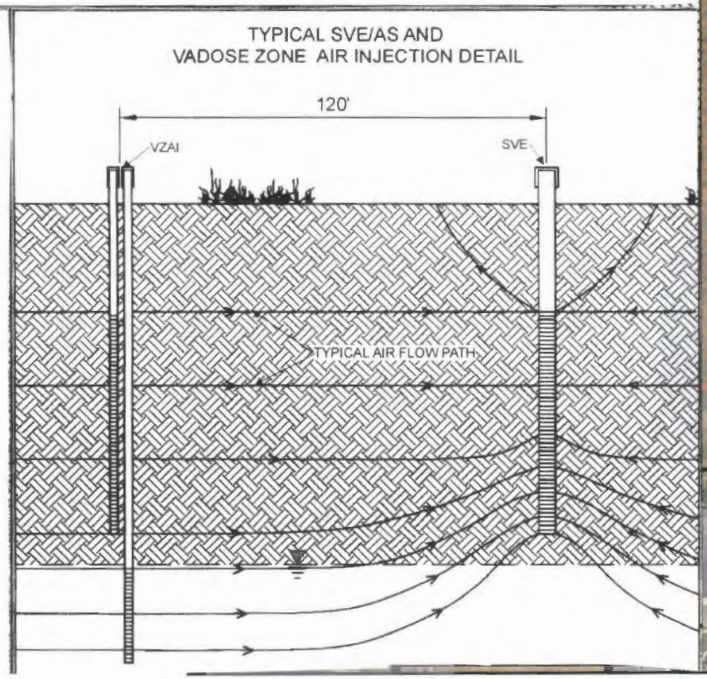
Landfill Property Boundary
Flow Direction

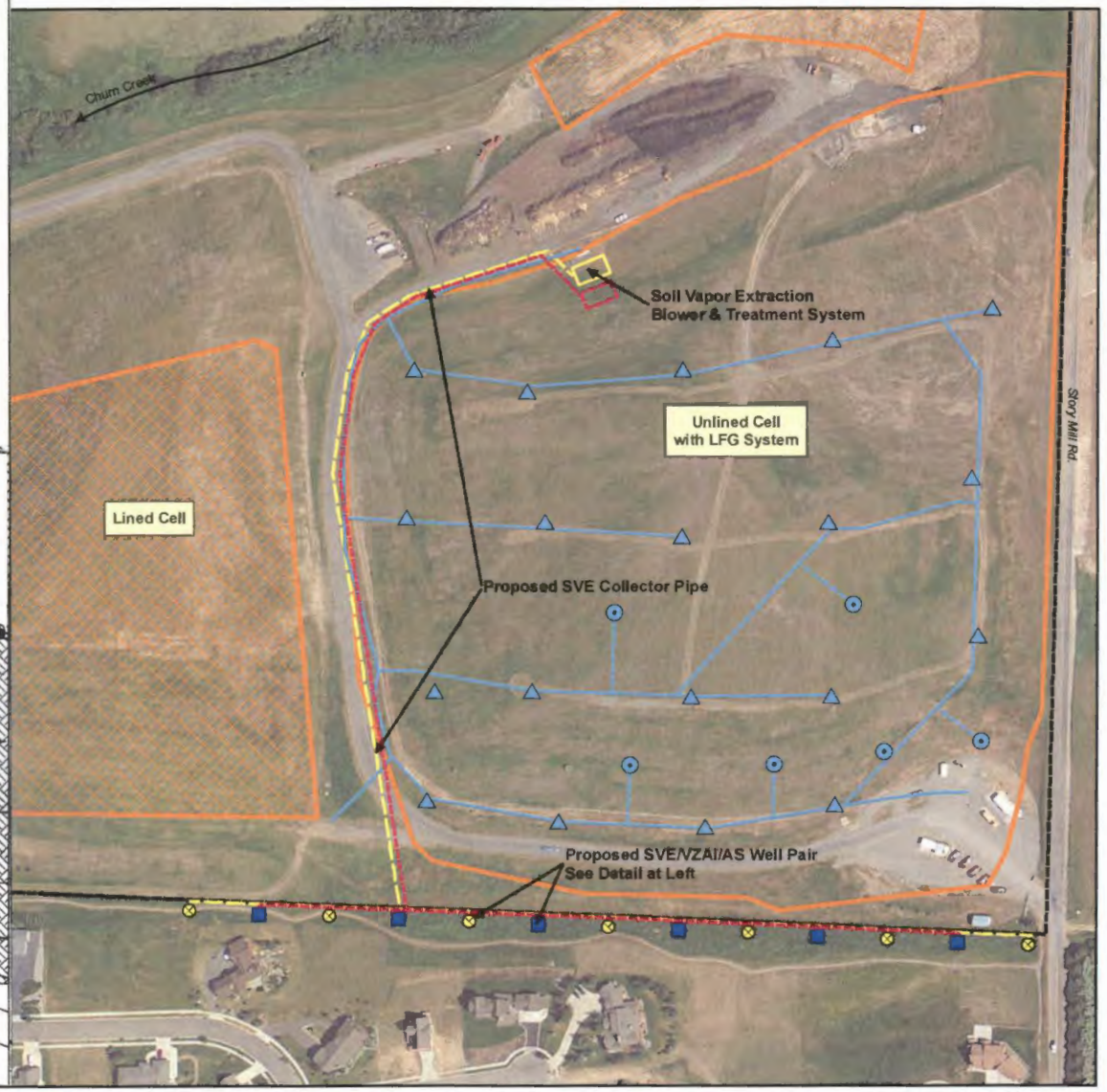
Class IV Cell
Lined Landfill
Unlined Landfill

Site Plan
Revised Corrective Measures Assessment
City of Bozeman Landfill
Bozeman, Montana

Figure 3







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Datum: NAD83 StatePlane Montana

- Proposed Vadose Zone Injection/Air Sparging Wells
- Existing Landfill Gas Extraction Well
- Proposed Additional Landfill Gas Extraction Well
- SVE Well Location
- Existing Landfill Gas Collection Pipe
- Proposed Landfill Gas Collection Pipe
- Proposed Air Sparge Pipe
- SVE Collection Pipe
- Flow Direction
- Landfill Property Boundary
- Class IV Cell
- Lined Landfill
- Unlined Landfill

Conceptual SVE, Vadose Zone Air Injection/Air Sparging & Additional Landfill Gas Extraction Well
Revised Corrective Measures Assessment
City of Bozeman Landfill
Bozeman, Montana

Figure 4